



၂၀၂၁ ခုနှစ်၊ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုရ

ပါရဂူကျမ်း

သုတေသနလုပ်ငန်း အစီရင်ခံစာများ

2021 Calendar Year, Myanmar Academy of Arts and Science Award Winning
Doctoral Dissertation

Research Reports

၂၀၂၄ ခုနှစ်၊ ဇွန်လ

2024, June



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အမှာစာ

ပညာရေးသည် လူမှုစီးပွား ဘဝကို မြှင့်တင်ပေး ရုံသာမက၊ ပြည်တွင်း ငြိမ်းချမ်းရေးမှသည် နိုင်ငံတော်၏ စီးပွားရေးနှင့် အမျိုးသားစည်းလုံးညီညွတ်ရေးကို ဖွံ့ဖြိုးတိုးတက်စေရာတွင် အဓိကအခန်းကဏ္ဍမှ ပါဝင်နေပါသည်။

မြန်မာနိုင်ငံ၏ ပညာရေးအဆင့်အတန်းကို နိုင်ငံတော်က အာဆီယံဒေသတွင်း နိုင်ငံများ၏ အဆင့်အတန်းမှသည် ကမ္ဘာ့ဖွံ့ဖြိုးပြီးနိုင်ငံကြီးများ၏ အဆင့်အတန်းကို မီသည်အထိ မြှင့်တင်ပေးသွားရန် ရည်မှန်းထားပါသည်။ ပညာရေးဝန်ကြီးဌာနအနေဖြင့် ဤရည်မှန်းချက် အထမြောက်စေရေးအတွက် အမျိုးသားပညာရေး မဟာဗျူဟာ စီမံကိန်း (၂၀၂၁-၂၀၃၀)ကို ရေးဆွဲချမှတ်၍ အကောင်အထည်ဖော် ဆောင်ရွက်လျက်ရှိပါသည်။

အမျိုးသားပညာရေးဥပဒေကို ပြင်ဆင် သည့်ဥပဒေ (၂၀၁၅)၊ စာမျက်နှာ (၁၃)၊ ပုဒ်မ(၂၈)တွင် သုတေသန ဆောင်ရွက်မှုနှင့်စပ်လျဉ်း၍ အဆင့်မြင့်ပညာ သင်ကြားပို့ချနေသော တက္ကသိုလ်ကောလိပ်များအား သုတေသနနှင့် ပညာရပ်ဖွံ့ဖြိုးမှုကို ဦးစားပေး ဆောင်ရွက်ရမည်ဟု ပြဌာန်းထားပါသည်။

နိုင်ငံတော်အစိုးရက မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ကို ၁၉၉၉ ခုနှစ်၊ ဩဂုတ်လ (၁၆)ရက်နေ့တွင် ဖွဲ့စည်းပေးခဲ့ပါသည်။ ဤပညာရှင်အဖွဲ့အနေဖြင့် ပညာရေးနှင့် နီးနယ်သော -

- (က) သင်ကြားရေးနှင့်သင်ယူရေး၊
- (ခ) သုတေသန လုပ်ငန်းလမ်းညွှန်မှု ပေးရေး၊
- (ဂ) ပညာပြန့်ပွားရေးနှင့်ပညာဖြန့်ဖြူးရေး၊
- (ဃ) ပညာရှင်များ ပြုစုပျိုးထောင်ရေး

ဟူသော လုပ်ငန်းကြီးလေးမျိုးကို ပညာရေးကဏ္ဍ၏ လိုအပ်ချက်များအရ ဦးစားပေးအစီအစဉ်အတိုင်း ပြည်တွင်း ပြည်ပ ပညာရှင်များနှင့် ပူးပေါင်း၍ ဆောင်ရွက်လျက်ရှိပါသည်။

ပညာရှင်အဖွဲ့ကို စတင်ဖွဲ့စည်းချိန် ၁၉၉၉ ခုနှစ်မှစတင်၍ သုတေသနစာတမ်းဖတ်ပွဲများကို နှစ်စဉ် ကျင်းပ ပေးနိုင်ခဲ့ပါသည်။ ၂၀၀၅ ခုနှစ် ပဉ္စမအကြိမ် သုတေသနစာတမ်းဖတ်ပွဲမှ အစပြု၍ **အကောင်းဆုံး သုတေသန စာတမ်းဆု(Best Paper Award)**ကို ချီးမြှင့်ခဲ့ရာ၊ တစ်နှစ်ထက်တစ်နှစ် ဆုရစာတမ်းများ၏ အရေအတွက် ပိုမို၍တိုးပွားလာခဲ့ပါသည်။ ၂၀၂၂ ခုနှစ်တွင် သုတေသနညီလာခံ၌ အကောင်းဆုံး သုတေသနစာတမ်းဆုကို စာတမ်းရှင် စုစုပေါင်း (၂၄)ဦး အား ချီးမြှင့်နိုင်ခဲ့ပါသည်။

သုတေသနလုပ်ငန်းများပေါ် အခြေခံ၍ ပါရဂူကျမ်းပြုစုခဲ့သော ပညာရှင်များအနက် ထူးချွန်သူများအား ရွေးချယ်၍ **မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆု** (Academy Award) ကို ချီးမြှင့်ရန် ပညာရှင်အဖွဲ့အနေဖြင့် ကြိုးပမ်းခဲ့ပါသည်။ ၂၀၂၁ ပြည့်နှစ်တွင် ပါရဂူဘွဲ့ ရရှိခဲ့သူ စုစုပေါင်း (၁၆)ဦး ယှဉ်ပြိုင်ခဲ့ရာ (၈) ဦး ပညာရှင်အဖွဲ့ဆု ရရှိခဲ့ကြပါသည်။ ဘာသာရပ်တိုင်း၌ ပညာရှင်အဖွဲ့ဆု၏ အရေအတွက်နှင့်အတူ ဆုငွေ၏ပမာဏကိုလည်း တိုးမြှင့်ပေးအပ်သွားရန်ပညာရှင်အဖွဲ့က ကြိုးစားနေပါသည်။ ပညာရှင်အဖွဲ့ဆု အစပျိုးချိန်တွင် ပညာရှင်အဖွဲ့၊ ထွန်းဖောင်ဒေးရှင်း၊ သီရိမွန် ဖောင်ဒေးရှင်း၊ ကမ္ဘောဇဘဏ်တို့၏ လှူဒါန်းငွေဖြင့် ဆုများကိုချီးမြှင့်ခဲ့ပါသည်။

ယခုအခါ (က) မြန်မာနိုင်ငံစာစစ်အဖွဲ့ဥက္ကဋ္ဌ(ငြိမ်း) ဦးမောင်မောင်စိန်နှင့်ဇနီး ဒေါ်ခင်မာမာတို့က ရန်ကုန် တက္ကသိုလ် ပါမောက္ခချုပ် ဆရာကြီး ဒေါက်တာထင်အောင် အထိမ်းအမှတ်အဖြစ် လှူဒါန်းငွေ၊

- (ခ) ရန်ကုန်စီးပွားရေးတက္ကသိုလ်မှ ဆရာကြီး ဦးဝီလျံပေါ အထိမ်းအမှတ်အဖြစ် လှူဒါန်းငွေ၊
- (ဂ) ရန်ကုန်တက္ကသိုလ် မြန်မာစာဌာနမှ မြန်မာစာဌာန တည်ထောင်ခဲ့သည့် (၇၅) နှစ်ပြည့် အထိမ်းအမှတ်အဖြစ် လှူဒါန်းငွေနှင့်

(ဃ) ဆရာမကြီး ဒေါ်ခင်သိန်း၊ ပါမောက္ခ(ငြိမ်း)၊ အရှေ့တိုင်းပညာဌာနမှ ရန်ကုန်တက္ကသိုလ် ပါမောက္ခချုပ် ဆရာကြီးဦးဖေမောင်တင် အထိမ်းအမှတ်အဖြစ် လှူဒါန်းငွေ များကို ဘဏ်တွင်ပဒေသာပင်အဖြစ် အပ်နှံကာတိုးပွားလာသည့် ဘဏ်အတိုးငွေများဖြင့် ဆုငွေကိုချီးမြှင့်လျက် ရှိပါသည်။

ထိုလှူဒါန်းငွေများအပြင် သုတေသနစာတမ်းဆုနှင့် ပညာရှင်အဖွဲ့ဆုအတွက် ၂၀၁၆ ခုနှစ်၊ (၁၆) ကြိမ်မြောက် သုတေသနစာတမ်းဖတ်ပွဲမှ အစပြု၍ ပညာရေးဝန်ကြီးဌာနမှ ဆုငွေများကို ထုတ်ပေးနေပါသည်။

တက္ကသိုလ်၊ ကောလိပ်များမှ ဆရာဆရာမများ၏ စွမ်းဆောင်ရည်သည် တစ်ဦးချင်း၏ ပညာ အရည်အချင်းနှင့်အတူ မိမိတတ်ကျွမ်းသော ဘာသာရပ်၌ မိမိဆောင်ရွက်ခဲ့သော သုတေသနလုပ်ငန်းများမှ ရရှိထားသည့် အတွေ့အကြုံများ အပေါ်တွင်လည်း အများအပြား မူတည်နေပါသည်။

(၂၂) ကြိမ်မြောက် သုတေသနညီလာခံတွင် ၂၀၂၁ ပြက္ခဒိန်နှစ် အတွက် မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံ ပညာရှင် အဖွဲ့ဆု ရရှိခဲ့သည့် သုတေသနလုပ်ငန်း အစီရင်ခံစာများမှာ အောက်ပါအတိုင်း ဖြစ်ပါသည် -

(က) ဝိဇ္ဇာပညာရပ်

- နိုင်ငံတကာဆက်ဆံရေးပညာ ဘာသာရပ်
Myanmar-China-India Trilateral Relations Since 2011
- ဒဿနိကဗေဒ ဘာသာရပ်
The Sceptical Trend and Its Contribution to Western Philosophy
- စိတ်ပညာ ဘာသာရပ်
The Correlates and Consequences of Post-Traumatic Stress Disorder Among Disaster Victims in Myanmar
- မြန်မာစာ ဘာသာရပ်
ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်း နှင့် အခြားရာဇဝင်ဆိုင်ရာ စာပေများ နှိုင်းယှဉ်လေ့လာချက်

(ခ) သိပ္ပံပညာရပ်

- သတ္တဗေဒ ဘာသာရပ်
Seasonal Prevalence of *Aedes Aegypti* (Linnaeus, 1762) Larvae in Various Water Storage Containers in Six Areas of Hinthada District, Ayeyarwady Region
- ဓာတုဗေဒ ဘာသာရပ်
Chemical and Pharmacological Study of Bioactive Secondary Metabolites from *Pseudomonas Aeruginosa*

(ဂ) လူမှုရေးပညာရပ်

- သင်ရိုးညွှန်းတမ်းနှင့် သင်ပြနည်း ဘာသာရပ်
An Investigation into The Impact of Contextualized Instruction in Learning Physics at The High School Level in Myanmar

▪ ပညာရေးစိတ်ပညာ ဘာသာရပ်

An Analytical Study of the Effect of Classroom Emotional Climate on Motivating Learners and Their Moral Maturity

ပါရဂူကျမ်းဆိုင်ရာ သုတေသနပြုစုသူများ အပါအဝင် တက္ကသိုလ် ဆရာ၊ ဆရာမများနှင့် အများပြည်သူတို့ လေ့လာခွင့် ရရှိစေရန် ရည်ရွယ်၍ ဤစာအုပ်ကို ပုံနှိပ်ထုတ်ဝေ ဖြန့်ချိခြင်း ဖြစ်ပါသည်။



ဒေါက်တာသက်လွင်

ဥက္ကဋ္ဌ

မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့

FOREWORD

Education not only improves socio-economic lives of all ethnic groups in enhancing the country's economy, national unity, peace and tranquility.

The Primary aim of the government is to raise the level of Myanmar education from the current level of the ASEAN member countries to those of the world's developed countries. The Ministry of Education has been implementing the National Education Strategic Plan 2021-2030 to achieve this goal.

The National Education Law had been amended in 2015; On page 13, Section 28 of this law stipulates that research and academic development projects must be given priority by universities and colleges offering various courses.

In 1999, the government constituted the Myanmar Academy of Arts and Science on August 16, academics at Higher Education Institutions were entrusted with the following tasks –

- (a) teaching and learning,
- (b) providing research guidance,
- (c) Imparting core subject and disseminating knowledge, and
- (d) Nurturing Scholars.

According to the needs of the education sector, these tasks are being carried out in cooperation with both local as well as overseas experts according to priorities adopted in the strategic plan.

Since the establishment of the academy in 1999, research conferences have been held every year. Beginning with the fifth research conference in 2005, the Best Paper Award was awarded. The number of award-winning papers has increased year by year; in 2022 a total of 24 authors received the best paper award.

Based on the research activities, the academy tried to confer **Myanmar Academy of Arts and Science Award** (Academy Award) to outstanding scholars who had submitted doctoral theses. In 2021, out of a total of five 16 scholars who had earned their doctorate degrees, eight received the academy award. Our academy is trying to increase the amount of prize money in every subject. At the time of the initiation of the award, prizes were awarded with donations from Thiri Mon Foundation, Htun Foundation, Kanbawza Bank and other donors viz.

- (a) Retired President of the Board of Examinations U Maung Maung Sein and his spouse donated money in commemoration of Sayagyi Dr Htin Aung, Rector of Rangoon University
- (b) Yangon University of Economics donated money in commemoration of Sayagyi Saw William Paw
- (c) Department of Myanmar, University of Yangon, donated money in commemoration of its 75th anniversary, and
- (d) Sayamagyi Daw Khin Thein, Retired Professor of the Department of Oriental Studies, University of Yangon donated money in commemoration of Sayagyi U Pe Maung Tin

In addition to those donations, for the Best Paper Award and the Academy Award in 2016. Starting from the 16th Research Conference, the Ministry of Education has been providing funds for conferring awards.

The performance of academics viz. faculty staff members at higher education institutions depends to a large extent on the individual's educational qualifications as well as the experience gained from the research activities carried out in the subject of his/her choice.

The research reports that won Academy Award for the 2021 calendar year at the 22nd Research Conference were given below –

The best research report of doctoral theses for the year 2021 are:

(a) Arts

- International Relations

Myanmar-China-India Trilateral Relations Since 2011

- Philosophy

The Sceptical Trend and Its Contribution to Western Philosophy

- Psychology

The Correlates and Consequences of Post-Traumatic Stress Disorder Among Disaster Victims in Myanmar

- Myanmar

ထွန်းရွှေနိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်း နှင့် အခြားရာဇဝင်ဆိုင်ရာ စာပေများ နှိုင်းယှဉ်လေ့လာချက်

(b) Physical Sciences

Zoology

Seasonal Prevalence of *Aedes Aegypti* (Linnaeus, 1762) Larvae in Various Water Storage Containers in Six Areas of Hinthada District, Ayeyarwady Region

Chemistry

Chemical and Pharmacological Study of Bioactive Secondary Metabolites from *Pseudomonas Aeruginosa*

(c) Social Science

▪ **Curriculum and Methodology**

An Investigation into the Impact of Contextualized Instruction in Learning Physics at the High School Level in Myanmar

▪ **Educational Psychology**

An Analytical Study of the Effect of Classroom Emotional Climate on Motivating Learners and their Moral Maturity

The Myanmar Academy of Arts and Science is delighted to publish this book for the benefit of the Contestants concerned, the academicians in the universities and colleges as well as the general public.



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President

Myanmar Academy of Arts and Science

၂၀၂၁ ခုနှစ်၊ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုနှင့်
နှီးနွယ်သော ပါရဂူကျမ်းနှင့်သုတေသနလုပ်ငန်းအစီရင်ခံစာ
ရွေးချယ်မှု

- ရည်ရွယ်ချက်
- ဆုပေးအပ်ချီးမြှင့်မှု
- စံသတ်မှတ်ချက်
- ရွေးချယ်ရေးအဖွဲ့ ဖွဲ့စည်းခြင်း
- ဆုချီးမြှင့်ခြင်း

၁။ ။ ၂၀၂၁ ခုနှစ်၊ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုနှင့် နှီးနှယ်သော ပါရဂူကျမ်းသုတေသနလုပ်ငန်း အစီရင်ခံစာ ရွေးချယ်မှု

ရည်ရွယ်ချက်

၁။ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့၊ အခြေခံစည်းမျဉ်းများ အခန်း(၂)၊ အပိုဒ် (၃) တွင်ပါရှိသည့် ရည်ရွယ်ချက် (၅)ရပ်အနက် -

(၁) နိုင်ငံတော်ကို အကျိုးပြုမည့် သုတေသနလုပ်ငန်းများ ဆောင်ရွက်ရန်နှင့်

(၂) နိုင်ငံတော်ကိုအကျိုးပြုမည့် ဝိဇ္ဇာသိပ္ပံပညာရှင်များ မွေးထုတ်နိုင်ရေးအတွက် စီမံ ဆောင်ရွက်ရန်၊

တို့ပါရှိပါသည်။

ဆုပေးအပ်ချီးမြှင့်မှု

၂။ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အမှုဆောင်အဖွဲ့၏ စတုတ္ထလုပ်ငန်းအဖွဲ့ဖြစ်သော ပညာရှင်ပြုစု ပျိုးထောင်ရေးအဖွဲ့က ချမှတ်ထားသည့် လုပ်ငန်းစဉ် (၁၄)ရပ်အနက်၊ လုပ်ငန်းစဉ် (၆)တွင် ဝိဇ္ဇာနှင့်သိပ္ပံ ပညာရပ်ဆိုင်ရာ ကျမ်းများ၊ စာအုပ်များအနက်မှ အကောင်းဆုံးကို “ဝိဇ္ဇာနှင့်သိပ္ပံဘာသာ စာပေဆု” ချီးမြှင့်ရန် ပါရှိပါသည်။ အဆိုပါဆုကို မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုအနေဖြင့် ထိုက်တန်စွာပေးအပ်ချီးမြှင့်ရန် ရည်ရွယ်ခြင်း ဖြစ်ပါသည်။

စံသတ်မှတ်ချက်

၃။ “မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆု” ရွေးချယ်ရေးအတွက် ယေဘုယျသတ်မှတ်ထားသော စံများမှာ အောက်ပါအတိုင်းဖြစ်ပါသည်-

- (က) ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံတော်၊ ပညာရေးဝန်ကြီးဌာနအောက်ရှိ တက္ကသိုလ်များတွင် သတ်မှတ်ထားသည့်ခုနှစ်အတွင်း တင်သွင်းလက်ခံခဲ့သော ပါရဂူကျမ်း ဖြစ်ရမည်။
- (ခ) နိုင်ငံတော်နှင့်လူမျိုးအတွက် အသိဉာဏ်တိုးတက်စေရန်(သို့မဟုတ်) အသိဉာဏ်ကို အသုံးပြုနိုင်စေ ရန် (သို့မဟုတ်) သက်ဆိုင်ရာဘာသာရပ် ဖွံ့ဖြိုးတိုးတက်စေရန် ထူးခြားစွာအကျိုးပြုစေနိုင်သည့် ပါရဂူကျမ်းဖြစ်ရမည်။
- (ဂ) “မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့ဆု” အတွက် မိမိ၏ပါရဂူကျမ်းကိုအခြေခံ၍ စာမျက်နှာ (၂၀-၃၀) ခန့်ရှိ သုတေသနလုပ်ငန်း အစီရင်ခံစာ (Research Report) ပြုစုရေးသားတင်သွင်းရမည်။
- (ဃ) မူပိုင်ကိစ္စနှင့်စပ်လျဉ်း၍ ရှင်းရှင်းလင်းလင်း ရှိစေရမည်။
- (င) ၂၀၂၁ ခုနှစ်အတွင်း ပညာရေးဝန်ကြီးဌာန အောက်ရှိ တက္ကသိုလ်များတွင် ထုတ်ပြန်သော ပါရဂူကျမ်း အောင်စာရင်းတွင် ပါရှိကြောင်း သက်ဆိုင်ရာ ပါရဂူဘွဲ့ရယူခဲ့သည့် တက္ကသိုလ်၏ မော်ကွန်းထိန်းထံမှ ထောက်ခံချက်ပါရှိရမည်။

ရွေးချယ်ရေးအဖွဲ့ ဖွဲ့စည်းခြင်း

၄။ “မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆု” ရွေးချယ်ရေးအဖွဲ့များကို အကဲဖြတ်နိုင်မည့် ပညာရှင်များဖြင့် ဖွဲ့စည်း၍ ရွေးချယ်ခြင်းဖြစ်ပါသည်။

၅။ သုတေသနလုပ်ငန်းအစီရင်ခံစာကို အောက်ဖော်ပြပါ မူ (၅)ရပ်အပေါ်တွင် အခြေခံ၍ အကဲဖြတ်ရွေးချယ်ပါသည်-

- (က) သုတေသနလုပ်ငန်းသည် နိုင်ငံတော်အတွက် မည်၍ မည်မျှအကျိုးပြုခြင်း (Contribution to the National Interest)
- (ခ) သုတေသနလုပ်ငန်းသည် ပင်ကိုဖြစ်ခြင်း (Originality)
- (ဂ) သုတေသနလုပ်ငန်းကို စနစ်တကျ/သိပ္ပံနည်းကျ ဆောင်ရွက်ထားခြင်း (Systematic/Scientific Approach)
- (ဃ) သုတေသနလုပ်ငန်းသည် ဘာသာရပ်အတွက် မည်သည့်အတိုင်းအတာအထိ အကျိုးပြုနိုင်ခြင်း (Contribution to the Subject)
- (င) သုတေသနအစီရင်ခံစာ ဖတ်ကြားတင်ပြပုံ စနစ်ကျနခြင်း (Presentation, Format and Style)

ဆုချီးမြှင့်ခြင်း

၆။ “မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆု” ချီးမြှင့်ပေးအပ်ရာတွင် -

- (က) အဆိုပြုလာသော ဝိဇ္ဇာဘာသာရပ်ဆိုင်ရာ ပါရဂူကျမ်းများအနက်၊ အကောင်းဆုံး ဝိဇ္ဇာပညာရပ် ပါရဂူကျမ်းနှင့် သုတေသနလုပ်ငန်းအစီရင်ခံစာ ပြုစုသောပုဂ္ဂိုလ်အား ပညာရှင်အဖွဲ့၏ဆုကို **ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့ဆု (ဝိဇ္ဇာပညာရပ်)** ဟူ၍လည်းကောင်း၊
- (ခ) အဆိုပြုလာသော သိပ္ပံဘာသာရပ်ဆိုင်ရာ ပါရဂူကျမ်းများအနက်၊ အကောင်းဆုံး သိပ္ပံပညာရပ် ပါရဂူကျမ်းနှင့် သုတေသနလုပ်ငန်း အစီရင်ခံစာ ပြုစုသောပုဂ္ဂိုလ်အား ပညာရှင်အဖွဲ့၏ဆုကို **ဝိဇ္ဇာနှင့်သိပ္ပံ ပညာရှင်အဖွဲ့ဆု (သိပ္ပံပညာရပ်)**ဟူ၍ လည်းကောင်း၊
- (ဂ) အဆိုပြုလာသော လူမှုရေး (စီးပွားရေးပညာ၊ သင်ပြမှု/သင်ယူမှုပညာ၊ ဥပဒေပညာ၊ ဘာသာစကားစသည့်) ဘာသာရပ်ဆိုင်ရာ ပါရဂူကျမ်းများအနက်၊ အကောင်းဆုံး လူမှုရေးပညာရပ် ပါရဂူကျမ်းနှင့် သုတေသနလုပ်ငန်းအစီရင်ခံစာ ပြုစုသောပုဂ္ဂိုလ်အား ပညာရှင်အဖွဲ့၏ဆုကို **ဝိဇ္ဇာနှင့်သိပ္ပံ ပညာရှင် အဖွဲ့ဆု (လူမှုရေးပညာရပ်)** ဟူ၍လည်းကောင်း၊

ဆု (၃)မျိုး ခွဲခြား၍ ချီးမြှင့် ပေးအပ်ခြင်း ဖြစ်ပါသည်။

မှတ်ချက် ။ ဆု တစ်ဆုစီအတွက် အကောင်းဆုံးဟု ယူဆထားသော ပါရဂူကျမ်း အကယ်၍မရှိပါက ထိုဆုအတွက် ချီးမြှင့်မည်မဟုတ်ပါ။

၇။ ၂၀၂၁ ခုနှစ်၊ (၁၆)ကြိမ်မြောက် “**မြန်မာနိုင်ငံဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့ဆု**”အတွက် ပြိုင်ပွဲဝင်သည့် ပါရဂူဘွဲ့ရပညာရှင် စုစုပေါင်း (၁၆)ဦး ရှိခဲ့ရာ၊ အောက်ဖော်ပြပါ (၈) ဦးတို့သည် “**မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆု**” ကို -

- (၁) **ဝိဇ္ဇာပညာရပ်မှ** နိုင်ငံတကာဆက်ဆံရေးပညာ ဘာသာရပ်တွင် ဒေါက်တာတင်တင်မာစန်း၊ ဒဿနိက ဗေဒဘာသာရပ်တွင် ဒေါက်တာသက်သက်မြင့်၊ စိတ်ပညာဘာသာရပ်တွင် ဒေါက်တာတင်တင်၊ မြန်မာစာဘာသာရပ်တွင် ဒေါက်တာနီနီခိုင်က လည်းကောင်း
- (၂) **သိပ္ပံပညာရပ်မှ** သတ္တဗေဒ ဘာသာရပ်တွင် ဒေါက်တာ မင်းဇော်လတ်၊ ဓာတုဗေဒဘာသာရပ်တွင် ဒေါက်တာစုဆွေစု ကလည်းကောင်း၊
- (၃) **လူမှုရေးပညာရပ်မှ** သင်ရိုးညွှန်းတမ်းနှင့်သင်ပြနည်း ဘာသာရပ်တွင် ဒေါက်တာစုမွန်အောင်၊ ပညာရေးစိတ်ပညာ ဘာသာရပ်တွင် ဒေါက်တာ အိသဉ္ဇာကို ကလည်းကောင်း၊

အသီးသီး ရရှိကြပါသည်။

၈။ အဆိုပါ “**မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆု**” ချီးမြှင့်ရာ၌ ပါရဂူကျမ်းနှင့် သုတေသနလုပ်ငန်း အစီရင်ခံစာများအပေါ်တွင် အခြေပြု၍ အရွေးချယ်ခံရသည့်အကြောင်းရင်းတို့ကို အောက်တွင်အကျဉ်းချုပ်၍ ဖော်ပြထားပါသည်-

- (၈-၁) ဝိဇ္ဇာ ပညာရပ် (၁) - **နိုင်ငံတကာ ဆက်ဆံရေးပညာ ဘာသာရပ်**
ဒေါက်တာတင်တင်မာစန်း
ကထိက၊ နိုင်ငံတကာဆက်ဆံရေးပညာဌာန၊
ရန်ကုန်နိုင်ငံခြားဘာသာတက္ကသိုလ်

ကျမ်းခေါင်းစဉ် - Myanmar- China- India Trilateral Relations Since 2011

(က) **ဝိဇ္ဇာပညာရပ်တွင်** ပညာရှင်အဖွဲ့ဆုရသူ **ဒေါက်တာတင်တင်မာစန်း** သည် ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ **နိုင်ငံတကာဆက်ဆံရေးပညာဘာသာရပ်** ဖြင့် ပါရဂူဘွဲ့ရရှိခဲ့သူ ဖြစ်ပါသည်။

- (ခ) ဒေါက်တာတင်တင်မာစန်း၏ သုတေသနသည် -
 - မြန်မာနိုင်ငံနှင့် အိမ်နီးချင်းနိုင်ငံကြီးများ ဖြစ်ကြသည့် တရုတ်ပြည်သူ့ သမ္မတနိုင်ငံနှင့် အိန္ဒိယနိုင်ငံတို့၏ ဆက်ဆံခဲ့မှုများကို ၂၀၁၁ ခုနှစ်မှစ၍ လေ့လာတင်ပြထားရာ မိမိနိုင်ငံ၏ စီးပွားရေးတိုးတက်မှုနှင့် ခေတ်မီနည်းပညာ ဖွံ့ဖြိုးတိုးတက်မှုတို့အတွက် အဆိုပါနိုင်ငံကြီးများနှင့် မည်သို့ဆက်လက်၍ ဆက်သွယ်ဆောင်ရွက်သင့်ကြောင်း အကြံပြုတင်ပြထားသဖြင့် အမျိုးသားအကျိုးစီးပွား (National Interest)ကို အထောက်အကူပြုကြောင်း တွေ့ရှိရခြင်း

တို့ကြောင့် **ဝိဇ္ဇာပညာရပ်ဆိုင်ရာ** မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့ဆုအတွက် ရွေးချယ်ခဲ့ခြင်းဖြစ်ပါသည်။

(၈-၂) ဝိဇ္ဇာ ပညာရပ် (၂)

- **ဒဿနိကဗေဒဘာသာရပ်**

ဒေါက်တာသက်သက်မြင့်

တွဲဖက်ပါမောက္ခ၊ ဒဿနိကဗေဒဌာန၊

ပြည်တက္ကသိုလ်

ကျမ်းခေါင်းစဉ်

- **The Sceptical Trend and Its Contribution to Western Philosophy**

(က) ဝိဇ္ဇာပညာရပ်တွင် ပညာရှင်အဖွဲ့ဆုရသူ ဒေါက်တာသက်သက်မြင့် သည် ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ ဒဿနိကဗေဒဘာသာရပ်ဖြင့် ပါရဂူဘွဲ့ရရှိခဲ့သူ ဖြစ်ပါသည်။

(ခ) ဒေါက်တာ သက်သက်မြင့်၏ သုတေသနသည်-

- အနောက်တိုင်း တွေးခေါ်ရှင်များ၏ သံသယဝါဒ (Scepticism) ကိုလေ့လာသုံးသပ် တင်ပြထားပြီး အရှေ့တိုင်းအတွေးအခေါ်မှာလည်း မြတ်ဗုဒ္ဓ၏ ကာလမသုတ်တော်မှာ သံသယထားသင့်သည့် အချက် (၁၀) ချက် ဟောကြားထားခြင်းကိုလည်း ယှဉ်တွဲတင်ပြ ထားခြင်းဖြစ်ရာ လူသားတို့ နေ့စဉ်ရင်ဆိုင်နေရသည့် ဘဝပြဿနာများကို အစွန်း ရောက်မှုများမှကင်းဝေးပြီး အမှန်တရားလက်ကိုင်ထားကာ လျှောက်လှမ်း နိုင်စေရန် လိုအပ်ကြောင်း မှန်ကန်သည့်အသိ၊ အကောင်းအဆိုး၊ အမှန်အမှားပိုင်းခြား ဝေဖန်မှု ပြုနိုင်ရန်အတွက် အထောက်အကူပြုစေသည့်တွက် ဒဿနိကဗေဒ (Philosophy) ဘာသာရပ် သင်ကြားရေးအတွက်သာမက ပြည်သူတို့၏ လူမှုရေးအကျိုးကို အကျိုးပြု စေခြင်း

တို့ကြောင့် ဝိဇ္ဇာပညာရပ်ဆိုင်ရာ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့ဆုအတွက် ရွေးချယ်ခဲ့ခြင်း ဖြစ်ပါသည်။

(၈-၃) ဝိဇ္ဇာ ပညာရပ် (၃)

- **စိတ်ပညာ ဘာသာရပ်**

ဒေါက်တာတင်တင်

ကထိက၊ စိတ်ပညာဌာန၊

မုံရွာတက္ကသိုလ်

ကျမ်းခေါင်းစဉ်

- **The Correlates and Consequences of Post-Traumatic Stress Disorder Among Disaster Victims in Myanmar**

(က) ဝိဇ္ဇာပညာရပ်တွင် ပညာရှင်အဖွဲ့ဆုရသူ ဒေါက်တာတင်တင် သည် ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ စိတ်ပညာဘာသာရပ် ဖြင့် ပါရဂူဘွဲ့ရရှိခဲ့သူ ဖြစ်ပါသည်။

(ခ) ဒေါက်တာတင်တင်၏ သုတေသနသည်-

- သုတေသနလုပ်ငန်းများကို လိုက်နာဆောင်ရွက်ရာတွင် စာရင်းအင်းပညာဖြင့် တွေ့ရှိချက်များကို တင်ပြထားခြင်း၊
- သဘာဝအန္တရာယ် ကျရောက်ပြီးနောက် လူအများစုသည် နောက်ဆက်တွဲ စိတ်ခံစား ကြရာ ဆက်စပ်အကြောင်းရင်းများနှင့် အကျိုးသက်ရောက်မှုများကို ဖော်ထုတ်ခြင်း၊ ဤတွေ့ရှိချက်များသည် Clinical Psychology, Environmental Psychology အတွက်

လိုအပ်ချက်ကို ဖြည့်ဆည်းနိုင်ခြင်းကြောင့် ဆေးပညာနှင့် လူမှုရေးကဏ္ဍအတွက်ပါ အကျိုးပြုကြောင်း တွေ့ရှိရခြင်း
 တို့ကြောင့် **ဝိဇ္ဇာပညာရပ်ဆိုင်ရာ** မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့ဆုအတွက် ရွေးချယ်ခဲ့ခြင်း ဖြစ်ပါသည်။

(၈-၄) ဝိဇ္ဇာ ပညာရပ် (၄)

- **မြန်မာစာ ဘာသာရပ်**

ဒေါက်တာနီနီခိုင်

တွဲဖက်ပါမောက္ခ၊ မြန်မာစာဌာန၊

အမျိုးသားစီမံခန့်ခွဲမှုပညာ ဒီဂရီကောလိပ်

ကျမ်းခေါင်းစဉ်

- **ထွန်းရွှေခိုင် (မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြား ရာဇဝင်ဆိုင်ရာ စာပေများနှိုင်းယှဉ်လေ့လာချက်**

(က) **ဝိဇ္ဇာပညာရပ်**တွင် ပညာရှင်အဖွဲ့ဆုရသူ **ဒေါက်တာနီနီခိုင်** သည် ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန် တက္ကသိုလ်မှ **မြန်မာစာဘာသာရပ်** ဖြင့် ပါရဂူဘွဲ့ရရှိခဲ့သူ ဖြစ်ပါသည်။

(ခ) ဒေါက်တာနီနီခိုင်၏ သုတေသနသည် -

- မျက်မှောက်ခေတ် ရာဇဝင်ကျမ်းဖြစ်သော ထွန်းရွှေခိုင် (မဟာဝိဇ္ဇာ)၏ **ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြားရာဇဝင်ဆိုင်ရာ စာပေများနှိုင်းယှဉ် လေ့လာချက်ကျမ်းသည်** ဝေသာလီခေတ်၊ မြောက်ဦးခေတ်၊ ကိုလိုနီခေတ်၊ မျက်မှောက်ခေတ်တွင် ရေးသားပြုစုခဲ့ကြသော ရခိုင်ရာဇဝင်ကျမ်းနှင့် နှိုင်းယှဉ်လေ့လာ၍ သုတေသန ပြုထားသောကြောင့် နိုင်ငံသမိုင်းအတွက် အကျိုးပြုခြင်း၊
- တိမ်မြုပ်နေသော ရခိုင်ရာဇဝင်ကျမ်းများကို သုတေသနပြု၍ နှိုင်းယှဉ်စိစစ်ခြင်း၊ ရခိုင်ရာဇဝင်ကျမ်းတို့၏ စာပေအဆင့်အတန်းကို ဆန်းစစ်တင်ပြထား ခြင်း၊
- ရခိုင်ရာဇဝင်ကျမ်းများအကြောင်းနှင့် ရခိုင်စာပေအဆင့်အတန်းတို့ကို သိရှိခွင့်ရခြင်း တို့ကြောင့် ဘာသာရပ် သင်ကြားရေးကိုလည်း အကျိုးပြုခြင်း

တို့ကြောင့် **ဝိဇ္ဇာပညာရပ်ဆိုင်ရာ** မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့ဆုအတွက် ရွေးချယ်ခဲ့ခြင်း ဖြစ်ပါသည်။

(၈-၅) သိပ္ပံ ပညာရပ် (၁)

- **သတ္တဗေဒ ဘာသာရပ်**

ဒေါက်တာမင်းဇော်လတ်

ကထိက၊ သတ္တဗေဒဌာန

ဟင်္သာတတက္ကသိုလ်

ကျမ်းခေါင်းစဉ်

- **Seasonal Prevalence of *Aedes Aegypti* (Linnaeus, 1762) Larvae in Various Water Storage Containers in Six Areas of Hinthada District, Ayeyarwady Region**

(က) **သိပ္ပံပညာရပ်**တွင် ပညာရှင်အဖွဲ့ဆုရသူ **ဒေါက်တာမင်းဇော်လတ်** သည် ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ **သတ္တဗေဒဘာသာရပ်** ဖြင့် ပါရဂူဘွဲ့ရရှိခဲ့သူ ဖြစ်ပါသည်။

(ခ) ဒေါက်တာမင်းဇော်လတ်၏ သုတေသနသည် -

ဤသုတေသနတွေ့ရှိချက်များသည် ပြည်သူလူထုကျန်းမာရေးကို အထောက်အကူပြုသည့် တင်ပြချက်များဖြစ်ပြီး၊ ဒေသအကျိုး၊ လူမှုအကျိုးကို အထောက်အကူပြုသည့် ကျန်းမာရေးတစ်ခုဖြစ်ပါခြင်း၊ ကမ္ဘာနှင့်အဝှမ်း ဤသုတေသန ထိန်းချုပ်နိုင်ခြင်းမရှိသေးသော ငှက်ဖျားရောဂါနှင့်ပတ်သက်၍ ကာကွယ်နိုင်သည့် နည်းလမ်းများကို ဖော်ပြထားခြင်းကြောင့် သတ္တဗေဒဘာသာရပ်သင်ကြားရေးအတွက် သာမကပြည်သူ၏ ကျန်းမာရေးဘဝကို အထောက်အကူပြု အကျိုးရှိကြောင်း တွေ့ရှိရခြင်း၊

- ယခုထက်တိုင် ကလေးသူငယ်များ၏ ကျန်းမာရေးကို ထိခိုက်နစ်နာဆုံးရှုံးစေသော ကူးစက်ရောဂါတစ်မျိုးဖြစ်သည့် သွေးလွန်တုပ်ကွေးကို လေ့လာသုတေသနပြုထားပါသည်။ ဧရာဝတီတိုင်းဒေသကြီး ဟင်္သာတခရိုင်သည် သွေးလွန်တုပ်ကွေး ရောဂါအဖြစ်များပြီး ထိခိုက်မှုကြီးမားပါသည်။ ရေကြည်၌ပေါက်ဖွားသော Aegypti ခြင်္ကားတစ်မျိုးမှ နေထိုင်ပေါက်ဖွားသော ခြင်္ကားသဘာဝကို သားလောင်းအဆင့်မှ စတင်ကာသိပ္ပံနည်းကျ အသေးစိတ်သုတေသနပြုထားကြောင်း တွေ့ရှိရခြင်း၊
- သိပ္ပံအမည်အားဖြင့် Aedes aegypti (Linnaeus 1762) သည် သွေးလွန်တုပ်ကွေး အမျိုးမျိုးကို ဖြစ်စေသော ဗိုင်းရပ်ကိုသယ်ဆောင်သည်။ ဗိုင်းရပ်စ်ပိုးကို သယ်ဆောင်ကာ လူကိုကိုက်ပြီး ပျံ့နှံ့စေသည့်ခြင်မျိုးနွယ်ဖြစ်၏။ ခြင်မျိုးများ၏ ပျံ့နှံ့ပေါက်ဖွားရာ ဒေသ ရောဂါဖြစ်ပွားနိုင်ချေ၊ ရောဂါဖြစ်ပွားနှုန်း၊ ကာကွယ်ပုံကာကွယ်နည်းများကို ဧရာဝတီတိုင်းဒေသကြီး၊ ရွာကြီးခြောက်ရွာတွင် သုတေသနပြုခဲ့သည်။ ကလေးငယ်များရှိသော လူနေအိမ်ခြေများ၏ ရေထည့်ရေလှောင် စည်ပိုင်း၊ ရေပုံး၊ ခွက်၊ ရေအိုးမှအစ ခွက်ကြီး ခွက်သေးမကျန် သွေးလွန်တုပ်ကွေး ခြင်မျိုးနှင့် ခြင်သားလောင်း ပေါက်ပွားတွေ့ရှိနှုန်းကို ရာသီအလိုက် တိကျစွာတိုင်းတာ မှတ်တမ်းပြုခြင်း၊ ရောဂါပျံ့နှံ့မှု၏အဓိကဖြစ်သော ဥဆောင်ခြင်အမများ ပျံ့နှံ့တွေ့ရှိပုံ ဥ ဥချနုန်းကို အိမ်တွင်းအိမ်ပြင် colour attraction method ဖြင့် အရိပ်ခိုခြုံပုတ်ကြားပါမကျန် ရှာဖွေတိုင်းတာသည်။ ပတ်ဝန်းကျင်ကို ထိခိုက်စေသော ဓာတုပစ္စည်းသုံး၍ တားဆီးကာကွယ်ခြင်းအစား ဥနှင့်ခြင် သားလောင်းကို စားသောက်သော ပြည်တွင်းဖြစ်တည် ရှင်သန်သည့် သားလောင်းစားငါးမျိုးကို အသုံးပြုလျက် သွေးလွန်တုပ်ကွေးခြင်များကို ကောင်းစွာနှိမ်နင်းကာကွယ် တားဆီးနိုင်ပုံကိုလည်း အောင်မြင်စွာ သုတေသနပြုထားကြောင်း တွေ့ရှိရခြင်း

တို့ကြောင့် သိပ္ပံပညာရပ်ဆိုင်ရာ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုအတွက် ရွေးချယ်ခဲ့ခြင်း ဖြစ်ပါသည်။

(ဂ-၅) သိပ္ပံပညာရပ် (၂)

- ဓာတုဗေဒဘာသာရပ်

ဒေါက်တာစုဆွေစု

ကထိက၊ ဓာတုဗေဒဌာန

ရတနာပုံတက္ကသိုလ်

ကျမ်းခေါင်းစဉ်

- Chemical and Pharmacological Study of Bioactive

Secondary Metabolites From *Pseudomonas Aeruginosa*

(က) သိပ္ပံပညာရပ်တွင် ပညာရှင်အဖွဲ့ဆုရသူ ဒေါက်တာစုဆွေစု သည် ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ ဓာတုဗေဒဘာသာရပ် ဖြင့် ပါရဂူဘွဲ့ရရှိခဲ့သူ ဖြစ်ပါသည်။

(ခ) ဒေါက်တာစုဆွေစု၏ သုတေသနသည် -

ပိုးမွှားဓာတ်ခွဲဌာန၊ ပရိဝုဏ်အတွင်း (Clinical Soil) မြေနမူနာမှ *Pseudomonas aeruginosa* ကို ခွဲထုတ်မျိုးပွားပြီး ဓာတ်ခွဲခြင်းတို့မှတစ်ဆင့် ဆေးဝါးထုတ်လုပ်နိုင်ရန် ဖြစ်သည်။ ဤသို့ပြုလုပ်ရာခြပ်ပေါင်း ၅ မျိုးတွေ့ရှိခဲ့ကြောင်း ၎င်းတို့အထဲမှ I-Hydroxyphenazine နှင့် Phenazine -1- Carboxylic acid ခြပ်ပေါင်းနှစ်မျိုးသည် ရင်သားကင်ဆာ (MCF7) ကုသရာတွင် ထိရောက်မှု ရှိကြောင်းတွေ့ရှိရခြင်း

တို့ကြောင့် သိပ္ပံပညာရပ်ဆိုင်ရာ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုအတွက် ရွေးချယ်ခဲ့ခြင်း ဖြစ်ပါသည်။

(စ-၇) လူမှုရေးပညာရပ်(၁) - သင်ရိုးညွှန်းတမ်းနှင့်သင်ပြနည်း ဘာသာရပ်

ဒေါက်တာ စုမွန်အောင်

ကထိက၊ သင်ရိုးညွှန်းတမ်းနှင့်သင်ပြနည်းဌာန

ရန်ကုန်ပညာရေးတက္ကသိုလ်

ကျမ်းခေါင်းစဉ်

- An Investigation into the Impact of Contextualized Instruction in Learning Physics at the High School Level in Myanmar

(က) လူမှုရေးပညာရပ်တွင် ပညာရှင်အဖွဲ့ဆုရသူ ဒေါက်တာစုမွန်အောင်သည် ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်ပညာရေးတက္ကသိုလ်မှ သင်ရိုးညွှန်းတမ်းနှင့်သင်ပြနည်း ဘာသာရပ်ဖြင့် ပါရဂူဘွဲ့ ရရှိခဲ့သူဖြစ်ပါသည်။

(ခ) ဒေါက်တာ စုမွန်အောင်၏ သုတေသနသည် -

ခေတ်မီဖွံ့ဖြိုးတိုးတက်သောနိုင်ငံ တည်ဆောက်ရာတွင် သိပ္ပံပညာရေးကဏ္ဍသည် အရေးပါပုံ၊ ရူပဗေဒဘာသာရပ်အတွက် ဆန်းသစ်မှုရှိပြီး ထိရောက်သော သင်နည်းသစ်၏ အကျိုး သက်ရောက်မှုကို လေ့လာဖော်ထုတ်ထားသည့် သုတေသနဖြစ်သည့်အတွက် အခြေခံ ပညာရေး သင်ရိုးသစ်ကို ပြောင်းလဲသင်ကြားနေချိန်တွင် မိမိနိုင်ငံ၏ပညာရေးဖွံ့ဖြိုး တိုးတက် မှုအတွက် အထောက်အကူဖြစ်စေခြင်း၊ သုတေသနရလဒ်သည် ရူပဗေဒပညာရပ် သင်ကြားရေးတွင် Contextualized Instruction ဟူသော Instructional Design တစ်ခုကို Experiment ပြုလုပ်ပြီး ဤသင်ကြားမှုပုံစံသစ်ဖြင့် ရူပဗေဒဘာသာရပ် သင်ကြားသင်ယူမှု အပေါ် အကျိုးသက်ရောက်မှုရှိခြင်းကို Multiple Regression Model တစ်ခုအဖြစ် ဖော်ထုတ်ထားကြောင်း တွေ့ရှိရခြင်း

တို့ကြောင့် လူမှုရေးပညာရပ်ဆိုင်ရာ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုအတွက် ရွေးချယ်ခဲ့ခြင်း ဖြစ်ပါသည်။

(၈-၈) လူမှုရေး ပညာရပ်(၂) - **ပညာရေးစိတ်ပညာ ဘာသာရပ်**

ဒေါက်တာ အိသဉ္ဇာကို

လက်ထောက်ကထိက၊ ပညာရေးစိတ်ပညာဌာန

ရန်ကုန်ပညာရေးတက္ကသိုလ်

ကျမ်းခေါင်းစဉ်

- **An Analytical Study of the Effect of Classroom Emotional Climate on Motivating Learners and their Moral Maturity**

(က) လူမှုရေးပညာရပ်တွင် ပညာရှင်အဖွဲ့ဆုရသူ ဒေါက်တာ အိသဉ္ဇာကို သည် ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်ပညာရေးတက္ကသိုလ်မှ **သင်ရိုးညွှန်းတမ်းနှင့်သင်ပြနည်း ဘာသာရပ်ဖြင့်** ပါရဂူဘွဲ့ ရရှိခဲ့သူဖြစ်ပါသည်။

(ခ) ဒေါက်တာ အိသဉ္ဇာကို၏ သုတေသနသည် -

- ဒေါက်တာ အိသဉ္ဇာကို၏ ပါရဂူကျမ်းနှင့် သုတေသနလုပ်ငန်း အစီရင်ခံစာတွင် Classroom Emotional Climate နှင့် Moral Maturity ဆိုင်ရာ အကြောင်းအရာ များကို လေ့လာမှု ပြုထားခြင်း၊ သင်ကြားသင်ယူမှုတွင် Classroom Emotional Climate နှင့် သင်ယူသူ၏ Motivation and Moral Maturity ဆက်စပ်မှု Multiple Regression Model တစ်ခုကို ဖော်ထုတ်ထားရာ ဤသုတေသန ကျမ်းသည် သင်ကြားသင်ယူမှုတွင် အရေးပါသောကြောင်း တွေ့ရှိရခြင်း၊ အခြေခံပညာကျောင်းသားများ၏ Motivation နှင့် Moral Maturity တို့အပေါ် Classroom Emotional Climate ၏ လွှမ်းမိုးမှုရှိပုံကို ဖော်ထုတ်ခြင်းဖြင့် ပညာရေး စိတ်ပညာဘာသာရပ်အတွက် များစွာ အကျိုးပြုပါသည်။ ဤသုတေသနတွင် Classroom Emotional Climate နှင့် Moral Maturity ဆိုင်ရာ အကြောင်းအရာများကို လေ့လာမှုပြုထားရာ မျက်မှောက်ခေတ် ကျောင်းသား ကျောင်းသူ များ၏ Soft Skill ဖွံ့ဖြိုးတိုးတက်မှုကို ရှေးရှုသည့်အတွက် အမျိုးသားအကျိုးစီးပွားကို အထောက်အကူပြုနိုင်ကြောင်း တွေ့ရှိရခြင်း
- အခြေခံပညာကျောင်းသားများ၏ Motivation နှင့် Moral Maturity တို့အပေါ် Classroom Emotional Climate ၏လွှမ်းမိုးမှုရှိပုံကို ဖော်ထုတ်ခြင်းဖြင့် ပညာရေး စိတ်ပညာဘာသာရပ်အတွက် များစွာအကျိုးပြုခြင်း
- ဤသုတေသနတွင် Classroom Emotional Climate နှင့် Moral Maturity ဆိုင်ရာ အကြောင်းအရာများကို လေ့လာမှုပြုထားရာ မျက်မှောက်ခေတ် ကျောင်းသား ကျောင်းသူ များ၏ Soft Skill ဖွံ့ဖြိုးတိုးတက်မှုကို ရှေးရှုသည့်အတွက် အမျိုးသားအကျိုးစီးပွားကို အထောက်အကူပြုနိုင်ကြောင်း တွေ့ရှိရခြင်း

တို့ကြောင့် လူမှုရေးပညာရပ်ဆိုင်ရာ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုအတွက် ရွေးချယ်ခဲ့ခြင်း ဖြစ်ပါသည်။

MYANMAR-CHINA-INDIA TRILATERAL RELATIONS SINCE 2011

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(၂-၁) MYANMAR-CHINA-INDIA TRILATERAL RELATIONS SINCE 2011

Tin Tin Mar San*

Abstract

An attempt has been made to analyze Myanmar's relations with China and India since the democratic reforms in Myanmar, and to evaluate the policies and mutual relations of China and India towards Myanmar. Myanmar situated between the world major powers of China and India. Throughout the history, Myanmar and China and India have had both friendly and strained relations. In addition, India-China competition along with the strategic importance of Myanmar's geopolitical position has made the tripartite relations that attract the interest of the international community. This research mainly inquires how Myanmar is implicated by the relationship between China and India, particularly their strategic rivalries, and how Myanmar's democratic transition affects Myanmar's bilateral relations with China and India. The scope of the research is to study the trilateral relations under the Union Solidarity and Development Party (USDP) government and the National League for Democracy (NLD) government. This is qualitative research using a combination of historical and comparative approaches by reviewing the studies and evaluations of previous scholars. This research finds out that Myanmar's domestic reforms, anti-Chinese resentments on lack of environmental concerns and ethical standards of Chinese companies, greatly caused the hindrance in relationship between Myanmar and China under USDP government, while becoming closer relations with India, a large democratic country despite tense relations before 2010. Nevertheless, under the NLD government, Myanmar could build cordial relationship with both countries. As China and India are major competing powers in the region, they are trying to promote their relations with the important neighbour, Myanmar. Since there are no permanent friends or no permanent enemies, just permanent interests, Myanmar should practice soft balancing policy in her relations with China and India, based on independent and active foreign policy, in order to maximize its national interests.

Keywords: Myanmar, China, India, geopolitical position, Democratic transition

Introduction

This research examines the impact of the strategic rivalry between China and India in the context of multi-dimensional relations with Myanmar. Since the beginning of Myanmar's democratic reforms, Myanmar highly improved its foreign relations including India and Western nations. China's policy towards Myanmar declined apparently in every sector under the USDP administration after Myitsone dam suspension. Unlike USDP government, the NLD-led government especially focused on enhancing relations with China. In the context of Bengalis issues in 2017 paved the way to closer ties between Myanmar and China. Under the NLD administration, Myanmar's response to BRI became more active and signed several agreements for projects which created further deepening economic cooperation. Both India and China have geo-political and geo-economic reasons for their interest in Myanmar and the region. Thus, to offset the Chinese influence, India has cultivated close ties with Myanmar and facilitated the improvement of Myanmar's military capabilities. In this research, firstly relations between

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Myanmar and China since 2011, secondly relations between Myanmar and India since 2011 and finally China- India relations and its implications on Myanmar were presented.

Aims and Objectives

The research was submitted for the Ph. D degree and aims to analyze the impacts on Myanmar in relations with China as well as India after democratic transition in Myanmar. It attempts to evaluate their policies towards Myanmar and find out opportunities and challenges of Myanmar during the USDP and NLD governments. In addition, it intends to examine the competitions of China and India in Myanmar and the region.

Outcome

By doing this research, it could analyze Myanmar's impact in economy and politics in relations with China and India after its democratization. The political reforms in Myanmar brought the opportunities and challenges in its relations with China and India because Myanmar's domestic changes have influenced on its external ties since 2011. Moreover, China and India's policies towards Myanmar were evaluable. And also, how China and India's strategic rivalries implicated in Myanmar could explored.

Research Methodology

This study is qualitative research and it uses descriptive and analytical approaches in order to make its full assessment. This study mainly relies on the primary sources such as government's statements, and official documents like annual reports and newspapers. In addition, it uses the secondary sources such as books, academic journals, e-books, periodicals, and conference papers which are available at the official internet websites and electronic database. In addition, the personal interviews with some responsible persons of foreign relations and economic development are conducted.

Findings

This research described the economic and political relations with China and India have been affected to some extent after democratic transition in Myanmar. Due to the development of democratic values and principles in Myanmar, the growth of anti- Chinese sentiments has caused tension between Myanmar and China. Suspension of China's Myitsone dam project in Myanmar by the USDP government has been a major cause of improvement between Myanmar and India. The political reforms in Myanmar brought the opportunities and challenges in its relations with China and India because Myanmar's domestic changes have influenced on its external ties since 2011.

China maintains ties with political actors in Myanmar at all levels. Some scholars argued that it was the suspending of Myitsone Dam due to local unrest that caused China to develop a horizontal foreign policy approach, seeking to establish political ties with all major political actors. China has always maintained political ties with all major political players, including the opposition groups and EAOs. The economic and strategic stakes for China to protect its

investments in Myanmar are high, thereby necessitating a multilayered approach to diplomacy. Therefore, it is argued that China's multi-layered engagement strategy has initiated to Myanmar after Myitsone Dam suspension.

The suspension of the projects, particularly, Myitsone dam, shook the foundation of the relationship built during the USDP period in Myanmar. As a result of suspension, China has felt aggrieved about the damage that has been inflicted in Chinese political, economic and strategic interests inside Myanmar. It had also to face with the challenges in its Myanmar policy because of negative images of Chinese government, corporations, and exploitation of Myanmar's natural resources by Chinese investors. In this context, China has responded to the changes inside Myanmar in several important fronts. These include a major reduction of Chinese direct investments, the cooling off of the political relationship, the establishment of relations with the democratic forces especially with NLD and major public relations campaign. In this context, Myanmar-China relationship had become the ice age under USDP administration.

In 2013, Beijing's new policy completely changed the landscape, paving the way for peace talks. By acting as coordinator and "witness" between the KIO and the central government, China has positioned itself openly as a mediator and a tacit guarantor of any agreement reached between the parties.

Since the inception of the NLD-led government in 2016, it especially focused on enhancing relations with China. Myanmar has faced increasing international pressure over the military operations in northern Rakhine State in 2017 under the label of ethnic cleansing by the United Nations Security Council (UNSC). China has actively supported Myanmar's stance on this particular issue.

China and Myanmar held a series of new round of diplomacy and defense consultations pledging to further promote bilateral ties, keep close communication on the situation in northern Myanmar and maintain peace and stability in the border areas between the two countries. Peace process in Myanmar was the Chinese security concern in the border areas.

The economic conditions of Myanmar and China after 2011 are described in the tables. Table (I) shows bilateral trade between Myanmar and China during (2011-12)-(2018-19).

Table (I) Myanmar-China Bilateral Trade during (2011-12)- (2018-19) (USD Million)

Year	Myanmar Exports to China	China Exports to Myanmar	Total Bilateral Trade	Balance of Trade
2011-2012	2,214.30	2,786.84	5,001.13	-572.54
2012-2013	2,238.07	2,719.49	4,957.56	-481.42
2013-2014	2,913.67	4,119.45	7,033.13	-1205.78
2014-2015	4,692.46	5,019.63	9,712.09	-327.17
2015-2016	4,596.96	6,395.48	10,992.44	-1798.52
2016-2017	5,055.49	5,749.29	10,804.77	-693.80
2017-2018	5,699.35	6,086.78	11,786.13	-387.43
2018-2019	5,063.54	6,330.06	11,393.60	-1266.52

Source: Ministry of Commerce, Nay Pyi Taw, Myanmar

According to the table, it can be clearly seen China always achieved trade surplus over Myanmar. In terms of total bilateral trade, it can be seen increasing trend since 2011-12. It shows that relations between Myanmar and China became closer and deeper. On the other hand, it is not surprising that economic interests have been one of the China's vital policy objectives towards Myanmar.

Table (II) shows Myanmar's total border trade with China including Muse, Lwejel, Chinshwehaw, Kanpitete and Kyaingtong border check point from 2011-12 to 2018-19.

Table (II) Myanmar-China Bilateral Border Trade during (2011-12) -(2018-19)

(USD Million)

Year	Myanmar Exports to China	China Exports to Myanmar	Total Bilateral Trade	Balance of Trade
2011-2012	1,821.90	1,162.60	2,984.50	+693.3
2012-2013	1,896.89	1,041.24	2,938.12	+855.65
2013-2014	2,502.24	1,367.76	3,870.00	+1134.48
2014-2015	4,052.30	1,834.37	5,886.67	+2217.93
2015-2016	4,242.12	1,708.56	5,950.68	+2533.56
2016-2017	4,521.24	1,775.40	6,296.65	+2745.84
2017-2018	4,973.74	1,796.68	6,770.42	+3177.06
2018-2019	4,010.72	1,898.71	5,909.44	+2112.01

Source: Ministry of Commerce, Nay Pyi Taw, Myanmar

According to the table, it can be seen that, in contrast with the normal trade, Myanmar always achieved trade surplus over China. In terms of total bilateral trade, it can also be seen increasing trend since 2011-12. Thus, Myanmar-China border trade is very important for Myanmar economy and Myanmar needs to upgrade the border trade sector more than ever.

The Chinese investments in Myanmar were extremely reflected by local people in Myanmar since 2011. Myanmar people are anxious about China investment. The people of Myanmar are suspicious and worried about the Chinese investment project in Myanmar for four reasons. Firstly, Myanmar people regards Chinese investments as irresponsible and lack of transparency and responsibility. Secondly, Myanmar people thought Chinese investments are lack of contributions to the social and economic developments of local communities and without the consultations of the local communities for example Letpadaung Bronze Mining Project. Thirdly, Myanmar people criticized Chinese investments are lack of proper Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) for example Myitsone Dam project. Finally, Myanmar people regards Chinese investments are considered as harmful to long- term economic development of Myanmar especially referring to Chinese debt trap development of Hambantota port project in Sri Lanka for example Kyaukphyu port project. The growing resentments opposed Chinese and its investments have been hindered for China's economic policy towards Myanmar. In order to bolster China investments through people-to-people contact, the government should openly give information about the government projects and cooperation with China.

The implementations of BRI project in Myanmar have not only geopolitical impact but also geo-economic implications on Myanmar. Indeed, the BRI is the latest initiative in three decades of efforts to promote Chinese trade and investment in Myanmar. Through democratic reforms, the government could attract FDI to a certain extent that could lead to economic growth. Additionally, it sets a goal of improving infrastructural development through cooperation with foreign countries, especially with China.

In the context of Myanmar-China relations, Chinese investments in Myanmar were extremely reflected by the voice of local people in Myanmar since 2011. And the growing resentment opposed Chinese and its investments have been hindered for China's economic policy towards Myanmar. President Xi Jinping's visit to Myanmar in 2020 has opened up a new chapter of deeper relations between Myanmar and China. These bilateral ties were mutually beneficial as the NLD government's dream is to build a peaceful and developed country meanwhile China has a dream to initiate the BRI project. Myanmar-China relation is a multi-facet and the contacts between government to government, organization to organization, and people to people are strengthening. There have been political, economic and social relations, and security cooperation between the two countries. But on the other hand, Myanmar-China relations is counter checked and balanced by Myanmar's immediate powerful democracy country, India which also have profound impact on the bilateral relations of Myanmar.

In this context, Myanmar is a place where China can use as a springboard for its ambition to expand its sphere of influence in Southeast Asia and South Asia. Therefore, in parallel with India's efforts in Myanmar, China has also acted to protect its rights and influence in the country.

In summary, the hindering factors of Chinese policy towards Myanmar under the NLD government are ongoing ethnic issues in the border areas which are threatening Chinese political stability and economic developments and final resolution of Myitsone dam project. Therefore, China was in a better bargaining position of its foreign policy with Myanmar than the previous government.

India sought to achieve four main objectives in its policy towards Myanmar, to counterbalance China's strategic influence and commercial interests into Myanmar since 1988, to stabilize border region in northeast India, to find new energy supply routes and expand new markets in Southeast Asian region, and to use Myanmar as a spearhead for its AEP and explore its diplomatic visibility in Asia. From Myanmar side, her policy towards India based on the ability to diversify the external participation, and India was seen as a potential counterweigh to China.

Myanmar-India bilateral relations launched the new era and have gradually improved through regular exchanges and contacts in high-level relations, through which many important documents have been signed.

The economic conditions of Myanmar and India after 2011 are presented in the tables. Table (III) shows the bilateral trade between Myanmar and India (2011-2012) -(2019-2020 September).

Table (III) Myanmar and India Bilateral Trade (2011-2012) -(2019-2020 September)
(USD Million)

Year	India's Exports to Myanmar	Myanmar's Exports to India	Total Bilateral Trade	Balance of Trade
2011-2012	545.38	1,324.82	1,870.20	+779.44
2012-2013	544.53	1,404.76	1,494.29	+860.23
2013-2014	787.01	1,395.67	2,182.68	+608.66
2014-2015	773.74	1,231.54	2,005.28	+457.8
2015-2016	1,070.65	984.27	2,054.92	-85.73
2016-2017	1,107.89	1,067.25	2,175.14	-40.64
2017-2018	966.19	639.63	1,605.82	-326.56
2018-2019	761.22	682.78	1,444.00	-78.44
2019-2020 (September)	180.36	151.55	331.91	-28.81

Source: Ministry of Commerce. Nay Pyi Taw, Myanmar

According to the table, it can be seen that bilateral trade between the two sides was highest in 2013-14 during President U Thein Sein government with the Myanmar's trade surplus over India. In terms of Indian exports, it was larger than Myanmar in 2016-17. It was because, primarily, fifty percent of Myanmar's exports to India has only been timber and wood products. However, in April 2014, India government banned the exports of logs from Myanmar to slow deforestation and boost its own production and then the exports of timber slowed down. So, it has declined to about fifteen percent in 2016-2017. On the other hand, Indian exports of pharmaceuticals has risen to Myanmar. Nevertheless, total bilateral trade is the second largest during 2011-12 to 2019-2020 September. Therefore, it can be concluded that Myanmar achieved much trade benefits under the President U Thein Sein government, immediately after the democratic transition.

Table (IV) shows the Myanmar-India Border trade from 2011 to 2019.

Table (IV) Myanmar- India Border Trade During 2011-12 to 2019-20 (USD Million)

Year	Myanmar's Exports to India	India's Exports to Myanmar	Total trade	Balance of Trade
2011-2012	8.87	6.54	15.41	+2.33
2012-2013	26.96	11.67	38.63	+15.29
2013-2014	30.92	17.71	48.63	+13.21
2014-2015	42.61	18.11	60.72	+24.5
2015-2016	53.02	18.62	71.64	+34.4
2016-2017	63.46	24.44	87.90	+39.02
2017-2018	68.77	21.79	90.57	+46.91
2018-2019	88.41	1.00	89.38	+87.41
2019-2020	38.78	1.00	39.78	+37.78

Source: Ministry of Commerce, Nay Pyi Taw, Myanmar

Table (IV) shows that border trade had a considerable amount of increase between Myanmar and India since 2011 to 2019. In the year 2017-2018, total trade reached to USD 90.57 million, the highest since 2011-12, with the trade surplus of Myanmar over India. In terms of exports, Myanmar exports were higher than India in 2018-19 and lower than India in 2016-17. Generally, Myanmar always achieved surplus over India in border trade sector. Therefore, unlike normal trade, it can be said that border trade is significantly increased in the period of the NLD-led government. Furthermore, it can be seen that India exported about one percent in 2018-2020. It was because India has closed border crossing points at Manipur and Mizoram on account of Coronavirus pandemic (COVID-19). As a result, border trade has stopped and traders have been suffered by the impact of this global pandemic.

In comparison with normal trade between Myanmar and India, bilateral border trade was extremely lower than normal one. It was because trading across the border costs high transaction fee. In addition, there were non-tariff barriers, poor connectivity, lack of quality infrastructure border crossing points, informal side payments and then limited trade financing institutions.

The fundamental factor of close bilateral political relations, the reason why India can play an important role in the Myanmar peace process, Bengali crisis and joint military operations in border also lies in the political needs of both sides under U Thein Sein government. In the context of shifting LEP to AEP in 2014, with India's changing posture in the Indo-Pacific and containment of China also approached the fully amicable relations with Myanmar. During the period 2011 to 2015, there had been a significant growth of high-level exchanges, resulting in the deepening and widening of bilateral ties. Besides, the main factor of close bilateral economic relations rooted in the context of suspending China's Myitsone dam in September 2011 strongly paved the way to upgrade economic ties between Myanmar and India. Under these circumstances, Myanmar-India bilateral trade was highest in 2013-14 during President U Thein Sein administration with the Myanmar trade surplus over India. Under the NLD administration, China has increased its influence in Myanmar because of the country's renewed isolation over the Bengalis crisis. Myanmar can scale down its dependence on China in economic sector but China's diplomatic shield from international arena is essential for Myanmar. It can be noted that China's influence on Myanmar was undeniably as Myanmar has to rely politically and economically on diplomatic support of China.

Both China and India want to be regional influence, they are competing on all fronts such as politic, economic and strategic interests. As Myanmar is strategically important in Southeast Asia, India and China may focus more on good relations with Myanmar. Consequently, for Myanmar, aids, investment and technology from China and India will be available, and there will be an impetus for the development of the country. There are several advantages for Myanmar with regard to Sino-Indian competition. China has been a mediator in Myanmar's peace process. China committed to support Myanmar's peace-making efforts to realize internal peace and to ensure the national reconciliation through political dialogues. China stands as a diplomatic shield for Myanmar in UNSC whenever Myanmar faces a difficult situation to keep its role to counter India. The Myanmar-China Oil and Gas Pipeline project created a huge amount of job opportunities for local people, hiring many constructions work and Myanmar enterprises were involved in the project with their employees being technically trained. After Myanmar detected its first case of COVID-19 on March 23, China assisted pandemic aids to Myanmar.

The joint military cooperation between Myanmar and India has secured the respective security forces, accompanied with joint exercises, and joint maneuvering on the border to alleviate the insurgents. Like China, India also played a role in Myanmar's own internal peace process, acting as a signatory witness to Myanmar's Nationwide Ceasefire Agreement ceremonies in 2015 and 2018.

The challenges in Myanmar-India relations are China's great regional influence and Myanmar's growing dependence on China in politics and economy. Myanmar can scale down its dependence on China in economic sector but China's diplomatic shield from international arena is essential for Myanmar. By balancing relations between China and India like Shwe Gas project, Myanmar has been able to promote its national interests.

In short, in order to meet its domestic needs for Myanmar, it is essential to be good neighborly relations with not only China but also India. Myanmar needs to use soft balancing policy to China and India as Myanmar is significant in geographical, trading and security. After considering the challenges, threats and strategic influences, only by balancing relations between China and India, Myanmar can be able to promote its economic, political and security interests.

Discussion

Since the beginning of Myanmar's democratic reforms, Myanmar highly improved its foreign relations including India and Western nations. China's policy towards Myanmar declined apparently in every sector under the USDP administration. In fact, by late 2011, relationship between Myanmar and China have been deteriorated. It aims to argue the influencing factors of Myanmar's policy towards China since 2011 which are to escape from Myanmar's international isolation, to reduce Myanmar's overdependence on China, to improve the population's economic situation and to rebrand and improve the image of the government. Indeed, the dramatic political changes and democratic reform in Myanmar have been affecting on the traditional ties between China and Myanmar. On the other hand, it has been trying a good relationship with the democratic forces, especially with the NLD. While China is cooling down on its economic and political engagement, it has actively undertaken the public campaigns through media, Buddhist diplomacy, friendship festivals, and corporate social responsibility. Therefore, it can be clearly seen that China uses the multi- tracks policy towards Myanmar, based on its self-interests.

In comparison with USDP government, The NLD-led government especially focused on enhancing relations with China. While the change of government in Myanmar did not shift China's overall goals in its relations with Myanmar. NLD led government has also apparently recalibrating Myanmar's policy toward China. Chinese government has been eagerly pushing for a resolution of the Myitsone Dam to Myanmar. Bengalis crisis in 2017 paved the way to close the bilateral ties between Myanmar and China. China has always provided diplomatic protection to Myanmar in the international arena. Furthermore, NLD led government's response to BRI became more active and signed the several agreements for projects.

Border stability, energy transportation, and economic cooperation remain China's basic considerations in Myanmar. China's growing energy needs and 'two-ocean nation' strategy has been critical in widening Beijing's interest. The political stability and economic development in Myanmar are also significant in Chinese strategic policy towards Myanmar. In addition,

Myanmar's geo-strategic position and abundance of oil, gas, and hydroelectric power resources also allows the country to manage its relations competitively between China and India.

Being the only country that sits at the intersection of India's Neighborhood First policy and its Act East Policy (AEP), Myanmar serves as a land bridge to connect South Asia and Southeast Asia, and is an essential element in India's practice of regional diplomacy in the Indo-Pacific. India believes that the success of India's AEP and Neighborhood first policy largely depends on its relations with Myanmar.

Border stability, energy transportation and economic cooperation are the paramount concerns of India's policy towards Myanmar. Myanmar's potential role as a supplier of natural gas that was crucial for improving bilateral relations with India. India's participation in Quad in Indo-Pacific region has been balancing with China. Therefore, India strengthening of relations with Myanmar is the key to the success of its foreign policy.

To sum up, in the context of political relations between Myanmar and India, it is analyzed that that the growing exchanges in the bilateral sphere, including in the areas of trade, investment, culture, people-to-people contacts and security cooperation bear testimony to the synergies between Myanmar's independent, active and non-aligned foreign policy and India's pragmatic Neighbourhood First and Act East policies. It paved the way for new opportunities to expand bilateral relations for the mutual benefit of India and Myanmar after the democratic transition.

With regard to the Indo-Pacific region, China's influence over Myanmar was perceived as a threat to regional power for India. Thus, to offset the Chinese influence, India has cultivated close ties with the Myanmar government and facilitated the improvement of Myanmar's maritime capabilities. India sees China's increasing interest and activities in the Indian Ocean and its growing relationships with India's neighboring states, such as Myanmar, as encroaching on its home territory. India has been expanding its presence in the region since Narsimha Rao Government launched LEP in the 1990s, which accelerated under the Modi government's AEP. Under the circumstances, India had delivered INS Sindhuvir to Myanmar in October 2020. The Myanmar Navy named the Indian ship UMS Minye Theinkhathu. It is the first submarine in the Myanmar Navy arsenal. The former Soviet-era submarine was in operation in the Indian Navy since 1988.

China has responded against the tactics of India in Indo-Pacific to create its hegemony by investing in China Pakistan Economic Corridor (CPEC) and it will directly connect China to Arabian Sea via Pakistan. China is also attracting with BRI project to some countries like Sri Lanka, Myanmar, Maldives, Bangladesh and some African nations towards its bloc by investing a large sum of money to counter the dominant position of India and the US in the region. Additionally, the strings of pearl refer to the policy of China to establish military bases in Indian Ocean Region (IOR) between Chinese mainland and Port Sudan to counter the growing military influence of the US and India. In India response, India skipped the BRI first and second forums at the Great Hall of the People, in Beijing in May 2017 and April 2019.

Indeed, China and India competed over exploration rights and access to Myanmar's energy resources. It is noted that the Chinese companies have always managed to grab a larger share of the contracts, either through their stronger influence in Myanmar, or by exploiting India's weaknesses. The Myanmar-China oil and gas pipeline is around 1,420 kilometers long.

China National Petroleum Corporation signed 30-year hydrocarbons purchase and sale agreement with Daewoo International in December 2008 to draw gas extracted from the Shwe gas project located offshore in the Bay of Bengal. Gas transport started in July 2013. Construction of the oil pipeline was completed in August 2014, and on 30 January, 2015, it began operating the oil pipeline and announced the inauguration of the oil port in Made Island. On 10 April 2017, the Myanmar-China Oil Transportation Agreement was signed and officially announced that it could begin operating the entire pipeline project. About 400 million cubic feet of natural gas and oil to China are exported, and for Myanmar, around 100 million cubic feet [100 million cubic meters] of natural gas are consumed daily. Myanmar earns about USD1 billion annually from gas sales, with most volumes being exported via pipeline to China and also Thailand.

Myanmar, which is situated between India and China, is a resource-rich country, and has a proven 20 trillion cubic feet (570 billion cubic metres) of natural gas. In the energy sector, the two countries enjoy a robust partnership and also recognize the benefits of deeper integration in the energy sector. With investments of over USD 1.2 billion, Myanmar has the highest Indian investment in any country in South Asia, and India approved an investment of over USD 120 million in the Shwe Oil and Gas project.

Conclusion

This research evaluates about Myanmar's democratic reform processes which had significantly affected its foreign relations. This research highlights the consequences of Myanmar's democratic reforms in its bilateral relations with China and India, and the impacts of the relations between China and India on Myanmar covering both periods under USDP government and NLD government.

A series of democratic reforms taken by the USDP government is the major factor in the changes of her relations with China. It also gave rise to speculation that Myanmar might be seeking to emerge from its long-standing dependence on China. In that case, Myanmar might want to show its growing political status as an instance of Myanmar clearly stating a preference to pursue her "independent and active" foreign policy.

Myanmar received China's diplomatic shield in the international pressure concerning with the Rakhine issue. In addition, China provides assistance for the socio-economic development to the Muslim minorities in Rakhine State. Indeed, involving in Myanmar's Rakhine crisis as a regional power is a political opportunity for China to receive public support from Myanmar. In addition, unresolved Myitsone Dam Project has been limiting relations between Myanmar and China relations after democratic transition. Likewise, ongoing ethnic problems and internal peace process were hindering peace process in Myanmar. Finally, lack of corporate social responsibility (CSR) by the Chinese investment firms might be an influencing factor to be frustrated in the traditional friendship between Myanmar and China.

In the context of Myanmar-India relations, the political changes in Myanmar along with its modified foreign policy brought up new opportunities for India to pursue its interests and to regenerate its policy towards Myanmar. Myanmar's democratization and India's Act East Policy are the main points in developing relations between them. There are reasons why India shifted its

policy towards Myanmar are based on strategic and economic interests. As for strategic objectives, India wants to explore Myanmar government's participation for cross-border insurgency problems, to check insurgencies along borders for the purpose of keeping stability in Northeast India, and to counter Chinese influence in the region. The great reservation of energy resource base through Kaladan Multi-modal Transport project was an important economic reason for this policy shift in India. Under the framework of India's Look East/Act East Policy, there are numerous bilateral engagements between Myanmar and India. In fact, a series of India's infrastructure projects, trade and investments have increased in Myanmar since 2011. It is noted that while China was cooling down on its economic and political engagement with Myanmar, particularly concerning with Myitsone dam project in 2011, India has actively initiated the new steps with Myanmar government. It seems that the presence of China in Myanmar became relatively weaker and India in Myanmar has been turning into stronger since 2011.

While China was cooling down on its economic and political engagement with Myanmar, particularly concerning with Myitsone dam project in 2011, India has actively initiated the new steps with Myanmar government through its AEP.

As a democratic country, India was ready to support its democratic aspirations and other assistances during Myanmar transition period. Defense cooperation with India, specifically in terms of training of officers at Indian defense academies coupled with the sale of military equipment, is crucial for Myanmar, which is actively seeking to diversify its defense imports. The institutionalization of cooperation against illicit drug trafficking across the border region through border patrolling further intensifies bilateral ties. Therefore, for Myanmar, India's AEP plays an advantageous role in meeting its strategic interests specifically from the angle of military engagement.

From India's standpoint, this is a crucial area to pitch to Myanmar given that other players in the security dimension. In addition, India regards the growing Chinese influence and presence in Myanmar as undermining their strategic interests in the Indo-Pacific region. Thus, to offset the Chinese influence, India has cultivated close ties with the Myanmar government and facilitated the improvement of Myanmar's maritime capabilities. India prepared a naval base in the Andaman Islands to anticipate China's military incursion into the Indian Ocean. The growing Chinese influence might pose a threat to Cocos Islands and Myanmar maritime territory.

Myanmar has long factored into India's strategic calculations. India considers relations with Myanmar to be very important, particularly in the context of evolving Indo-Pacific strategic dynamics, and Myanmar is also a key link in furthering India's Act East Policy. For China, which has a bigger political and economic footprint in Myanmar, its inroads into Myanmar have geostrategic implications because it gives Beijing proximity to the Bay of Bengal and the Andaman Sea, maritime space that is crucial to Indian security. China is concerned about India's increasing efforts to improve closer military ties with neighboring ASEAN countries and the level of India's naval activity in the Indian Ocean, which it perceives as a possible challenge to China's sea lane access.

Energy security is apparently important for both China as well as India. They are both net importers of crude oil, and both are seeking to diversify their energy supply through natural gas.

Myanmar is abundant in oil and gas and second largest natural gas reserves in Southeast Asia. Myanmar's energy sector has now emerged as a clear marker of the growing rivalry between China and India, with both countries anxious to secure new hydrocarbon reserves and take advantage of overland transportation routes to the Indian Ocean. However, China has maintained the upper hand position so far.

Myanmar is perceived to be a buffer state between India and China, and India has always been concerned about China's relative gains in Myanmar. Political changes in Myanmar were significant attraction to their multiple interests. There are lots of opportunities regarding connectivity of India with South East Asian nations through North East India within the framework of Act East Policy. India's wish to regenerate the NER is matched by China's desire to develop Yunnan in order to gain access and integrate Myanmar.

There might be some implications with respect to the relationship between china and India. China and India are rivals especially in political, economic and military matters. It is suggested that the two regional powers understand the strategic importance of Myanmar and would like to maintain steady and persistent relationships with Myanmar.

Myanmar can scale down its dependence on China in economic sector but China's diplomatic shield from international arena is essential for Myanmar. Therefore, it is assumed that Myanmar governments have been able to balance China and India for its own interests.

Myanmar should strategically use its foreign policy towards China and India to enhance its security and development prospects significantly. Both China and India recognize Myanmar's strategic significance, neither can do without the active cooperation of Myanmar to deal with a host of transnational challenges, and both increasingly regard Myanmar as an asset in their global competition for energy resources. With these stakes in Myanmar, it looks quite unlikely that either China or India can be easily weaned off their policy of full engagement with Myanmar. By developing and deepening the relationship with both China and India, it is likely to continue to benefit further from relations with China and India.

In short, Myanmar can promote the political, economic and social needs of the country to a certain extent from China and India rivalry. Myanmar can promote economic cooperation by trading with China while receiving high technology and defense equipment as India's aid. Myanmar could build up its national interest by adapting to balance between two countries with high energy needs. Myanmar can succeed in fulfilling its domestic and external interests and to overcome from its complete economic dependence on China by promoting foreign relations with other countries, especially, like a regional power India. Therefore, Myanmar should maintain significant political tactics in balancing its relations with China and India to sustain its vital national interests.

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THE SCEPTICAL TREND AND ITS CONTRIBUTION TO WESTERN PHILOSOPHY

Abstract

Introduction

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(၂-၂) THE SCEPTICAL TREND AND ITS CONTRIBUTION TO WESTERN PHILOSOPHY

Thet Thet Myint*

Abstract

Scepticism is a philosophy that does not accept beliefs based on authority or faith and holds that human knowledge cannot give certainty and that there are no absolute truths. The research problem of the dissertation is “why do some philosophers maintain that the sceptical outlook is a necessary function in the search for knowledge and that it cannot be rejected out of hand? The solution will be provided by evidences and reasons from the history of philosophy in support of scepticism. It will also mention the fact that some philosophers reject scepticism because it defends individual and relativist views which have a negative impact on ethics and morality. The descriptive and evaluative methods are used. The research findings are evaluated with the principle of implication. This dissertation will contribute to the realization that ‘scepticism’ plays an important role in the search for knowledge, but it is also a reminder that sceptical thinking is different from critical thinking and keeping an open mind but that scepticism taken to extremes will be a great obstacle in the search for knowledge.

Keywords: Scepticism, Faith, Truth, Critical Thinking

Introduction

Scepticism means someone who is unsatisfied and still looking for truth. The term is generally used for those who doubt and those who doubt even about the probability of knowledge. In philosophy, the philosophers use various forms of thoughts and possibilities in the pursuit of truth and reality. When history of western philosophy is studied it is found that philosophers build up their philosophy in different ways of thinking and reasoning. One's philosophy is reviewed, analyzed and reconstructed with new ideas. By holding scepticism and reconstructing with new ideology philosophy has developed from the ancient Greek to the present.

The western philosophy begins with cosmology. Ancient Greek philosophers search for the fundamental roots of the universe. But, there have no common agreement. The Milesian School conceives the root of the universe as water, boundless something and air. They all have suspected one's outlook by another. The idealists, Pythagorean School suspect the ideology of the Milesian School. In the later period of the Greek Philosophy, the philosophers argue one another upon the doctrines of ethics, metaphysics, ethics, politics, etc. The first famous sceptics are the sophists.

At the end of fifth century B.C., Socrates appears and attacks the subjective ideas of the sophists. Socrates lays down a way of searching for general truth. In the later period of the Greek philosophy, Plato and Aristotle criticize and object to the subjectivism propounded by the

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sophists. In the theory of knowledge Plato asserts that sense perception can give only knowledge of changing particular appearances. Plato builds up a firstly systematic metaphysics, in which Plato places the universal ideas in the higher position.

The Greek rationalism has been inherited by modern philosophers. Descartes has reconstructed new rationalism with his own method. Descartes like Socrates, begins his method with doubt. Descartes, philosopher as well as a mathematician applies mathematics method in philosophy to in order to get a certainty just as in mathematics. However, the British philosophers attack Descartes' rationalism. John Lock suspects Descartes' innate ideas and he replaces "tabula rasa" in getting knowledge. The British philosophers construct the empiricism. They hold that knowledge begin with experience. British philosopher Hume's scepticism in causation awakens German philosopher Immanuel Kant who was in dogmatic slumber; it is said by Kant himself. So, Kant synthesizes the two extreme theories of Descartes' rationalism and the British philosophers' empiricism. Kant claims that the foundation of knowledge is based on both empiricism and rationalism.

In modern period, the sciences have been developed and scientific thoughts have been influenced in every field not only in philosophy. The method of science is "verification and hypothesis". The philosophers begin to reexamine the usual method of verification whether it can effort to get certain and whether there is another method. The critics come to find that it is more favourable to falsify than to verify in formulating a hypothesis. Then, Karl Popper who is one of the great philosophers of science in the twentieth century creates a "Principle of Falsification".

So, the scepticism is very important for the development of not only sciences and technology but also other fields of philosophy such as metaphysics, epistemology, ethics, politics and even religion. This paper will present how scepticism is important in the development of western philosophy. In this paper, there three parts such as definition of scepticism and the scepticism in the Greek philosophy, scepticism in modern philosophy, Karl Popper's Principle of Falsification and Faith and Scepticism in science and ethics. It is concluded with *Kalama Suttā* of the Buddha. In this paper, the descriptive and evaluate method are used and the principle is implication. This dissertation will contribute to the realization that 'scepticism' plays an important role in the search of knowledge.

I. The Definition of Scepticism

In human beings' life, sceptical thinking is involved in some way or another. Everybody wants to be sure and certain about what he or she knows but there is no certainty. A person may not be satisfied with what he knows, though he attempts to reach the anticipated goal by fulfilling the requirements which seem to be necessary for it. Thus, sceptical thinking cannot be avoided and many western philosophers have proved that sceptical thinking can provide critical habits of thought which can lead to further knowledge. Scepticism is a critical philosophical attitude which examines the reliability of knowledge. Originally it is a Greek term *Skeptikos* which means

inquirers. It also means someone is unsatisfied with what is known and is still looking for truth. The term is generally used for those who doubt even about the probability of knowledge. Scepticism is defined by different scholars in their own ways. The term is generally used for those who doubt and those who doubt even about the probability of knowledge. Hence, it had been a long tradition in Greek in the broadest sense of the word 'Scepticism'. The Cambridge Dictionary of Philosophy defined "Scepticism is the denial for granting any knowledge or justification."¹

II. The scepticism in Greek philosophy

Scepticism in Western thought is a kind of thinking, according to which there is no certain knowledge. Sceptics usually employ various forms of doubting. In Ancient Greece, the sceptics like the sophists arose to challenge the basic accepted views of the world before them. Chirstopher Biffle defines scepticism as follows;

The view is that the mind possesses little or no reliable knowledge. An extremely radical sceptic might hold that nothing is certain including the view that nothing is certain.²

Chirstopher Biffle explains scepticism from an epistemological aspect that the mind has no reliable way of acquiring knowledge. The sceptics have been engaged in inquiry which tries to see if any knowledge could be gained at all. Therefore, scepticism usually begins with doubt and uncertainty. Sceptical thinking started in Greece when the discussions of early Greek thinkers about the origin and nature of the universe. Then, later Greek thinkers turned their attention to the study of morals, law and politics. Their investigation was extended to problems concerning the state, the principle of conduct, religion, art and education. The spirit of sceptical and individualistic thinking came up with the new movement which was represented by the sophists who were prominent for their scepticism.

Xenophanes is a Pre-Socratic philosopher whose sceptical thought is flourished in Greece. Xenophanes doubts whether there is any criterion for knowledge to decide whether a statement is true or not. For Xenophanes even if there is a chance to find truth then it is not easy to distinguish it from error. He thinks that there is always an element of guess work in one's ideas. The scepticism is found distinctly in the teachings of the sophists. They distrust the power of human being's mind to solve the world problems. In their thoughts, there is also lack of faith in traditional conceptions. This lack of faith and realization of uncertainty led to the sceptical tendency of the sophists, which has a critical attitude and which questions the reliability of knowledge. Among the sophists, Protagoras, Gorgias, Hippias and Prodicus were well known during the second half of the fifth century. Protagoras had no confidence in the human ability to attain absolute truth. He was famous and his motto, 'Man is the measure of all things,' was influential upon all sophists and conceived that knowledge depends upon the particular knower, that what seems true to him is true for him, that there is no objective truth, but only subjective opinion.

¹ Robert Audi. (1995). *The Cambridge Dictionary of Philosophy*. New York: Cambridge University Press. p.738.

² Chirstopher Biffle. (1999). *Land Scape of Wisdom*. London: Mayfield Publishing Company. California. P.25.

At the end of fifth century B.C., Socrates was one of the greatest philosophers in the history of philosophy. Especially, the aim of Socrates is to challenge the sophists' conception of subjective and doubt in search of truth. According to Socrates, truth is not subjective but there is a general agreement which is the common ground of knowledge. In order to get general agreement, Socrates sets up his method. In his method, there are five characteristics. They are (1) It is sceptical, (2) conversational, (3) conceptual or definitional, (4) empirical or inductive, and (5) deductive. According to Socrates begins with doubt but it is tentative. That conception of doubt is solved by other four steps to get general agreement.

In the later period of the Greek philosophy, Plato and Aristotle criticized and objected to the subjectivism propounded by the sophists. For them the sophistic movement in the history of thought was not acceptable because it discourages the search for truth and wisdom. The sophists' weakness lies in the fact that scepticism taken to extremes which lead to subjectivism, individualism and emotionalism. Plato is against the skeptical outlook of Protagoras, who maintained that 'man is a measure of all things.' In the theory of knowledge Plato asserted that sense perception can give only knowledge of appearances. For Plato, sense knowledge which was accepted by the sophists could not be a genuine knowledge.

After Aristotle, Greek philosophy went into decline. There is no great and original system. Post Aristotelian thinkers only try to repeat the great philosophers Plato and Aristotle. This is also a period of social and intellectual chaos. In the third century B.C., the leaders of Plato's academy formulated a new philosophical methodology. They rejected Plato's metaphysics and accepted Socrates statement that entire he knows is that he knows nothing. They are the sceptics who also accepted Socrates' method of questioning. They maintained that one cannot make any assertion of truth or falsity about what is happening beyond one's immediate experiences. The only thing one can say is that it is only probable. The famous sceptics are, Pyrrho, Timon, Arcesilaus, Carneades. They argues that even if there is no criterion for knowing and judging the nature of things with certainty there may be some degree of probability. In this way, new conceptions which are more promising gradually displaced the old. They began to realize that they should accept only beliefs based on some evidence. This in turn encouraged critical thinking in the search for knowledge and truth.

III. The Scepticism in Modern Philosophy

In modern period, the scepticism is open with Descartes's rationalism. The aim of Descartes is to find a body of certain and self- evident truths. In order to fulfill his aim, Descartes used the mathematic method as the model since he conceives that mathematical thinking is a universally applicable method. By using deductive reasoning Descartes can prove his existence, the existence of God and the existence of the external world. In this way, Descartes can refute the sceptical thinking of the sophists who held that nothing else could be known with certainty. Descartes suggests paying attention to the advice in his famous work "*A Discourse On the Method*". In that work, he provides four important guidelines for his method. It is made clearly as follows;

The first was never to accept anything as true that I did not incontrovertibly know to be so. The second was to divide all as many parts as possible. The third was to begin with the simplest and to most complex ones. The last was to be sure to have

left nothing. The first one is never to accept anything as true which one does not know clearly, avoid hasty judgment and prejudice and never to include anything which is not clear and distinct which can be doubted in one's judgments. The second guideline is when one has to examine something it is necessary to provide as many parts as possible in order to resolve it better. The third is to commence from simplest until it reaches the most composite things when one has to conduct one's thought. The last is when one has to enumerate, the enumerations must be complete and to review it till one is assured that nothing is omitted. In this way, Descartes suggests the elements of his philosophical method.¹

In the *Meditation I*, Descartes reflected on his earlier years and found that he had accepted many false opinions as true, and premises which are doubtful and uncertain. Hence he came to realize that he must reject those false opinions which were previously accepted in order to get firm and certain knowledge. In order to do so, Descartes firstly examined the principles on which his former opinions were founded. Then he rejected those which were not certain. In *Meditation II*, he proves that while he doubts everything, one thing which cannot be doubted comes up. Descartes wants to concentrate on truth. He tries to reject everything which is completely false. He detects and doubts until he reaches the one which is completely indubitable. In this way, he tries to doubt everything till he observes the truth 'I am thinking therefore, I exist'.

In Meditation II, it describes I am thinking therefore I exist, which makes me sure that I am telling the truth, except that I can see very clear that, in order to think, one has to exist, I conclude that I could take it to be a general rule that things we conceive of very clearly and distinctly are all true, but that there is some difficulty in being able to identify those which we conceive of distinctly. It is so secure and certain that it cannot be shaken by anyone of the sceptics. Thus he reaches a rational, self-evident proposition to doubt means to think, to think means to exist; 'Cogito, Ergo Sum', I think, therefore I am. Descartes proves the objective truth of 'I exist' by using the method of doubt. He proves his existence because he must exist to doubt. He has clear and distinct idea of his mind. After Descartes has proved his existence, he continues to prove the existences of God. According to him, the idea of God is one of the innate ideas which are very clear and distinct. One can perceive that God is eternal, omniscient, and omnipotent, the source of all goodness and truth and the creator of all things. God is perfect and infinite. But Descartes goes to reason and explain that human beings are finite and imperfect and so the idea of a perfect and infinite being God, cannot have come from them. From this Descartes draws the conclusion that God exists.

Another problem to be considered is the existence of the external world. Descartes continues to prove that the external world must exist. If the external world does not exist, God will be a deceiver. God cannot be deceiver because Descartes has a belief that God creates everything. Hence, the external world that God creates must exist. Thus, Descartes by using the mathematical method proved the truths of his existence, the existence of God, and the existence of the external world from his truth of 'Cogito Ergo Sum' as a self-evident truth. Descartes had, thus, searched truth and certainty by applying the method of doubt at the beginning of his pursuit

¹ Rene' Descartes. (2006). *A Discourse On The Method* -A new translation by IanMaclean. p.17.

for certainty. This proof leads him to develop a view of the world which consists of two kinds of substance namely mind and body or matter. In his thinking, he sees human beings as the subjects who are experiencing or observing the material objects of the external world. It is remarkable that this idea of Descartes is the division of nature into two kinds of substances which are separated as mind and body, subject and object, the observer and the observed. Hence, this way of thinking of Descartes is referred to Western thinkers as 'Cartesian dualists'.

However, the British empiricists, Locke, Berkeley and Hume opposed Descartes' innate ideas and existence of self. Locke propounded his theory of 'tabula rasa' that men are born with minds like clean slates on which nothing was written. Thus, knowledge comes from experience. The more experience a person has the more knowledge will be obtained. Western epistemological schools of rationalism and empiricism try to find out the roots of knowledge.

Rationalists hold that 'truth comes from within' because they believe that truth can be known only by reason. The empiricists argue that 'truth comes from without' because the empiricists believe that experience is the primary source of knowledge. The school of rationalism grew out of Descartes' application of deductive method and the use of reason. The Rationalism of Descartes, Spinoza and Leibnitz has had important influence on western thinking.

Locke does not accept the rationalist position that there are certain universally accepted principles before experience. He asserts knowledge is the result or consequence of one's perception of the world. For Locke, human perceptions are real and at the same time the objects of perception are real. What Locke means is that there is an objective physical world existing independently of those who perceive. That is why the empiricism of Locke is known as epistemological realism. Locke asserts that when human beings perceive things, they do not perceive things directly. They can perceive only copies of a certain thing or things because their senses cannot have direct contact with the external world. They come to know the external objects of the world only through their ideas of the objects. That is why they come to know the objects not directly but only through the ideas which represent the object.

Locke draws a distinction between two kinds of quality, primary and secondary qualities. Primary qualities are those that are inherent in objects themselves. The quantitative aspects of experience, extension, number, shape, solidity and motion are primary qualities as these are integral parts of objects which are inseparable from the objects. For example, the shape of a tree is there in the object independent of perceiving it.

Secondary qualities are those that are not dependent on the objects as these are dependent on human beings. These are color, taste, sound and smell. Secondary qualities are subjective because these qualities depend on the perceiver. These qualities vary with the percipient so they are called secondary qualities. For Locke, the world is composed of objects that have primary qualities and secondary qualities of objects which can be perceived. All that one can perceive are qualities of a thing. But one can never perceive that which Locke calls the substance that binds the qualities together. Substance which is the substratum of the qualities is unknown and unknowable for Locke. But Locke's new philosophy was in line with the new science because both emphasize observation and verification by experience.

But, many empiricists including Berkeley criticized and denied Locke's theory of material substance and differentiation of primary and secondary qualities of an object. It is because primary qualities are also subjective and as dependent as secondary qualities on the perceiver's mind. According to Berkeley, the existences of material things are dependent upon the perceiving mind. The same is true for all sensations. That is why existence is identical with perception. Here Berkeley states his famous statement 'esse est = percipi', 'To be is to be perceived'. He maintains that since all human beings know only what they perceive there cannot be anything exists outside of their perceptions. Therefore, one cannot know that a physical world exists. The only things human beings can maintain that exists are their perceptions and their minds and God who perceives even things that human beings do not perceive.

However, the empiricist David Hume has been sceptical upon Locke's and Berkeley's theories. Hume denied Locke's differentiation of primary and secondary qualities and he also rejects the Berkeley's substitution of spiritual substance of God in the place of Locke's material substance. Besides, Hume denies the necessary relation of cause and effect. According to Hume, perception can be divided into two major classes which are impressions and ideas. The impressions are the immediate perceptions that come to human beings through their senses. The difference between impression and idea is due to the degrees of force and liveliness. For Hume, impressions are more lively and active perceptions. But, as ideas are copies of such impressions they are less lively and faint perceptions. That is why one can find that all simple ideas and impressions resemble each other as complex ideas are formed from simple ideas and complex impressions are formed from simple impressions.

Hume's outlook in the Relation of Cause and Effect he denied the necessary relation between cause and effect. According to him, human's conception of cause and effect relations are only habitual thinking. Cause- effect relations cannot be perceived in the external world. It is merely by seeing one event precedes another. The conjunction may be due to his conjecture. That conjecture comes from his custom or habit. Hume asserts that the mind is led by habit or custom to believe that the two objects are connected and they will always go together, such as heat and flame, weight and solidity. After Hume denies the causal relation, he denies the existence of self. According to Hume, there is no idea of self, because there is no empirical evidence for the existence of self. For Hume, all the positive assertions of self are contrary to experience because there is no impression about it. Self is the succession of sensations.

Kant examines Hume's denial of causation as a necessary relation. Unlike Hume, Kant believes that the principles of science are reliable. Kant believes that the principle of cause and effect is both a necessary and universal characteristic of the world. So, the fundamental problem for Kant is to examine human knowledge. In examining the nature of knowledge, Kant finds that both rationalism and empiricism are the two extremes. According to him, in the nature of knowledge both reasoning and experience are involved. So, Kant sets up four kinds of proposition which are founded on reasoning and experience.

The four kinds of proposition are apriori analytic proposition, aposteriori synthetic proposition, aposteriori analytic proposition, and apriori synthetic proposition. Among those four kinds of proposition, Kant accepts the true and reliable proposition is only apriori synthetic proposition which is based on reasoning and experience. Thus, Kant synthesized the rationalism

and empiricism in the nature of knowledge. For example, 'Every event has a cause'. The statement is known apriori because it cannot be known from experience. At the same time, it is synthetic because the predicate 'a cause' gives new knowledge about the subject. That is how Kant proves that a proposition or statement can be apriori and synthetic at the same time.

IV. Karl Popper's Principle of Falsification

Kant has affirmed the reliability of causation and sciences are built up by the principle of causation. However, the statements of sciences are confirmed by the principle of verification and hypothesis. But, the critics come to find that it is more favourable to falsify than to verify the scientific statements. In science, after formulating a hypothesis, the scientist has to find out whether it will be contradicted in experience and turn out to be false. If this turns out to be false, he rejects it and formulates another one. The new hypothesis will last as long as it cannot be proved false. It is the method of falsification undertaken by Karl Popper who was one of the great philosophers of science of the twentieth century.

Popper held that sciences begin by formulating hypothesis and in doing so science uses propositions which are objective. Thus, scientific knowledge consists of propositions which are strongly believed by the scientists as objective. That is, why there are expectations and strong beliefs which can be regarded convictions in scientific knowledge. Popper also claimed that science uses the critical method. To eliminate the mistakes and false theories, science uses the critical method which is non-dogmatic. The critical method is a method which aims at searching for contrary instances in order to test general statements. In this method, criticism is the chief means by which one can make progress. If the falsity of a statement cannot be tested, then it cannot be accepted as scientific. It means that although general theory cannot be proved as true, it can be tested as false. For example, one cannot prove the truth of the statement, 'All swans are white'. No one can observe all white swans. But, the statement 'All swans are white' can be proved as false by a single observation of a black swan. The principle of falsification that Popper proposed consists of three stages namely, the problem, the attempted solution and the elimination. First, there is the problem to solve. The second stage consists of multiple solutions and the third is the elimination of errors. If the solutions turn out to be unworkable then the solutions are eliminated in the third stage. Then, new attempts have to be made for finding new solutions. If a new attempt is successful, then the problem is solved. For solution and elimination Popper used the critical method.

For Popper, science is perpetually growing and dynamic so that it is never finished. Science emerges through critical discussion and there is no point as the final goal. Falsification for Popper is a methodological norm for the sciences. Scepticism discourages dogmatism. Scepticism encourages critical reflection and analysis. Popper's philosophy which is a theory of falsification is a kind of critical rationalism. But it is not the same as Descartes' rationalism. Popper's rationalism is not a philosophical rationalism. For Popper, rationalism means the conviction that one can learn through criticism of one's mistakes and errors. For Popper, only through criticism can human beings discover innovative methods and obtain new ideas to add to what they have already learned.

V. The Role of Faith and Scepticism in Science

The problem of scepticism has been involving not only in metaphysics and epistemology but also other fields of sciences and ethics. It may be said that the development of sciences is also proceeded by mean of scepticism. It is because in the age of Greek period, Ptolemy's geocentric theory had been accepted as truth. But, in the modern period the scientific knowledge had been developed and Ptolemy's theory was suspected and Copernicus examined and set up new theory of heliocentric theory.

Science is the most reliable form of knowledge about the world. Science does not simply accept new ideas without finding verifiable evidence to confirm them. The methods used by different sciences may be different but there are fundamental characteristics of the methods which are basically used by sciences and the scientists. They are (1) objective, (2) phenomenality (3) generalization, (4) universality, (5) accumulation (6) consistency, (7) repeatability, and (8) regularity and applicability. Applicability is also a character of science. Since the purpose of science is to benefit the practical life of people, the result of science can be used to facilitate human life. Hence it must be applicable.

A scientific theory may be correct as long as it is supported by and coincides with the facts. Scientific knowledge is obtained through a certain method. Science reaches its universal laws about the facts, after the facts are verified by observation and experiment. Hence, it is systematic and has regularity. Since all sciences proceed from the assumption that nature is ordered, rational and intelligible, the scientist whether he is a physicist, mathematician, or astronomer proceeds from their assumptions. So, there is something like trust faith in the assumptions of the scientists. Upon this faith, they extend their knowledge through experiments.

VI. The Role of Faith and Scepticism in Ethics

The scepticism is more needed and related in ethics it is because moral values and ethical doctrine are based upon the traditional beliefs. Some traditional beliefs provide and carry the development of community but some traditional beliefs are based on myths and they have no practical values. Those norms of ethics may disturb the development of community which will be kept in dogmatism. By holding the scepticism people may examine the worth of the norms of morality and ethical principles.

Conclusion

It has already examined that how scepticism contributes the development of Metaphysic, Epistemology, Ethics and Sciences. If there is no scepticism human beings' knowledge and technologies will not be advanced up to this present time. Some people accept scepticism in negative sense. They believe that it is useless and it is the obstacle to get truth and certainty because by holding the scepticism in mind no definite decision will occur. However, when it is examined from the positive side, it supports to avoid the wrong doings and to choose the right ones. The scepticism sends the people to the right way and give the value of conscience and prudence. If a person does without sceptical mind, he may encounter the wrong way. Thus, before a work is done people firstly consider its possibilities of the good and the bad again and

again. After the end of consideration, a person has to choose a way seemed to be true and then he must hold it as a faith and carry out it definitely without doubt. So, in the pursuit of truth, doubt is unavoidable but it must be eliminated by finding truth through own efforts.

In concerning with scepticism, there is a distinct teaching of the Buddha in the *Kalama Suttā*. The Buddha once visited Kesaputta in the kingdom of Kosala. The inhabitants of this town are known by the common name Kalama. They told Buddha as follows;

Sir, there are some recluses and brahmanas who visit Kesaputta. They explain and illumine only their own doctrines, and despise, condemn and spurn others doctrines. Then come other recluses and brahmanas, and they, too, in their turn, explain and illumine only their own doctrines, and despise, condemn and spurn others doctrines. But, for us, Sir, we have always doubt and perplexity as to who among these venerable recluses and brahmanas spoke the truth, and who spoke falsehood. Then Buddha replied that only after thorough investigation and reflection, one must accept anything as true and live in accordance with it.

One must use both experience and reason before accepting anything as true.¹

Buddhist thought denounced adherence to blind faith and dogmatism. Instead of dogmatic thinking, Buddhist thought encouraged free inquiry and investigation. The Buddha urges to investigate and reflect. After thorough investigation and reflection, anyone can find what is true and right with reason and experience. Then it will be conducive to the good and benefit everyone. Those are stages that one passes through in the search for truth.

In human beings' life, sceptical thinking is involved in some ways or other. Since anything can happen unexpectedly, so anyone, whether he is investigating something in the field of science, philosophy, or religion may pass through a stage of uncertainty or have some doubt about his claim. In the field of sciences, in order to achieve objective knowledge of the empirical world, it necessarily needs a sceptical outlook and thinking. It is because scepticism abolishes unnecessary obstacles. Scepticism and faith operate as separate of powers in the search for knowledge. If there is no sceptical thinking, faith may deviate from its right way to the goal and as a result it may be led to dogmatism. Scepticism takes the role of helping people to avoid blind faith.

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¹ *KalamaSutta*. Retrieved on October7, 2020 from www.ling.upenn.edu/~beatricbuddhist/practice, (7.10.2020)

Notes

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**THE CORRELATES AND CONSEQUENCES OF
POST-TRAUMATIC STRESS DISORDER AMONG DISASTER
VICTIMS IN MYANMAR**

- 1. Abstract**
- 2. Introduction**
- 3. Method**
- 4. Results and Discussion**
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(၂-၃) THE CORRELATES AND CONSEQUENCES OF POST-TRAUMATIC STRESS DISORDER AMONG DISASTER VICTIMS IN MYANMAR

Tin Tin*

Abstract

The aim of the present study was to explore the correlates and consequences of Post-Traumatic Stress Disorder (PTSD) among flood victims in Myanmar. A total of 300 flood victims from Mottama village in Paung Township, Mon State participated in the study. The participants were 122 males (40.7%) and 178 females (59.3%) and their age range was from 13 to 70 years old with mean age was 40.46 ± 13.61 years. Using structured interviews, data were obtained with PTSD Checklist Civilian Version PCL-C, (Weathers et al., 1994). Regression analysis highlighted that female, unemployed, and older flood victims were more likely to report symptoms of PTSD. And then, higher physical damage was associated with PTSD. With respect to personality traits, only conscientiousness may protect the flood victims from developing PTSD. After that, the IQ appeared as the most risk factor for PTSD. In addition, the trauma exposure was more significantly predictive to PTSD than trauma intensity. Moreover, lack of social support also influenced the incidence of PTSD. Symptoms of PTSD had a significant impact on psychosocial functioning of the participants. Especially, avoidance symptom of PTSD had the strongest impact on self-care domain, romantic domain, family domain, work domain and friendship domain. Arousal symptom of PTSD had a significant impact on self-care domain, family domain and parenting domain. Re-experiencing symptom of PTSD was a significant impact on only self-care domain. The findings of the study may help policy makers to improve early intervention and screening programs and may also show significant public health implications in the control and prevention of flood related posttraumatic stress disorder (PTSD) in Myanmar.

Keywords: *Posttraumatic stress disorder, personality traits, social support, intelligence quotient, psychosocial functioning*

Introduction

Disasters are events that traumatized victims. These caused both mental and physical negative health consequences (Neria et al., 2007). Disasters can be classified into three categories i.e. natural disasters, man-made disasters and pandemic or disease epidemics. Natural disasters are known to be flood, earthquake, volcano, hurricane, cyclone, tornado and outbreak that cause fires in the forest (Barkun, 1947). Man-made disasters are terrorism, suicide bombing, violence, rape and war. These are regarded as manmade which occur due to human wickedness, hatefulness and bad blood (Fritz, 2015). These disasters affect a large population of people. They cause emotional trauma and psychological distress which causes real or anticipated fear of death, physical damage, economic loss or death of a close family member or relative (Bromet & Dew., 1995).

Globally, frequent flooding causes higher magnitude of disaster among the developing and developed nations (Ahern et al., 2005; Kar & Bastia, 2006; Kar et al., 2007). In the recent study conducted by Myanmar Red Cross Society (MRCS, 2009), it was reported that people are under constant and severe stress and fear due to series of natural disasters. It could be recalled that Cyclone Nargis of 2008 causes many deaths and damages (MRCS, 2009). Many death and

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destruction in some parts of Yangon and Ayeyarwady Regions were caused by the Cyclone Nargis (Kyi Kyi Hla, 2010).

Again, some parts of the Rakhine State suffered many damages and losses by hitting Cyclone Giri in 2010 (OCHA, 2010). Moreover, a severe flood in 2015 in Myanmar left hundreds of thousands of residents homeless and destroyed many projects. It damaged farmlands along river banks (IFRC, 2016). The consequences of the floods were direct economic and property losses, physical harm and fatalities due to drowning and deaths, and psychological injuries and acute trauma (Sana & Khattak, 2014; Yeo & Blong, 2010; Zahran et al., 2011).

The epidemiological data suggest that flooding is responsible for tremendous physical, social and psychological disruptions that necessitate extensive rehabilitation of the affected population. Apart from the great impact on human health due to injuries and unhygienic conditions, flooding can have considerable negative psychological effect on survivors in terms of mental illness, who can be diagnosed with post-traumatic stress disorder (PTSD), anxiety and depression (Ahern et al., 2005; Mason et al; 2010). Some studies have reported long-term effects on mental health with profound psychiatric morbidity in flood affected individuals. The most frequently diagnosed psychological illness of people living in flood affected areas is PTSD which manifests as difficulty in sleeping, emotional distress, avoidance and emotional arousal (Huang et al., 2010; Mason et al; 2010).

Correlate factors of PTSD

A large number of studies stated the relationship between personality variables, exposure to traumatic events and the severity of PTSD symptoms (Lauterbach & Vrana., 2001; Hyer et al., 1994 & Chung et al., 2007). Other risk factors for PTSD include a family history of psychopathology, lower IQ, childhood adversity, preexisting avoidant personality or behavioral problems, and poor social support (Yehuda et al., 2007; Sutker, & Allain., 1995). Furthermore, many researches have demonstrated that a range of socio-demographic variables are associated with the mental health effects of disasters, for example, age, gender, education, marital and socio-economic status (Jahan., 2015, Tolin & Foa., 2006, Olf et al., 2007).

Numerous studies have revealed that personality type is one risk factor for PTSD as well as many other disorders. In reviewing literature, it was known that people with high neuroticism experience and more emotional distress have a wide range of emotional state such as anxiety, hostility, and depression. Neuroticism refers to an increased sensitivity to react to unpleasant emotions. Those who are low in neuroticism tend to be more emotionally stable and have greater self-control. By means of the Five-factor model of personality (FFM), it was found that only higher neuroticism was associated with significant PTSD (Brodsky et al., 2004; Hyer et al., 1994 & Chung et al., 2007).

As described in the Neo-personality model, extraversion is characterized by sociability, assertiveness, emotional expressiveness and excitability. Individuals who are high on extraversion are likely to develop a positive self-perception, optimism, and a sense of meaning to life, while those who are low on extraversion tend to respond negatively after a life threatening event and thus, are vulnerable to PTSD (Kessler et al., 2001; Miller, 2003). Thus, the personality traits that have been found to consistently correlate with PTSD are neuroticism and extroversion (Watson et

al., 2005). One of these factors, individual differences in personality traits, plays an important role in the development and formation of specific symptoms of PTSD after exposure to trauma. Therefore, it is important to explore the related factors mentioned above with PTSD.

Moreover, exposure to disaster or any other traumatic event is a precondition for the occurrence of PTSD (Tracy et al., 2011; Boden et al., 2015). Previous study shows that exposure to single or multiple traumas are more predictive of PTSD (Huang et al., 2012). Then, intensity of trauma coupled with the total number of traumatic events experienced contributes a substantial impact in PTSD severity (Lee et al., 1995).

In addition, previous studies were found that low intelligence is associated with severity of PTSD (McNally & Shin, 1994; Vasterling et al., 2002). High intelligence is thought to protect people from developing PTSD as well as moderate its severity and limit the number of symptoms experienced by traumatized individuals (Sutker, & Allain., 1995). McNally & Shin (1995) also found that individuals with high intelligence were more likely to have cognitive ability to facilitate adaptive coping and less likely to develop chronic PTSD.

Past studies stated that poor perceived social support is one of the most important risk factors for the onset, maintenance of PTSD symptoms and other mental health problems following a disaster (Ruggiero et al., 2009; Brewin et. al., 2000; Andrykowsky & Cordova, 1998). Duffy et al (2014) found that lack of social support to be related to higher levels of fatigue, burnout, difficulties in managing work-related stress and even posttraumatic stress responses. Thus, this study will explore the relationship between social support and PTSD among flood victims in Mon State.

Furthermore, gender and age play an important role in the development of PTSD following disaster. Women have been found to have a higher risk of developing mental illness, especially PTSD after flooding. Females suffered more PTSD than males after the same flood (Wani et al., 2016; Feng et al., 2007; Damir & Toadir, 2014; Senyonga, Owens & Olema, 2013). Children and adolescents appear more at risk of developing psychological distress than adults (Vigil et al., 2008). In addition, low income and adolescents are related to the higher rates of PTSD (Jahan, 2015, Tolin & Foa, 2006). Respondents with low income had a higher risk of developing depression and PTSD than those with high income after the flood (Kar et al., 2007; Stimpson et al., 2006). Liu et al (2006) also found that being females, single and having a low income may increase the risk of developing PTSD.

Consequences of PTSD

Posttraumatic stress disorder (PTSD) is associated with a range of deleterious outcomes. Posttraumatic stress disorder (PTSD) is reported to be associated with direct negative emotional and cognitive functioning. The individuals with PTSD often experience clinically significant psychosocial functional impairment across a range of domains (Belleville, 2012 & Matthews, 2005). In the previous findings, Solomon and Mikulincer (2007) reported that PTSD symptoms (intrusive, avoidance /numbing and hyper-arousal) led to impair psychosocial functioning. Psychosocial functioning consists of self-care, romantic relationship with spouse or partner, family, work, friendships and socializing, parenting and education (Solomon and Mikulincer,

2007; Kuhn, Blanchard, & Hickling, 2003). Studies have found that PTSD avoidance symptoms are strongly associated with intimate relationship problems among Veterans (Riggs et al., 1998; Solomon et al., 2008b). Gewirtz et al., (2010) found that PTSD symptoms were associated with decreased parenting satisfaction among male Vietnam Veterans. Rona and colleagues (2009) also found that PTSD related avoidance symptoms were most strongly associated with poor performance at work among a sample of UK military personnel. They also tend to generally have poor mental health conditions (Zayfart, 2002). Therefore, studying the consequences of PTSD is important and helpful to victims of flood.

It is quite clear that exposure to trauma is common in the general population. But not everyone who experienced trauma experiences develops PTSD. As there was the lack of systematic investigation of posttraumatic stress disorder among flood victims in Myanmar, it is necessary to explore the nature of PTSD and its consequences in flood affected areas. Thus, the present study attempts to explore the prevalence of posttraumatic stress disorder in the flooded areas and intend to contribute the understanding correlates and consequences of PTSD in Myanmar by drawing upon theoretical models as well as previous researches.

1.1 Objective

The main objective of this study is to explore the correlates and consequences of post-traumatic stress disorder among flood victims in Myanmar.

1.2 Hypotheses

Based on the literature and previous research findings, the following hypotheses were considered in this study:

Hypothesis 1: Elevation in Neuroticism will be associated with high level of PTSD among flood victims.

Hypothesis 2: Elevation in Extroversion will be associated with low level of PTSD among flood victims.

Hypothesis 3: Trauma exposure will be positively associated with PTSD among flood victims.

Hypothesis 4: The intensity of the trauma will be positively associated with PTSD among flood victims.

Hypothesis 5: Flood victims with lower intelligence score will be more likely to report higher level of PTSD than victims with higher intelligence score.

Hypothesis 6: Flood victims with less social support will be more likely to report higher level of PTSD than victims with more social support.

Hypothesis 7: Female flood victims will be more likely to report higher level of PTSD than male flood victims.

Hypothesis 8: Younger flood victims will be more likely to report higher level of PTSD than older flood victims.

Hypothesis 9: Flood victims with low-income will be more likely to report higher level of PTSD than victims with high-income.

Hypothesis 10: PTSD will be positively associated with impairment in psychosocial functioning.

Methods

2.1 Participants

A group of 300 flood victims were used as participants in this study. This included 122 males and 178 females, with an average age of 40.46 ± 13.61 years (mean \pm SD). All participants were aged from 13 to 70 years old. Those who are living in Waryiu, Yesulanthit and Myittarmon blocks, in Mottama village were selected. The area included (817) households containing (5146) flood affected people. These areas were located at riverine areas and flooded on 6 - 9 August 2019. The participants were displaced at nearby government schools and they had to live there for a week. The crops and their properties were lost under flood at that time.

2.2 Procedure

Approximately four months following the flood, the researcher contacted Township Administrator in order to get representative sample of participants for data collection. According to community village heads' recommendation, 3 blocks out of 6 in Mottama village with 817 households living 5146 individuals, and aged 13 years and above were selected for the study. The sample selection procedure of this study is purposive. The survey was conducted on door to door basis and only one flood victim from each house was made structured interview (appendix section). The whole structured interview took about one hour: testing intelligence took 15 minutes and structured interview on six scales about 45 minutes. The data collection team consisted of five interviewers: one leading researcher, two psychology graduates and two facilitators from ward administrative office. Before the beginning of the interview, the researcher first explained to team members about the purpose of the study, the questionnaires and how to conduct interview with keeping research ethics. Data collection was done from 27th December 2019 to 6th January 2020. The participants were informed that their responses were confidential. The collected data were entered onto a database the Statistical Package for the Social Science (SPSS, 22.0 versions) for further analysis. Descriptive, *t*-tests, ANOVA, correlation and regression analysis statistics were computed.

2.3 Measures

The questionnaire packet contained six measures: PTSD Checklist-Civilian Version (PCL-C), Big Five Inventory (BFI), Traumatic Events Questionnaire (TEQ) and Trauma Intensity (TI), Multidimensional Scale of Perceived Social Support (MSPSS) and Brief Inventory of Psychosocial Functioning (B-IPF). Moreover, Raven's Progressive matrices or RPM which is a nonverbal group test were used in the study. Demographic items elicited information about flood victim characteristics (age, gender, education and marital status, employment status, monthly income, previous health status). And then, exposure assessment data included water level, injury, financial help, and loss of property or land. Under the advice and guidance of the supervisor and experienced psychologists, all items were translated and adapted into Myanmar Language.

PTSD CheckList – Civilian Version (PCL-C)

In order to assess PTSD of flood victims the PTSD Checklist-Civilian Version (PCL-C) was used. This was developed by Weathers et al., 1994. It derived from the PCL-Military Version (PCL-M; Weathers et al., 1993). All 17 items included in the scale corresponds to the criteria of DSM IV. The items were so arranged that each item may be self-reported by 5- point Likert-type scale responses ranging from 1 (*not at all*) to 5 (*extremely*). The total score was computed by summing responses on all items of the scale. Total score range was 17 to 85, and the severity was classified as follows: 17 to 27 little to no severity, 28 to 29 mild PTSD symptoms, 30 to 44 Moderate 45 to 85 high severity of PTSD symptoms. The scale was reported to be valid and reliable: sensitivity .86, Cronbach's α .82, and the split-half reliability .65. Based on the test construction results, Myanmar Version of this scale showed good internal consistency in the current sample among individual screening into the Cronbach's α .88 (Total Score). In addition, three symptoms of PTSD, the alpha values were .75, .78 and .65 for re-experiencing symptom, avoidance symptom, and hyperarousal symptom, respectively.

Big Five Inventory (BFI)

For personality assessment Big Five Inventory BFI (John and Srivastava., 1999) was used. It consists of 44-items covering five bipolar scales: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to experience. It is in self-report questionnaire form, with five-point Likert scale, ranging from 1 strongly disagree to 5 strongly agreed. Negative question items are included where reverse scoring was done. This scale was translated into Myanmar by Phyu Phyu Khing, Department of Psychology, University of Mandalay (2008) and internal consistency scores were reported to be extroversion .56, agreeableness .72, conscientiousness .81, neuroticism .71 and openness to experience .73 respectively. In the present study, the coefficient alphas for all five factors of Big Five Inventory (BFI) were .58 for extroversion, .55 for agreeableness, .71 for conscientiousness, .58 for neuroticism, and .65 for openness to experience, respectively.

Multidimensional Scale of Perceived Social Support (MSPSS)

The Multidimensional Scale of Perceived Social Support MSPSS developed by Zimet et al., 1988 was used. This scale derived from the original version of the MSPSS that consisted of 24 items, scored on a 7-point Likert scale. They later modified the original scale to 12 items MSPSS based on a series of content analyses and exploratory data reduction strategies. The 12 items final version included three factors, such as significant others, families, and friends. Specifically, each revised MSPSS subscale is made up of four items, and the response options are respecified to be scored from 1 (very strongly disagree) to 7 (very strongly agree). Responses to items within each of the subscales are summed to derive a total subscale score. Scores on all 12 items are summed to obtain a composite MSPSS scale score (i.e., global perceived social support).

The items mean of the MSPSS all fell above the midpoint of 3.5, suggesting higher levels of social support. Reported coefficient alpha for the Significant Other, Family and Friend factors, the values were .91, .87, and .85, respectively. The reliability of the total scale was .88. In the study on Turkish adaptation of the MSPSS, the values were .85, .90, and .88, respectively, and for the total scale the reliability was .87 (Duru, 2007). For the whole scale, the value obtained was .85

(Zimet et al. 1988). Canty-Mitchell and Zimet (2000) showed the whole MSPSS scale has reliability estimate of .93 and good reliability .91, .91, and .89 for the factors of the Significant Other, Family and Friend. In the present study, the whole MSPSS has shown high internal reliability .89.

The Traumatic Events Questionnaire (TEQ) and Trauma Intensity (TI)

Traumatic Events Questionnaire (TEQ) by Vrana & Lauterbach, (1994) which consists of 11-item with dichotomous yes/no scale was used. The TEQ assesses experiences with nine specific types of traumatic events: accidents, natural disasters, crime, child abuse, rape, adult abusive experiences, witnessing the death/mutilation of someone, being in a dangerous/life-threatening situation, receiving news of the unexpected or sudden death of a loved one (Vrana & Lauterbach, 1994). These events were reported in the empirical literature as having the potential to elicit posttraumatic stress symptoms. Finally, the trauma exposure score was computed by summing responses on all items of the scale. In all cases, higher scores indicate greater traumatic exposure. In addition, this TEQ was used to identify the most traumatic event for further investigation of the trauma intensity. The reliability estimate of Traumatic Events Questionnaire (TEQ) was found to be .33 in the present sample. Based on the most traumatic event, trauma intensity was measured with a 7-point Likert scale from 1 (Not at All) to 7 (Severely/Extremely). This scale consists of four items and these items were summed for the worst event experienced to produce a trauma intensity score ranging from 4 to 28. The reliability estimate of the present study was .85 for trauma intensity.

Intelligence

In order to test the level of Intelligence, Standard Progressive matrices by Raven (1956) was used. It is usually a 60-item test used in measuring abstract reasoning and regarded as a non-verbal intelligence test. It is the most common and popular test administered to groups ranging from 5 years old to the elderly. It is made of 60 multiple choice questions, listed in order of difficulty and the format is designed to measure the test taker's reasoning ability (Raven., 1956). The tests were originally developed by John C. Raven in 1936. A total intelligence score of Raven's Progressive matrices was used in this study.

Brief Inventory of Psychosocial Functioning (B-IPF)

The 14-item Brief Inventory of Psychosocial Functioning (B-IPF) developed by Marx et al, (2013) was used. This scale derives from The IPF Marx et al, (2009) is an 80-item, self-report instrument that measures PTSD related psychosocial functional impairment in the past 30 days. The B-IPF is a 14 items self-report instrument that evaluates PTSD-related psychosocial functional impairment within the last 30 days across seven functional domains (self-care, romantic relationship with a spouse or partner, family relationships, work, friendships and socializing, parenting and education) as the IPF; each item on the B-IPF corresponds to two IPF functional domain. Higher scores indicate greater functional impairment. Respondents answer each item by using a 7 point Likert scale ranging from 1 (not at all) to 7 (very much). The B-IPF was also designed to allow some missing data so that respondents only complete scales that have been relevant for them in the past 30 days. That is, participants are instructed to skip any item that does

not reflect a domain that they have participated in over the past 30 days (e.g., participants who were not enrolled in school within the past 30 days are instructed to skip the education item). The B-IPF demonstrates excellent internal consistency, with a Cronbach alpha coefficient of .93 for the entire scale (Marx et al., 2013). Another study by Bovin et al., (2018) showed good reliability .78, .83, .84, .81, .88, .90 and .74 for the sub-domains of the romantic, family, parenting, friendships, work, education and self-care. In the present study, the reliability estimate of the whole B-IPF scale was .88 and its sub-domains were .86 for self-care, .83 for Romantic, .91 for family, .93 for work, .83 for friendships and .89 for parenting, respectively.

Result and Discussion

3.1 Results

Item Analysis

In order to conduct the item analyses, the data were entered onto a database in the Statistical Package for the Social Science (SPSS, 22-version). To conduct an item analysis for the Myanmar version of the PTSD Checklist-Civilian Version (PCL-C) the responses of participants were scored by using the scoring keys for each subject. After the total scores for each subscale were obtained and arranged in ascending order from the 27 percent of low-scoring individuals, and the 27 percent of high-scoring individuals the Chi-square method was conducted to find out any significant differences between the two groups on each item.

According to the results of the items analysis for the PTSD CheckList - Civilian Version (PCL-C) whole scale and on each subscale, it was found that all items of the whole scale and on each subscale were significant at .001 levels. Therefore, each item can discriminate between low-group and high-group. This study showed that the 17-item Myanmar version of the PTSD CheckList - Civilian Version (PCL-C) is an appropriate measure for Myanmar cultural setting.

Reliability Analysis

In order to examine internal consistency reliability analysis on the 17-item Myanmar version of the (PCL-C), the Cronbach's Alpha for the whole scale of PTSD was found to be .88. In addition, three symptoms of the PTSD CheckList - Civilian Version (PCL-C) were also computed. The reliability estimate was .75 for re-experiencing symptom, .78 for avoidance symptom, and .65 for hyper-arousal symptom, respectively (see Table 1).

Table 1. Internal Consistency Reliability for the Myanmar Version of the PTSD CheckList Civilian Version (PCL-C)

No.	Test	Cronbach's Alpha
1.	Myanmar version of the PTSD CheckList - Civilian Version (PCL-C)	.88
2.	re-experiencing symptom	.75
3.	avoidance symptom	.78
4.	hyper-arousal symptom	.65

Factor Analysis of the Myanmar Version of the Brief Inventory of Psychosocial Functioning

First analysis examined the factor structure of the Brief Inventory of Psychosocial Functioning B-IPF through the use of a principal component analysis with varimax rotation. Two items for education domain did not appear in the result of analysis because of a few respondents for them. Therefore, the principal component analysis was conducted again for the rest 12 items. The results suggested a six domain solution in the analysis. The results indicated 12 items with a factor loading greater than .70. The six domains were self-care, romantic relationship with a spouse or partner, family relationships, work, friendships and socializing and parenting. These factors are accounted for 1.94%, 1.94%, 1.82%, 1.76%, 1.69 %, and 1.62% of the total variance, respectively.

Reliability Analysis of the Brief Inventory of Psychosocial Functioning

As a result of internal consistency reliability analysis on the 12-items (B-IPF), the Cronbach's alpha for this entire scale was found to be .88. With respect to sub-domains of B-IPF, .86 for self-care, .83 for Romantic relationship with a spouse or partner, .91 for family, .93 for work, .83 for friendships, and .89 for parenting, respectively (see Table 2). So, it is clear that the value of reliability coefficients for this scale and its sub-domains was high enough.

Table 2 Internal Consistency Reliability for the Myanmar Version of the Brief Inventory of Psychosocial Functioning

No.	Test	Cronbach's Alpha
1.	Brief Inventory of Psychosocial Functioning (B-IPF)	.88
2.	Self-care	.86
3.	Romantic relationship with a spouse or partner	.83
4.	Family	.91
5.	Work	.93
6.	Friendships	.83
7.	Parenting	.89

Correlations Analysis

Means, standard deviations and correlational matrix calculated among the measures are shown in Table 3. As a result, gender ($r = .14, p < .05$), age ($r = .45, p < .001$), previous health status ($r = .18, p < .01$) and physical damage ($r = .20, p < .001$) were positively correlated with Post-Traumatic Stress Disorder. Education ($r = -.41, p < .001$), employment status ($r = -.22, p < .001$) and monthly income ($r = -.16, p < .01$) were significant negatively related to PTSD. However, marital status ($r = .06, ns$), flood level ($r = -.03, ns$), loss of property or land ($r = .05, ns$) and financial help ($r = .01, ns$) were not significantly correlated with PTSD.

PTSD had significantly negative correlations with conscientiousness personality ($r = -.12, p < .05$), IQ ($r = -.60, p < .001$) and social support ($r = -.48, p < .001$) but not with extroversion ($r = -.01, ns$), agreeableness ($r = -.09, ns$), neuroticism ($r = .07, ns$) and openness to experience ($r = -.01, ns$). Trauma exposure ($r = .35, p < .001$) and trauma intensity ($r = .32, p < .001$) had significantly positive correlations with PTSD. Furthermore, PTSD was found to have a significantly positive correlation with psychosocial functioning ($r = .53, p < .001$).

Independent Sample *t*-tests Analysis

To assess the gender differences in PTSD and psychosocial functioning, independent sample *t*-test was conducted and the results were displayed in Table 4. It was found that there was

a significant difference between the two groups on PTSD only, but did not for psychosocial functioning. Particularly, female participants reported significantly higher mean scores on PTSD than their counterparts ($t = -2.45$, $p < .01$). However, there was no significant difference in psychosocial functioning between male and female.

To assess the differences in PTSD between two groups of lower and higher level of perceived social support, independent sample t -test was also conducted and the results were presented in Table 5. It was found that there was a significant difference between the two groups on PTSD. Especially, participants who had lower social support reported significantly higher mean scores on PTSD than their higher social support counterparts ($t = -6.52$, $p < .001$).

Analysis of Variance (ANOVA)

In order to investigate the differences among three age groups, One-way ANOVA analysis with post-hoc method was computed. Table 6 showed that the age group of elderly ($M = 42.26$; $SD = 10.24$) reported higher mean score on PTSD than Adults ($M = 31.47$; $SD = 8.65$) while children group ($M = 25.35$; $SD = 4.64$) had the lowest score among these groups.

Secondly, One-way ANOVA analysis with post-hoc method was conducted to assess the differences among four income groups on PTSD. The result showed that the group who earned below 100000 per monthly income reported significantly the highest mean score on PTSD than the other three groups (Between 100001 and 200000, Between 200001 and 300000, Above 300001) as seen in Table 7.

The PTSD differences among three IQ levels were examined by using One-way ANOVA analysis with post-hoc method and the result was presented in Table 8. It was found that the participants who have low level of IQ presented significantly higher score on PTSD than the other two groups.

Table 3 Means, stand deviations and correlations among measures used in the study (N=300)

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 Gender	1.59	.49	-									
2 Age	40.46	13.61	-.09	-								
3 Education	5.77	3.64	-.02	-.65***	-							
4 Marital status	1.71	.46	-.13*	.27***	-.23***	-						
5 Employment status	1.64	.48	-.11	-.13*	.19***	.29***	-					
6 Income	207966	59076	-.18***	-.19***	.19***	.23***	.31***	-				
7 Previous health status	1.02	.13	.06	.24***	-.14*	-.03	-.12*	-.17**	-			
8 Flood level	1.52	.50	.04	.04	-.02	-.02	.08	.14*	.07	-		
9 Physical damage	1.08	.27	.04	.05	-.10	.05	.03	.00	-.04	.02	-	
10 Property or land damage	1.64	.48	.04	-.03	-.04	.12*	.09	.21***	-.12*	.30***	.16**	-
11 Extroversion	7.46	1.77	.03	.00	.01	-.02	.06	-.15**	-.08	.04	-.07	-.04
12 Agreeableness	16.57	2.58	-.02	-.04	.09	-.04	.05	-.03	-.05	-.08	-.04	-.10
13 Conscientiousness	27.52	5.53	.01	.01	-.02	.00	.18**	-.09	.05	.07	.04	.03
14 Neuroticism	22.05	4.85	-.06	.06	-.04	.08	-.04	.03	-.03	-.11	-.00	-.09
15 Openness to experience	20.87	3.74	-.06	-.00	.01	-.03	.04	-.01	-.04	-.05	-.02	-.06
16 IQ score	30.39	9.72	-.14*	-.51***	.57***	-.11*	.23***	.20***	-.20***	.03	-.17**	-.00
17 Trauma exposure	2.95	1.29	-.04	.27***	-.24***	.23***	.03	-.03	.05	-.12*	.14*	.09
18 Trauma intensity	11.36	5.79	-.13*	.36***	-.26***	.17**	-.03	-.01	.12*	-.01	.11	.10
19 Financial help	1.01	.08	.07	.02	.01	-.04	.06	-.10	-.01	.08	.13*	-.11
20 Social support	58.23	12.75	-.04	-.37***	.36***	-.06	.03	.22***	-.16**	.20***	.00	.06
21 PTSD	31.80	9.10	.14*	.45***	-.41***	.06	-.22***	-.16**	.18**	-.03	.20***	.05
22 B-IPF	19.33	9.51	-.01	.18**	-.21***	.23***	.20***	-.08	.05	-.05	.16**	.11

Note: (PTSD) Post Traumatic Stress Disorder, (B-IPF) Brief Inventory of Psychosocial Functioning, * $p < .05$ ** $p < .01$ *** $p < .001$

Table 3 ~ Continued

Variables	11	12	13	14	15	16	17	18	19	20	21	22
1 Gender												
2 Age												
3 Education												
4 Marital status												
5 Employment status												
6 Income												
7 Previous health status												
8 Flood level												
9 Physical damage												
10 Property or land damage												
11 Extroversion	-											
12 Agreeableness	.30***	-										
13 Conscientiousness	.54***	.31***	-									
14 Neuroticism	-.24***	-.00	-.40***	-								
15 Openness to experience	.37***	.41***	.30***	-.14*	-							
16 IQ score	-.02	.16**	.05	-.10	.08	-						
17 Trauma exposure	-.01	-.05	.06	.07	-.10	-.32***	-					
18 Trauma intensity	-.02	-.11	.03	.11	-.09	-.35***	.47***	-				
19 Financial help	.03	.03	.10	-.00	.03	-.12*	.04	.06	-			
20 Social support	-.06	-.04	-.02	-.12*	.00	.37***	-.38***	-.28***	.08	-		
21 PTSD	-.01	-.09	-.12*	.07	-.01	-.60***	.35***	.32***	.01	-.48***	-	
22 B-IPF	.06	.04	.01	.17**	-.06	-.35***	.37***	.31***	.05	-.44***	.53***	-

Note: (PTSD) Post Traumatic Stress Disorder, (B-IPF) Brief Inventory of Psychosocial Functioning, * $p < .05$ ** $p < .01$ *** $p < .001$

Table 4 Results of *t*-test analysis for gender differences in PTSD and Impairment of Psychosocial Functioning

Variables	Male (n=122) M (SD)	Female (n=178) M (SD)	<i>t</i>	Sig.
PTSD	30.26 (7.89)	32.86 (9.72)	-2.45	.01
B- IPF	19.46(9.32)	19.25(9.67)	.19	.67

Note: B-IPF = Brief Inventory of Psychosocial Functioning

Table 5. Result of *t*-test analysis for different perceived social support groups in PTSD

Variables	Lower perceived social group (n=67) M (SD)	Higher perceived social group (n=233) M (SD)	<i>t</i>	Sig.
PTSD	37.79 (11.23)	30.08 (7.58)	-6.52	.001

Table 6 Results of ANOVA Analysis for different age groups in PTSD

	Variables (age)	Number	Means (SD)	<i>F</i> value
1.	Children (Below 18)	17	25.35 ^c (4.64)	19.07***
2.	Adults (between 18 and 60)	264	31.47 ^b (8.65)	
3.	Elderly (Above 61)	19	42.26 ^a (10.24)	

When superscript letters differ, there was a statistically significant means difference between age groups. *** $p < .001$

Table 7 Results of ANOVA Analysis for different levels of income groups in PTSD

	Income Level	Number	Means (SD)	F value
1.	Below 100000	21	37.62 ^a (10.83)	4.12 ^{**}
2.	Between 100001 and 200000	163	32.11 ^b (9.29)	
3.	Between 200001 and 300000	102	30.43 ^b (8.02)	
4.	Above 300001	14	29.50 ^b (8.41)	

When superscript letters differ, there was a statistically significant means difference between income levels. ^{**} $p < .01$

Table 8 Results of ANOVA Analysis for different levels of intelligence groups in PTSD

	IQ Level	Number	Means (SD)	F value
1.	Low	182	35.36 ^a (9.41)	46.21 ^{***}
2.	Average	89	26.48 ^b (5.06)	
3.	High	29	25.79 ^b (4.55)	

When superscripts letters differ, there was a statistically significant means difference between intelligence levels. ^{***} $p < .001$

Regression analysis

To examine our hypotheses in more detail, a multiple regression analyses on PTSD was undertaken with demographic variables, previous health status, physical damage, personality, IQ, trauma exposure and trauma intensity and social support being introduced as explanatory variables. A multiple regression was performed to obtain precise information concerning the contribution of seven group independent variables to the prediction of the dependent variable. The results were displayed in Table 9.

The first was a set of demographic variables that include gender, age, education, employment status and monthly income. The second set consisted of previous health status of the participants. The third set consisted of physical damage of the participants. The fourth set of variables consisted of five factors of personality namely extroversion, agreeableness, conscientiousness, neuroticism and openness to experience. The fifth set of variables consisted of IQ of the participants. The sixth was a set of trauma variables that include trauma exposure and trauma intensity. The final set of variables consisted of social support and these were put into the regression model independently to test the effect on post-traumatic stress disorder.

Table 9 indicates that IQ was a strongest predictor of PTSD ($\beta = -.35, p < .001$). Moreover, gender ($\beta = .09, p < .05$), age ($\beta = .14, p < .05$), employment status ($\beta = -.10, p < .05$), physical damage ($\beta = .13, p < .01$), conscientiousness ($\beta = -.17, p < .01$), trauma exposure ($\beta = .10, p < .05$) and social support ($\beta = -.27, p < .001$) were significant in explaining on PTSD. Monthly income, previous health status of the participants, extroversion, agreeableness, neuroticism, openness to experience and trauma intensity were not found to be significant impact on PTSD.

To examine hypothesis (10) in more detail, a multiple regression analysis was conducted between PTSD and psychosocial functioning. Again, multiple regression analyses were separately computed to examine the prediction of three symptoms of PTSD on six sub-domains of psychosocial functioning. Table 10 presented that the whole PTSD was positively related to the entire psychosocial functioning ($\beta = .53, p < .001$). It indicates that re-experiencing symptom of PTSD was significant in explaining on only self-care domain ($\beta = .23, p < .001$). Avoidance symptom of PTSD has impact on self-care domain ($\beta = .35, p < .001$), romantic domain ($\beta = .22, p < .05$), family domain ($\beta = .28, p < .001$), work domain ($\beta = .41, p < .001$) and friendships domain ($\beta = .31, p < .001$). Arousal symptom of PTSD was found to be significant impact on self-care domain ($\beta = .12, p < .05$), family domain ($\beta = .14, p < .05$) and parenting domain ($\beta = .21, p < .05$). Among the three symptoms of PTSD, the avoidance symptom was the strongest predictor of different psychosocial functioning domains.

Table 9 Results of a Multiple Regression Analysis Testing demographic, personality, IQ, trauma exposure and social support as predictors of PTSD

Predictor Variables	B	SE	β	<i>t</i>	R^2	ΔR^2
Step 1					.27	.27***
Gender	1.74	.82	.09*	2.13		
Age	.10	.04	.14*	2.40		
Education	.10	.15	.04	.65		
Employment status	-	.87	-.10*	-2.08		
Income	1.82					
	5.58	.00	.04	.78		
Step 2					.27	.00
Previous health status	1.91	3.15	.03	.61		
Step 3					.30	.03***
Physical damage	4.49	1.47	.13**	3.06		
Step 4					.32	.02
Extroversion	.16	.27	.03	.60		
Agreeableness	-.06	.17	-.02	-.32		
Conscientiousness	-.27	.09	-.17**	-2.97		
Neuroticism	-.12	.09	-.07	-1.38		
Openness	.20	.12	.08	1.67		
Step 5					.43	.11***
IQ Score	-.33	.05	-.35***	-6.09		
Step 6					.47	.03***
Trauma Exposure	.70	.35	.10*	1.98		
Trauma Intensity	.07	.08	.05	.88		
Step 7					.51	.05***
Social support	-.20	.04	-.27***	-5.30		

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 10 Results of a Multiple Regression Analysis Testing re-experiencing, avoidance and arousal symptoms of PTSD as predictors of psychosocial functioning

Variables	B- IPF Domain Scale															
	B-IPF Total				Self-care				Romantic				Family			
	B	SE	β	<i>t</i>	B	SE	β	<i>t</i>	B	SE	β	<i>t</i>	B	SE	β	<i>t</i>
PTSD Total	.56	.05	.53***	10.82												
Re-experiencing					.18	.05	.23***	3.78	.06	.07	.08	.97	.07	.05	.09	1.32
Avoidance					.20	.04	.35***	4.88	.13	.06	.22*	2.32	.16	.05	.28***	3.50
Arousal					.09	.05	.12*	1.97	.07	.07	.09	1.08	.10	.05	.14*	1.97
R ²			.28				.38				.12				.20	
ΔR^2			.28***				.38***				.12***				.20***	

*p<.05 **p<.01 ***p<.001

Table 10 ~ Continued

Variables	B- IPF Domain Scale											
	Work				Friendship				Parenting			
	B	SE	β	<i>t</i>	B	SE	β	<i>t</i>	B	SE	β	<i>t</i>
PTSD Total												
Re-experiencing	-.05	.08	-.05	-.63	.03	.05	.04	.58	.02	.05	.03	.36
Avoidance	.30	.07	.41***	4.46	.15	.04	.31***	3.82	.08	.05	.17	1.75
Arousal	.13	.08	.13	1.59	.08	.05	.13	1.80	.14	.06	.21*	2.47
R ²			.22				.19				.13	
ΔR^2			.22***				.19***				.13***	

*p<.05 **p<.01 ***p<.001

3.2 Discussion

The main objective of the study is to explore the correlates and consequences of post-traumatic stress disorder among flood victims in Myanmar. PTSD was found to have a significant association with correlated factors such as gender, age, education, employment status, and income, conscientiousness trait of personality, IQ, physical damage, trauma exposure, trauma intensity and social support. Furthermore, it was suggested that PTSD had a significant impact on psychosocial functioning.

Correlate factors of Post-Traumatic Stress Disorder

Personality Factors

On the basis of previous literature, it was hypothesized that elevation in neuroticism and low level of extroversion would be associated with high level of PTSD among flood victims. As a result, we found that the personality trait of neuroticism and extroversion were not correlated with PTSD in the present study. Thus, hypotheses 1 and 2 were not supported. Although described a link between high neuroticism and PTSD outcomes in several previous studies (Hyer et al., 1994

& Bramsen et al., 2000), unexpected findings was found that neuroticism was not significantly related to PTSD in this study. In general, it is likely that individual with high neuroticism may have more risks of high emotion and consequently severe PTSD. However, the finding showed the average score of the participants was low and moderate in Neuroticism that can appear no strong relationship between neuroticism and PTSD.

Another possible reason is that results may occur due to the low level of reliability coefficients of the Myanmar Version of the Big Five Personality scale used in the present study. The internal consistency reliability coefficient was analyzed by using 44- item of Myanmar versions of the BFI and found to be not good enough for the five factors of personality; .58 for extroversion, .55 for agreeableness, .71 for conscientiousness, .58 for neuroticism, and .65 for openness to experience. To improve the reliability coefficient, we decided to delete 17 items out of the total scale. Finally, the scale consists of 27 items with a low level of reliability. Low reliability means that the questions tended to be unrelated to each other in terms of who answered them correctly. The resulting test scores reflect peculiarities of the items or the testing situation more than participants' knowledge of the matter. The results of this study suggested that the scale need to be revised or the test definitely need to be supplemented by other measures (e.g., more tests) for applying purpose.

Although we did not hypothesize specifically in this study, we found that conscientiousness had a significantly negative correlation with PTSD. The significant negative correlation between PTSD and conscientiousness might be due to the tendency for such people with high score on this trait to control and regulate the stressful situation (Burger, 2008; Moorhead, 2010). According to this, Campbell-Sills et al. (2006) found that conscientiousness is positively related to PTSD resilience. To conclude, the overall findings from this study suggested that conscientiousness accounts for the risk of developing PTSD symptoms. As regard to personality dimensions, the results are somewhat inconsistent and further research is needed.

Exposure to Traumatic Events and Trauma Intensity

Hypothesis 3 indicated that trauma exposure would be positively associated with PTSD among flood victims. This hypothesis 3 was supported by correlation and regression analyses. The distressful experience after exposed to trauma was the strongest association with PTSD. This result supported to the past studies (Davidson et al., 2004; Dyregrov et al., 2002; Follette et al., 1996; Huang et al., 2012) that the exposure to multiple traumas, rather than a single trauma, leads to the development of more PTSD symptoms. The finding was also consistent with the previous study that exposure to multiple events in conflict and war zone represented a strong risk factor for PTSD (Herman, 1992).

Moreover, Hypothesis 4 stated that the intensity of the trauma would be positively associated with PTSD among flood victims. According to correlation analysis, there was a positively significant relationship between trauma intensity and PTSD in the present study ($r = .32, p < .001$). However, as a result of regression analysis, trauma intensity was not found to be significant impact on PTSD. It is hard to interpret the trauma intensity as a causing factor for PTSD in the present study. Therefore, hypothesis 4 was not supported. The result was not in line with the extant literature and previous findings that trauma intensity coupled with the total number of events experienced a substantial variance in PTSD severity (Lee et al., 1995; McCranie, Hyer,

Boudewyns, & Woods, 1992; Vernberg, LaGreca, Silverman, & Prinstein, 1996). However, according to Ozer and coauthors (2003), the effect of trauma intensity was stronger when chronic PTSD was taken into account as comparison of the recorded data shortly after a disaster. Thus, a conclusion can be drawn that this finding was somewhat consistent with the past results. Another reason seems to be the high correlation between the two independent variables.

Intelligence

Hypothesis 5 predicted that flood victims with lower intelligence would be more likely to report higher level of PTSD than victims with higher intelligence. The results of analysis supported Hypothesis 5. This finding is in line with previous studies that have found IQ level to be one of the predictors of PTSD (Brewin, Andrews, & Valentine, 2000; Ozer et al., 2003). People with higher IQ may also be more able to find treatment and to have more cognitive ability to enable adaptive coping and were less likely to develop chronic PTSD. It is likely that people who had higher IQ may be more able to cope with traumatic events or chose more suitable strategies to cope with their stress.

Social Support

Hypothesis 6 predicted that flood victims with less social support would be more likely to report higher level of PTSD than victims with more social support. It was found that less social support was associated significantly with more posttraumatic stress symptom. Additionally, participants who had lower perceived social support reported significantly higher mean scores on PTSD than their higher perceived social support counterparts ($t = -6.52, p < .001$). Therefore, Hypothesis 6 was supported. The finding was consistent with previous studies (Duffy et al., 2014; de Boer et al., 2014) that lack of social support has been found to be related to higher levels of fatigue, burnout, difficulties in managing work-related stress and even posttraumatic stress responses. This result also confirmed that low levels of post-combat social support interacted with the stressors of combat to produce increasing levels of PTSD over time (Keane et al., 1985). Strong social support can not only protect individuals from suffering from psychological disorders, but also facilitate the psychological recovery from disasters (de Boer et al., 2014). It is possible that social support may influence the way a person copes with stress and the effectiveness of these coping efforts and may motivate individuals to seek assistance when it is needed. Social support may have a long-term effect on alleviating the psychological consequences of flood.

Socio-Demographics Variables

On the basis of the gender, it was hypothesized that female flood victims would be more likely to report higher level of PTSD than male flood victims. According to *t*-test analyses, female flood victims scored higher than male counterparts on PTSD. Therefore, hypothesis 7 was supported. This is consistent with the past studies (Sipon, Nasrah, Nazli, Abdullah & Othman, 2014; Damir & Toadir, 2014; Ssenyonga, Owens & Olema, 2013) where women have higher rates of PTSD as compared to men. Olff et al., (2007) found that women are more likely than men to perceive a situation as threatening, rate events as significantly more stressful, and endorse more loss of personal control. Additionally, women are more likely to experience than men to acute physical and psychological responses to trauma including intense fear, avoidance, intrusive thoughts, horror, helplessness, panic, and anxiety (Olff et al., 2007).

Hypothesis 8 stated that younger flood victims would be more likely to report higher level of PTSD than older flood victims. This hypothesis was not supported by showing that older flood victims reported higher level of PTSD than the younger ones. Therefore, the present results were inconsistent with the past finding that older adults have been found to show lower lifetime PTSD prevalence rates than younger or middle aged adults (Frans et al., 2005; Kessler et al., 2005; Spitzer et al., 2008). Creamer & Parslow (2008) also found the highest rates of PTSD prevalence among both men and women are found between the age of 18 and 24 years. But, this result is consistent with previous findings of Telles et al., (2009) that the people over the age of 60 years old had highest scores on PTSD and depression than the other age groups significantly. This controversial issue should be considered with caution in future research.

Hypothesis 9 was that flood victims with low-income would be more likely to report higher level of PTSD than victims with high-income. Correlation analyses results showed that income was negatively related to PTSD. However, income did not appear as a predictor to PTSD in the regression analysis. Therefore, Hypothesis 9 was not supported. This result was inconsistent with the finding of the past study that respondents with low income had a higher risk of developing depression and PTSD than those with high income after the flood (Stimpson et al., 2006 & Kar et al., 2007). In this study, lack of variability in monthly income of participants (reflecting low income among respondents in this sample) made this relation difficult to assess.

Consequences of Post-Traumatic Stress Disorder

The final hypothesis 10 was that PTSD would be positively associated with impairment in psychosocial functioning. Correlation and regression analysis revealed that PTSD symptoms were positively associated at significant level with psychosocial functioning in overall score as well as six domains scores. Thus, Hypothesis 10 was supported.

This finding is in line with the previous studies in which avoidance symptom was associated with problems in various areas of psychosocial functioning such as romantic, family functioning, marital relationships, occupational, friendships and self-care (Kuhn, Blanchard, & Hickling, 2003; Riggs et al., 1998; Vogel, Wester, & Heesacker, 1999 and Bovin et al., 2018). It seemed that one's tendency to avoid emotionally laden situations and to detach from one's social surroundings has an especially negative effect on one's daily functioning (Vogel, Wester, & Heesacker, 1999). The avoidance may initiate a cycle in which withdrawal and reluctance to discuss the past may strengthen feelings of uncertainty and loneliness (Solomon et al., 2008). Moreover, these symptoms were related to an increasing reluctance to participate in previously enjoyable activities with their partners. In addition, it was found that avoidance symptom was most strongly associated with poor performance at work such as less time on task, less accomplished, difficulty performing duties (Rona et al., 2009). Therefore, it seemed that these participants were experiencing job burnout, job stress, work-family conflict, and job dissatisfaction.

In this study, it was found that Hyper-arousal symptoms of PTSD were also associated with self-care, family and parenting relationship difficulties. In particular, studies have found that increased anger, irritability, and aggression are related to problems in parent-child relationship (Taft et al., 2011; Monson et al., 2009). These symptoms were associated with volatile or emotionally deregulated parent-child interactions, especially in stressful situations. PTSD symptoms were associated with decreased parenting satisfaction, impaired attachment with children, child behavior problems, family violence and high levels

of verbal and physical abuse (Gewirtz et al., 2010; Kuhn, Blanchard, & Hickling, 2003). It is possible that PTSD symptoms were associated with less effective parenting such as inconsistent discipline and poor control.

Re-experiencing symptoms of PTSD were associated with only self-care impairment. The people with intrusive thinking and with difficulties in sharing thoughts or feelings, being emotionally supportive, and settling arguments or disagreements were more likely to occur self-care impairment such as difficulties in taking care of themselves. Based on these findings, it would be concluded that PTSD symptoms could be the risk factors for impairment of psychosocial functioning.

Summary and Conclusion

This study was carried out with the objective of exploring correlates and consequences of PTSD among flood victims in Mon State, Myanmar. A total of 300 flood victims participated in the study. The method of data collection team included a leading researcher, two trained psychology graduates, and two trained facilitators from ward administrative office in conducting structured interview with participants. It was done individually on a door-to-door basis. Altogether six scales were used to assess PTSD with its correlates and consequences. The original English scales were translated into Myanmar and developed through item analysis as well as factor analysis for its suitability to use with Myanmar respondents.

In order to do so, firstly we adapted PTSD Checklist - Civilian Version (PCL-C), which consists of 17 items developed by Weathers et al., 1994. The 17 items of the English version of the scale were translated into Myanmar by the researcher and checked by the supervisor against the original version to ensure the conceptual equivalence of the Myanmar version to the original version. To produce final version of the scale, the data were analyzed using the item analysis program. According to this result, all items of the whole scale and on each subscale were significant at 0.001 levels. As a result of internal consistency reliability analysis, the reliability coefficients were found to be 0.88 for the whole scale of PTSD Checklist - Civilian Version (PCL-C), 0.75 for re-experiencing symptom, 0.78 for avoidance symptom, and 0.65 for hyper-arousal symptom, respectively.

Secondly, we also conducted analysis by using factor analysis method for 14-item Myanmar version of Brief Inventory of Psychosocial Functioning (B-IPF). According to the factor analysis result, 12 items with a factor loading greater than .70 and we labeled the six domains as self-care, romantic relationship with a spouse or partner, family relationships, work, friendships and socializing and parenting. These factors are accounted for 1.94%, 1.94%, 1.82%, 1.76%, 1.69%, and 1.62% of the total variance, respectively. As a result of internal consistency reliability analysis on the 12-items (B-IPF), the Cronbach's alpha for this entire scale was found to be 0.88. With respect to sub-domains of B-IPF, 0.86 for self-care, 0.83 for Romantic relationship with a spouse or partner, 0.91 for family, 0.93 for work, 0.83 for friendships, and 0.89 for parenting, respectively. As regards to intelligence measure, Raven's original Progressive Matrices (RPM) non-verbal designs were used to estimate their intelligence level.

Regression analysis highlighted that being females, being unemployed, and being older flood victims were more likely to increase symptoms of PTSD. And then, higher physical damage was also associated with PTSD. With respect to personality traits, only conscientiousness protects the flood victims from developing PTSD. Moreover, IQ appeared as the most risk factor for PTSD.

In addition, the trauma exposure was more significantly predictive to PTSD than trauma intensity. Lack of social support also influenced the incidence of PTSD. The findings indicated 9.3% of flood victims met severe criteria symptom of PTSD. Finally, it was found that different domains of psychosocial functioning were impaired as related the consequences of three symptoms (re-experiencing symptom, avoidance symptom, and hyper-arousal symptom) of PTSD.

4.1 Implications

This study evaluated the prevalence of PTSD and its related factors, and found potential risk factors of PTSD. The research findings may provide some insight to government policy maker, disaster management team and international humanitarian organizations to take early mental health and psychosocial support (MHPSS) intervention in emergency crisis situations. This will also support to public health intervention planning and implementation in order to control and prevent flood related mental health problems. Moreover, the finding may also contribute that female, older people, unemployed persons and people with physical damage should also initially be considered when making emergency intervention. Understanding the impact of trauma events such as flood disasters and PTSD symptoms development will inform us to focus on preventive management strategies needed to face another calamity. Finally, the findings of this study may help policy makers to improve early intervention and screening programs and may also have significant public health implications in the control and prevention of flood related posttraumatic stress disorder (PTSD) in Myanmar.

4.2 Limitations and Suggestion for future research

Like any other studies, there were some limitations in the course of conducting research. The first limitation was that as data were collected by using purposive sampling method, the result cannot be generalized to the whole population of flood victims.

The second limitation was that no mental health counselor was included in data collection team led by the researcher when conducting prior structured interview with flood victims. Normally, when doing research in any disaster areas, mental health professionals were essential to reduce and heal the psychological problems such as anxiety and stress that can appear among the participants during the interview session. Because of this, Ph.D steering Committee decided that the researcher has to go back along with a counselor or a psychiatric and observe the situations of the participants. In order to do so, researcher tried the best to return to the flood affected areas as suggested by Ph.D Steering Committee. Unfortunately, researcher did not get a chance and opportunity to go back there as COVID 19 outbreak was occurred around the country at that time. Thus, the study strongly suggested that one of the mental health professionals (e.g., clinical psychologists, counseling psychologists or psychiatrist etc.) should be included in the data collection for future PTSD research.

Finally, in order to be a more complete research program of disasters, a future study should be recommended with wider sample of population covering many parts of the state not only on flood victims but also earthquake disaster victims and landslide disaster victims.

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ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြားရာဇဝင်ဆိုင်ရာ
စာပေများနှိုင်းယှဉ်လေ့လာချက်

- ၁။ ကျမ်းအကျဉ်းချုပ်
 - ၂။ သုတေသနရည်ရွယ်ချက်နှင့်ဦးတည်ချက်
 - ၃။ မျှော်မှန်းရလဒ်
 - ၄။ တွေ့ရှိချက်နှင့် ရလဒ်များ
 - ၅။ ဆွေးနွေးသုံးသပ်ချက်
- နိဂုံး
- ကျမ်းကိုးစာရင်း

(၂-၄)။ ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြားရာဇဝင်ဆိုင်ရာ စာပေများနှိုင်းယှဉ်လေ့လာချက်

နိဒ္ဒါခိုင်*

ကျမ်းအကျဉ်းချုပ်

ဤကျမ်းကိုလေ့လာတင်ပြရာတွင် ဦးစွာရခိုင်ရာဇဝင် စာပေကျမ်း(၄၆)စောင်ကို ဝါစဉ်အတိုင်း မိတ်ဆက် တင်ပြထားပါသည်။ ထို့နောက် ရခိုင်ရာဇဝင် စာပေကျမ်းများ၏ အကြောင်းအရာအချုပ်၊ ရခိုင်ရာဇဝင် စာပေကျမ်းများ၏ အကြောင်းအရာစီစဉ်တင်ပြပုံ၊ ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီး အကြောင်းအရာ စီစဉ်တင်ပြပုံနှင့် အခြားရခိုင်ရာဇဝင်စာပေကျမ်းများ၏ အကြောင်းအရာ စီစဉ်တင်ပြပုံ တို့ကိုနှိုင်းယှဉ်လေ့လာ တင်ပြထားပါသည်။ ထို့ပြင်ရခိုင်ရာဇဝင်စာပေကျမ်းများ၏ စကားပြေ အရေးအသားကို စကားပြေသဘောတရားလာ(၁) စကားပြေအဖွဲ့ပုံစံများနှင့်(၂) စကားပြေရေးဟန်ဟူ၍ နှစ်ပိုင်းခွဲပြီး လေ့လာတင်ပြထားပါသည်။ ဤသို့လေ့လာတင်ပြရာတွင် ခေတ်ပြိုင်မူရင်းပေမူ အထောက် အထား ရခိုင်ရာဇဝင်ကျမ်းများ၊ မူရင်းသဖွယ်အထောက်အထားပြုနိုင်သော တစ်ဆင့်ခံရခိုင် ရာဇဝင်ပေမူ များ၊ ခေတ်ပြိုင်ကမ္ဘာဦးကျောက်စာများ၊ ဒင်္ဂါးများ၊ ပြည်ပသမိုင်းပညာရှင်တို့၏ ခေတ်ပြိုင်ရခိုင်သမိုင်း မှတ်တမ်းများ၊ ကျမ်းများ၊ စာတမ်းများ၊ရခိုင်စာပေ သုတေသီတို့၏ ရခိုင်သမိုင်းဆိုင်ရာ စာအုပ်များကို လည်း အထောက်အထားပြု၍ လေ့လာတင်ပြထားပါသည်။

၁။ သုတေသနရည်ရွယ်ချက်နှင့်ဦးတည်ချက်

ရခိုင်လူမျိုးတို့သမိုင်း မည်သည့်အချိန်ကစသည်၊ ရခိုင်ဘုရင်တို့ မည်သည့်အမျိုးအနွယ်က ဆင်းသက် လာသည်စသည့် ရခိုင်ဘုရင်တို့၏ ရာဇဝင်သမိုင်းတို့နှင့်ဆိုင်သော အတိတ်သမိုင်းဖြစ်ရပ်များကို လေ့လာလိုခြင်း၊ ရခိုင် သုတေသီတို့ သတ်မှတ်ကြသည့် ရခိုင်ရာဇဝင် ၄၈ စောင်ရှိသည်ဆိုသော အချက်မှန်၊ မမှန်၊ ရခိုင်ရာဇဝင်ကို မည်သည့်ခေတ်မှစတင်၍ ရေးသားခဲ့ကြသနည်း၊ မည်သည့်ခေတ် မည်သည့်မင်းဆက်တို့ကိုစတင်၍ မှတ်တမ်းတင် ရေးသားကြသနည်း၊ မင်းတို့နှင့်ဆိုင်သည့် မည်သည့်အကြောင်းအရာတို့ကို ထည့်သွင်းရေးသားကြသနည်း၊ ရခိုင်ရာဇဝင်စာပေ ပုံသဏ္ဌာန် ဘယ်နှစ်မျိုး ရှိသနည်းစသည့် မေးခွန်းများ (သုတေသနပြဿနာများ) ရှိခဲ့ပါသည်။ ဤကျမ်းသည် အထက်ပါ သုတေသနပြဿနာများကို အဖြေရှာနိုင်ရန် ကြိုးပမ်းထားသည့် ကျမ်းဖြစ်ပါသည်။

ရခိုင်စာပေတွင် မိမိလူမျိုးတို့၏ မင်းစဉ်မင်းဆက်သမိုင်းကြောင်းကို အထောက်အထားများနှင့် တိုက်ဆိုင် စစ်ဆေး၍ ပြည့်စုံမှန်ကန်သည့် ရခိုင်ရာဇဝင်ကျမ်းတစ်စောင်ပြုစုရန် လိုအပ်သည်ဟု ထင်မြင်ယူဆပါသည်။ မျက်မှောက်ခေတ်တွင် ရေးသားသော ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်ရာဇဝင်ကြီးကျမ်းသည် ရှေးအစဉ်အလာ ရာဇဝင်ပါ အကြောင်းအရာများနှင့် သုတေသနတွေ့ရှိချက်များကို ပေါင်းစပ်ရေးသားထားသော သုတေသနသဘော ပါဝင်သည့် ရခိုင်ရာဇဝင်တစ်စောင်ဖြစ်ပါသည်။ သုတေသနရာဇဝင်၏ လမ်းပြသဖွယ်ဖြစ်သည့် ထွန်းရွှေခိုင် (မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြားရခိုင်ရာဇဝင်ကျမ်းများ၏ အကြောင်းအရာစီစဉ်တင်ပြပုံ မည်သို့ကွာခြားမှုရှိသည်ကို လေ့လာဆန်းစစ်ပြရန်၊ ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့်

* မြန်မာစာဌာန၊ အမျိုးသားစီမံခန့်ခွဲမှုပညာကောလိပ်

အခြားရခိုင် ရာဇဝင်ကျမ်းများ၏ အကြောင်းအရာတန်ဖိုးကို သိရှိစေရန်ရည်ရွယ်ချက်ဖြင့် ဤကျမ်းကိုရေးသား ပြုစုခဲ့ပါသည်။ ထို့ပြင် ရခိုင်ရာဇဝင်စာပေအရေးအသား ဖွံ့ဖြိုးတိုးတက်မှုကို ဆန်းစစ်နိုင်ရန်ရည်ရွယ်၍ ရခိုင်ရာဇဝင် ကျမ်းတို့၏ အရေးအသားကိုလည်း လေ့လာတင်ပြထားပါသည်။ ရခိုင်လူမျိုးတို့၏ အတိတ်သမိုင်းဖြစ်စဉ်များကို မှန်မှန်ကန်ကန်သိရှိစေရန်နှင့် ရခိုင်ရာဇဝင် စာပေကဏ္ဍဖွံ့ဖြိုးတိုးတက်မှုတွင် တစ်စိတ်တစ်ဒေသ အထောက်အကူ ပြုနိုင်ရန်အတွက် ဤကျမ်းကို လေ့လာရန် လိုအပ်သည်ဟု ထင်မြင်ယူဆမိပါသည်။ ထို့ကြောင့်ကျမ်းပြုသူ၏ ပါရဂူဘွဲ့ယူကျမ်းအဖြစ် ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြားရခိုင်ရာဇဝင်ဆိုင်ရာ စာပေများ နှိုင်းယှဉ်လေ့လာချက်ကျမ်းကို ရေးသားပြုစုရခြင်းဖြစ်ပါသည်။

ထွန်းရွှေခိုင် (မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြားရခိုင်ရာဇဝင်ကျမ်းများ၏ အကြောင်းအရာတန်ဖိုးကိုသိရှိစေရန်၊ ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြားရခိုင် မဟာရာဇဝင်ကျမ်းများ၏ အကြောင်းအရာစီစဉ်တင်ပြပုံ မည်သို့ကွာခြားမှုရှိသည်ကို လေ့လာဆန်းစစ်ပြရန်နှင့် ရခိုင်ရာဇဝင်စာပေ အရေးအသားဖွံ့ဖြိုးတိုးတက်မှုကို လေ့လာဆန်းစစ်ရန် ရည်ရွယ်ချက်တို့ဖြင့် ဤကျမ်းကို ရေးသားရခြင်းဖြစ်ပါသည်။

၂။ မျှော်မှန်းရလဒ် (Hypotheses)

ရခိုင်ရာဇဝင်စာပေကျမ်းတို့ကို သုတေသနပြုလေ့လာကြည့်သောအခါ ယနေ့အထိ ရခိုင်ရာဇဝင်စာပေ ကျမ်း (၄၆) စောင်ကိုတွေ့ရှိရပါသည်။ ခေတ်ဦးရခိုင်မင်းဆက်တို့ကို ဝေသာလီခေတ်တွင် ရေးထိုးခဲ့သည့် အာနန္ဒစန္ဒြ ကျောက်စာ၌ အစောဆုံးတွေ့ရပါသည်။ ဤကျောက်စာတွင် ရခိုင်ခေတ်ဦး ခေတ္တဝတီခေတ်မင်းဆက်နှင့် ဝေသာလီ ခေတ် မင်းဆက်တို့ကို တွေ့ရပါသည်။ ထို့နောက် မြောက်ဦးခေတ်၊ ကိုလိုနီခေတ်၊ မျက်မှောက်ခေတ်တွင် ရေးသားသည့် ရခိုင်ရာဇဝင်စာပေကျမ်းတို့ကိုလည်း တွေ့ရပါသည်။ အပြည့်စုံဆုံး၊ အခိုင်မာဆုံးရခိုင်ရာဇဝင် ကျမ်းများဖြစ်သည့် ရခိုင်ရာဇဝင်ကြီးကျမ်း၊ ရခိုင်ရာဇဝင်သစ်ကျမ်းတို့တွင် ရခိုင်ပြည်သမိုင်းကို ကမ္ဘာဦးမှစတင်၍ အင်္ဂလိပ်မင်းအုပ်ချုပ်သည့်ခေတ်အထိ ရေးသားထားပါသည်။ ထိုကျမ်းတို့သည် ရာဇဝင်ကျမ်းတစ်စောင်၏ အင်္ဂါရပ်များ အားလုံးပါဝင်၍ အကြောင်းအရာပြည့်စုံမှုရှိပါသည်။ ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီး ကျမ်းသည် အကြောင်းအရာအားဖြင့် ပြည့်စုံမှုမရှိသော်လည်း ရှေးရခိုင်ရာဇဝင်တို့တွင် ဖော်ပြထားသော ခေတ္တဝတီ ခေတ်၊ ဝေသာလီခေတ်တို့ကို နောက်ပိုင်းသုတေသနတွေ့ရှိချက်များနှင့် အထောက်အထားပြု၍ ပေါင်းစပ်ရေးသား ထားသောကြောင့် ထိုခေတ်၏ရာဇဝင်ကြောင်းကို ပိုမိုခိုင်မာစေသည်ဟု သိရပါသည်။

ထို့ပြင် ရခိုင်ရာဇဝင်ကျမ်းတို့တွင် စကားပြေအဖွဲ့ပုံစံလေးမျိုးကို သူ့နေရာနှင့်သူ အံဝင်ခွင်ကျအသုံးပြု ရေးသားထားခြင်း၊ ရာဇဝင်စာပေနှင့် အံဝင်ခွင်ကျဖြစ်သည့် စကားအသုံးအနှုန်းများကို သုံးနှုန်းထားခြင်း၊ ဝါကျ တည်ဆောက်ပုံ ကျွမ်းကျင်ခြင်းတို့ကိုလည်း တွေ့ရပါသည်။ အရေးအသားရှင်းလင်းပြေပြစ်ပြီး ဆိုလိုချက်ကိုလည်း ရှင်းရှင်းလင်းလင်း နားလည်စေပါသည်။

၃။ တွေ့ရှိချက်များနှင့် ရလဒ်များ

ဤကျမ်းတွင် ရှေးဦးစွာ ရခိုင်လူမျိုး၏ အမျိုးနှင့်သီလကို စောင့်ရှောက်သောလေ့တို့ကြောင့် ရခိုင်လူမျိုး ဟုခေါ်ဆိုပုံ၊ ရကွီကွါ၊ ရကွီလင်၊ ရခိုင်ဟု အဆင့်ဆင့်ပြောင်းရွှေ့ခေါ်ဝေါ်လာပုံ၊ ရခိုင်လူမျိုးစတင်ပုံ နှင့်တိုင်းပြည် တည်ထောင်ပုံတို့ကို ရခိုင်ရာဇဝင်ကျမ်းများ၊ ခေတ်ပြိုင်သမိုင်းမှတ်တမ်းများ၊ ပထဝီပညာရှင်တို့၏ အဆိုအမိန့်များ ကိုကိုးကား၍ ဖော်ပြထားပါသည်။

ရခိုင်ရာဇဝင်စာပေအနေဖြင့် အစောဆုံးရခိုင်မင်းဆက်ကို အေဒီ ၇၂၉ ခန့်က ရေးထိုးခဲ့သော အာနန္ဒစန္ဒြ ကျောက်စာတွင် ဖော်ပြခြင်း၊ အာနန္ဒစန္ဒြကျောက်စာတွင် အေဒီ ၄ ရာစုနှောင်းပိုင်း ကာလမှစတင်၍ စိုးစံခဲ့သော မင်းဆက်တို့ကို မှတ်တမ်းတင်ထားခြင်း၊ ရခိုင်ရာဇဝင်ကျမ်းတို့ကို မြောက်ဦးခေတ်၊ ကိုလိုနီခေတ်၊ မျက်မှောက် ခေတ်တို့တွင်တွေ့ရှိရခြင်း၊ စကားပြေနှင့်ရေးသား ထားသောရခိုင်ရာဇဝင်စာပေကျမ်းများ ကဗျာလင်္ကာနှင့်ရေးဖွဲ့ ထားသော ရခိုင်ရာဇဝင်စာပေကျမ်းများကို တွေ့ရခြင်းတို့ကို တင်ပြထားပါသည်။ ထို့နောက် တွေ့ရှိရသမျှ ရခိုင်ရာဇဝင်စာပေကျမ်း (၄၆)စောင်နှင့် မိတ်ဆက်တင်ပြထားပါသည်။

ဤကျမ်းတွင် ဝါသုဒေဝမင်းညီနောင်တို့အကြောင်းမှ လေးမြို့ခေတ်အထိ ရာဇဝင်အကြောင်းများကို ရှေးရာဇဝင်ကျမ်းများအတိုင်း ရေးသားထားပါသည်။ ထို့နောက် နောက်ပိုင်းသုတေသနတွေ့ရှိချက်များဖြစ်သော ဓညဝတီခေတ်နှင့် ဝေသာလီခေတ်တို့အပေါ် လေ့လာသုံးသပ်ခြင်း၊ ဓညဝတီမြို့အားလေ့လာခြင်း၊ ဓညဝတီမြို့၏ သက်တမ်းကိုလေ့လာခြင်း၊ ဝေသာလီမြို့တော်၏ သက်တမ်းကာလခန့်မှန်းခြင်း၊ ဝေသာလီတူးဖော်မှုနှင့် ဗုဒ္ဓယဉ်ကျေးမှုဆိုင်ရာ တွေ့ရှိချက်များ၊ ရခိုင်မြို့တော်များကို ပျူမြို့တော်များနှင့် နှိုင်းယှဉ်လေ့လာခြင်းစသည့် ခေါင်းစဉ်ငယ်များဖြင့် ပေါင်းစပ်ရေးသားထားပါသည်။ ထို့ပြင်မြေပုံများ၊ ကောင်းကင်ဓာတ်ပုံများနှင့် ပေါင်းစပ် ဖြည့်စွက်၍ တင်ပြထားသောကြောင့် ထိုခေတ်တို့၏ ရခိုင်ရာဇဝင်ကြောင်းကို ပိုမိုခိုင်မာထင်ရှားစေသည်ကို တွေ့ရပါသည်။

မြောက်ဦးခေတ်ကို ရေးသားတင်ပြရာ၌ အခြားရခိုင်ရာဇဝင်ကျမ်းများနှင့်မတူဘဲ ရခိုင်ရှေးဟောင်း မြို့တော်များ၊ မြောက်ဦးရွှေမြို့တော်၊ နန်းတော်ရာကုန်း၊ ရွှေနန်းတော်ကြီး၊ မြောက်ဦး ရွှေနန်းတော်အုပ်ချုပ်ရေး၊ မြောက်ဦးရွှေနန်းတော်၏ ညီလာခံသဘင်၊ မြောက်ဦးရွှေမြို့တော်၏ မဟာဗျူဟာမြောက်ကာကွယ်ရေး အစီအမံ များ၊ မြို့ရိုး၊ ကျုံး၊ ခံတပ်များ၊ မြောက်ဦးမြို့၊ မြောက်ဦးမြို့ကို မင်းအဆက်ဆက် တည်ဆောက် ပြုပြင်ခြင်းများ၊ မြောက်ဦးအမည်ခေါ်တွင်ခြင်း၊ နိုင်ငံခြားသားတစ်ဦး ပြောပြသည့် မြောက်ဦးမြို့တော်အကြောင်း၊ မြောက်ဦးခေတ် စီးပွားရေး၊ အုပ်ချုပ်ရေး၊ မြောက်ဦးခေတ်ဗုဒ္ဓသာသနာ၊ နိုင်ငံရေး၊ မြောက်ဦးခေတ်ပြည်ပ ဆက်သွယ်ရေး၊ ဒတ်ချ်နယ်ချဲ့တို့၏ ပရိယာယ်စသည့် ခေါင်းစဉ်ငယ်များခွဲ၍ ဖော်ပြထားပါသည်။

မြောက်ဦးခေတ်၏ ထင်ရှားသော မင်းများဖြစ်သည့် မင်းရာဇာကြီး၊ မင်းခမောင်း၊ မင်းစနေ၊ စန္ဒသုဓမ္မရာဇာ စသည့်မင်းတို့လက်ထက်အကြောင်းအရာတို့ကို ရေးသားထားပါသည်။ ထို့နောက် မြောက်ဦးမြို့ပေါ်ရှိ ဘုရားစေတီ ပုထိုးများ၏ ဘုရားသမိုင်းကို ဓာတ်ပုံများနှင့်တကွ ဖော်ပြထားပါသည်။

ဤအပိုင်းကို ရေးသားရာတွင် ရခိုင်ရာဇဝင်ကြီး၊ မင်းရာဇာကြီးစာတမ်း၊ ဝိမလအမတ်ကြီး၏ ရခိုင်မဟာ ရာဇဝင်တော်ကြီးကျမ်း၊ ရခိုင်မင်းသမီးဇချင်း၊ ရမ်းဗြဲဦးစံတင်၏ ရခိုင်ရာဇဝင်လင်္ကာ (မြို့တည်ခြင်းလင်္ကာ)တို့ကို အဓိကထား ကိုးကားရေးသားထားပါသည်။

ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းသည် ယခင်ရေးသားတင်ပြခဲ့သော ရခိုင်ရာဇဝင် ကျမ်းတို့၌ ဖော်ပြထားသော အကြောင်းအချက်တို့မှ ကောင်းနိုးရာရာထုတ်လျက် အကိုးအထောက်စုံစုံလင်လင်ဖြင့် ရာဇဝင်ရေးနည်းအတတ်ပညာတို့ ပေါင်းစပ်ရေးသားထားသော ကျမ်းတစ်စောင်ဖြစ်ပါသည်။ ပြည့်စုံခိုင်မာသည့် မျက်မှောက်ခေတ် ရခိုင်ရာဇဝင်ကျမ်းတစ်စောင်လည်း ဖြစ်ပါသည်။

ရခိုင်ရာဇဝင်ကျမ်းတို့၏ အကြောင်းအရာအချုပ်တို့ကို လေ့လာကြည့်သောအခါ ရခိုင် မင်းသမီးဇချင်းသည် ရာဇဝင်သံခိုင်တစ်စောင်ဖြစ်ပြီး နောက်ပိုင်းတွင်ရေးသားကြသော ရခိုင်ရာဇဝင်တို့၏ လမ်းပြရာဇဝင်လင်္ကာ

တစ်စောင်လည်း ဖြစ်ကြောင်းတွေ့ရပါသည်။ ရခိုင်မင်းသမီးဧချင်း စာဆိုသည် ဧချင်းကဗျာစာပေကိုဖွဲ့ဆိုရင်း ရခိုင်ရာဇဝင်ကိုပါ အနှစ်ချုပ်ရေးဖွဲ့ထားနိုင်သည်ကို တွေ့ရပါသည်။

ဒုတိယမြောက်ဦးခေတ်တည် ဘုရင်မင်းပါကြီးလက်ထက်တွင် ဝိမလအမတ်ကြီးရေးသားသော ရခိုင်မဟာ ရာဇဝင်တော်ကြီးကျမ်းတွင် ရှေးဦးစွာ ရခိုင်မင်းတို့သည် မဟာသမ္မတမင်းတို့ အဆက်အနွယ်များဖြစ်ကြောင်းကို မဟာ သမ္မတမင်းမျိုးနှင့် ရခိုင်မင်းမျိုးကို ချိတ်ဆက်တင်ပြသည်။ ဤကျမ်း၌ အခြားရခိုင်ရာဇဝင်ကျမ်းများထက် ထူးခြားချက်များမှာ ပထမမြောက်ဦးခေတ်၏ ခေတ်နှောင်းပိုင်းတွင် ရှင်အဂ္ဂမုနိနှင့် ရှင်ငယ်ဆရာမြဝတီက ရွှေမျဉ်း ဓမ္မသတ်ကျမ်းကိုပြုစုခြင်း၊ ဘုရင်မင်းပါကြီးမှစ၍ မြောက်ဦးခေတ်ဘုရင်တို့သည် ရွှေမျဉ်းဓမ္မသတ်ကျမ်းလာ ဥပဒေသတို့နှင့် တိုင်းပြည်အုပ်ချုပ်ကြခြင်း၊ ရွှေမျဉ်းဓမ္မသတ်တွင် အမျိုးလေးပါးတို့၏ ကျင့်ဝတ်(၄၈)ပါး ပါဝင်ခြင်း၊ ရခိုင်ဘုရင်နိုင်ငံတွင် ဘဏ္ဍာတော်သုံးရပ် ဖွဲ့စည်းထားခြင်းနှင့် ဘဏ္ဍာတော်သုံးရပ်၏ လုပ်ဆောင်ချက်များ၊ ဘုရင်မင်းပါကြီးလက်ထက် ပြောင်းလဲလာသော နိုင်ငံရေးအခြေအနေ၊ မင်းပါကြီးလက်ထက် ဘင်္ဂါ ၁၂ မြို့ အုပ်ချုပ်ရေး၊ ပြည်တွင်းပြည်ပကုန်သွယ်ရေး၊ ဘုရင်မင်းပါကြီးသည် ရှင်ငယ်ဆရာမြဝတီ၏ အစီအမံဖြင့် ဧကရာဇ် ဘွဲ့နှင့်ရာဇဘိသေက ခံယူတော်မူခြင်း၊ ရှစ်သောင်းပုထိုးတော်ကြီးကို အဓိပတိမဏ္ဍိုင်ကြီးငါးရပ်စိုက်ထူပြီး တန္တိပညာ၊ ဝိဇ္ဇာပညာတို့ဖြင့် တည်ဆောက်ခြင်းစသည့် အကြောင်းအရာတို့ကို အခြားရာဇဝင်တို့ထက် ပိုမိုပြည့်စုံစွာ တွေ့ရပါသည်။ ကျမ်းပြုစုသူ ဝိမလအမတ်ကြီး၏ ကိုယ်တွေ့များဖြစ်သောကြောင့် မှတ်တမ်းသဖွယ်ခိုင်မာမှုလည်း ရှိပါသည်။ ရခိုင် သမိုင်း၏ ဘုရင်မင်းပါကြီးလက်ထက် ခိုင်မာသောသမိုင်းဆိုရာ အထောက်အထားများကို အခြား ရာဇဝင်ကျမ်းများထက် ပို၍အထောက်အကူပြုနိုင်သည့် ရခိုင်ရာဇဝင်ကျမ်းတစ်စောင်ဖြစ်ပါသည်။

ဤရခိုင်မဟာရာဇဝင်တော်ကြီးကျမ်းတွင် ဦးသာထွန်းအောင်သည် မြောက်ဦးခေတ် ဝိမလအမတ်ကြီး၏ ရခိုင်မဟာရာဇဝင်တော်ကြီးကျမ်းနှင့် ရွှေမျဉ်းဓမ္မသတ်တို့မှ ကူးယူဖော်ပြထားခြင်း ဖြစ်ပါသည်။ ဤသို့ဖော်ပြရာ တွင်စာရေးသူ၏ ရည်ရွယ်ချက်အတိုင်း ဘုရင်မင်းပါကြီး၏ ရှေ့မှမင်းတို့၏အကြောင်းကို အကျဉ်းချုံး၍ ဖော်ပြ ထားပြီး ဘုရင်မင်းပါကြီးလက်ထက် ခေတ်အခြေအနေကို အဓိကထား၍ ကျယ်ကျယ်ပြန့်ပြန့် ရေးသားထားသည်ကို တွေ့ရပါသည်။ ဤကျမ်းတွင်ဖော်ပြချက်တို့ကို ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာ ရာဇဝင်ကြီးကျမ်းတွင် ဒုတိယမြောက်ဦး ခေတ်ကိုတင်ပြရာ၌ ကိုးကားရေးသားထားသည်ကို တွေ့ရပါသည်။

မင်းရာဇာကြီးစာတမ်းသည် ဒုတိယမြောက်ဦးခေတ်တွင် ရေးသားထားသော ရခိုင်ရာဇဝင်ဖြစ်၍ အခြားရခိုင်ရာဇဝင်တို့တွင် မပါဝင်သောအကြောင်းအရာတို့ကို ထူးခြားစွာတွေ့ရပါသည်။ အခြားရာဇဝင်ကျမ်း တို့တွင် ဖော်ပြထားခြင်းမရှိသော ဧညဝတီခေတ် စန္ဒသူရိယ မင်း၏သားတော် စန္ဒသူရိယဓိပတိမင်းလက်ထက် အကြောင်းအရာတို့ကို တွေ့ရပါသည်။ စန္ဒသူရိယ ဓိပတိမင်းလက်ထက် တပ်တော်နှင့်အစုများဖွဲ့စည်းရာတွင် ဖော်ပြထားသော မင်းမှုထမ်းစစ်သည်များမှာ မရမာ၊ ကုလားတိလောင်ဂါ၊ ဒေရီကုလား၊ အန်ပူလီကုလား၊ ဝွတ်ဇာလီ၊ ကော်ပူရ၊ မဂိုကုလား၊ မြို့၊ ကတူး၊ လဝတို့ကိုတွေ့ရပြီး ကိုယ်ရံကြီးအမတ်၊ ပြည်စိုးကြီးအမတ်၊ ဆင်ကဲကြီး အမတ်၊ ဓားပိုင်ကြီးအမတ်၊ အရှေ့ဝင်းမှူး၊ အနောက်ဝင်းမှူး၊ မြောက်ဝင်းမှူးတို့ကိုလည်း ဘုရင်က ခန့်အပ်ကြောင်းသိရှိရပါသည်။ မင်းရာဇာကြီးစာတမ်းအရ ထိုရာထူးများကို ဧညဝတီခေတ်တွင် စတင်တွေ့ရ ပါသည်။ အမတ်ကြီးလေးပါး၏ရာထူးကို လေးမြို့ခေတ်ဘုရင်မင်းထီး လက်ထက်တွင်လည်း တွေ့ရပါသည်။ မြောက်ဦးခေတ် မင်းရာဇာကြီးလက်ထက်တွင်လည်း ထိုအမတ်ကြီးလေးဦးတို့၏ ရာထူးနှင့်တာဝန်တို့ကို တွေ့ရပါသည်။

ထို့နောက် မင်းရာဇာကြီးစာတမ်းတွင် စန္ဒသူရိယဓိပတိမင်းလက်ထက်တွင် ဆွေတော်မျိုးတော်များအား အဆောင်အယောင်နှင့် စားကျေးနယ်ပယ်ပေးတော်မူသည်။ တောင်မိဖုရားကြီး၊ မြောက်မိဖုရား၊ အလယ်မိဖုရား၊ လက်ဝဲမြန်၊ လက်ယာမြန်၊ အတွင်းမှူး၊ ဘဏ္ဍာစိုးတို့ကိုလည်း ခန့်တော်မူ၍ အခြွေအရံနှင့်စားကျေး၊ စားမြို့ တို့ကိုလည်း ပေးတော်မူကြောင်းတွေ့ရပါသည်။ လေးမြို့ခေတ်တွင် ဘုရင်မင်းထီးသည် ဘေးလောင်းတော် စန္ဒသူရိယ ဓိပတိမင်းလက်ထက်ကကဲ့သို့ မှူးမတ်မြို့စားတို့ကို မျိုးရိုးဆက်ခံစေသည်။ မြောက်ဦးခေတ် မင်းရာဇာကြီးလက်ထက်တွင်လည်း ဆက်လက်ကျင့်သုံးသည်ကို တွေ့ရပါသည်။

မင်းရာဇာကြီးသည် ဘုရင့်အမှုတော်ကိုထမ်းကြသော ပုဏ္ဏားတို့၏ တာဝန်ဝတ္တရားများကို စန္ဒသူရိယ ဓိပတိမင်းနှင့် ဘုရင်မင်းထီးတို့ထုတ်ပြန်ထားသည့် အမိန့်တော်အတိုင်း ဆက်လက် ထုတ်ပြန်ထားခြင်းတို့ကို ပြုလုပ်ခဲ့ကြောင်း တွေ့ရသည်။

ထို့အတူ မင်းရာဇာကြီးသည် ပဲခူးမင်း၏သမီးတော်ရှင်ထွေးနှောင်းကို တန်ဆောင်းမိဖုရားပေးအပ်တော် မူသည်။ တန်ဆောင်းမိဖုရားရာထူးကို ရခိုင်ရာဇဝင်ကျမ်းတို့တွင် မင်းပါကြီး လက်ထက်မှစတင်၍တွေ့ရပြီး မင်းရာဇာကြီးလက်ထက်တွင် ထပ်မံတွေ့ရပါသည်။ နှစ်ဦးစလုံးမှာ မြန်မာအမျိုးသမီးများဖြစ်ကြောင်းလည်း တွေ့ရ ပါသည်။

တစ်ဖန် မင်းရာဇာကြီးစာတမ်းတွင် သာသနာရေးနှင့်ပတ်သက်၍ ဖော်ပြချက်များကိုလည်း ထူးခြားစွာ တွေ့ရပါသည်။ မင်းရာဇာကြီးလက်ထက်တွင်လည်း ကျမ်းစာများကို သင်္ဂြိုဟ်တော်နှင့် ညီမညီ စစ်ဆေးရန်နှင့် ဘုရားဟောမူရင်းစကားအတိုင်းသာ သာသနာထားရန် အမိန့်တော်ထုတ်ပြန်ခဲ့သည်။ မင်းရာဇာကြီး စာတမ်း၏ အခြားထူးခြားမှုတစ်ခုမှာ မင်းရာဇာကြီးနှင့် အမတ်ကြီးမဟာဇေယျသိန်၊ ဓမ္မသာမိဆရာတော်တို့၏ သာသနာရေး၊ တိုင်းရေးပြည်ရေး ဆွေးနွေးချက်များကို ထည့်သွင်း၍ ရေးသားဖော်ပြထားခြင်းဖြစ်ပါသည်။

မင်းရာဇာကြီးစာတမ်းအရ မင်းရာဇာကြီးဟံသာဝတီကို စစ်ချီခါနီးတွင် အမတ်ကြီးမဟာ ဇေယျသိန် လျှောက်တင်သော သေနင်္ဂဗျူဟာကျမ်းသည် ရှေးရသေ့တို့ လောကီဝိဇ္ဇာမယနည်းဖြင့် စီရင်ထားခဲ့ကြောင်း သိရှိရပါသည်။

ထို့ပြင် မင်းရာဇာကြီးစာတမ်းတွင်ပါဝင်သော အမျိုးလေးပါးနှင့် လူမျိုး ၁၀၁ ပါးတို့ကို သတ်မှတ်တော် မူခြင်း၊ မင်းရာဇာကြီး ဟံသာဝတီ(ပဲခူး)သို့ စစ်ချီရန်ပြင်ဆင်တော်မူခြင်း၊ ဟံသာဝတီကို သိမ်းတော်မူခြင်း၊ အမတ်ကြီးမဟာပညာကျော်ကွယ်လွန်တော်မူခြင်း၊ ပဲခူးမှပါလာသော သုံ့ပန်းများကို အစုဖွဲ့တော်မူခြင်းတို့သည် အမတ်ကြီးမဟာဇေယျသိန်၏ မျက်မှောက်ခေတ်အခြေ အနေတို့ကိုရေးသားထားခြင်းဖြစ်၍ မှတ်တမ်းသဖွယ် ခိုင်မာမှုရှိပါသည်။ ရခိုင်ရာဇဝင်ကြောင်းအတွက် အဖိုးတန်သော အကြောင်းအရာများဖြစ်သည်။ ရခိုင်ရာဇဝင် ကြောင်းကို ပို၍ပြည့်စုံစေသည်။ မင်းရာဇာကြီးစာတမ်းသည် ၁၇ ရာစုတွင် ရေးသားသော အစောဆုံး ရခိုင်ရာဇဝင် ကျမ်းဖြစ်၍ ရခိုင်သမိုင်းအတွက် တန်ဖိုးမဖြတ်နိုင်သော အထောက်အထားပြည့်စုံသည့် ရာဇဝင်တစ်စောင်ဖြစ် ပါသည်။ မင်းရာဇာကြီးစာတမ်းသည် ဘုရင်မင်းရာဇာကြီးက အမတ်ကြီးမဟာဇေယျသိန်ကို အမိန့်တော်ရှိ၍ ရေးသားရသောကျမ်းဖြစ်ပါသည်။ အမတ်ကြီးမဟာဇေယျသိန်သည် ကျမ်း၏ရည်ရွယ်ချက်အတိုင်း ဗုဒ္ဓဝင်၊ မဟာဝင်ပါအကြောင်းအရာများ၊ မင်းရာဇာကြီးမတိုင်မီ မင်းများလက်ထက်နှင့် မင်းရာဇာကြီးလက်ထက် အခြေအနေတို့ကို ပေါ်လွင်အောင် ရေးသားထားနိုင်သည်ကို တွေ့ရပါသည်။ ဤမင်းရာဇာကြီး စာတမ်းတွင်

ပါဝင်သော ထူးခြားသည့်အကြောင်းအရာတို့ကို အကိုးအကားပြု၍ ထွန်းရွှေခိုင် (မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာ ရာဇဝင်ကြီးကျမ်းတွင် မြောက်ဦးခေတ်ကဏ္ဍ၌ ရေးသားထားသည်ကို တွေ့ရပါသည်။

ရခိုင်ရာဇဝင်သစ်ကျမ်းကို ရှင်စန္ဒမာလာလင်္ကာရက အတွဲပေါင်း(၇)တွဲဖြင့် ရေးသားပြုစုထားပါသည်။ ရှင်စန္ဒမာလာလင်္ကာရသည် ဤကျမ်းရေးသားရခြင်း ရည်ရွယ်ချက်ကို ကျမ်းနိဒါန်းတွင် ရာဇဝင်အရပ်ရပ်နှင့် ညှိနှိုင်းရေးသားထားသည်ဟု ဖော်ပြထားပါသည်။ ထို့ပြင်ပါဠိတော်-အဋ္ဌကထာ၊ ဋီကာ-ပုံပြင်၊ ရာဇဝင်အရပ်ရပ်တို့ ဖြင့် နှံ့စပ်စေ့ငုံသေချာစွာရှုလျက် ဂရုစိုက်ကာ ညှိနှိုင်းဖော်ပြထားသောကျမ်းဖြစ်ပါသည်။ တစ်ဖန် ကမ္ဘာကြီး၏ ဖြစ်ပျက်ပုံတို့နှင့်တကွ အန္တရကပ်ဦး၌ဖြစ်သော မဟာသမ္မတမှစ၍ ၃၃၄၅၆၉ သုံးသိန်းသုံးသောင်း လေးထောင်ငါးရာ ခြောက်ကျိပ် ကိုးယောက်မကသော မင်းတို့ကိုလည်း ဖော်ပြထားပါသည်။ ထို့နောက် မဇ္ဈိမဒေသမင်းဆက်၊ ဒွါရာဝတီ၊ ခညဝတီ၊ ဝေသာလီ၊ စမ္ပဝက်၊ ပရိန်၊ ပဉ္စ၊ လောင်းကြက်၊ မြောက်ဦး စသောမြို့တို့၌ ထီးနန်းစိုးစံတော် မူကြသော မင်းများကိုလည်း ပြည့်ပြည့်စုံစုံဖော်ပြထားသည်ကို တွေ့ရပါသည်။ ထို့ပြင် ရှင်စန္ဒမာလာ လင်္ကာရသည် ဤကျမ်းကိုရေးသားရန်အတွက် ပါဠိတော်၊ သုတ်၊ အဋ္ဌကထာ၊ နိပါတ်၊ ဋီကာ၊ ဒီပဝင်ကျမ်း၊ မဟာဝင်ကျမ်း၊ ရာဇနီတိကျမ်း၊ ရာဇဘိသေကကျမ်း၊ အာဒိကပ္ပ ကမ္ဘာဦးကျမ်း၊ သေနင်္ဂဗျူဟာ ကျမ်းအပြင် ရာဇဝင်နှင့်သက်ဆိုင် သော ကျမ်းများကို ကိုးကားရေးသားထားကြောင်း ဖော်ပြထားပါသည်။ ထို့ပြင် ရခိုင်ရာဇဝင်ကြီး (ဒိုးဝေ)၊ ပြည်ကြီး ရာဇဝင် (ဒိုးဝေ)၊ ရာဇဝင်ဟောင်း၊ ရာဇဝင်သစ်၊ ဆရာမည်ရခိုင်ရာဇဝင်၊ ရခိုင်ရာဇဝင် အင်းစောက်၊ ရခိုင်ရာဇဝင် လင်္ကာ(ဦးစံတင်)၊ ရခိုင်ရာဇဝင်ကျောက်ရိုး၊ မြောက်ဦးမင်းဆက်လင်္ကာ (မောင်သာအောင်) စသည့် ရခိုင်ရာဇဝင် များနှင့် မြန်မာရာဇဝင်များကိုလည်း ကိုးကားရေးသားထားကြောင်း တွေ့ရပါသည်။ ဒွိဟဖြစ်ဖွယ် အကြောင်းအရာ တို့ကို ဖော်ပြရာတွင် ရာဇဝင်အစောင်အစောင်တွင်ပါဝင်သော အကြောင်းအရာတို့ကို ဖော်ပြပြီးမှ ဖြစ်သင့်သည် ယူသင့်သည်ကို အဆုံးဖြတ်ပေးသည်။ သုတေသနသဘောပါသည့် ရေးသား ဖော်ပြမှုတို့ကိုလည်း တွေ့ရပါသည်။

ရခိုင်ရာဇဝင်ကျမ်းအချို့သည် တတိယမြောက်ဦးခေတ် မဟာသမ္မတရာဇာမင်းအထိသာ ရေးသားကြသော် လည်း ဤရခိုင်ရာဇဝင်သစ်ကျမ်းတွင် ခရစ်နှစ် ၁၇၈၄ ဘိုးတော်ဘုရားရခိုင်ပြည် ကိုသိမ်းယူပြီးနောက်မှ အင်္ဂလိပ် မင်းသိမ်းပိုက်အုပ်ချုပ်သည်အထိ ရေးသားဖော်ပြထားရာ မြန်မာမင်း၊ အင်္ဂလိပ်မင်းလက်ထက်အထိ ရခိုင်ပြည်၏ အုပ်ချုပ်ရေးကို သိရှိရပါသည်။ ရခိုင်ရာဇဝင်သစ်ကျမ်းကို ပြည့်စုံခိုင်မာသော တန်ဖိုးရှိသည့် ရခိုင်ရာဇဝင်တစ်စောင် အဖြစ် သတ်မှတ်နိုင်ပါသည်။ စံပြထိုက်သော ရခိုင်ရာဇဝင်ကျမ်းတစ်စောင်လည်း ဖြစ်ပါသည်။

ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းတွင် ရခိုင်ရာဇဝင်သစ်ကျမ်းကဲ့သို့ ရှည်လျား ပြည့်စုံသော အကြောင်းအရာများ၊ နှိုင်းယှဉ်ချက်၊ သုံးသပ်ချက်များကို မတွေ့ရပါ။

ငလက်ရုံးရာဇဝင်၏ ထူးခြားချက်မှာ ပထမဝေသာလီတွင် ဘီလူးဝင်စားသည်ဟူသော အကြောင်းကို ပြည့်စုံစွာရေးသားထားခြင်း၊ မင်းစောမွန်မြောက်ဦးမြို့တည်သောအခါ ဗေဒင်ယတြာအရ အင်းမြှုပ်ခြင်း၊ မင်းပါကြီး နန်းတက်ခါနီးပေါ်လာသော တဘောင်စကား၊ မင်းတိက္ခာတဘောင်အရပြုလုပ်သော ယတြာ၊ မင်းဖလောင်း ထပ်မံပြုလုပ်သည့် ယတြာအင်းမန္တန်၊ မင်းရာဇာကြီး၊ မင်းခမောင်းတို့လက်ထက် ဟူးရာတတ်တို့ သိုက်နီတန် ကျမ်းဂန်အရ လျှောက်တင်ချက်များ၊ ဘုရင်သီရိသုဓမ္မရာဇာလက်ထက် တဘောင်၊ ယတြာ၊ ပတ္တရာများ၊ ငလက်ရုံး၊ စစ်ကွက်ဆရာတော်နှင့် လောင်းကြက်စားငှက်သလတို့၏ တဘောင်များ၊ ယတြာ၊ ပတ္တရာများ၊ ဘုရင်နရပတိကြီး လက်ထက် ဘုရင်နှင့်သိုက်တတ်ငလက်ရုံးတို့ အပြန်အလှန် ပြောဆိုသော သိုက်နီတန်ကျမ်းထွက် စကားများ၊ ဘုရင်နရပတိကြီးနှင့်ပြည်စိုးကြီးတို့ အပြန်အလှန်ပြောကြားသည့် သိုက်နီတန်ကျမ်းထွက်စကားများကို ထူးခြားစွာ

တွေ့ရပါသည်။ ဤအကြောင်းအရာတို့သည် ရာဇဝင်ကျမ်း အချို့တွင်တွေ့ရသော်လည်း ငလက်ရုံး ရခိုင်ရာဇဝင်ကဲ့သို့ ပြည့်စုံမှုမရှိချေ။

ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းတွင် မြောက်ဦးခေတ်အပိုင်း၌ ဘုရင်သီရိသုဓမ္မရာဇာအကြောင်း ရေးသားရာတွင် ငလက်ရုံးရခိုင်ရာဇဝင်နှင့် ဒုကံပျို့မှ အကြောင်းအရာတို့ကို ထည့်သွင်းရေးသားထားသည်ကို တွေ့ရပါသည်။

ရခိုင်ဇာတိဝံသမော်ကွန်းစာသည် ရခိုင်ဘုရင်တို့က မြို့စားနယ်စားများကိုပေးအပ်သော အမိန့်တော်မော်ကွန်းစာဖြစ်သည်။ ရခိုင်ရာဇဝင်အကျဉ်းအပြင် ရခိုင်ဘုရင်၏ အုပ်ချုပ်ရေးယန္တရား အောက်တွင်ရှိသော ရာထူးဌာနန္တရတို့၏ အဓိပ္ပာယ်နှင့် ထိုရာထူးဌာနန္တရတို့၏ တာဝန်များကိုပါ ဖော်ပြထား၍ ရခိုင်ရာဇဝင်အတွက် အဖိုးတန်သော မော်ကွန်းစာဖြစ်ပါသည်။

ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းတွင် ရခိုင်ဘုရင်နိုင်ငံ၏ ရာထူးတို့ကို ရေးသားဖော်ပြရာတွင် ဤမော်ကွန်းစာကို ကိုးကားရေးသားသည်ကို တွေ့ရပါသည်။

မဟာသမ္မတရာဇဝင်အရေးပုံ (စတုတ္ထတွဲ)သည် မြောက်ဦးခေတ်၏ နောက်ဆုံးဘုရင် ဖြစ်သော မဟာသမ္မတရာဇာ(အေဒီ ၁၇၈၂-၁၇၈၄)၏ မုဒ္ဒါဘိသိက်ခံယူပုံကို ရေးသားထားသော ပေစာတစ်စောင်ဖြစ်ပါသည်။ ဤပေစာတွင် ရခိုင်ပြည်မှ မဟာသမ္မတရာဇာမင်းနှင့် မိဖုရား၊ သားတော်၊ သမီးတော်၊ ပုဏ္ဏား၊ ဆင်၊ မြင်း၊ လက်နက်၊ စာပေကျမ်းဂန်တို့အမရပူရသို့ ရောက်ရှိလာပုံ၊ ဗဒုံမင်း၏အမိန့်တော်ကြောင့် ရခိုင်မဟာသမ္မတရာဇာ မုဒ္ဒါဘိသိက်ခံယူပုံအကြောင်း၊ ရခိုင်ဘုရင်က ဘိသိက်မခံယူမီ မှူးမတ်ပညာရှိတို့နှင့်တိုင်ပင်ဆွေးနွေးပုံ၊ ရခိုင် ဘုရင်တို့၏ မင်းမြောက်တန်ဆာငါးပါး၊ ရခိုင်ဘုရင်တို့ ဆောင်းသည့်ထီးဖြူ၊ ဘိသိက်ခံယူရာမဏ္ဍပ် ဆောက်လုပ်ပုံ၊ ရာဇပလ္လင်အကြောင်းတို့ကို ပြည့်စုံစွာ ရေးသားထားပါသည်။

ဤအကြောင်းအရာတို့သည် ရခိုင်ရာဇဝင်နှင့်ရခိုင်သမိုင်းအတွက် အလွန်အရေးပါသော အထောက်အထားတစ်ခုဖြစ်သည်။ ဤအကြောင်းအရာတို့ကို ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် အခြားရာဇဝင်ကျမ်းတို့တွင် ဖော်ပြထားသည်ကို မတွေ့ရပါ။

မင်းစောမွန်ရမ်းဗြဲကျွန်း၊ သံတွဲကျွန်း၊ မာန်အောင်ကျွန်း ရွာတည်ခန်းသည် မင်းစောမွန်က သက္ကရာဇ် ၇၉၃ ခု (အေဒီ ၁၄၃၁)တွင် ရမ်းဗြဲကျွန်း၊ သံတွဲကျွန်း၊ မာန်အောင်ကျွန်းတို့ကို ကျွန်းစဉ် မပြတ်ပြန်လည်တည်ထောင်ရန် ရှေးမင်းစဉ်ရာဇဝင်တတ်၊ သိုက်တတ်၊ နိမိတ်တတ် အမတ်ကြီး အနန္တသူရိယကို အမိန့်အာဏာမော်ကွန်းထုတ်ပြန်ပုံ၊ အမတ်ကြီးအနန္တသူရိယနှင့် မြင်းစိုင်းစား အမတ်တို့က သက္ကရာဇ် ၇၉၃ ခု တန်ဆောင်မုန်းလပြည့်နေ့တွင် မြောက်ဦးမြို့မှစတင်ထွက်ခွာပြီး ရမ်းဗြဲကျွန်းတွင် ၁၀ ရွာ၊ သံတွဲကျွန်းတွင် ငါးရွာ၊ မာန်အောင်ကျွန်းတွင် သုံးရွာ တည်ထောင်ပြီး သက္ကရာဇ် ၇၉၃ (အေဒီ ၁၄၃၁) တပေါင်းလပြည့်ကျော် ၅ ရက်နေ့တွင် မြောက်ဦးနေပြည်တော်သို့ ပြန်လည် ရောက်ရှိသည့်အကြောင်းများကို မှတ်တမ်းတင်ထားသော ပေစာဖြစ်သည်။ ဤအကြောင်းကို အခြားရခိုင်ရာဇဝင်ကျမ်းတို့တွင် ဖော်ပြထားခြင်းမရှိပါ။ ဤပေစာစာတမ်းသည် မင်းစောမွန် အုပ်ချုပ်ခဲ့သည့် မြောက်ဦးခေတ်ရခိုင်သမိုင်းတွင် မင်းစောမွန်ရခိုင်ပြည် တည်ဆောက်မှုအပိုင်းအတွက် အလွန်တန်ဖိုးရှိသော အထောက်အထားတစ်ခုဖြစ်ပါသည်။

ဧည့်ဝတီအရေးတော်ပုံကျမ်းတွင် ရခိုင်မင်းတို့၏ အရေးတော်ပုံ(၈၇)ခုပါဝင်ပြီး အရေးတော်ပုံပေါ်သော မင်းပေါင်း(၂၅)ပါး အကြောင်းပါဝင်ပါသည်။ ဧည့်ဝတီအရေးတော်ပုံကျမ်းတွင် မဟာပညာကျော် လျှောက်ထုံးကို ကျမ်း၏ တစ်စိတ်တစ်ဒေသအဖြစ် ထည့်သွင်းရေးသားထားပါသည်။

အင်းစောက်ရာဇဝင်သည် ရခိုင်ရာဇဝင်ကြောင်းကိုလည်း ပြည့်စုံစေပြီး မင်းဆက်တို့ကို အင်းဇယားနှင့် လည်း ပြည့်စုံအောင် ဖော်ပြထားပါသည်။

ဆရာဇမည်ရခိုင်ရာဇဝင်သည် ရခိုင်ရာဇဝင်ကြီး၊ ရခိုင်ရာဇဝင်သစ်ကဲ့သို့ ရာဇဝင်ကြောင်း ပြည့်စုံအောင် ရေးသားထားပြီး ဗြိတိသျှတို့၏ ကိုလိုနီဖြစ်သည့် အေဒီ ၁၈၂၆ ခုနှစ်အထိ ရေးသား ထားပါသည်။

မဇ္ဈိမဒေသအရေးတော်ပုံကျမ်းတွင် ပထမပိုင်း၌ ဗဒုံမင်း ရခိုင်ပြည်ကိုသိမ်းပိုက်ခဲ့ပုံ၊ ရခိုင်တို့ ၏ပုန်ကန်မှုကို နှိမ်နင်းပုံ၊ နေမျိုးဇေယျကျော်ထင်သည် ဗဒုံမင်း၏ စေခိုင်းချက်အရ အိန္ဒိယနိုင်ငံသို့ စာပေကျမ်းဂန်များ ရေးကူး ရန်သွားရောက်ရသည့် ခရီးစဉ်တို့ပါဝင်ပါသည်။ မြန်မာမင်းလက်ထက် ရခိုင်ရာဇဝင်အကြောင်းကို ဖြည့်စွက် ပေးသော ကျမ်းဖြစ်ပါသည်။

ဦးစံသာအောင်၏ အာနန္ဒစန္ဒရုပ်ရာဇဝင်ဝေသာလီမင်းစာအုပ်သည် အေဒီ ၇၂၉ ခန့်က ဝေသာလီမင်း အာနန္ဒစန္ဒရေးထိုးခဲ့သော ကျောက်စာအကြောင်းကို ရေးသားထားသော စာအုပ်ဖြစ်ပါသည်။ အာနန္ဒစန္ဒ ကျောက်စာတွင် ခေတ်ဦးရခိုင်မင်းဆက်သုံးဆက်ကိုဖော်ပြထားပါသည်။ ပထမမင်းဆက်သည် ဧည့်ဝတီခေတ် မင်းဆက်ဟုယူဆရပြီး ဒုတိယနှင့်တတိယမင်းဆက်တို့သည် ဝေသာလီခေတ်မင်းဆက်တို့ဖြစ်ကြသည်။ ဤ ကျောက်စာကို အာနန္ဒစန္ဒမင်း၏ ဩဘာစာဟုလည်း ခေါ်ဆိုကြသည်။ ဤကျောက်စာတိုင်သည် ခေတ်ဦး ရခိုင်မင်းဆက်များမှစ၍ အေဒီ ၇၀၀ ကျော်အထိ ရခိုင်မင်းဆက်တို့ကို သိရှိရသောကြောင့် ရခိုင်ရာဇဝင်အတွက် တန်ဖိုးမဖြတ်နိုင်သော ကျောက်စာ တစ်ချပ်ဖြစ်ပါသည်။

ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်း၊ မင်းရာဇာကြီးစာတမ်း၊ ဧည့်ဝတီ အရေးတော်ပုံ ကျမ်းတို့၏ စကားပြေအဖွဲ့ပုံစံများကို လေ့လာကြည့်သောအခါ သရုပ်ဖော်အဖွဲ့၊ ဖြစ်စဉ်ပြအဖွဲ့၊ ဖွင့်ဆိုရှင်းပြအဖွဲ့၊ ကျိုးကြောင်းပြအဖွဲ့ဟူ၍ အဖွဲ့ပုံစံ(၄)မျိုးလုံးအသုံးပြုထားသည်ကို တွေ့ရပါသည်။

အထက်ပါရာဇဝင်ကျမ်း(၃)စောင်တွင် မြင်ကွင်းငြိမ်အဖွဲ့နှင့် လှုပ်ရှားမှုအဖွဲ့နှစ်မျိုးလုံးကို သုံး၍ သရုပ်ဖော် အဖွဲ့တို့ကို ရေးသားထားရာ ရာဇဝင်ဆရာတင်ပြလိုသော အကြောင်းအရာအချက် အလက်များကို ပိုမိုပေါ်လွင်စေ ပါသည်။

မှတ်တမ်းအဖွဲ့၊ ဇာတ်လမ်းအဖွဲ့တို့ကို ဖြစ်စဉ်ပြအရေးအသားနှင့် ရေးသားထားသောကြောင့် အဖြစ်အပျက်လှုပ်ရှားမှု၊ ဆောင်ရွက်မှုတို့ကို ထင်ရှားပေါ်လွင်လာစေကြောင်းတွေ့ရပါသည်။

ဖွင့်ဆိုရှင်းပြအဖွဲ့နှင့်ပတ်သက်၍ အထက်ပါရာဇဝင်ကျမ်း(၃)စောင်တွင် အဓိပ္ပာယ်ဖွင့်ဆိုပြသော ဖွင့်ဆို ရှင်းပြအဖွဲ့နှင့် ခွဲခြမ်းစိတ်ဖြာဖွင့်ဆိုရှင်းပြအဖွဲ့တို့ကို အများဆုံးတွေ့ရသည်။

ကျိုးကြောင်းပြအရေးအသားများထဲမှ ဟုတ်မဟုတ် သဘောပြအဖွဲ့နှင့်သင့်မသင့် သဘောပြအဖွဲ့တို့ကို ရာဇဝင်(၃)စောင်လုံးတွင် အများဆုံးတွေ့ရပါသည်။

အထက်ပါရာဇဝင်ကျမ်းတို့၏ စကားပြေအရေးအသားကို လေ့လာကြည့်ပါက စကားပြေအဖွဲ့ပုံစံ ၄ မျိုးလုံးကို သူ့နေရာနှင့်သူအောင်ခွင့်ကျအသုံးပြုရေးသားထားသည်ကို လေ့လာတွေ့ရှိရ ပါသည်။

တစ်ဖန် ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်း၊ မင်းရာဇာကြီးစာတမ်း၊ ခညဝတီ အရေးတော်ပုံကျမ်း၊ ဦးသာထွန်းအောင်၏ ရခိုင်မဟာရာဇဝင် တော်ကြီးကျမ်းတို့တွင် အချိန်ကာလပြ စကားအသုံး အနှုန်း၊ ထီးသုံးနန်းသုံးစကားအသုံးအနှုန်း၊ စစ်ရေးစစ်ရာသုံးစကားအသုံး အနှုန်း၊ ရာထူးဌာနန္တရဆိုင်ရာ စကားအသုံးအနှုန်း၊ သာသနာရေးဆိုင်ရာ စကားအသုံးအနှုန်းတို့ကို အများဆုံးတွေ့ရပါသည်။

ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းတွင် စကားအသုံးအနှုန်းတို့ကို သက်ဆိုင်ရာ အခန်းကဏ္ဍအလိုက် အံဝင်ခွင်ကျထည့်သွင်း၍ ရေးသားထားသည်ကို တွေ့ရပါသည်။

ရခိုင်မဟာရာဇဝင်ကြီးကျမ်း၊ မင်းရာဇာကြီးစာတမ်း၊ ခညဝတီအရေးတော်ပုံကျမ်းတို့၏ ဝါကျဖွဲ့ပုံတို့ကို လေ့လာကြည့်သောအခါ ဝါကျတိုများကို အကြောင်းအရာတစ်ချက်စီကို ဖော်ပြလိုသောအခါနှင့် ဂုဏ်အရည်အချင်း တစ်ခုစီကို ဆက်တိုက်ဖော်ပြလိုသောအခါတွင်သုံးထားသည်ကို တွေ့ရသည်။ ဝါကျတိုများကို သုံးထားခြင်းသည် ဆိုလိုချက်ကိုတိတိကျကျနှင့် ရှင်းလင်းပေါ်လွင်စေသည်ကို တွေ့ရပါသည်။

အကြောင်းအရာတစ်ခုကို တစ်ဆက်တည်း အမျှင်မပြတ်ဖော်ပြလိုသည့်အခါ ဝါကျရှည်များကိုသုံး၍ ရေးသားထားကြသည်ကို တွေ့ရပါသည်။ ထို့အပြင် ရခိုင်ရာဇဝင်စာဆိုတို့သည် များသောအားဖြင့် အကြောင်းအရာ တစ်ခုတည်းကို ဝါကျတိုရာ ဝါကျရှည်ပါရာ၍ ရေးသားတတ်သည်ကိုလည်း တွေ့ရပါသည်။ သဘောချင်း တူသော၊ အရေးပါမှုအတိုင်းအဆချင်းတူသော အကြောင်းအရာတို့ကို ပုံစံတူစကားစုများနှင့်ဖော်ပြကာ ပုံစံတူဝါကျ များကိုသုံး၍လည်း ရေးသားကြသည်ကိုလည်း တွေ့ရပါသည်။ ဝါကျများကို သူ့နေရာနှင့်သူ အံဝင်ခွင်ကျ ဖြစ်အောင် သုံးနှုန်း၍ရေးသားထားကြသဖြင့် ရခိုင်ရာဇဝင်စာဆိုတို့သည် ဝါကျတည်ဆောက်မှု အဆင့်တွင် ကျွမ်းကျင်သည်ဟု ဆိုနိုင်ပါသည်။

ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းတွင် စကားပြေရေးနည်းလေးမျိုးကို သူ့နေရာနှင့် သူ ရှင်းရှင်းလင်းလင်းအံဝင်ခွင်ကျ ရေးသားနိုင်ခြင်း၊ စကားအသုံးအနှုန်း ရှင်းလင်းပြေပြစ်ခြင်း၊ ဝါကျဖွဲ့ပုံ သူ့နေရာနှင့်သူ အံဝင်ခွင်ကျဖြစ်ခြင်းတို့ကို တွေ့ရပါသည်။ ရှင်းလင်းမှု၊ တိကျမှု၊ ကျစ်လျစ်မှု၊ ပြေပြစ်မှု၊ လိုက်ဖက်မှု ဟူသော စကားပြေကောင်း၏ အခြေခံလက္ခဏာများနှင့်လည်း ပြည့်စုံသည်ကို တွေ့ရပါသည်။ အရေးအသား ရှင်းလင်းပြေပြစ်သည့်အတွက် ဆိုလိုချက်ကို ရှင်းရှင်းလင်းလင်း နားလည်စေသည့် ကျမ်းတစ်စောင်လည်း ဖြစ်ပါ သည်။

ရခိုင်ရာဇဝင်ကျမ်းဖြစ်သော်လည်း ရခိုင်လူမျိုးများသာမက အခြားတိုင်းရင်းသားများအားလုံး ရှင်းရှင်း လင်းလင်း နားလည်စေသော ကျမ်းတစ်စောင်လည်းဖြစ်ပါသည်။

၄။ ဆွေးနွေးသုံးသပ်ချက်

ရခိုင်စာပေတွင် မိမိတို့အမျိုးသားသမိုင်း(ရာဇဝင်)ကို ရေးသားနိုင်သော ရဟန်းရှင်လူပညာရှင်များ၊ သမိုင်း သုတေသီများ ခေတ်အဆက်ဆက်ပေါ်ထွန်းခဲ့ပါသည်။ ထိုစာပေပညာရှင်တို့သည် ရခိုင်လူမျိုးတို့၏ ရှည်လျား သောသမိုင်းကြောင်းကို ရာဇဝင်ဆိုင်ရာစာပေများအဖြစ်ပြည့်စုံသော ရခိုင်ရာဇဝင်ကျမ်းများ၊ ရာဇဝင်သံဒိပ် လင်္ကာများ၊ စာတမ်းများ၊ အင်းဇယားများ၊ အရေးတော်ပုံကျမ်း၊ ရာဇပုံ၊ သိုက်စာစသည့် စာပေပုံသဏ္ဌာန်

အမျိုးမျိုးဖြင့် ရေးသားတင်ပြထားကြသည်။ ထိုသို့ရေးသားထားသည့် ရခိုင်ရာဇဝင် (၄၈)စောင်ရှိသည်ဟု ရခိုင်စာပေသုတေသီတို့အဆိုအရ သိရပါသည်။

ဦးစံသာအောင် (၁၉၇၅) ၏ အာနန္ဒစန္ဒြိ ရှစ်ရာစုရခိုင်ဝေသာလီမင်းစာအုပ်နိဂုံးတွင် -

ရာဇဝင်ကြီး ၄၈ စောင်အားလုံးကိုဖတ်မှသာ ရခိုင်ပြည်နှင့်ပတ်သက်သည့် အကြောင်းအချက် တို့ကို ပြည့်ပြည့်စုံစုံသိနိုင်သည်ဟု အဆိုရှိပါသည်။ (နိဂုံး)

ဟုဖော်ပြထားပါသည်။

ရခိုင်ရာဇဝင်စာပေကျမ်းတို့ကို သုတေသနပြုလေ့လာကြည့်သောအခါ ယနေ့အထိ ရခိုင်ရာဇဝင်စာပေ ကျမ်း (၄၆) စောင်ကို တွေ့ရှိရပါသည်။

ဤသို့ လေ့လာတင်ပြရန်အတွက် ဒေါက်တာအောင်မြင့်ဦး (၂၀၁၈)၏ သုတေသနဟူသည် စာအုပ်တွင် ဖော်ပြထားသည့် သုတေသနနည်းနာများထဲမှ စူးစမ်းလေ့လာနည်း၊ အဆင့်သတ်မှတ် နည်း၊ ဝေဖန်အကဲဖြတ်နည်း၊ ဝေဖန်အကဲဖြတ်ဖြစ်ရပ်နည်း၊ အကြောင်းရင်းခွဲခြမ်းစိတ်ဖြာနည်း၊ ခွဲခြမ်းစိတ်ဖြာစမ်းသတ်နည်း၊ စုစည်းဖော်ပြသည့် နည်း၊ စစ်တမ်းပုံစံနည်းလမ်း၊ နှိုင်းယှဉ်လေ့လာနည်း၊ ရှင်းပြသည့်နည်းလမ်းတို့ကို အသုံးပြု၍ အချက်အလက်များကို ကောက်ယူစုဆောင်းပါသည်။

ကောက်ယူစုဆောင်းရရှိသည့် အချက်အလက်များကို မောင်ခင်မင်(ဓနုဖြူ) (၂၀၁၈)၏ စကားပြေ သဘောတရား စကားပြေအတတ်ပညာကျမ်းမှ အကြောင်းအရာသီအိုရီ၊ ရွေးချယ်စီစဉ်မှု သီအိုရီ၊ စကားပြေသီအိုရီ၊ ကဗျာသီအိုရီ၊ တက္ကသိုလ်မြန်မာအဘိဓာန် (၁၉၆၃)မှ စကားပြေသီအိုရီ၊ မြန်မာ့စွယ်စုံကျမ်း (၁၉၅၆)မှ စကားပြေ သီအိုရီ၊ ပါဠိပါရဂူဦးအောင်မိုး (၁၉၆၇)၏ ရသဂုဏ်ဆောင်းပါးများစာအုပ်မှ စကားပြေသီအိုရီ၊ သရုပ်ဖော်အဖွဲ့ သီအိုရီ၊ ဖြစ်စဉ်ပြအဖွဲ့သီအိုရီ၊ ဖွင့်ဆိုရှင်းပြအဖွဲ့သီအိုရီ၊ ကျိုးကြောင်းပြအဖွဲ့သီအိုရီ၊ စကားအသုံးအနှုန်းသီအိုရီ၊ ဝါကျတို၊ ဝါကျရှည် သီအိုရီ၊ ပုံစံတူဝါကျသီအိုရီ၊ ဆရာကြီးရွှေဥဒေါင်း (၁၉၆၈)၏ တစ်သက်တာမှတ်တမ်းနှင့် အတွေးအခေါ်များစာအုပ်မှ ဝါကျတို၊ ဝါကျရှည်သီအိုရီစသည့် ပညာရပ်ဆိုင်ရာ နည်းနာသီအိုရီများ နှင့်ပေါင်းစပ်ပြီး ဆန်းစစ်လေ့လာတင်ပြထားပါသည်။

ဤကျမ်းကို နိဒါန်း၊ စာပေလေ့လာဆန်းစစ်ချက်၊ နည်းနာ၊ လေ့လာတွေ့ရှိချက်၊ သုံးသပ်ချက်ဟူ၍ ကျမ်း၏အခန်းဖွဲ့စည်းပုံဖြင့် ဆန်းစစ်လေ့လာတင်ပြထားပါသည်။ ရခိုင်ရာဇဝင်စာပေကျမ်းများကို အချက်အလက် ကောက်ယူစုဆောင်းခြင်း၊ စုဆောင်းရရှိသော ရာဇဝင်ကျမ်းတို့ကို ခေတ်အလိုက်၊ ခုနှစ်သက္ကရာဇ်အလိုက် ဝါစဉ်ခြင်း၊ စကားပြေ၊ ကဗျာအမျိုးအစားခွဲခြားခြင်း၊ ကျမ်းကြီး၊ ကျမ်းငယ်ခွဲခြားခြင်း၊ အကြောင်းအရာစီစဉ်တင်ပြခြင်း၊ ရေးနည်းရေးဟန်တို့ကို လေ့လာတင်ပြထားခြင်းများဖြင့် လေ့လာတင်ပြထားပါသည်။

ဤကျမ်းတွင်ဦးစွာ ရခိုင်ရာဇဝင်စာပေကျမ်းများကို မိတ်ဆက်တင်ပြထားပါသည်။ အစောဆုံးရခိုင် မင်းဆက်ကို အေဒီ၇၂၉ ခန့်က အာနန္ဒစန္ဒြိမင်းရေးထိုးခဲ့သော အာနန္ဒစန္ဒြိမင်းကျောက်စာတွင် တွေ့ရပါသည်။ အာနန္ဒစန္ဒြိမင်းသည် အေဒီ ၈ ရာစု ကာလက ဝေသာလီတွင်စိုးစံခဲ့သော မင်းတစ်ပါးဖြစ်သည်။ ဤကျောက်စာတွင် လေးရာစုနှောင်းပိုင်းကာလမှစတင်၍ စိုးစံခဲ့သောမင်းတို့၏ ဆွေစဉ်မျိုးဆက်စာရင်းကို မှတ်တမ်းတင်ရေးထိုးထား ပါသည်။ ဤကျောက်စာပါ မင်းတို့ကို ညောင်တီခေတ်နှင့် ဝေသာလီခေတ်မင်းဆက်များဟု ပညာရှင်တို့က ကောက်ချက်ချထားကြသည်။

ရခိုင်ရာဇဝင်စာပေကျမ်းများကို မြောက်ဦးခေတ်တွင် ဆက်လက်တွေ့ရှိရပါသည်။ ထို့ပြင်ကိုလိုနီခေတ်နှင့် မျက်မှောက်ခေတ်တွင် ရေးသားသော ရခိုင်ရာဇဝင်စာပေကျမ်းတို့ကိုလည်း ဆက်လက် တွေ့ရပါသည်။ ရခိုင် ရာဇဝင်တွင် စကားပြေဖြင့်ရေးသားထားသော ရခိုင်ရာဇဝင် ကျမ်းကြီးများ၊ ကဗျာလင်္ကာဖြင့် ရေးဖွဲ့သော ရခိုင် ရာဇဝင်လင်္ကာများ၊ သမိုင်းမှတ်တမ်းသဖွယ် အားကိုးအားထားပြုနိုင်သော ရခိုင်မင်းသမီးချင်း ကဲ့သို့ ရာဇဝင် သံသိပ်လင်္ကာ၊ ဘုရင့်အမိန့်တော်နှင့် ရေးသားသော မင်းရာဇာကြီးစာတမ်း၊ မင်းဆက်တို့ကို အင်းဇယားနှင့် ပြည့်စုံစွာဖော်ပြထားပြီး ရာဇဝင်အကြောင်းနှင့် တွဲဖက်၍ရေးသားသော အင်းစောက်ရာဇဝင်၊ ရာဇက္ခမသင်္ဃေပ ကျမ်း၊ အရေးတော်ပုံကျမ်းများ၊ တဘောင်များ၊ သိုက်စာများ၊ ယတြာများပါဝင်ပြီး ရာဇဝင်ကြောင်း နှင့်တွဲ၍ ရေးသားထားသော ငလက်ရုံးသိုက်ကျမ်း၊ ရာဇဝင်နှင့်ဓမ္မသတ်ပေါင်းစပ် ရေးသားထားသော ရာဇဝင်ကျမ်း များ၊ အစဉ်အလာရာဇဝင်နှင့် သုတေသနရာဇဝင်တို့ ပေါင်းစပ်ပါဝင် ရေးသားထားသော ရာဇဝင်ကျမ်းများ၊ စာဆို၏ မျက်မှောက်ခေတ်အခြေအနေကို အဓိကထားရေးသားသော မှတ်တမ်းသဘောပါသည့် မဇ္ဈိမဒေသအရေးတော်ပုံ ကျမ်းစသည့် စာပေအမျိုးအစားများကို တွေ့ရပါသည်။ ရခိုင်ရာဇဝင်စာပေကျမ်း (၄၆)စောင်ကို ရှာဖွေတွေ့ရပါ သည်။

ရခိုင်မင်းသမီးချင်း (အဒူမင်းညို)၊ ရခိုင်မဟာရာဇဝင်တော်ကြီးကျမ်း (အမတ်ကြီးဝိမလ) (ဦးသာထွန်းအောင် (၁၉၂၆) ကူးယူဖော်ပြသည်။)၊ ရခိုင်ရာဇဝင် (ခေါ်) မင်းရာဇာကြီးစာတမ်း၊ ငလက်ရုံးရာဇဝင်၊ ရခိုင်ရာဇဝင်ကြီး (ရာဇဝင်ဟောင်း) (အမတ်ကြီးစာဖတ်ဒိုးဝေ)၊ ရခိုင်ရာဇဝင်ကြီး (ပေမူ) (တက္ကသိုလ်များ ဗဟိုစာကြည့်တိုက် တိုက်ပိုင်အမှတ်တစ- ၉၈၃၇)၊ သာစွလေမင်းစဉ်လင်္ကာ (အမတ်ကြီးစာဖတ်ဒိုးဝေ)၊ ရခိုင်ဇာတိဝံသ မော်ကွန်းစာ၊ မင်းစောမွန်ရွာတည်ခန်းစာတမ်းတို့သည် မြောက်ဦးခေတ်တွင် ရေးသားခဲ့သော ရခိုင်ရာဇဝင်စာပေ ကျမ်းများဖြစ် ကြသည်။

ရခိုင်မင်းသမီးချင်းသည် မြောက်ဦးခေတ်တွင်တွေ့ရသော အစောဆုံးရခိုင်ရာဇဝင် သံသိပ်ကဗျာလင်္ကာ ဖြစ်သည်။ စကားပြေနှင့်ရေးသားထားသော ရခိုင်ရာဇဝင်ကျမ်းများတွင် အမတ်ကြီးဝိမလ၏ ရခိုင်မဟာ ရာဇဝင်တော်ကြီးကျမ်း(ဦးသာထွန်းအောင်(အေဒီ ၁၉၂၆)ခုနှစ်တွင် ကူးယူဖော်ပြသည်။)ကိုအစောဆုံး တွေ့ရပါ သည်။

ရခိုင်မဟာသမ္မတရာဇဝင်အရေးပုံ၊ မဇ္ဈိမဒေသအရေးတော်ပုံကျမ်း၊ ခညဝတီအရေးတော်ပုံကျမ်း (ရခိုင် အရေးတော်ပုံ (ရှင်ကဝိသာရ)) တို့သည် မြန်မာမင်းလက်ထက်တွင် ရေးသားခဲ့သော ရခိုင်ရာဇဝင်ကျမ်းများဖြစ်ကြ သည်။

ရခိုင်ရာဇဝင်ကျောက်ရိုး၊ ဆရာငမည်ရခိုင်ရာဇဝင်၊ အင်းစောက်ရာဇဝင်၊ ရခိုင်ရာဇဝင် အကောက် လျှောက်ထုံး၊ ရခိုင်ရာဇဝင်လင်္ကာ (မြို့တည်ခြင်းလင်္ကာ) (ရမ်းဗြဲဦးစံတင်)၊ ရခိုင် ရာဇဝင်ကြီး (စန္ဒကုမာလင်္ကာ) (ပေမူ)၊ ရခိုင်ရာဇပုံ၊ ရခိုင်ရာဇဝင်၊ စည်သူဂါမဏိသင်္ကြံ၏ ရခိုင်ရာဇဝင် (ပေမူ၊ ပုံနှိပ်မှု၊ ဌေးဝေ-ရခိုင်ရာဇဝင်၊ ရခိုင်သမိုင်း)၊ ခညဝတီအရေးတော်ပုံကျမ်း၊ မဟာဝိဟိက ရာဇဝင်လင်္ကာ (ဒွါရာဝတီလမုချောင်း ဆရာကျော်မဲ)၊ ရခိုင်ရာဇဝင်ချုပ်နှင့်တိတ္ထိကျမ်း၊ ခညဝတီရာဇဝင်သစ် (ပဲခူးမင်းကျောင်း ဆရာတော်ဦးပဏ္ဍိ)၊ ရခိုင်ရာဇဝင်သစ် ကျမ်း (ရှင်စန္ဒမာလာ လင်္ကာရ)၊ ရာဇက္ခမသင်္ဃေပကျမ်း (ရှင်စန္ဒမာလာလင်္ကာရ)၊ မြောက်ဦးမင်းဆက်လင်္ကာ (မောင်သာအောင်)၊ ဝါးကျောင်းဆရာ ရခိုင်ရာဇဝင်လင်္ကာအကျဉ်း (ဝါးကျောင်းဆရာဦးပဏ္ဍိ)တို့သည် ကိုလိုနီ ခေတ်တွင် ရေးသားခဲ့ကြသော ရခိုင်ရာဇဝင်ကျမ်းများ ဖြစ်ကြသည်။

ဓညဝတီရာဇဝင်သစ်ကျမ်း (ဦးဉာဏ)၊ ရက္ခမဏ္ဍလရခိုင်ရာဇဝင် (ဦးအောင်သာဦး)၊ အာနန္ဒစန္ဒရစ်ရာစု ရခိုင်ဝေသာလီမင်း (ဦးစံသာအောင်)၊ ရက္ခပူရကြေးမုံကျမ်း (ဓညဝတီ အောင်ဇေယျ)၊ ရခိုင်သမိုင်းအလင်းပြကျမ်း (ဦးရွှေဇံ)၊ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်း (ထွန်းရွှေခိုင်၊ မဟာဝိဇ္ဇာ)၊ ရခိုင်သမိုင်းမိတ်ဆက် (ဒေါက်တာအေးချမ်း)တို့ သည် မျက်မှောက်ခေတ်တွင် ရေးသားကြသော ရခိုင်ရာဇဝင်ကျမ်းများဖြစ်ကြသည်။

ရခိုင်ရာဇဝင်စာဆိုတို့သည် ရခိုင်ရာဇဝင်စာပေကျမ်းတို့ကို စကားပြေဖြင့်လည်းကောင်း၊ ကဗျာလင်္ကာဖြင့် လည်းကောင်း ရေးသားခဲ့ကြသည်။ ရခိုင်မင်းသမီးချင်း (အဒူမင်းညို(ဖဒူမင်းညို)) မင်းဆက်လင်္ကာကြီး (သာစွလေမင်းစဉ်လင်္ကာ) (အမတ်ကြီးစာဖတ်ဒိုးဝေ)၊ မြောက်ဦးမင်းဆက် လင်္ကာ (မောင်သာအောင်)၊ ဝါးကျောင်း ဆရာ ရခိုင်ရာဇဝင်လင်္ကာ အကျဉ်း (ဝါးကျောင်းဆရာ ဦးပဏ္ဍိ)၊ ရခိုင်ရာဇဝင်လင်္ကာ (မြို့တည်ခြင်းလင်္ကာ) (ရမ်းဗြဲဦးစံတင်) ၊ မဟာဝိဟိက ရခိုင်ရာဇဝင်လင်္ကာ (ဒွါရာဝတီလမုချောင်း ဆရာကျော်မဲ)တို့သည် ကဗျာလင်္ကာဖြင့် ရေးဖွဲ့ထားသော ရခိုင်ရာဇဝင်လင်္ကာများဖြစ်ကြသည်။ ကျန်ရှိသော ရခိုင်ရာဇဝင်စာပေကျမ်းများမှာ စကားပြေနှင့် ရေးသား ထားသော ရခိုင်ရာဇဝင်စာပေကျမ်းများ ဖြစ်ကြသည်။

အကြောင်းအရာလေ့လာချက်

ရခိုင်ရာဇဝင်စာပေကျမ်းများ၏ အကြောင်းအရာကို လေ့လာတင်ပြရာတွင် ရခိုင်ရာဇဝင်စာပေကျမ်းများ၏ အကြောင်းအရာအချုပ်၊ ရခိုင်ရာဇဝင်စာပေကျမ်းများ၏ အကြောင်းအရာစီစဉ်တင်ပြပုံ၊ ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်း အကြောင်းအရာစီစဉ်တင်ပြပုံကို အခြားရခိုင်ရာဇဝင် စာပေကျမ်းများ၏ အကြောင်းအရာ စီစဉ်တင်ပြပုံတို့နှင့် နှိုင်းယှဉ်လေ့လာချက်ဟူ၍ ပိုင်းခြားပြီးလေ့လာတင်ပြထားပါသည်။

ဤအခန်းတွင် ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းအကြောင်းအရာအချုပ်၊ စကားပြေ နှင့်ရေးသားထားသော ရခိုင်ရာဇဝင်စာပေကျမ်းများအနက် ဝိမလအမတ်ကြီး၏ ရခိုင်မဟာရာဇဝင်တော်ကြီး ကျမ်းနှင့် အမတ်ကြီးမဟာဇေယျသိန်၏ မင်းရာဇာကြီးစာတမ်းတို့၏ အကြောင်းအရာအချုပ်တို့ကို လေ့လာတင်ပြ ထားပါသည်။ ဤကျမ်းတို့သည် အစောဆုံးရခိုင်ရာဇဝင် ကျမ်းများဖြစ်ပြီး စာရေးသူ၏ မျက်မှောက်ခေတ်တွင် ရေးသားခဲ့သော မှတ်တမ်းသဖွယ်အထောက် အထားပြုနိုင်သည့် ခိုင်မာသောရခိုင်ရာဇဝင်ကျမ်းများဖြစ်ကြသည်။ ထို့ပြင်အပြည့်စုံဆုံး ရခိုင်ရာဇဝင်ကျမ်းဖြစ်သော ရှင်စန္ဒမာလာလင်္ကာရ၏ ရခိုင်ရာဇဝင်သစ်ကျမ်း၏ အကြောင်း အရာအချုပ်ကိုလည်း လေ့လာတင်ပြထားပါသည်။

ကဗျာလင်္ကာနှင့်ရေးဖွဲ့ထားသော ရခိုင်ရာဇဝင်စာပေကျမ်းများအနက် အစောဆုံးရခိုင် ရာဇဝင်သံခိပ် ကဗျာလင်္ကာဖြစ်သော ရခိုင်မင်းသမီးချင်းကဗျာနှင့် အပြည့်စုံဆုံးရခိုင်ရာဇဝင် လင်္ကာဖြစ်သော ရမ်းဗြဲဦးစံတင်၏ ရခိုင်ရာဇဝင်လင်္ကာ(မြို့တည်ခြင်းလင်္ကာ)တို့၏ အကြောင်းအရာအချုပ် တို့ကို လေ့လာတင်ပြထားပါသည်။

ထို့နောက် ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းကို အခြားရခိုင်ရာဇဝင် စကားပြေကျမ်း များ၊ ကဗျာလင်္ကာကျမ်းများ၏ အကြောင်းအရာစီစဉ်တင်ပြပုံတို့နှင့် နှိုင်းယှဉ်လေ့လာတင်ပြထားပါသည်။

အရေးအသားလေ့လာချက်

ရခိုင်ရာဇဝင်ဆိုင်ရာ စာပေကျမ်းများ၏စကားပြေအရေးအသားကို သရုပ်ဖော်အဖွဲ့၊ ဖြစ်စဉ်ပြအဖွဲ့၊ ဖွင့်ဆိုရှင်းပြအဖွဲ့၊ ကျိုးကြောင်းပြအဖွဲ့စသည့် စကားပြေအဖွဲ့လေးမျိုးဖြင့် လေ့လာတင်ပြထားပါသည်။ စကားပြေအဖွဲ့ပုံစံကို တင်ပြရာ၌ ထွန်းရွှေခိုင် (မဟာဝိဇ္ဇာ) ၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်း၊ မင်းရာဇာကြီးစာတမ်း၊ ဓညဝတီအရေးတော်ပုံကျမ်းတို့၏ စကားပြေအဖွဲ့ပုံစံတို့ကိုသာ လေ့လာတင်ပြထားပါသည်။

ရခိုင်ရာဇဝင်စာပေကျမ်းတို့၏ စကားအသုံးအနှုန်းတို့ကိုလေ့လာရာ ထွန်းရွှေခိုင် (မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းတွင် မြောက်ဦးရွှေနန်းတော်အုပ်ချုပ်ရေး၊ မြောက်ဦးရွှေနန်းတော်ညီလာခံသဘင်၊ မြောက်ဦးခေတ်စီးပွားရေး၊ အုပ်ချုပ်ရေး၊ နိုင်ငံရေး၊ မြောက်ဦးခေတ်ဗုဒ္ဓသာသနာအခန်းတို့၌ အံဝင်ခွင်ကျ ဆီလျော်အောင် သုံးနှုန်းထားရာ ဆိုလိုသည့်အဓိပ္ပာယ်ကို ပိုမိုပေါ်လွင်စေကြောင်း တွေ့ရပါသည်။

ဝါကျဖွဲ့ပုံအနေဖြင့် ရခိုင်ရာဇဝင်စာဆိုတို့သည် များသောအားဖြင့် အကြောင်းအရာတစ်ခုတည်းကို ဝါကျတိုနှင့်ဝါကျရှည်ကိုမျှ၍ ရေးထားသည်ကိုလည်းတွေ့ရသည်။ ပုံစံတူဝါကျ၊ အပြိုင်ဝါကျများကိုသုံး၍ ရေးထားသဖြင့် ရခိုင်ရာဇဝင်စာဆိုတို့သည် ဝါကျအဆင့်တွင် ကျွမ်းကျင်သည်ဟု ဆိုနိုင်ပါသည်။

နိဂုံး

ဤကျမ်းသည် မျက်မှောက်ခေတ် ရခိုင်ရာဇဝင်ကျမ်းတစ်စောင်ဖြစ်သော ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင်ကြီးကျမ်းနှင့် ဝေသာလီခေတ်၊ မြောက်ဦးခေတ်၊ ကိုလိုနီခေတ်၊ မျက်မှောက်ခေတ်တို့တွင် ရေးသားခဲ့ကြသော ရခိုင်ရာဇဝင်ကျမ်းတို့ကို နှိုင်းယှဉ်လေ့လာ၍ သုတေသနပြုတင်ပြထား သော ကျမ်းဖြစ်ပါသည်။ ဤသို့ သုတေသနပြုလေ့လာတင်ပြခြင်းဖြင့် ရခိုင်ရာဇဝင် (၄၆)စောင်ကိုတွေ့ရပါသည်။ ထို့အပြင် ခေတ်ဦးရခိုင်မင်းဆက်တို့ကို ခိုင်ခိုင်မာမာရေးထိုးထားသော ကျောက်စာများ၊ ရခိုင်ရာဇဝင်သံဒိပ်များ၊ ရခိုင်ရာဇဝင်လင်္ကာများ၊ ပြည့်စုံ၍စုံပြုထိုက်သည့် ရခိုင်ရာဇဝင်ကျမ်းများ၊ ရခိုင်ရာဇဝင်ဆရာ၏ မျက်မှောက်ခေတ်မင်းတို့လက်ထက် အရေးပါသောအဖြစ်အပျက်အချို့ကို အသေးစိတ်ထည့်သွင်းဖော်ပြထားသည့် မှတ်တမ်းသဖွယ်အားကိုးနိုင်သော ရခိုင်ရာဇဝင်ကျမ်းများ၊ မင်းတို့၏အမိန့်တော်နှင့် ရေးသားသည့်ရာဇဝင်ကျမ်းများ၊ အရေးတော်ပုံကျမ်းများ၊ ရခိုင်ဘုရင်တို့ လက်ထက်ရာထူးဌာနန္တရနှင့်တာဝန်တို့ကို အဓိပ္ပာယ်ဖွင့်ဆိုချက်များပါသည့် ရခိုင်ရာဇဝင်ကျမ်းများစသည်ဖြင့် ရခိုင်ရာဇဝင်ကျမ်းများကို လေ့လာဆန်းစစ်မှတ်တမ်းတင်နိုင်ခဲ့ပါသည်။

ဤကျမ်း၏ လေ့လာတင်ပြမှုအပိုင်းသည် ပြီးပြည့်စုံပြီဟု ဆိုနိုင်မည်မဟုတ်သော်လည်း ရခိုင်စာပေရှိ တိမ်မြုပ်နေသော ရခိုင်ရာဇဝင်စာပေကျမ်းအချို့ကို လေ့လာဖော်ထုတ်ခြင်း၊ မှတ်တမ်းတင်ခြင်း၊ သုံးသပ်လေ့လာသုတေသနပြုလုပ်ခဲ့ခြင်းတို့ကြောင့် ရခိုင်စာပေအတွက် ရခိုင်ရာဇဝင်ကျမ်းများ၏ အရေအတွက်ကို စုစည်းဖော်ပြနိုင်ခဲ့ပါသည်။ ရခိုင်ရာဇဝင်ကျမ်းများ၏ အကြောင်းအရာ အချက်အလက်စီစဉ်တင်ပြမှုကို သိရှိစေနိုင်ပါသည်။ ရခိုင်ရာဇဝင်ကျမ်းတို့၏ စာပေအဆင့် အတန်းကိုလည်း သိရှိစေနိုင်ပါသည်။ ရခိုင်စာပေသမိုင်းတွင် လိုအပ်နေသည့် ကွက်လပ်ကိုအနည်းငယ် ဖြည့်စွက်အထောက်အကူပြုနိုင်လိမ့်မည်ဟုလည်း မျှော်လင့်ပါသည်။

ဤကျမ်းသည် ရခိုင်ရာဇဝင်ကို ဆက်လက်လေ့လာလိုသူများအတွက် တစ်ထောင့်တစ်နေရာမှ အထောက်အကူပြုနိုင်သော ကျမ်းတစ်စောင်ဖြစ်လာမည်ဟု ယူဆပါသည်။ ရခိုင်စာပေသမိုင်း၏ အရေးပါသော

အခန်းကဏ္ဍတစ်ရပ်ဖြစ်သည့် ရခိုင်ရာဇဝင်ကျမ်းတို့ကို ရခိုင်စာပေသုတေသီများနှင့် သုတေသနကျမ်းပြုသူများ အနေနှင့် ဆက်လက်လေ့လာလိုသူများ သုတေသနပြုလာကြလိမ့်မည်ဟု မျှော်လင့်မိပါသည်။

ကျမ်းပြုသူ၏ လေ့လာတင်ပြမှုတွင် ချွတ်ယွင်းချက်များ၊ အငြင်းပွားဖွယ်ရာအချက်အလက်များပါဝင် ခဲ့သော်ပညာရှင်များ၊ သုတေသီများက ပြင်ဆင်ခြင်း၊ ဖြည့်စွက်ခြင်းများ ပြုလုပ်ပေးကြပါရန် ပန်ကြားအပ်ပါသည်။

ကျေးဇူးတင်လွှာ

ဤကျမ်းဖြစ်မြောက်ရေးအတွက် ကျမ်းခေါင်းစဉ်ကို အတည်ပြုသတ်မှတ်ပေးပါသော မြန်မာစာပါရဂူဘွဲ့ သင်တန်း ကြီးကြပ်မှု ကော်မတီအဖွဲ့ဝင်ဆရာကြီး၊ ဆရာမကြီးများ၊ ကျမ်းအတွက်လိုအပ်သည်များကို အသေးစိတ် လမ်းညွှန်မှုပေးသော မြန်မာစာပါရဂူဘွဲ့ သင်တန်းဦးစီးကော်မတီ စာစစ်အဖွဲ့ဥက္ကဋ္ဌနှင့် ကျမ်းကြီးကြပ်သူ ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာဌာန၊ ပါမောက္ခ၊ ဌာနမှူး ဆရာကြီးဒေါက်တာထွန်းအောင်ကျော်၊ ကျမ်းပြုကာလ တစ်လျှောက် စေတနာမေတ္တာ အပြည့်ဖြင့် ကြီးကြပ်လမ်းညွှန်မှုပေးပါသော မိတ္ထီလာတက္ကသိုလ်၊ မြန်မာစာဌာန၊ ပါမောက္ခ(ငြိမ်း) ဆရာကြီး ဒေါက်တာဌေးလွင်၊ ကျမ်း အကဲဖြတ်အဖြစ် ဆောင်ရွက်ပေးသော ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာဌာန၊ ပါမောက္ခ၊ ဌာနမှူး(ငြိမ်း)၊ အချိန်ပြည့် မြန်မာစာအဖွဲ့ဝင် ဆရာမကြီးဒေါက်တာ ဒေါ်ခင်ဆွေမြင့်၊ ပြင်ပစာစစ်အဖြစ် ဆောင်ရွက်ပေးသော ရန်ကုန်အဝေးသင် တက္ကသိုလ်၊ မြန်မာစာဌာန၊ ပါမောက္ခ၊ ဌာနမှူး(ငြိမ်း) ဆရာမကြီး ဒေါက်တာဒေါ်ခင်မြင့်၊ ကျမ်းစာစစ် အဖွဲ့ဝင်များ ဖြစ်ကြသော ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာဌာန၊ ပါမောက္ခ ဒေါက်တာလွင်မာဦးနှင့် ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာဌာန၊ ပါမောက္ခဒေါက်တာ ခင်ဆွေမြင့် တို့အားလည်း အထူးကျေးဇူးတင်ရှိပါသည်။ ကျမ်း၏စီစဉ်တင်ပြမှုနှင့် ပတ်သက်၍ လမ်းညွှန်မှုပေးကြပါသော ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာဌာန၊ ပါမောက္ခ၊ ဌာနမှူး(ငြိမ်း) ဆရာကြီးဒေါက်တာ ခင်အေး၊ ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာဌာန၊ ပါမောက္ခ၊ ဌာနမှူး(ငြိမ်း) ဆရာကြီးဒေါက်တာ အောင်မြင့်ဦးတို့ကို လည်းအထူးကျေးဇူး တင်ရှိပါသည်။ ကျမ်းနှင့်ပတ်သက်၍ ဆွေးနွေးအကြံပြုလမ်းညွှန်မှု ပေးကြပါသော စစ်တွေတက္ကသိုလ်၊ ဒုတိယပါမောက္ခချုပ် ဆရာကြီးဒေါက်တာကျော်ဝင်းဦး၊ ရန်ကုန်တက္ကသိုလ်၊ သမိုင်းဌာန၊ ပါမောက္ခ ဒေါက်တာ ဇော်လင်းအောင်၊ ရခိုင်စာပေသုတေသီ ဆရာတော်ရမ္မာဝတီဦးပညာစာရ၊ ရခိုင်စာပေသုတေသီ ဆရာကြီး ဦးမောင်ဗသိန်း၊ ရခိုင်စာပေသုတေသီ ဆရာကြီးဦးအောင်လှသိန်း၊ ရခိုင်စာပေသုတေသီ စာရေးဆရာဦးမောင်ကျော်ဇော (နောင်အေး)တို့ အားလည်း အထူးကျေးဇူးတင်ရှိပါသည်။ ကျမ်းအတွက် လိုအပ်သည့် စာအုပ်များ၊ ကျမ်းများကို ဖတ်ရှုကူးယူခွင့်ပြုပါသော ရန်ကုန်တက္ကသိုလ်၊ တက္ကသိုလ်များ ဗဟိုစာကြည့်တိုက်၊ ဌာနမှူး (စာကြည့်တိုက်) ဒေါက်တာလှိုင်လှိုင်ကြီး၊ ရခိုင်ရာဇဝင်ပေမူများကိုကူးယူခွင့်၊ ဓာတ်ပုံ ရိုက်ခွင့်ပြုပါသော ရန်ကုန်တက္ကသိုလ်၊ တက္ကသိုလ်များ ဗဟိုစာကြည့်တိုက်၊ ပေ၊ ပုရပိုက်ဌာန၊ ဌာနစိတ်မှူး ဒေါ်စုစုမြတ်ဌေးဒ်တို့အားလည်း အထူးကျေးဇူးတင်ရှိ ပါသည်။ ပညာအမွေပေးခဲ့ပါသော ကျေးဇူးရှင်မိဘနှစ်ပါး၊ သင်ဆရာ၊ မြင်ဆရာ၊ ကြားဆရာများနှင့် ကျေးဇူးတင်ထိုက်သူများ အားလုံးကို အထူးကျေးဇူး တင်ရှိကြောင်း မှတ်တမ်းတင်အပ်ပါသည်။

ကျမ်းကိုးစာရင်း

မြန်မာဘာသာ

ကာတီရခိုင်ရာဇဝင်(ပေမူ)။

ကုလား၊ ဦး။ (၁၉၆၀)။ *မဟာရာဇဝင်ကြီး* (ပထမတွဲ၊ ဒုတိယတွဲ၊ တတိယတွဲ)။ ရန်ကုန်၊ ဟံသာဝတီ ပိဋကတ်တိုက်။

ကိုကိုသန်း၊ မောင်။ (၁၉၉၃)။ *ညောင်တီအရေးတော်ပုံကျမ်းလေ့လာချက်*။ ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာမဟာဝိဇ္ဇာဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

ကျခတ်ရခိုင်ရာဇဝင်(ပေမူ)။

ကျော်ဇော၊ မောင်။ (၂၀၁၆)။ *အဖရခိုင်ပြည်နှင့်မြောက်ဦးရွှေမြေ*။ ရန်ကုန်၊ ရခိုင်သားကြီးစာပေ။

ကျော်မဲ၊ ဒွါရာဝတီလမုချောင်းဆရာ။ *မဟာဝိဟိကရခိုင်ရာဇဝင်လင်္ကာ*။ (ပေမူ)။ (ရမ္မာဝတီ ပညာစာရထံမှရရှိသည်)။

ကျော်ဝင်းဦး။ (၁၉၉၆)။ *မြောက်ဦးခေတ်နှောင်းပိုင်းရခိုင်သမိုင်း*။ ရန်ကုန်တက္ကသိုလ်၊ သမိုင်းမဟာဝိဇ္ဇာဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

ကျော်ဝင်း၊ ဦး။ သမိုင်းပါမောက္ခ(တည်းဖြတ်သူ)။ (၁၉၉၈)။ *မဟာရာဇဝင်သစ် (တောင်ငူခေတ်)* ဒုတိယတွဲ။ ရန်ကုန်၊ မြတ်မီခင် ဝံသဒက္ခိဏအဖွဲ့။

ကျိန်းကျွန်းသား။ *ရှေးဟောင်းရခိုင်ပြည်အုပ်ချုပ်ရေးစနစ်*၊ ရခိုင်မဂ္ဂဇင်း၊ အမှတ် (၃)။ ၁၉၉၆။

ကြခတ်ရခိုင်ရာဇဝင်(ပေမူ)။

ခင်မင်၊ မောင်(ခန့်ဖြူ)။ (၂၀၁၁)။ *ရှေးဟန်ပညာနိဒါန်း*။ ရန်ကုန်၊ စိတ်ကူးချိုချိုစာပေ။

ခင်မင်၊ မောင်(ခန့်ဖြူ)။ (၂၀၁၈)။ *စကားပြေသဘောတရား စကားပြေအတတ်ပညာ* (သတ္တမအကြိမ်)။ ရန်ကုန်၊ ပန်းရွှေပြည် စာအုပ်တိုက်။

ခင်သန်း၊ မ။ (၂၀၁၉)။ *မြောက်ဦးခေတ်အုပ်ချုပ်ရေး (အေဒီ ၁၄၃၀-၁၆၃၈)*။ ရန်ကုန်၊ ရခိုင်သားကြီးစာပေ။

ခင်အေး၊ ဦး။ (၁၉၈၂)။ *စကားပြေဟန်*။ တက္ကသိုလ်ပညာပဒေသာစာစောင်အတွဲ(၇)၊ အပိုင်း(၄)။ ရန်ကုန်၊ အထက်တန်းပညာ ဦးစီးဌာန။

ဇမည်၊ ဆရာ။ (၁၈၄၂)။ *ရခိုင်ရာဇဝင်*(ပေမူ)။

ဇလက်ရုံး(လေးမြို့စား)။ (မ ၁၁၈၃)။ *ဇလက်ရုံးရာဇဝင်နှင့်ဒုကယျို့*။ ရန်ကုန်တက္ကသိုလ်များဗဟို စာကြည့်တိုက်။ ပေ၊ တိုက်ပိုင် အမှတ်-၁၃၂၈၀၄။

ဇအောင်(ညောင်တီမြို့သူကြီး-)။ *ညောင်တီမြို့စစ်တမ်း*(ပေမူ)။

စံတင်၊ ဦး၊ ရမ်းဗြဲ။ (၁၈၅၀)။ *ရခိုင်ရာဇဝင်လင်္ကာ*။ (မြို့တည်ခြင်းလင်္ကာ) (ပေမူ)။

စံသာအောင်၊ ဦး။ (၁၉၇၄)။ *အေဒီခြောက်ရာစုနှင့်ယင်းမတိုင်မီ ရခိုင်ပြည်သုံးအက္ခရာ*။ ရန်ကုန်၊ သင်းစာပေ။

စံသာအောင်၊ ဦး။ (၁၉၇၅)။ *အာနန္ဒစန္ဒြိရစ်ရာစု ရခိုင်ဝေသာလီမင်း* (ဒု-ကြိမ်)။ ရန်ကုန်၊ သင်းစာပေ။

စံသာအောင်၊ ဦး။ (၁၉၇၉)။ *ရခိုင်ဒင်္ဂါးများ*။ ရန်ကုန်၊ ဒေါ်စောစောစာပေ။

စက္ကိန္ဒ၊ ဦးနှင့်မာန်အောင်ဝိယ။ (၁၉၆၉)။ *ရခိုင်ယဉ်ကျေးမှုများ*။ ရန်ကုန်၊ တိုင်းလင်းစာပေတိုက်။

စက္ကန့်၊ အသျှင်။ **ရခိုင်ဇာတိဝိသမော်ကွန်းစာ။** ရခိုင်တန်ဆောင်မဂ္ဂဇင်း။ ရန်ကုန်၊ ရခိုင်စာပေနှင့် ယဉ်ကျေးမှုဆပ်ကော်မတီ၊
(၁၉၇၃-၇၄)၊ အမှတ်-၁၃။

စက္ကန့်၊ အသျှင်။ (၂၀၀၅)။ **ရခိုင်ယဉ်ကျေးမှုများ၊ အမှတ်(၉)။** ရန်ကုန်၊ ရခိုင်သားကြီးစာပေ။

စက္ကန့်၊ အသျှင်။ မင်းဘာဘုရင်မင်းမြတ်အမိန့်တော်ပြန်တမ်း (၁၃)ရပ်။ **ရခိုင်ယဉ်ကျေးမှုများ-၁၀။** ရန်ကုန်၊ ရခိုင်သားကြီးစာပေ၊
၂၀၁၇။

စန္ဒကုမာလင်္ကာ၊ ဆရာတော်။ **ရခိုင်ရာဇဝင်ကြီး(ပေမူ)။**

စန္ဒမာလာလင်္ကာရ၊ ရှင်၊ ရမ်းဗြဲတောင်ကျောင်းဆရာတော်။ (၂၀၁၄)။ **ရခိုင်ရာဇဝင်သစ်ကျမ်း။** ရန်ကုန်၊ ရာပြည့်စာအုပ်တိုက်။

စန္ဒမာလာလင်္ကာရ၊ ရှင်၊ ရမ်းဗြဲတောင်ကျောင်းဆရာတော်။ (၂၀၁၄)။ **ရာဇက္ခမသင်္ခေပကျမ်း။** ရန်ကုန်၊ ရာပြည့်စာအုပ်တိုက်။

ဇေယျသိန်၊ မဟာ(အမတ်ကြီး)။ (မ-၁၁၃၇)။ **ရခိုင်မင်းရာဇာကြီးစာတမ်း။** ရန်ကုန်၊ အမျိုးသားစာကြည့်တိုက်၊ ပေ၊
တိုက်ပိုင်နံပါတ်-၁၆၃၂။

ဇင်မာခိုင်။ (၂၀၁၃)။ **တွင်းသင်းမင်းကြီး၏ ရာဇဝင်စကားပြေ။** ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာ ပါရဂူဘွဲ့အတွက် တင်သွင်းသော
ကျမ်း။

ဉာဏ၊ ဦး(ဆရာတော်-)။ (မ-၁၃၁၆)။ **ညောင်တီရာဇဝင်သစ်။** ရန်ကုန်၊ ဟံသာဝတီပိဋကတ် ပုံနှိပ်တိုက်။

ဌေးဝေ။ (၂၀၁၄)။ **ရခိုင်ရာဇဝင်။** ရန်ကုန်၊ သီရိတိပိဋကတ်ပုံနှိပ်တိုက်။ (စည်သူဂါမဏိသင်္ကြံ၏ ရခိုင်ရာဇဝင်)။

တက္ကသိုလ်မြန်မာစကားပြေကောက်နုတ်ချက်။ (၁၉၆၈)။ ရန်ကုန်၊ ပြည်သူ့ပစ္စည်းကော်ပိုရေးရှင်း၊ စာအုပ်နှင့်စာရေးကိရိယာ။

တက်ထွန်းနီ။ **မြောက်ဦးခေတ်ညီလာခံသဘင်။** မြောက်ဦးမဂ္ဂဇင်း။ ရန်ကုန်၊ မြောက်ဦးမြို့နယ် ငြိမ်ဝပ်ပိပြားမှုတည်ဆောက်ရေး
အဖွဲ့၊ ၁၉၉၆။

တင်လေးနွယ်၊ မ။ (၂၀၁၂)။ **ကုန်းဘောင်ဆက်မဟာရာဇဝင်တော်ကြီးစကားပြေအရေးအသား။** မန္တလေးတက္ကသိုလ်၊ မြန်မာစာ
ပါရဂူဘွဲ့ အတွက် တင်သွင်းသောကျမ်း။

တင်လှ၊ ဦး(တည်းဖြတ်သူ)။ (၁၉၇၀)။ **မြန်မာမင်းများအုပ်ချုပ်ပုံစာတမ်းနှင့်ဘိုးတော်ဘုရားကြီး၏ ရာဇသတ်ခေါ်အမိန့်တော်
ကျမ်းကြီး** (ဒုတိယပိုင်း)။ ရန်ကုန်၊ ဗဟိုပုံနှိပ်တိုက်။

တင်မောင်ဌေး၊ မောင်။ (၁၉၆၀)။ **ရခိုင်ရိုးရာငါးစည်ရှာ-ရာဇဝင်ကဇာတ်ကြီး။** ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာမဟာဝိဇ္ဇာဘွဲ့
အတွက် တင်သွင်း သောကျမ်း။

ထွန်းရွှေ၊ ဦး။ (ခုနှစ်မပါ)။ **ရခိုင်ရာဇဝင်ကြီး။** (ပေ-၉၈၃၇)။ ပေမူ။

ထွန်းရွှေ။ (၂၀၁၂)။ **ဦးကုလားမဟာရာဇဝင်ကြီးစကားပြေအရေးအသား။** ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာပါရဂူဘွဲ့အတွက်
တင်သွင်းသော ကျမ်း။

ထွန်းရွှေခိုင်၊ (စစ်တွေကောလိပ်)။ (၁၉၈၅)။ **ရခိုင်ရှေးဟောင်းမြို့တော်များ။** ရန်ကုန်၊ လှကျော်စိန် စာပေ။

ထွန်းရွှေခိုင်၊ (စစ်တွေကောလိပ်)(တည်းဖြတ်သူ)။ (၁၉၉၁)။ **ရခိုင်မင်းသမီးဇချင်း။** ရန်ကုန်၊ စစ်သည် တော်စာပေ။

ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)။ (၂၀၁၃)။ **ရခိုင်မဟာရာဇဝင်ကြီး။** ရန်ကုန်၊ နဝရူပစာပေ။

ဒိုးဝေ၊ စာဖတ်။ **ပြည်၏ရာဇဝင်။** (ပေမူ)။

ဒိုးဝေ၊ ဦး။ **ရခိုင်ရာဇဝင်ကြီး။** ကင်းဝန်၊ ၁၈၁၊ အမျိုးသားစာကြည့်တိုက်။ ပေမူ။

ဒိုးဝေ၊ ဦး။ **မင်းဆက်လင်္ကာကြီး**။ (ပေမူ)။

နုယဉ်၊ မ။ (၁၉၉၀)။ **ဦးကုလားမဟာရာဇဝင်ကြီး၏ စကားပြေအရေးအသား**။ ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာမဟာဝိဇ္ဇာဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

နန္ဒမိတ်၊ (တက္ကသိုလ်-)။ (၁၉၆၁)။ **စာရေးချင်သောသူများသို့**။ ရန်ကုန်၊ တင်ဆွေအေးစာအုပ်ဆိုင်။

ပပဝင်း။ (၂၀၁၀)။ **ရာဇဝင်ကျမ်းစကားပြေရေးဟန်** (အင်းဝခေတ်မှညောင်ရမ်းခေတ်အထိ)။ ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာပါရဂူဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

ပဏ္ဍိ၊ ဦး။ (ပဲခူးမြို့၊ မင်းကျောင်းဆရာတော်)။ (မ-၁၂၇၁)။ **ညောင်တီရာဇဝင်သစ်**။ ရန်ကုန်မြို့၊ ပါဠိဆရာဦးဖြေပုံနှိပ်သည်။

ပဏ္ဍိ၊ ဦး။ (ဝါးကျောင်းဆရာတော်)။ (၂၀၀၅)။ **ရခိုင်ရာဇဝင်လင်္ကာအကျဉ်း**။ ရန်ကုန်မြို့၊ ရခိုင်သားကြီးစာပေ။

ဖေမောင်တင်၊ ဦး။ (၁၉၇၇)။ **မြန်မာစာပေသမိုင်း**(တ-ကြိမ်)။ ရန်ကုန်၊ စံပယ်ဦးစာပေ။

ဖြူ၊ မောင်။ (၁၉၉၂)။ **ဒုတိယမြောက်ဦးခေတ်နိုင်ငံရေးနှင့်စီးပွားရေး (၁၅၃၁-၁၆၃၈)**။ ရန်ကုန်တက္ကသိုလ်၊ သမိုင်းမဟာဝိဇ္ဇာဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

ဗေဒင်၊ ပက္ခဒိန်၊ **ရာဇဝင်ကျမ်းများ (နတ်စု)**။ ပေမူ။ (ရမ္မာဝတီပညာစာရထံမှရရှိသည်။)

ဘောဘိဇ္ဈ၊ မ။ (၁၉၈၄)။ **ဦးကုလားမဟာရာဇဝင်ကြီးလေ့လာချက်**။ မန္တလေးတက္ကသိုလ်၊ မြန်မာစာမဟာဝိဇ္ဇာဘွဲ့အတွက် တင်သွင်း သောကျမ်း။

မဟာပညာကျော်လျှောက်ထုံး။ (၁၉၆၄)။ ရန်ကုန်၊ ဟံသာဝတီပုံနှိပ်တိုက်။

မဟာဝိဟိကလင်္ကာတော်ကြီး (ရခိုင်ရာဇဝင်ပေါင်းချုပ်)။ ပေမူ။

မူမူအုန်း။ (၂၀၁၈)။ **မှန်နန်းရာဇဝင်တော်ကြီးမှ စကားပြေအရေးအသားလေ့လာချက်**။ ပါရဂူကျမ်း၊ မန္တလေးတက္ကသိုလ်၊ မြန်မာစာ ပါရဂူဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

မင်းစောမွန်၊ ရမ်းဗြဲကျွန်း၊ သံတွဲကျွန်း၊ မာန်အောင်ကျွန်း၊ ရွာတည်ခန်းစာတမ်း (ပေမူ)။

မင်းရာဇာကြီးစာတမ်း။ ရန်ကုန်တက္ကသိုလ်များ ဗဟိုစာကြည့်တိုက်၊ ပေ၊ တိုက်ပိုင်အမှတ်-၃၆၇၇၃၉။

မောင်ပုံရခိုင်ရာဇဝင် (ပေမူ)။

မောင်မောင်တင်၊ ဦး။ (၁၉၇၅)။ **ရွှေနန်းသုံးဝေါဟာရအဘိဓာန်**။ ရန်ကုန်၊ ဗုဒ္ဓဘာသာအဖွဲ့ပုံနှိပ်တိုက်။

မောင်မောင်တင်၊ ဦး။ (၂၀၀၄)။ **ကုန်းဘောင်ဆက်မဟာရာဇဝင်တော်ကြီး** (ပထမတွဲ၊ ဒုတိယတွဲ၊ တတိယတွဲ) (ပဉ္စမအကြိမ်)။ ရန်ကုန်၊ ရာပြည့် စာအုပ်တိုက်။

မြန်မာစာအဖွဲ့။ (၁၉၈၀)။ **မြန်မာအဘိဓာန်အကျဉ်းချုပ်**၊ အတွဲ-၄။ ရန်ကုန်၊ စာပေဗိမာန်ပုံနှိပ်တိုက်။

မြန်မာစာအဖွဲ့။ (၂၀၁၈)။ **မြန်မာအဘိဓာန်** (တ-ကြိမ်)။ နေပြည်တော်၊ ညွှန်ကြားရေးမှူးချုပ်က ထုတ်ဝေသည်။

မြန်မာစာအဖွဲ့။ (၂၀၁၉)။ **မြန်မာစာလုံးပေါင်းသတ်ပုံကျမ်း** (ဒု-ကြိမ်)။ မြန်မာနိုင်ငံတိုင်းရင်းသား ဘာသာစကားဦးစီးဌာန။

မြန်မာမင်းများအရေးတော်ပုံကျမ်း။ (၁၉၆၇)။ ရန်ကုန်၊ နံ့သာတိုက်။

မြန်မာ့စွယ်စုံကျမ်း အတွဲ(၃)။ (၁၉၅၆)။ အင်္ဂလန်၊ စတီဗင်အော်စတင်အင်ဆန်းလီမိတက်။

မြန်မာ့စွယ်စုံကျမ်း အတွဲ(၁၁)။ (၁၉၇၀)။ ရန်ကုန်၊ စာပေဗိမာန်ပုံနှိပ်တိုက်။

မြိုင်သန့်၊ မောင်။ (၁၉၆၁)။ **ရခိုင်ဘာသာစကားသမိုင်းစစ်တမ်း**။ ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာ မဟာဝိဇ္ဇာဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

မှန်နန်းရာဇဝင်ကြီး(တတိယတွဲ)။ (၁၉၉၂)။ ရန်ကုန်၊ ပြန်ကြားရေးဝန်ကြီးဌာန၊ သတင်းနှင့် စာနယ်ဇင်းလုပ်ငန်း။

ရခိုင်ဇာတိဝိသမော်ကွန်းစာ (ပေမူ)။

ရခိုင်ပြည်နယ်ဖြစ်စဉ်သမိုင်း (သမိုင်းကဏ္ဍ၊ ယဉ်ကျေးမှုကဏ္ဍ၊ စာပေကဏ္ဍ)။ (၁၉၈၄)။ ယဉ်ကျေးမှု ပြတိုက်နှင့် စာကြည့်တိုက်၊ ရခိုင်ပြည်နယ်။

ရခိုင်မဟာသမတရာဇဝင်အရေးပုံ (စတုတ္ထတွဲ) (ပေမူ)။

ရခိုင်ရာဇဝင်ကျမ်း(ပေမူ)။ (ရမ္မာဝတီပညာစာရထံမှ ရရှိသည်။)

ရခိုင်ရာဇဝင် (ပေမူ၊ အမျိုးသားစာကြည့်တိုက်၊ တိုက်ပိုင်အမှတ်-၁၄၈၃)။

ရခိုင်ရာဇဝင်ကြီး (ရန်ကုန်တက္ကသိုလ်များဗဟိုစာကြည့်တိုက်၊ တိုက်ပိုင်အမှတ်-၉၈၃၇) (ပေမူ)။

ရခိုင်ရာဇဝင်ချုပ်နှင့်တိတ္ထကျမ်း (ပေမူ)။

ရခိုင်ရာဇဝင်ချုပ်သံပိုင် (ပေမူ)။

ရခိုင်ရာဇဝင်၊ ရက္ခပူရ (ပေမူ)။

ရခိုင်ရာဇဝင်အကောက် (ပေမူ)။ (ရမ္မာဝတီပညာစာရထံမှ ရရှိသည်။)

ရီရီ၊ ဒေါက်တာ။ (၁၉၇၄)။ **သုတေသနအဘိဓာန်မှတ်စု**။ ရန်ကုန်၊ မြန်မာနိုင်ငံသုတေသနအသင်း။

ရည်စိန်၊ ဦး။ (၂၀၁၇)။ **လက်ရွေးစင်စာတမ်းများ**။ ရန်ကုန်၊ ယဉ်ကျေးမှုဝန်ကြီးဌာန။

ရွှေမံ၊ ဦး။ (၂၀၁၁)။ **ရခိုင်သမိုင်းအလင်းပြကျမ်း**။ Varanasi, (India). Nirankar Printing Press.

ရွှေဥဒေါင်း။ (၁၉၆၈)။ **တစ်သက်တာမှတ်တမ်းနှင့် အတွေးအခေါ်များ**။ ရန်ကုန်၊ နှလုံးလှစာပေ။

လှထွန်းဖြူ၊ ဦး။ (၁၉၇၆)။ **ရခိုင်ပြည်စီးပွားရေးဘဏ္ဍာတော်တိုက်**။ ရန်ကုန်၊ စံပယ်စာပေတိုက်။

လှထွန်းဖြူ၊ ဦး(တည်းဖြတ်သူ)။ (၁၉၉၈)။ **မဇ္ဈိမဒေသအရေးတော်ပုံကျမ်း**။ ရန်ကုန်၊ ရခိုင်သားကြီးစာပေ။ (နေမျိုးဇေယျ ကျော်ထင် ရေးသားပြုစုသည်)။

ဝေသာ။ ၂၀၁၉။ **ပျောက်ဆုံးနေသောဘုရင့်နိုင်ငံတော်များ**။ ရန်ကုန်၊ ပန်းဆွေမွန်စာပေ။

ဝင်းဗိုလ်။ (၂၀၁၃)။ **ထားဝယ်ရာဇဝင်တော်ကြီးလေ့လာချက်**။ ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာပါရဂူဘွဲ့အတွက် တင်သွင်းသော ကျမ်း။

သာမံ၊ ဦး။ (၁၉၃၆) ။ **ရခိုင်၊ မြန်မာ၊ တလိုင်းသုံးတိုင်းရာဇဝင်ချုပ်ကျမ်း**။ မော်လမြိုင်၊ ရွှေထွန်း ပုံနှိပ်တိုက်။

သာထွန်းအောင်၊ ဦး။ (၁၉၂၆)။ **ရခိုင်မဟာရာဇဝင်တော်ကြီး**၊ မြို့ဟောင်းမြို့၊ ရခိုင်ပြည်သတင်းစာ ပုံနှိပ်တိုက်။

သာအောင်၊ မောင်။ **မြောက်ဦးမင်းဆက်လင်္ကာ** (ပေမူ)။

သီတာဦး၊ မ။ (၂၀၁၀)။ **ရှင်မဟာသီလဝံသ၏ ရာဇဝင်ကျော်စကားပြေလေ့လာချက်**။ မန္တလေးတက္ကသိုလ်၊ မြန်မာစာပါရဂူဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

သန်းထွန်း၊ ဒေါက်တာ။ (၂၀၀၂)။ **ခေတ်ဟောင်းမြန်မာရာဇဝင်** (တ-ကြိမ်)။ ရန်ကုန်၊ အင်းဝ စာအုပ်တိုက်။

သိန်းလှိုင်၊ ဦး။ (၂၀၁၁)။ **ခေတ်ဟောင်းမြန်မာသမိုင်းသုတေသနအဘိဓာန်** (တ-ကြိမ်)။ ရန်ကုန်၊ နေရီရီစာပေ။

အနုမင်းညို။ (၁၉၆၅)။ မ-၁၃၂၇။ **ရခိုင်မင်းသမီးချောင်း**။ ရန်ကုန်၊ ဟံသာဝတီပုံနှိပ်တိုက်။

အနုမင်းညို။ (၁၉၈၉)။ **ရခိုင်မင်းသမီးချောင်း**။ ရန်ကုန်၊ ဘာသာပြန်နှင့်စာအုပ်ထုတ်ဝေရေးဌာန။

အနန္တဘယ (အမတ်ကြီး)။ (ခုနှစ်မပါ)။ **ရခိုင်ရာဇဝင်ကျောက်စာ**။ ပေမူ။ (ရမ္မာဝတီပညာစာရထံမှ ရရှိသည်။)

အရေးတော်ပုံငါးစောင်တွဲ။ (၁၉၂၃)။ ရန်ကုန်၊ သုဓမ္မဝတီစာပုံနှိပ်တိုက်။

အေးချမ်း။ (၁၉၇၈)။ **မြောက်ဦးခေတ်အစောပိုင်းရခိုင်သမိုင်း**။ ရန်ကုန်တက္ကသိုလ်၊ သမိုင်း မဟာဝိဇ္ဇာဘွဲ့အတွက် တင်သွင်းသော ကျမ်း။

အေးချမ်း၊ ဒေါက်တာ။ (၂၀၁၇)။ **ရခိုင်သမိုင်းမိတ်ဆက်**။ ရန်ကုန်၊ နေမင်းရာဇာစာပေ။

အေးမြင့်၊ မ။ (၁၉၇၇)။ **သုသောဓိတရာဇဝင်ကျမ်းကို မှန်နန်းကုန်းဘောင်ဆက်ရာဇဝင်ကျမ်းများနှင့် နှိုင်းယှဉ်လေ့လာချက်**။ ရန်ကုန်တက္ကသိုလ်၊ မြန်မာစာမဟာဝိဇ္ဇာဘွဲ့အတွက် တင်သွင်းသောကျမ်း။

အင်းစောက်ရာဇဝင်။ (ခုနှစ်မပါ)။ ပေမူ။ (ရမ္မာဝတီပညာစာရထံမှရရှိသည်။)

အောင်ဇေယျ(ဓညဝတီ)။ (၂၀၀၄)။ **ရက္ခပူရကြေးမုံကျမ်း**။ ရန်ကုန်၊ သန်းထိုက်ရတနာပုံနှိပ်တိုက်။

အောင်မိုး၊ ဦး(ပါဠိပါရဂူ)။ (၁၉၆၇)။ ရသဂုဏ်ဆောင်းပါးများ။ ရန်ကုန်၊ ချိုးဖြူစာပေ။

အောင်မြင့်ဦး၊ ဒေါက်တာ။ (၂၀၁၈)။ **သုတေသနဟူသည်**။ ရန်ကုန်၊ ဧရာဝတီစာပေတိုက်။

အောင်လှသိန်း။ (၂၀၁၅)။ **ရခိုင်သုတအဘိဓာန်** (ဒု-ကြိမ်)။ ရန်ကုန်၊ စန္ဒာဝင်းပုံနှိပ်တိုက်။

အောင်လှသိန်း။ (၂၀၁၉)။ **ရခိုင်သမိုင်းအဘိဓာန်အကျဉ်း**။ ရန်ကုန်၊ ကောင်းစံပုံနှိပ်တိုက်။

အောင်သာဦး၊ ဦး။ (၁၉၅၅)။ **ရက္ခမဏ္ဍလရခိုင်ရာဇဝင်**။ ရန်ကုန်၊ မြရတနာစာပုံနှိပ်တိုက်။

အောင်သာဦး၊ ဦး။ (၁၉၇၅)။ **ရခိုင်မင်းဆက်သမိုင်း**။ ရန်ကုန်၊ ရတနာစာပုံနှိပ်တိုက်။

အောင်သာဦး၊ ဦး။ (၁၉၉၅)။ **သာသနာသက္ကရာဇ်နှင့်ပတ်သက်၍ သုတေသီတို့၏ အယူအဆများ**။ ရခိုင်မဂ္ဂဇင်း (ဝေသာလီ အထူးထုတ်)။ ရန်ကုန်။

ဦးသာထွန်း၊ ဦး။ ကျော်ထွန်းအောင်၊ ဦး။ (၂၀၁၇)။ **ရခိုင်ကျောက်စာပေါင်းချုပ်**။ ရန်ကုန်၊ ဦးသန်းထွန်းပုံနှိပ်တိုက်။

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**SEASONAL PREVALENCE OF *Aedes Aegypti*
(LINNAEUS, 1762) LARVAE IN VARIOUS WATER STORAGE
CONTAINERS IN SIX AREAS OF HINTHADA DISTRICT,
AYEYARWADY REGION**

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(၂-၅) SEASONAL PREVALENCE OF *Aedes aegypti* (LINNAEUS, 1762) LARVAE IN VARIOUS WATER STORAGE CONTAINERS IN SIX AREAS OF HINTHADA DISTRICT, AYEYARWADY REGION

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Abstract

The seasonal study was carried out in six areas of Hinthada District, Ayeyarwady Region, from June 2017 to May 2021 using descriptive field investigation method. All potential breeding sites were examined seasonally by different larval positive container types (major, minor and miscellaneous) from 50 households each in six study areas and the occurrence of *Aedes aegypti* larvae was investigated in accordance with varying seasons. Seasonal variations of key containers and key premises in all areas were compared. Larval indices in each area were comparatively observed in three seasons. In various containers, viz. concrete jars, earthen pots and bamboo bowls were found to be most positive and predominated ones for breeding sources throughout the survey period. The larval prevalence in positive containers was significantly different ($p < 0.05$) between six areas in accordance with different seasons. Seasonal prevalence of *Ae. aegypti* larvae in various containers was investigated to be higher in wet season than other seasons. Colour attraction experiment was conducted by using 11 coloured ovitraps in Ywa-Thit village of Hinthada Township. The maximum percentage of laid eggs and highest frequency on oviposition were recorded in black ovitrap while the minimum and lowest were in clear white (control) in three conditions. Of three conditions, the highest total percentage of laid eggs and maximum frequency on oviposition were investigated in indoor condition than other conditions. A community-based biological control of *Ae. aegypti* larvae in various water storage containers was done by releasing indigenous *Colisa labiosus* fish in randomly selected 50 households in Ywa-Thit village of Hinthada Township as intervention area for four months and Tha-Phan-Pin village was designated as non-intervention area in Ingapu Township. It was investigated that one larvivorous fish consumed about 400-1000 larvae within 24 hours. After intervention, larval indices were highly significantly reduced ($p < 0.01$) in final survey. It was also observed that 100% reduction in number of key containers and key premises in test area of Ywa Thit village.

Introduction

Aedes aegypti and *Aedes albopictus* are belonging to the subgenus *Stegomyia* and they are closely associated with peri-domestic environments (Balasubramanian *et al.*, 2015). The species *Aedes aegypti* is one of the world's most widely distributed mosquitoes and is of considerable medical importance as a major vector of dengue, dengue haemorrhagic fever and dengue shock syndrome (DF, DHF and DSS) in many tropical and subtropical countries throughout the world (Akram *et al.*, 2010).

The abundance of dengue is closely associated with the abundance of vectors and environmental factors (rainfall, temperature and relative humidity) (Simmons *et al.*, 2012). Infestation of vectors to new geographical areas, warm and humid climate, increased population density, water storage pattern in houses and storage of trash, for instance, recyclable materials can serve as risk factors for dengue virus infections.

Aedes density, as well as the number of dengue cases, increased in the wet season in Malaysia, India, Sri Lanka, Myanmar, Indonesia, Philippines and Thailand. A severe outbreak of

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DHF occurred for the first time in Yangon in 1970. Ayeyarwady Region is the second position wise DF/DHF cases and deaths in 2015-2019 (Vector Borne Disease Control Program (Myanmar), 2016). Among six districts, Hinthada District is involved in high risk areas of dengue endemic disease in Ayeyarwady Region because it has yearly high rainfall, temperature, relative humidity and population that serve as favorable conditions for the distribution, breeding and existence of *Aedes* mosquitoes. There are several factors influencing *Aedes* mosquitoes, including water container types, seasons and socio-culture practices, topographic, climatic and vectoral factor (Chumsri *et al.*, 2018). Container type is probably the most important factor determining breeding sites of mosquito species (Rajesh *et al.*, 2013). The positive number of various water containers was higher in rainy season than other seasons (Maung Maung Mya *et al.*, 2016). *Aedes aegypti* breeds in a wide assortment of domestic containers whereas *Aedes albopictus* more likely to be found in actual containers (Scott *et al.*, 1993).

The occurrence of *Aedes aegypti* and dengue fever can be predicted by the use of House Index (HI), Container Index (CI), and Breteau Index (BI), that are accepted by World Health Organization (WHO) in the forecast of dengue outbreaks. Key containers are the primary source of adult *Aedes* mosquitoes. The use of oviposition traps or ovitraps is a possibility indirectly estimate the vector population and this technique recognized by WHO as it can attract female *Aedes* to oviposit. Size, colour, material, paddle and oviposition attractant have been reported to be the important factors that influence the efficacy of ovitrap.

Prevention of DHF outbreaks is based on long-term anti-mosquito control measures mainly household and environmental sanitation with emphasis on larval source reduction. *Aedes* larval control is the most effective method for controlling dengue disease (Singh and Taylor-Robinson, 2017). In choosing biological control programs, decreasing mosquito larval density, searching efficiencies, hunting power, adapting to different climatic conditions and interacting with predators of larvivorous fishes are very important. *Colisa* are very apparent larvivorous fish species in biological control programs. It was observed that the food consumption rate of a fish could consume 83% of the fish's weight per day (Jafari *et al.*, 2019). Thus, prevention of mosquito bite by personal protection and control of vectors are the only methods available to prevent dengue fever (DF) and dengue haemorrhagic fever (DHF) (Maung Maung Mya *et al.*, 2016). The present survey was not studied by any previous researchers in all six areas.

Aim of the present study was to provide the basic information on the larval densities in the six study areas where children predominated in the population.

Taking these into consideration this study was conducted with the following objectives.

- To determine the seasonal prevalence of *Aedes aegypti* larvae in various water storage containers in selected six areas
- To investigate the colour preferences for oviposition of gravid *Aedes aegypti* females in different coloured ovitraps in indoor, outdoor and in-bush conditions
- To assess the biological control of *Colisa labiosus* indigenous larvivorous fishes under field-based experiment condition

Materials and Methods

Study area

The present study was done in six field areas such as Ywa Thit village in Hinthada Township ($17^{\circ} 38' \text{ N}$ and $95^{\circ} 22' \text{ E}$), Set Kyi Tan village in Zalun Township ($17^{\circ} 28' \text{ N}$ and $95^{\circ} 33' \text{ E}$), Lal Tan Ngal village in Laymyethna Township ($17^{\circ} 41' \text{ N}$ and $95^{\circ} 41' \text{ E}$), Tha Phan Pin village in Ingapu Township ($17^{\circ} 48' \text{ N}$ and $95^{\circ} 15' \text{ E}$), Set Kwin village in Myanaung Township ($18^{\circ} 17' \text{ N}$ and $95^{\circ} 17' \text{ E}$) and Shwe Taung Su village in Kyangin Township ($18^{\circ} 20' \text{ N}$ and $95^{\circ} 15' \text{ E}$) in Hinthada District, Ayeyarwady Region (Fig.1).

Study period

The study period was lasted from June 2017 to May 2021. Field data collection was visited for three days per month in every season.

Utilization of equipment

Torch light, hand lens (magnification of $\times 4$ & $\times 6$), plastic cups, stereomicroscope, dissecting microscope, sweeper, plastic pipette, measuring slender tube, thermometer, litmus paper and thermo-hydrometer were utilized.

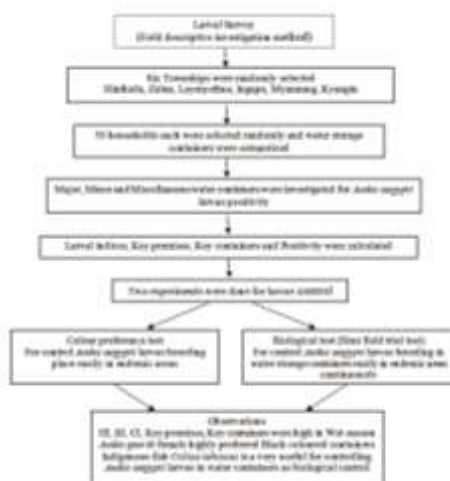
Larvae collection

Larvae collection was done by using sweeping method (Tun Lin *et al.*, 1995).

Colour attraction experiment

The study was conducted in Ywa Thit village (Hinthada Township) for colour experiment area to determine the colour preference and frequency on oviposition of gravid *Aedes aegypti* females in indoor, outdoor and in-bush conditions within three months. Three pairs of 11 coloured of plastic bowls as black, white, reddish brown, red, green, greenish black, blue, leaden, yellow, brown and clear white (control) were used as ovitraps and placed. The range of water temperature was from 17° C to 30° C and pH from 6 to 7 during the colour experiment. The range of temperature in indoor condition was from 15.5° C to 32° C , though 15.5° C to 34° C outdoor and 15.5° C to 37.5° C in in-bush condition. The range of RH indoor was from 25% to 72%, though 28% to 73% outdoor and 26% to 73% in-bush.

Study design



Collection of eggs and larvae

All papers of laid and anchored eggs were carefully taken off and placed in 45 cm white tray and dried for five hours in room temperature. All dried egg papers were examined and counted with hand lens.

Field experiment

Ywa Thit village, Hinthada Township was selected as intervention (test) area because of highest prevalence of DF/DHF cases (55.52% in 2018 and 62.72% in 2019) and Tha Phan Pin village, Ingapu Township was designated as non-intervention (control) area. A total of 50 households each from two study sites was randomly selected as test and control households to do the container survey. *Colisa labiosus* (Nga-phyin-tha-let) fishes (1g and 5-6 cm in sized) were introduced as biological control agents to control *Aedes aegypti* larvae harboring into all major, minor and miscellaneous water storage containers found in and around the households. Pre-intervention (first survey) was done in August. During intervention (second and third surveys) was conducted in September and October, and post-intervention (final survey) was in November.

Species identification

Identification of collected *Aedes aegypti* larvae was followed after Peyton and Harrison (1980), and Reid (1967). And, Identification of larvivorous fish species was undertaken according to Talwar and Jhingran (1991).

Weather parameters

Weather parameters were collected from Department of Meteorology and Hydrology in Hinthada Township.

DHF cases and death

DHF cases and death in six areas were obtained from Rural Health Center (RHC) and Public Health Center in Hinthada District.

Larval indices

Larval examination method of Sheppard *et al.* (1969) was used to confirm the presence of larvae in the different containers.

$$(a) \text{ Container Index (CI)} = \frac{\text{No. of positive containers with } Aedes \text{ larvae}}{\text{Total number of containers examined}} \times 100$$

$$(b) \text{ House Index (HI)} = \frac{\text{No. of positive houses for } Aedes \text{ larvae}}{\text{Total number of houses examined}} \times 100$$

$$(c) \text{ Breteau Index (BI)} = \text{No. of positive containers per 100 houses}$$

$$(d) \text{ Key container} = 500 \text{ and above larvae positive per container}$$

$$(e) \text{ Key premises} = 3 \text{ and above positive containers with } Aedes \text{ larvae per house}$$

Data collection form

Standard sheet for data collection was developed and noted down for the particulars including total water holding containers with water volume and percentages of positive containers (Source, Department of Medical Research, Yangon).

Statistical analysis

Larval indices, Key containers, Key premises, P value, Chi-square test and Kruskal Wallis test (SPSS version 23) and percentage (%) were calculated.

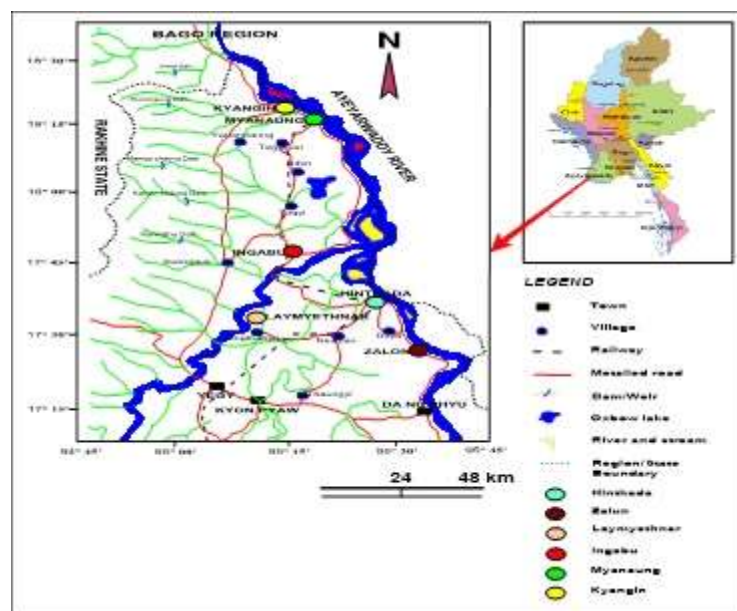


Figure.1 Location map of the study area

Source - Geology Department of Hinthada University, (2007)



A. *Ae. aegypti* (Adult) (40x)



B. Comb scales of *Ae. aegypti* larva (400x)



C. Eggs of *Ae. aegypti* female (40x)



D. *Ae. aegypti* larva



E. *Colisa labiosus* (Indigenous larvivorous fish)

Plate.1 Identification of egg, larva, comb scales, adult of *Ae. aegypti* and larvivorous fish

Results

Seasonal prevalence of *Aedes aegypti* larvae in six different Townships of Hinthada District

In dry season (2018), the seasonal positivity of *Aedes aegypti* larvae in water containers was highest to be 53 (31.74%) in Hinthada Township and the lowest positivity of larvae was observed: 7 (4.19%) in Kyangin Township. In wet season, the highest positivity was 89 (24.18%) in Kyangin and the lowest was 45 (12.23%) in Myanaung Township. In cool season, the highest larva positivity was recorded to be 59 (24.79%) in Kyangin and the lowest was 22 (9.24%) in Myanaung. The seasonal positivity was significantly different ($p<0.05$) between six areas. The highest number of positive containers was recorded seasonally in wet season and the lowest was in dry season in all six areas. The seasonal positivity rate was significantly different ($p<0.05$) between three seasons (Table.1). The highest *Aedes aegypti* larvae positivity in dry season (2019) was found: 42 (28.63%) in Laymyethna while the lowest was 10 (6.57%) in Kyangin. In wet season, the highest positivity was 98 (22.84%) in Hinthada while the lowest was 42 (9.79%) in Myanaung. In cool season, the highest larva positivity was recorded to be 51 (22.87%) in Ingapu while the lowest was 26 (11.66%) in Myanaung. The seasonal positivity was significantly different ($p<0.05$) between six areas. The highest number of positive containers was recorded seasonally in wet season and the lowest was in dry season in all six areas. The seasonal positivity rate was significantly different ($p<0.05$) between three seasons (Table.2).

Seasonal variation of recorded key containers harboring *Aedes aegypti* larvae in six areas of Hinthada District

In seasonal variation of key containers, one container each in dry, wet and cool seasons (2018) were recorded as the breeding habitats of *Aedes aegypti* larvae. Among three seasons in 2019, only one container was studied in cool season (2019) in Hinthada Township. The number of key containers in cool season (2018) was investigated to be higher than other seasons. The number of key containers in wet season was investigated to be higher than other seasons in Zalun Township. In Laymyethna Township, the highest number was occurred in cool season while the lowest was in dry season. The number of key containers in cool season was higher than other seasons. In Ingapu Township, the highest number was occurred in dry season while the lowest was in wet season. The number of key containers in cool season was studied to be higher than other seasons. In Myanaung Township, the highest number was determined in wet season while the lowest was in dry season. Among three seasons in 2019, two containers were studied only in cool season (2019). In Kyangin Township, the highest number was investigated in wet season. Among three seasons in 2019, one container was studied only in cool season (2019) (Table.3 and 4). In seasonal variation of key containers in six areas from dry season (2018) to cool (2019), the number of key containers was occurred to be higher in Ingapu Township in dry season (2018), Kyangin Township in wet season (2018), Hinthada Township in cool season (2018), Laymyethna Township in dry season (2019). Ingapu Township in wet season (2019) and Ingapu Township in cool season (2019) (Table.3 and 4).

Seasonal variation of recorded key premises harboring *Aedes aegypti* larvae in six areas

The highest number of key premises was found in both dry and wet seasons while the lowest was in cool season (2018). The number of key premises in wet season was determined to be higher

than other seasons in Hinthada Township (2019). The number of key premises in wet season was investigated to be higher than other seasons. The highest number was studied in wet season while the lowest was in dry season in Zalun Township (2018 and 2019). The highest number was examined in both wet and cool seasons while the lowest was in dry season. The highest number was observed in wet season while the lowest was in cool season in Laymyethna Township (2018 and 2019). The highest number was studied in wet season while the lowest was in dry season. The highest number was determined in wet season while the lowest was in dry season in Ingapu Township (2018 and 2019). The highest number was found in wet season, followed by cool season and the lowest was in dry season. The highest number was occurred in wet season, followed by cool season and the lowest was in dry season in Myanaung Township (2018 and 2019). The number of key premises in wet season was observed to be higher than other seasons. The number of key premises in wet season was studied to be higher than other seasons in Kyangin Township (2018 and 2019). In seasonal variation of key premises in six areas from dry season (2018) to cool season (2019), the number of key premises in Hinthada Township was occurred to be higher in dry season (2018), Kyangin Township in wet season (2018), Zalun Township in cool season (2018), Laymyethna Township in dry season (2019), Ingapu Township in wet season (2019) and Ingapu Township in cool season (2019) (Table.5 and 6)

Seasonal variation of Household Index (HI) in six areas of Hinthada District

HI in wet season was found to be the highest one while the lowest was in cool season. HI in wet season was also occurred to be higher than other seasons in Hinthada Township (2018 and 2019). HI in cool season was studied to be the highest one while the lowest was in dry season (2018). HI in wet season was observed to be the highest one and the lowest was in dry season in Zalun Township (2018 and 2019). HI in wet season was also studied to be the highest one and the lowest in cool season in Laymyethna Township (both 2018 and 2019). HI in wet season was recorded to be the highest one while the lowest was in dry season. in Myanaung and Kyangin Townships (both 2018 and 2019). In seasonal variation of Household Index (HI) in 2018, Ingapu Township was the highest in dry season, Kyangin Township in wet season and Laymyethna Township in cool season. In seasonal variation of Household Index (HI) in 2019, the highest in Ingapu Township was recorded in dry season, Hinthada Township in wet season and Laymyethna Township in cool season (Table.7 and 8).

Seasonal variation of Container Index (CI) in six areas of Hinthada District

CI in dry season was found to be the highest one while the lowest was in cool season in Hinthada Township (both 2018 and 2019). CI in wet season was studied to be the highest one while the lowest was in dry season in Zalun Township (both 2018 and 2019). CI in wet season was examined to be the highest one while the lowest was in dry season. CI in wet season was determined to be the highest one and the lowest was in cool season in Laymyethna Township (2018 and 2019). CI in wet season was found to be the highest one while the lowest was in dry season in Ingapu, Myanaung and Kyangin Townships (both 2018 and 2019). In seasonal variation of Container Index (CI) in 2018, Hinthada Township was in dry season, Kyangin Township in wet season and Laymyethna Township in cool season. In seasonal variation of Container Index (CI) in 2019, the highest in Laymyethna Township was recorded in dry season, Kyangin Township in wet season and Laymyethna Township in cool season (Table.9 and 10).

Table.1 Seasonal prevalence of *Aedes aegypti* larvae in six different Townships in Hinthada District (2018)

Study areas	Inspected houses	Dry season		Wet season		Cool season		Significant Difference
		Positive containers	Positivity (%)	Positive containers	Positivity (%)	Positive containers	Positivity (%)	
Hinthada Township	50	53	31.74	54	14.67	23	9.66	Significant ($p<0.05$)
Zalun Township	50	19	11.38	50	13.59	35	14.71	Significant ($p<0.05$)
Laymyethna Township	50	35	20.95	63	17.12	55	23.11	Significant ($p<0.05$)
Ingapu Township	50	40	23.95	67	18.21	44	18.49	Significant ($p<0.05$)
Myanaung Township	50	13	7.78	45	12.23	22	9.24	Significant ($p<0.05$)
Kyangin Township	50	7	4.19	89	24.18	59	24.79	Significant ($p<0.05$)
Total	300	167	100	368	100	238	100	
Average	50	27.83	16.67	61.33	16.67	39.67	16.67	
Positivity % (Seasonal)		21.60%		47.61%		30.79%	100%	
Significant Difference		Significant ($p<0.05$)		Significant ($p<0.05$)		Significant ($p<0.05$)		

Table.2 Seasonal prevalence of *Aedes aegypti* larvae in six different Townships in Hinthada District (2019)

Study areas	Inspected houses	Dry season		Wet season		Cool season		Significant Difference
		Positive containers	Positivity (%)	Positive containers	Positivity (%)	Positive containers	Positivity (%)	
Hinthada Township	50	30	19.74	98	22.84	28	12.56	Significant ($p<0.05$)
Zalun Township	50	16	10.53	54	12.59	30	13.45	Significant ($p<0.05$)
Laymyethna Township	50	42	28.63	76	17.72	43	19.28	Significant ($p<0.05$)
Ingapu Township	50	39	25.65	95	22.14	51	22.87	Significant ($p<0.05$)
Myanaung Township	50	15	9.86	42	9.79	26	11.66	Significant ($p<0.05$)
Kyangin Township	50	10	6.57	64	14.92	45	20.18	Significant ($p<0.05$)
Total	300	152	100	429	100	223	100	
Average	50	25.33	16.67	71.5	16.67	37.17	16.67	
% Positivity (Seasonal)		18.91%		53.36%		27.74%	100%	
Significant Difference		Significant ($p<0.05$)		Significant ($p<0.05$)		Significant ($p<0.05$)		

Table.3 Seasonal variation of recorded key containers in six areas of Hinthada District (2018)

Areas	Key containers			Significant Difference P value
	Dry (2018)	Wet (2018)	Cool (2018)	
Hinthada Township	1	1	1	Not Significant ($p>0.05$)
Zalun Township	0	6	9	Highly Significant ($p<0.01$)
Laymyethna Township	3	6	13	Significant ($p<0.05$)
Ingapu Township	8	3	5	Not Significant ($p>0.05$)
Myanaung Township	3	14	5	Highly Significant ($p<0.01$)
Kyangin Township	2	19	2	Highly Significant ($p<0.01$)

Table.4 Seasonal variation of recorded key containers in six areas of Hinthada District (2019)

Areas	Key containers			Significant Difference P value
	Dry (2019)	Wet (2019)	Cool (2019)	
Hinthada Township	0	0	1	Not Significant ($p>0.05$)
Zalun Township	0	2	1	Not Significant ($p>0.05$)
Laymyethna Township	1	0	5	Significant ($p<0.05$)
Ingapu Township	0	6	8	Significant ($p<0.05$)
Myanaung Township	0	0	2	Not Significant ($p>0.05$)
Kyangin Township	0	0	1	Not Significant ($p>0.05$)

Table.5 Seasonal variation of recorded key premises in six areas of Hinthada District (2018)

Areas	Key premises			Significant Difference P value
	Dry (2018)	Wet (2018)	Cool (2018)	
Hinthada Township	5	5	2	Not Significant ($p>0.05$)
Zalun Township	0	6	1	Significant ($p<0.05$)
Laymyethna Township	1	8	8	Significant ($p<0.05$)
Ingapu Township	1	10	2	Highly Significant ($p<0.01$)
Myanaung Township	1	5	2	Not Significant ($p>0.05$)
Kyangin Township	0	15	11	Highly Significant ($p<0.01$)

Table.6 Seasonal variation of recorded key premises in six areas of Hinthada District (2019)

Areas	Key premises			Significant Difference P value
	Dry (2019)	Wet (2019)	Cool (2019)	
Hinthada Township	1	14	1	Highly Significant ($p<0.01$)
Zalun Township	1	7	2	Significant ($p<0.05$)
Laymyethna Township	6	9	5	Not Significant ($p>0.05$)
Ingapu Township	1	15	10	Highly Significant ($p<0.01$)
Myanaung Township	1	8	3	Significant ($p<0.05$)
Kyangin Township	0	11	9	Highly Significant ($p<0.01$)

Table.7 Seasonal variation of Household Index (HI) in six areas of Hinthada District (2018)

Areas	Household Index (HI)			Significant Difference P value
	Dry (2018)	Wet (2018)	Cool (2018)	
Hinthada Township	58	64	32	Highly Significant ($p<0.01$)
Zalun Township	30	52	58	Significant ($p<0.05$)
Laymyethna Township	44	60	62	Not Significant ($p>0.05$)
Ingapu Township	60	66	56	Not Significant ($p>0.05$)
Myanaung Township	20	44	24	Significant ($p<0.05$)
Kyangin Township	12	82	54	Highly Significant ($p<0.01$)

Table.8 Seasonal variation of Household Index (HI) in six areas of Hinthada District (2018)

Areas	Household Index (HI)			Significant Difference P value
	Dry (2019)	Wet (2019)	Cool (2019)	
Hinthada Township	42	80	42	Highly Significant ($p<0.01$)
Zalun Township	22	64	38	Highly Significant ($p<0.01$)
Laymyethna Township	48	70	52	Not Significant ($p>0.05$)
Ingapu Township	56	76	48	Significant ($p<0.05$)
Myanaung Township	24	42	28	Not Significant ($p>0.05$)
Kyangin Township	18	50	40	Highly Significant ($p<0.01$)

Table.9 Seasonal variation of Container Index (CI) in six areas of Hinthada District (2018)

Areas	Container Index (CI)			Significant Difference P value
	Dry (2018)	Wet (2018)	Cool (2018)	
Hinthada Township	26.11	24.66	13.22	Highly Significant ($p<0.01$)
Zalun Township	12.67	34.97	28.23	Highly Significant ($p<0.01$)
Laymyethna Township	18.62	34.62	29.26	Highly Significant ($p<0.01$)
Ingapu Township	17.7	30.32	20.47	Highly Significant ($p<0.01$)
Myanaung Township	6.44	22.73	8.49	Highly Significant ($p<0.01$)
Kyangin Township	4.19	52.66	26.94	Highly Significant ($p<0.01$)

Table.10 Seasonal variation of Container Index (CI) in six areas of Hinthada District (2019)

Areas	Container Index (CI)			Significant Difference P value
	Dry (2019)	Wet (2019)	Cool (2019)	
Hinthada Township	18.18	41.35	16.77	Highly Significant ($p<0.01$)
Zalun Township	10.32	32.73	21.13	Highly Significant ($p<0.01$)
Laymyethna Township	26.42	30.77	24.86	Not Significant ($p>0.05$)
Ingapu Township	18.66	33.69	22.97	Highly Significant ($p<0.01$)
Myanaung Township	8.2	19.72	13.98	Highly Significant ($p<0.01$)
Kyangin Township	7.87	43.24	22.84	Highly Significant ($p<0.01$)

Seasonal variation of Breteau Index (BI) in six areas of Hinthada District

BI in wet season was the highest while the lowest was in cool season in Hinthada Township (both 2018 and 2019). BI in wet season was the highest while the lowest was in dry season in Zalun, Laymyethna, Ingapu, Myanaung and Kyangin Townships (both 2018 and 2019). In seasonal variation of Breteau Index (BI) in 2018, Hinthada Township was the highest in dry season, Kyangin Township in wet season and Kyangin Township in cool season. In seasonal variation of Breteau Index (BI) in 2019, the highest in Laymyethna Township was recorded in dry season, Hinthada Township in wet season and Ingapu Township in cool season (Table.11 and 12).

Seasonal variation of positive different containers in Hinthada District

The highest number of major and minor positive containers (217, 122, 208 and 153) was occurred in wet season (both 2018 and 2019) while the lowest (110, 35, 94 and 49) was found in

dry season (both 2018 and 2019). In miscellaneous type, the highest number of positive containers (29 and 68) was investigated in wet season (both 2018 and 2019) although the lowest (13 and 9) was examined in cool season (2018) and dry season (2019) (Fig.2).

Seasonal occurrence of DHF patients in six areas of Hinthada District

The number of DHF cases and death were found to be higher in under 12 years age group (868, 822, 1 and 3) than in above 12 years age group (181 and 103) of DHF patients (both 2018 and 2019). The highest number of DHF patients (840 and 741) was occurred in wet season while the lowest (52 and 47) was found in dry season in all six areas (both 2018 and 2019). Among six study areas, the highest number of DHF patients (1665) was found in Hinthada Township and the lowest (68) was in Kyangin Township (Fig.3).

Oviposition site of gravid *Aedes aegypti* mosquitoes

In indoor condition, the highest preference of oviposition of gravid *Aedes aegypti* females on different colour was found in a black coloured ovitrap: 21.07% (1173 eggs) and the lowest was observed in a clear white (control) ovitrap: 0.65% (36 eggs). In both outdoor condition and in-bush conditions, out of 11 colours, black (33.57% (1093 eggs) and 37.56% (1168 eggs) was found to be the highest preference of oviposition of gravid *Aedes aegypti* females on different colours and the lowest was observed in a clear white (control): 0.06% (two eggs) and 0.29% (nine eggs). Of three conditions, the total percentage of eggs was the highest (46.66%) in indoor condition and the lowest was (26.06%) in in-bush condition in the study period (Table.13). According to the three replications of colour attraction test, in indoor condition, the maximum frequency of oviposition of gravid *Aedes aegypti* females on different colours was found in a black coloured ovitrap (13.18% (29 times), 17.39% (20 times) and 19.08% (25 times)) while the minimum frequency which was observed in white and clear white (control) coloured ovitraps: 5.91% (13 times), 0.87% (one time) and 1.53% (two times) in all three conditions (Table.14).

Biological control of *Aedes aegypti* larvae using *Colisa labiosus* (Nga- phyin-tha-let) fish

In pre-intervention period, among 50 examined houses, 35 houses were positive for *Aedes aegypti* larvae. Out of 82 inspected major containers, 31 (37.8%) containers; out of 125 minor containers, 24 (19.20%) containers; and out of 82 inspected miscellaneous containers, 42 (51.22%) containers were positive with *Aedes larvae*. After introducing *Colisa labiosus* as biological control agent in the various containers, the number of positive houses reduced from 35 (70%) in the pre-intervention period (first survey) to 4 (8%) in the post-intervention period (final survey). In positivity of various water storage containers, there was highly significant reduction ($p < 0.01$) from 31 (37.8%) in major, 24 (19.20%) in minor and 42 (51.22%) in miscellaneous in the pre-intervention period to 0 (0%), 3 (3.09%) and 1 (3.33%) in the post-intervention period in intervention area of Hinthada Township (Table.15). In non-intervention area, out 50 households, 36 houses were positive. Among 149 major containers inspected, 47 (31.54%) containers; a total of 17 (26.98%) out of 63 containers in minor; and out of 42 miscellaneous containers examined, 30 (71.43%) containers were positive. During non-intervention period, the positive houses were nearly equal number from pre- to post-non-intervention. In positive major and minor containers, the reductions were not significantly different ($p > 0.05$) and the positive number significantly increased from 47 (31.54%) and 17 (26.98%) to 61 (40.40%) and 29 (37.18%) while the number of miscellaneous ones was significantly increased ($p < 0.05$) from 30 (71.43%) to 49 (92.45%) in the survey period respectively (Table.16). In intervention area of Ywa Thit village, HI, CI and BI highly significantly reduced ($p < 0.01$) from 70, 33.56 and 194 in pre-intervention period to eight, 1.97 and also eight in post-intervention period. Although, CI and BI significantly increased ($p < 0.01$) from 37.01 and 188 in the first survey to 49.29 and 278 in the final survey (post-non-

intervention period) (Table.17). In pre-intervention period (first survey), key containers and key premises were recorded as 24 and 14 in Ywa Thit village of Hinthada Township; and 22 and 14 in Tha Phan Pin village of Ingapu Township respectively. Percentage reductions of key containers and key premises were found to be highly significant 100% reduction in test area of Ywa Thit village. But the number of key premises was not significant reduction ($p>0.05$) in non-intervention area and observed as 78.57% increased in percentage reduction. In percentage reduction of key containers of non-intervention area, it was found to be significantly different ($p<0.05$) and not also significantly reduction; and observed as 90.91% increased in the final survey (Table.18 and 19).

Table.11 Seasonal variation of Breteau Index (BI) in six areas of Hinthada District (2018)

Areas	Container Index (BI)			Significant Difference P value
	Dry (2018)	Wet (2018)	Cool (2018)	
Hinthada Township	106	108	46	Highly Significant ($p<0.01$)
Zalun Township	38	100	70	Highly Significant ($p<0.01$)
Laymyethna Township	70	126	110	Highly Significant ($p<0.01$)
Ingapu Township	80	134	88	Highly Significant ($p<0.01$)
Myanaung Township	26	90	44	Highly Significant ($p<0.01$)
Kyangin Township	14	178	118	Highly Significant ($p<0.01$)

Table.12 Seasonal variation of Breteau Index (BI) in six areas of Hinthada District (2019)

Areas	Container Index (BI)			Significant Difference P value
	Dry (2019)	Wet (2019)	Cool (2019)	
Hinthada Township	60	196	56	Highly Significant ($p<0.01$)
Zalun Township	32	108	60	Highly Significant ($p<0.01$)
Laymyethna Township	84	152	86	Not Significant ($p>0.05$)
Ingapu Township	78	190	102	Highly Significant ($p<0.01$)
Myanaung Township	30	84	52	Highly Significant ($p<0.01$)
Kyangin Township	20	128	90	Highly Significant ($p<0.01$)

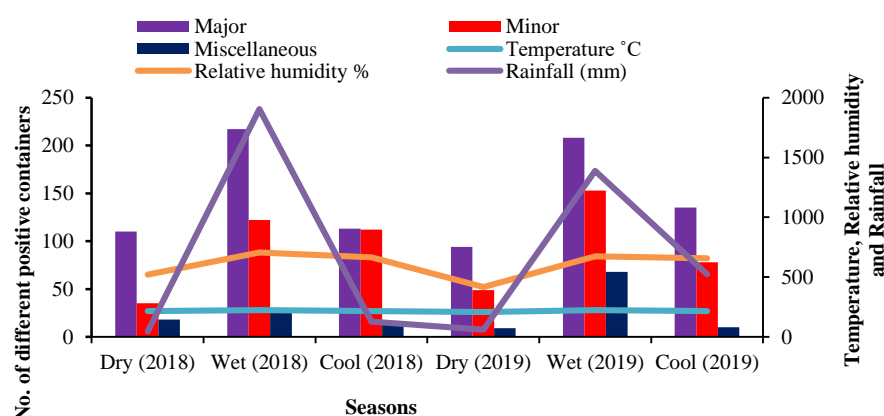


Figure.2 Relationship between positive different containers and weather parameters

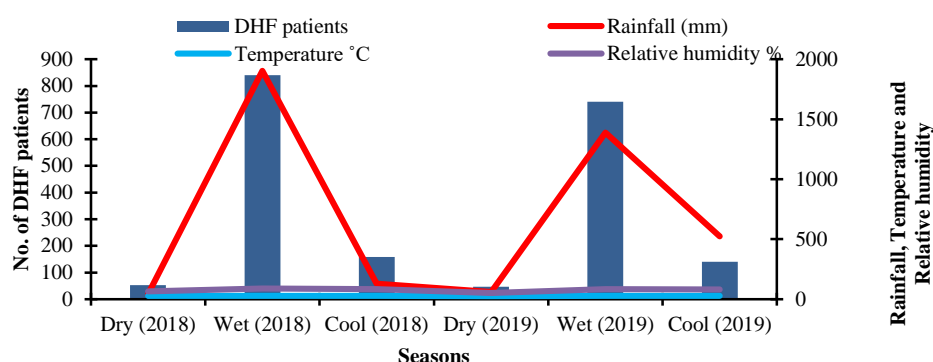


Figure.3 Relationship between DHF patients and weather parameters

Table.13 Colour preference on oviposition of gravid *Aedes aegypti* in indoor, outdoor and in-bush conditions (colour experiment)

Sr. No	Colours	Indoor	Percentage (%)	Outdoor	Percentage (%)	In-Bush	Percentage (%)	Total	Total Percentage (%)
1	Black	1173	21.07	1093	33.57	1168	37.56	3434	28.77
2	White	296	5.32	3	0.09	59	1.9	358	3
3	Reddish brown	607	10.9	840	25.8	634	20.39	2081	17.44
4	Red	637	11.44	607	18.64	247	7.94	1491	12.49
5	Greenish black	561	10.08	77	2.36	180	5.79	818	6.85
6	Green	325	5.84	198	6.08	290	9.32	813	6.81
7	Blue	799	14.35	145	4.45	216	6.95	1160	9.72
8	Leaden	278	4.99	47	1.44	154	4.95	479	4.01
9	Yellow	454	8.15	63	1.93	31	1	548	4.59
10	Brown	402	7.22	181	5.56	122	3.92	705	5.91
11	Control	36	0.65	2	0.06	9	0.29	47	0.39
Total		5568		3256		3110			
Average		506.18		296		282.73			

Table.14 Colour preference on oviposition of gravid *Aedes aegypti* in indoor, outdoor and in-bush conditions (colour experiment)

Sr. No	Colours	Indoor	Percentage (%)	Outdoor	Percentage (%)	In-Bush	Percentage (%)	Total	Total Percentage (%)
1	Black	29	13.18	20	17.39	25	19.08	74	15.88
2	White	13	5.91	1	0.87	4	3.05	18	3.86
3	Reddish brown	26	11.82	20	17.39	19	14.5	65	13.95
4	Red	26	11.82	18	15.65	18	13.74	62	13.3
5	Greenish black	24	10.91	9	7.83	14	10.69	47	10.09
6	Green	14	6.36	10	8.69	12	9.16	36	7.73
7	Blue	22	10	13	11.3	15	11.45	50	10.73
8	Leaden	20	9.09	8	6.96	8	6.11	36	7.73
9	Yellow	16	7.27	4	3.48	4	3.05	24	5.15
10	Brown	17	7.73	11	9.57	10	7.63	38	8.15
11	Control	13	5.91	1	0.87	2	1.53	16	3.43
Total		220		115		131			
Average		20		10.45		11.91			

Table.15 Number of different containers harboring *Aedes aegypti* larvae in intervention area (Ywa Thit village)

Survey	Total no. of houses	Positive houses	Key containers	Key premises	Containers					
					Major		Minor		Miscellaneous	
					Inspected	Positivity	Inspected	Positivity	Inspected	Positivity
Pre-intervention	50	35(70%)	24	14	82	31(37.8%)	125	24(19.2%)	82	42(51.22%)
During intervention	50	27(54%)	2	5	81	16(19.75%)	103	12(11.65%)	40	18(45%)
During intervention	50	10(20%)	1	1	82	2(2.44%)	111	6(5.41%)	67	11(16.42%)
Post-intervention	50	4(8%)	0	0	76	0(0%)	97	3(3.09%)	30	1(3.33%)
						Highly significant $p<0.01$ $\chi^2=47.76$	Highly significant $p<0.01$ $\chi^2=23$		Highly significant $p<0.01$ $\chi^2=50$	

Table.16 Number of different containers harboring *Aedes aegypti* larvae in non-intervention area (Tha Phan Pin village)

Survey	Total no. of houses	Positive houses	Key containers	Key premises	Containers					
					Major		Minor		Miscellaneous	
					Inspected	Positivity	Inspected	Positivity	Inspected	Positivity
August (2019)	50	36(72%)	22	14	149	47(31.54%)	63	17(26.98%)	42	30(71.43%)
September (2019)	50	38(76%)	46	11	143	38(26.57%)	63	12(19.05%)	42	35(83.33%)
October (2019)	50	34(68%)	41	19	148	53(35.81%)	71	20(28.17%)	29	24(82.76%)
November (2019)	50	38(76%)	42	25	151	61(40.40%)	78	29(37.18%)	53	49(92.45%)
						Not significant $p>0.05$ $\chi^2=0.13$	Not significant $p>0.05$ $\chi^2=7.85$		Significant $p<0.05$ $\chi^2=9.88$	

Table.17 Larval indices of intervention and non-intervention areas in Hinthada District

Indices	Ywa Thit village/Intervention area				Tha Phan Pin village/Non-intervention area			
	Pre-intervention	During intervention	During intervention	Post-intervention	August (2019)	September (2019)	October (2019)	November (2019)
	Aug. (2019)	Sept. (2019)	Oct. (2019)	Nov. (2019)				
HI	70	54	20	8	72	76	68	76
CI	33.56	20.54	7.31	1.97	37.01	34.27	39.11	49.29
BI	194	92	38	8	188	170	194	278

HI = House Index, CI = Container Index, BI = Breteau Index, $p<0.01$

Table.18 Percentage reduction of key containers in intervention and non-intervention areas

Areas	Pre-intervention	Post-intervention	Percentage reduction
Ywa Thit village (Intervention area)	24	0	100%
Tha Phan Pin village (Non-intervention area)	22	42	90.91% increased

Table.19 Percentage reduction of key premises in intervention and non-intervention areas

Areas	Pre-intervention	Post-intervention	Percentage reduction
Ywa Thit village (Intervention area)	14	0	100%
Tha Phan Pin village (Non-intervention area)	14	25	78.57% increased

Discussion

Aedes aegypti is a vector of dengue in urban areas but now the species are distributed in rural areas in Myanmar. The present survey (2018 to 2019) studied the number of DHF cases and death was found to be higher in under 12 years age group than in above 12 years age group. The highest number of DHF patients was also occurred in wet season while the lowest was found in dry season in all six study areas of Hinthada District according to public health center report in Hinthada Township, 2021.

In present study, the highest number of positive containers and key containers, and highest positivity rate were recorded in concrete jars followed by bago jars, plastic drums, concrete barrels, metal drums and concrete tanks which were found to be more widely used for storing water, and not completely covered and treated of water, and concrete jars were predominated ones for larval breeding in all areas of Hinthada District. Other researchers revealed that same positivity of water storage containers and metal drums were recorded as key containers in Thakayta, Yangon Region (Ni War Lwin, 2013) and Hpa-an Township, Kayin State (Maung Maung Mya *et al.*, 2015). In minor type, the highest number of positive containers and key containers, and highest positivity rate were observed in small bago jars, followed by earthen pots in Laymyethna Township; earthen pots, followed by flower bidets in Zalun Township; and earthen pots, followed by plastic bowls and plastic buckets in the remaining areas in three seasons. These containers were also examined to be not carefully cleaned or changed of water and good breeding places of larvae. Similarly, it was revealed that the high number of larvae positivity was in small bago jars in Thakayta Township, Yangon Region (Ni War Lwin, 2013). In positivity of miscellaneous containers, the highest number and positivity were observed in bamboo bowls, followed by broken earthen pots, broken plastic bowls, broken bago jars, discarded tins, coconut shells, discarded tires and milk tins; and key containers were only occurred in bamboo bowls, broken bago jars and discarded tires in Hinthada District. These positive containers were examined to be not carefully discarded and filled with clean water for attractive breeding sources of *Aedes aegypti* larvae. The highest number of positive containers was studied in wet season and the lowest in dry season. Gould *et al.* (1970) mentioned that the natural breeding sites are more difficult to control than artificial containers, but for disease and pest control, it will be necessary to reduce or possibly eliminate these sources of vector species.

In seasonal occurrence of *Aedes aegypti* larvae in different types of container, the present finding pointed out that the positive rate of households in wet season was higher than other seasons in all study areas. In number of positive containers in three container types, the highest number of

positive containers was studied in major type, followed by minor type whereas the lowest was in miscellaneous type in all seasons. In positivity rate of different container types, the positive rate was recorded to be higher in miscellaneous than other container types in all seasons. Maung Maung Mya *et al.* (2015) also stated that the distribution of *Aedes* larvae in wet season was higher than in cool and dry seasons. Larval abundance also coincided with the periods of greatest rainfall, probably reflecting the cultural habit of collecting rainwater when it was available and also the abundance of unmanaged water sources (Strickman and Kittayapong, 2002).

In the present study, the highest seasonal prevalence or positivity of larvae was found in wet season followed by in cool season and lowest was found in dry season in both years, 2018 and 2019. The present study revealed that the highest *Aedes* larvae positivity was found in Hinthada and Laymyethna Townships in dry season (2018 and 2019). Same result had been found in Dala Township, Yangon Region in dry season (Pe Than Htun *et al.*, 2010). In wet season, the highest positivity of *Aedes aegypti* larvae in water containers was found in Kyangin Township in 2018 and Hinthada Township in 2019. In cool season, the high positivity was found in Kyangin Township in 2018 and Ingapu Township in 2019. Result in wet season was agreed with the results of Kyi Myint Tine and Thakayta Townships, the prevalence of *Aedes* larvae were high in water containers in wet season (Tun Lin *et al.*, 1995 and Maung Maung Mya *et al.*, 2011).

The present observation showed that the seasonal variation of recorded key containers in positive containers from 50 houses was significantly found to be higher in cool season than other seasons in all six study areas. Because, the breeding of *Aedes aegypti* larvae was examined to be the highest in various water storage containers that stored rain water without changing or cleaning of water or covering completely with lids and with retaining of water for long periods for a requirement of domestic usage. Similarly, Ahmed *et al.* (2019) reported that the containers that retained water for long periods of time make good are suitable breeding habitats for mosquitoes such as the different water holding artificial containers. In the present finding, the seasonal variation of recorded key premises in positive households from 50 houses was higher in wet season than other seasons in all six study areas. In addition, the high number of households was observed that had three and above positive containers without completely covering of lids were placed under roof gutter to store rainwater in this season. Tin Mar Yi Tun (2007) likely found that the high number of key premises in all areas was high in rainy season than other seasons.

The seasonal variation of larval indices (HI, CI and BI) was investigated to be higher in wet season than other seasons in all study areas of Hinthada District during the study period. Many households were more and more storing of clean water, and well received rainwater in various containers for domestic usage that were supported to the breeding places for dengue vectors in wet season. Same larval indices had been found in Shwe Pyi Thar Township, Hmawbi and Thakayta Townships, and Hpa-an Township (Maung Maung Mya *et al.*, 2011, 2013 and 2016).

Among six study areas, Hinthada Township was a high-risk area of DHF due to high Index values of HI in wet season, CI in dry season, BI in wet and dry seasons. The environment of Hinthada District had highest rainfall (1387 to 1904 mm), maximum relative humidity (84-88%) and moderate temperature (28°C) which were favorable for the breeding of *Aedes* mosquitoes; increased the maximum number of positive containers and caused to the high number of DHF patients. Wongkoon *et al.* (2013) similarly mentioned that rainfall, daily maximum rainfall and minimum/ maximum/ mean temperatures were associated with the dengue incidence.

The colour preference experiment showed that the percentage of laid eggs was recorded to be the highest in a black coloured ovitrap and the lowest was in a clear white (control) in all indoor, outdoor, and in-bush conditions. In frequency of oviposition, the present finding stated that the maximum percentage of frequency on oviposition was recorded in a black coloured ovitrap while the minimum in white and clear white (control) was equally in indoor condition and outdoor

conditions. The maximum percentage of frequency was in black whereas the minimum was in clear white (control) in in-bush condition. In three conditions, the number of laid eggs by gravid *Aedes aegypti* females was the highest indoor, and the lowest was in-bush. In three conditions, the frequency of oviposition was the highest indoor and the lowest was outdoor. David *et al.* (2011) reported that gravid *Aedes* females preferred to oviposit in black and blue coloured ovitraps equally well, with less oviposition in brighter coloured ovitraps such as orange and white under natural conditions in residential areas. Subrat *et al.* (2014) also mentioned that, *Ae. aegypti* female laid a maximum of eggs in black ovistrip in dark and lighted condition and no or minimum eggs on white.

One-gram weight of only one *Colisa labiosus* consumed the highest number of about 1000 larvae and the lowest number of 400 larvae were found in 1 to above 30 litre-water volume of various containers against *Aedes aegypti* larvae per day in field-based survey. It was similarly mentioned that one-gram weight of *Colisa labiosus* consumed about 1000 larvae within 24 hours (Maung Maung Mya *et al.*, 2016). When compared with other above larvivorous fish species, *Colisa labiosus* was found the suitable species for predatory rates and better effective to control the *Aedes* immature larvae.

During intervention, *Ae. aegypti* immature stages were reduced apparently over 50% within one month with introducing of larvivorous fish in first month of the intervention period and the positivity rates were significantly decreased ($p < 0.01$) 0% in major, 3.09% in minor and 3.33% in miscellaneous containers in Hinthada Township in the post-intervention period. However, in Ingapu Township, the positivity rates of three container types were not reduced significantly and apparently increased from pre- to post-intervention period.

After intervention period, the larval indices in test area as HI, CI and BI were significantly declined ($p < 0.01$) from 70, 33.56 and 194 in the pre-intervention period to eight, 1.97 and also eight in the post-intervention period respectively. While, in control area of Ingapu Township, the larval indices were not significantly reduced ($p < 0.01$) and highly increased in post-non-intervention period. Similar biological control study by different researchers found that the larval indices were significantly declined by using biological control method in the intervention areas (Nyunt Nyunt Oo *et al.*, 2018 and Maung Maung Mya *et al.*, 2019).

In pre-and post-intervention surveys, the percentage reductions of key containers and key premises were reduced as 100% ($P = 0.001$) in intervention area. Although, in control area, the percentage reductions were not significantly different to be the reduction i.e. 90.91% in key containers and 78.57% in key premises. Similar findings were also observed by using biological control method in intervention survey (Nyunt Nyunt Oo *et al.*, 2018 and Maung Maung Mya *et al.*, 2019).

Kumar and Hwang (2006) mentioned that larvivorous fishes had been widely used as biocontrol agents of mosquito larvae, but they had their own limitations as they did not survive for long in small containers. The previous finding was more or less agreed with the observations of the present study. During intervention period, the larvivorous fish could not be jumped out from various water storage containers whenever were filled with water and heavy rain because the containers were partially covered with plastic and bamboo nets in accordance with participating of the local community. When there were not any disturbed conditions, the fish also survived and could tolerate apparently for longer period (about 4 months) in water storage containers. Hasan (2014) reviewed the similar result that the effectiveness of any control programs is associated with the public's attitude, knowledge and practice. The present survey observed that the effective control of *Aedes* mosquito breeding places was best addressed by biological control method, using larvivorous fish with community participation in the test area of Hinthada Township.

Summary

Seasonal prevalence of *Aedes aegypti* larvae in various water storage containers was investigated comparatively and found highest in wet season in six areas of Hinthada District. The seasonal variations of key containers, key premises, larval indices (HI, CI and BI) in six areas were described and compared to each other and observed the highest in wet season. In various positive containers, concrete jars of major type, earthen pots of minor type and bamboo bowls of miscellaneous type were examined to be highly positive and predominant ones for breeding habitats of *Ae. aegypti* throughout the field survey. The positive rate and number of positive containers and larval indices were found to be higher in wet season than other seasons. The larval prevalence in various containers was observed to be significantly different ($p<0.05$) between six study areas in accordance with the different seasons. By doing colour attraction experiment, 11 coloured ovitraps were used and oviposition test was carried out for 3 months (three replications) in Ywa-Thit village of Hinthada Township. The percentage of laid eggs and frequency of oviposition were investigated to be the highest in indoor condition than other conditions. The number of laid eggs and frequency on oviposition were studied and described to be the maximum in black coloured ovitrap whereas the minimum was in clear white (control). By using larvivorous fish, a biological control survey was conducted to eliminate the breeding sources; and the entomological indices were calculated. Predatory rate of a *Colisa labiosus* (1g and 6 cm in size) larvivorous fish on immature stages of *Ae. aegypti* was found to be about 1000 larvae per day. After intervention survey using larvivorous fish, larval indices in intervention area were significantly reduced ($p<0.01$) from pre- to post-intervention period. The percentage reduction in number of key containers and key premises was examined to be 100% in the final survey. *C. labiosus* was very effective as biological control agent against *Ae. aegypti* breeding in domestic water storage containers. Entomological parameters (HI, CI and BI indices), key containers, key premises and DF/DHF endemicity were occurred to be significantly associated with weather parameters (rainfall, temperature and relative humidity) seasonally.

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CHEMICAL AND PHARMACOLOGICAL STUDY OF BIOACTIVE SECONDARY METABOLITES FROM PSEUDOMONAS AERUGINOSA

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(၂-၆) CHEMICAL AND PHARMACOLOGICAL STUDY OF BIOACTIVE SECONDARY METABOLITES FROM PSEUDOMONAS AERUGINOSA

Su Swe Su*

Abstract

This research focuses on the chemical and pharmacological study of bioactive secondary metabolites in the *Pseudomonas aeruginosa* isolated from the clinical soil sample collected from Insein General Hospital, Yangon Region. The isolated *P. aeruginosa* was cultured on nutrient agar medium in the large scale and the culture was subsequently centrifuged at 4 °C and 3500 rpm for 20 minutes. Extraction and Isolation was carried out by established methods. In the determination of chemical constituents, alkaloids, α -amino acids, carbohydrates, carboxylic acids, flavonoids, phenolic compounds, steroids and terpenoids were observed in the chloroform extract of isolated *P. aeruginosa*. The total phenols content (50.64 ± 1.5 mg GAE/g), total flavonoids content (24.70 ± 2.2 mg QE/g), total steroids content (50.43 ± 4.01 mg CE/g) and total carbohydrates content (28.4 ± 0.5 mg GE/g) and total proteins content (4.43 ± 0.8 mg BSAE/g) of the chloroform extract were also determined according to the appropriate reported methods. From the silica gel column chromatographic separation, five compounds: 1-hydroxyphenazine, phenazine-1-carboxylic acid, cyclo-(L-Leu-L-Pro), cyclo-(D-Pro-D-Leu) and cyclo-(D-Pro-L-Val) were isolated from the chloroform extract of *P. aeruginosa*. The isolated compounds were structurally identified by using modern spectroscopic techniques: 1D and 2D NMR spectroscopic methods, and mass spectrometric method. The chloroform extract of *P. aeruginosa* was found to possess high activity against all tested microorganisms: *A. tumefaciens* (N.I.T.E – 09678), *B. subtilis* (N.C.T.C-8236), *B. pumilus* (N.C.I.B-8982), *C. albicans* (-), *E. coli* (N.C.I.B-8134), *P. aeruginosa* (6749) and *S. aureus* (N.C.P.C6371). The isolated phenazines: 1-hydroxyphenazine and phenazine-1-carboxylic acid were also found to be potent in antimicrobial activity against all tested microorganisms with the inhibition zone diameters ranged between 18 ~ 32 mm, whereas the remaining three diketopiperazines showed mild antimicrobial activity. Among five isolated compounds, 1-hydroxyphenazine ($IC_{50} = 14.12$ μ g/mL) and phenazine-1-carboxylic acid ($IC_{50} = 14.91$ μ g/mL) were found to exhibit good antiproliferative activity against human breast cancer cell MCF7 and the remaining three compounds: cyclo(L-Leu-L-Pro) ($IC_{50} = 176.46$ μ g/mL), cyclo(D-Pro-D-Leu) ($IC_{50} = 87.72$ μ g/mL) and cyclo(D-Pro-L-Val) ($IC_{50} = 196.54$ μ g/mL) have mild antiproliferative activity.

Keywords: *Pseudomonas aeruginosa*, DNA sequencing technique, biological activities, 1-hydroxyphenazine, phenazine-1-carboxylic acid, cyclo(L-Leu-L-Pro), cyclo(D-Pro-D-Leu), cyclo(D-Pro-L-Val)

1. Introduction

Pseudomonas is a genus of gram-negative, rod-shaped, aerobic gamma-proteo-bacteria that can cause diseases for animals, including humans. *Pseudomonas aeruginosa* is one of the main organisms which is responsible for drug-resistant nosocomial infections, and is one of the leading causes of bacteremia and pneumonia in hospitalized patients. *Pseudomonas* is a large group of free-living bacteria that live primarily in soil, seawater, and fresh water. The soil isolate bacteria *P. aeruginosa* was reported to contain bioactive constituents like phenazine (pyocyanin, 1-hydroxy-phenazine, phenazine-1-carboxamide and phenazine-1-carboxylic acid) which serve as

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electron shuttles in reduction and solubilization of Fe (III) (Hernandez *et al.*, 2004) and function as antibiotics (Baron and Rowe, 1981). A study was also reported on secondary metabolites, such as diketopiperazines and phenazine derivatives compounds from the Antarctic strain, *P. aeruginosa*, along with their antibacterial activity. The present research focussed on some chemicals and some pharmacological activities of bioactive secondary metabolites from *Pseudomonas aeruginosa*. Hydroxyphenazinol (1) and phenazine carboxylic acid (2) were found to be useful as anti bacterial and anti fungi agents.

2. Materials and Methods

2.1 Collection of Soil Sample

In this research work, soil samples (A and B) were collected from two places in Insein General Hospital, Yangon Region during July 2017. After removal of the impurity, one soil sample (A) was collected from the surface soil and another one (B) collected from the soil of 15 cm depth for the isolation of bacteria. After three days, soil bacteria were isolated by the serial dilution method on nutrient agar medium.

2.2 Isolation, Characterization and Identification of *P. aeruginosa*

2.2.1 Isolation and characterization of bacterial strains from the soil sample

The four pure cultured bacterial strains: A1 from soil sample A, and B1, B2 and B3 from soil sample B were obtained (Atlas and Snyder, 2006). The isolated bacteria were characterized by microscopic examination and by conventional biochemical tests (Atlas and Snyder, 2006; Garcia and Isenberg, 2007). According to the results from biochemical tests, the bacterial strain showing similar characters of *P. aeruginosa* (Bisen and Kavita, 1998) was chosen for further experiments.

2.2.2 Identification of the selected bacterial strain by DNA sequencing technique

The selected isolated bacterial strain was subjected to genotypic molecular confirmation using DNA sequencing technology. Firstly, about 25 mL of nutrient broth medium at pH 7 was prepared and inoculated with two loops full culture of the isolated bacteria in 250 mL conical flask. It was then incubated at 37 °C in an incubated shaker for overnight providing the bacteria solution. Secondly, the DNA of the *P. aeruginosa* was extracted using Genomic DNA extraction kit (Real Genomics, Canada) according to the bacterial genomic DNA isolation protocol and the purity of the extracted genomic DNA was checked by using agarose gel electrophoresis (Amutha and Kokila, 2014). This experiment was performed in the Pharmaceutical Research Department, Insein, Yangon. Thirdly, the extracted genomic DNA was used as a template in PCR amplification which was carried out in 0.2 mL PCR tubes with 10 µL reaction volume with the composition as shown in Table 2.1.

Table 2.1 Composition of PCR Reaction Mixture

Reaction mixture	Volume (μL)
PCR buffer (10X) with MgCl_2 (1.5 mM)	2.5
dNTPs mixture (0.5 mM each)	2.0
Taq DNA polymerase (5U/ μL)	0.3
Primer F (10 nM)	0.6
Primer R (10 nM)	0.6
Template DNA (the extracted DNA from <i>P. aeruginosa</i>)	4.0
Total	10.0

Table 2.2 PCR Program Used to Amplify 16S rRNA

Stage of PCR		Time (min)	Temperature ($^{\circ}\text{C}$)	No. of cycle
Pre-PCR	Hot start	3	95	1
	Denaturation	0.5	95	
PCR	Annealing	0.5	50	35
	Extension	2	72	
Post –PCR	Final extension	10	72	1
Hold			4	

Amplification was performed using thermal cycler and with a temperature profile standardized for 16S rRNA gene amplification. The PCR program used to amplify the 16S rRNA is shown in Table 2.2. The PCR products obtained through amplification with two universal targeting 16S rRNA primers (27F (5'AGAGTTTGATCMTGGCTCAG-3') (M = C or A) and 1492R (5'GGYTACCTTGTTACGACTT 3') (Y = C or T) were subjected for sequencing using same upstream and downstream primers (Amutha and Kokila, 2014) and the present work was carried out in Bio Basic Lab, Singapore. Finally, molecular confirmation of the isolated bacteria was carried out by performing BLAST (Basic Local Alignment Search Tool) against the (National Center for Biotechnology Information) NCBI data.

2.3 Preparation of Chloroform Extract of the Selected Bacteria

The isolated bacteria chosen was cultured on nutrient broth medium in the large scale subsequently, the culture was centrifuged with 3500 rpm for 20 min at 4 $^{\circ}\text{C}$. The cell-free supernatant was extracted with chloroform for 10 times to get the chloroform soluble compounds by liquid-liquid partition between chloroform and the culture solution 1:1 (v:v). This process was done according to the ultrasound-assisted extraction to give 0.03 % (w/v) of chloroform extract.

2.4 Determination of Chemical Constituents of the Chloroform Extract of the Isolated Bacteria

(a) Qualitative determination of chemical constituents present in the chloroform extract

The chemical constituents such as alkaloids, α -amino acids, carbohydrates, cardiac glycosides, flavonoids, glycosides, organic acids, phenolic compounds, proteins, reducing sugars, starch, steroids and terpenoids were qualitatively determined according to the appropriate reported methods (Dhivya and Manimegalai, 2013; Marini-Bettolo *et al.*, 1981; Harborne, 1984; Robinson, 1983).

(b) Determination of total phenol content by Folin-Ciocalteu Reagent method

The total phenol content of chloroform extract of the selected bacteria was estimated by Folin-Ciocalteu (F-C) reagent method. The extract solution (1000 $\mu\text{g/mL}$) was mixed with 5 mL of F-C reagent (1:10) in a test tube and incubated for about 5 min. To each test tube, 4 mL of 1 M sodium carbonate was added and the test tubes were kept at room temperature for 15 min and UV absorbance of reaction mixture was read at λ_{max} 765 nm. The blank solution was prepared as the above procedure by using distilled water instead of sample solution. Total phenol content was estimated as milligram gallic acid equivalent per gram (mg GAE/g) of extract (Song *et al.*, 2010).

(c) Determination of total flavonoid content by aluminium chloride method

The total flavonoid content of chloroform extract of the selected bacteria was estimated by aluminium chloride method. The extract solution (1000 $\mu\text{g/mL}$) was mixed with 1.5 mL of methanol, 0.2 mL of 1 % AlCl_3 solution and 2.8 mL of distilled water. The absorbance of reaction mixture was at λ_{max} 415 nm. The blank solution was prepared as the above procedure by using distilled water instead of sample solution. Total flavonoid content was estimated as milligram quercetin equivalent per gram (mg QE/g) of extract (Song *et al.*, 2010).

(d) Determination of total steroid content by Zak's method

The total steroid content of chloroform extract of the selected bacteria was estimated by Zak's method. The extract solution (1000 $\mu\text{g/mL}$) was prepared by ferric chloride diluting agent. The test sample solution (5 mL) was added 4.0 mL of concentrated sulphuric acid to each tube. After 30 min incubation, intensity of the colour was read at 450 nm. The blank solution was prepared as the above procedure by using ferric chloride diluting agent instead of sample solution. Total steroid content was estimated as milligram cholesterol equivalent per gram (mg CE/g) of extract (Zak *et al.*, 1981).

(e) Determination of protein content by biuret method

A calibration curve of the standard protein solutions bovine serum albumin (BSA) is used to determine the total protein in the unknown. This (BSA) compound reacts with biuret reagent to give an indigo coloured product with absorption maximum at 560 nm. The sample solution (1 mL) was added with 4 mL of biuret reagent mixed and allowed to stand for 30 min at room temperature. The intensity of the violet to indigo colour developed was read at 560 nm. The blank solution was prepared as the above procedure by using distilled water instead of sample solution. The protein content was expressed as milligram of BSA equivalent per gram of sample solution (Stoscheck, 1990).

(f) Determination of carbohydrate content by anthrone method

The total carbohydrate content was estimated by the method of anthrone (Hedge *et al.*, 1962). Carbohydrate is first hydrolysed into simple sugars using dilute hydrochloric acid. In hot acidic medium glucose is dehydrated to hydroxymethyl furfural. This compound forms with anthrone as a green coloured product. The extract solution (5 mL) was added with 2.5 mL of anthrone reagent and allowed to stand for 10 min. The intensity of the green to dark green colour developed was read at 630 nm. The blank solution was prepared as the above procedure by using distilled water instead of sample solution. The carbohydrate content was expressed as milligram of glucose equivalent per gram of sample.

2.5 Isolation and Identification of Bioactive Compounds from the Chloroform Extract

The chloroform extract (5 g) prepared from the selected bacterial strain was separated by using silica gel column chromatographic method and different polarities of solvent systems of petroleum ether, PE: EA in 9:1, 4:1, 7:3, 3:2 and 1:1 v/v. On chromatographic separation, six main fractions (F-I to F-VI) were collected after examining on precoated TLC plates. On successive column chromatographic separation of the main fractions, compound **1** was obtained as a yellow crystal in 12 mg (0.24 % yield) from the sub-fraction F2b2 of F-II, 34.6 mg of compound **2** was obtained as a yellow amorphous powder in 0.72 % yield from the sub-fraction F3b of F-III, two colourless solid compounds: **3** (17 mg, 0.34 %) and **4** (4.5 mg, 0.09 %) were respectively isolated from the sub-fractions: F4b2 and F4b3 of F-IV, and compound **5** was obtained as a yellow oil in 0.18 % (10.4 mg) from the sub-fractions F5b and F6a of F-V and F-VI. The yield percentages were calculated based on the chloroform extract.

2.6 Identification of the Isolated Compounds 1 to 5

The isolated secondary metabolites were structurally identified by using modern NMR spectroscopic techniques such as ^1H NMR, ^{13}C NMR, COSY, HSQC, HMBC, ROESY and Mass spectroscopies, and also compared with the reported data. The NMR and Mass spectra of the isolated compound were measured at Division of Natural Product Chemistry, Institute of Natural Medicine, and University of Toyama, Japan.

2.7 Investigation of Some Biological Activities of Chloroform Extract and the Isolated Compounds

(a) Determination of antimicrobial activity of chloroform extract and isolated compounds by agar disc diffusion method

The screening of antimicrobial activity of the chloroform extract of selected bacteria and the isolated compounds were carried out by agar disc diffusion method (Perez *et al.*, 1990) at Department of Chemistry, University of Yangon, Myanmar. In this experiment, seven species of microorganisms namely *Agrobacterium tumefaciens* (N.I.T.E -09678), *Bacillus subtilis* (N.C.T.C-8236), *Bacillus pumilus* (N.C.I.B-8982), *Candida albicans* (-), *Escherichia coli* (N.C.I.B-8134), *Pseudomonas aeruginosa* (6749) and *Staphylococcus aureus* (N.C.P.C-6371) were used.

(b) Determination of antioxidant activity of the chloroform extract

In this experiment, DPPH (2 mg) was thoroughly dissolved in EtOH (100 mL). This solution was freshly prepared in the brown coloured reagent bottle and stored in the fridge for no

longer than 24 h. The chloroform extract of *P. aeruginosa* (1.6 mg) and 10 mL of EtOH were thoroughly mixed by shaker. The mixture solution was filtered and the stock solution was obtained. By adding with EtOH, the sample solutions in different concentrations of 160, 80, 40, 20, 10 and 5 µg/mL were prepared from the stock solution. The effect on DPPH radical was determined. The control solution was prepared by mixing 1.5 mL of 50 µM DPPH solution and 1.5 mL of EtOH using shaker. The test sample solution was also prepared by mixing thoroughly 1.5 mL of 50 µM DPPH solutions and 1.5 mL of each sample solution. The mixture solutions were allowed to stand at room temperature for 30 min. Then, the absorbance of each solution was measured at 517 nm by using UV-1650 spectrophotometer. Absorbance measurements were done in triplicate for each concentration and then mean values so obtained were used to calculate percent inhibition of oxidation (Bugchi *et al.*, 1998). The capability to scavenge the DPPH radical was calculated by using the following equation:

$$\% \text{ Inhibition} = \left[\frac{A_{\text{DPPH}} - (A_{\text{Sample}} - A_{\text{Blank}})}{A_{\text{DPPH}}} \right] \times 100$$

where, % Inhibition = percent inhibition of test sample

A_{DPPH} = absorbance of DPPH in EtOH solution

A_{Sample} = absorbance of sample + DPPH solution

A_{Blank} = absorbance of sample + EtOH solution

(c) Determination of ferric reducing antioxidant power by cyanoferrate method

Fe(III) reduction is often used as an indicator of electron donating activity, which is an important mechanism of phenolic antioxidant action. The reducing power of extract was determined by using the cyanoferrate method. The different concentrations of 1 mL sample extracts and positive control solutions were mixed with 2.5 mL of phosphate buffer (pH 6.6) and 2.5 mL of 1 % potassium ferricyanide. The mixture was incubated at 50 °C for 20 minutes. A portion (2.5 mL) of 10 % trichloroacetic acid was added to the mixture to stop the reaction, which was then centrifuged at 3,000 rpm for 10 minutes. 2.5 mL of upper layer solution was mixed with 2.5 mL of distilled water and 0.5 mL of 0.01 % FeCl₃ solution and the absorbance measured at 700 nm were recorded. Each experiment was carried out at least three times and the data presented as an average of three independent determinations. The ferric reducing antioxidant activity was calculated by the following equation (Moein, *et al.*, 2008).

$$\% \text{ FRAP} = \left[\frac{A_{\text{control}} - (A_{\text{sample}} - A_{\text{Blank}})}{A_{\text{control}}} \right] \times 100$$

where % FRAP = % ferric reducing antioxidant power

A_{control} = absorbance without sample solution, A_{sample} = absorbance of sample

A_{Blank} = absorbance of sample + distilled water solution

(d) Determination of diabetic activity of the chloroform extract

(i) Determination of α-amylase inhibitory activity

The enzyme inhibitory activity was expressed as a decrease in units of maltose liberated (Puls *et al.*, 1977). A modified dinitrosalicylic acid (DNS) method was adopted to estimate the maltose equivalent 1mL of the tested samples were pre-incubated with 1 mL of phosphate buffer and 2 mL of α -amylase at 37 °C for 20 min and thereafter 0.4 mL 1% starch solution was added. The mixture was further incubated at 37 °C for 30 min. Then the reaction was stopped by adding 2 mL of DNS reagent and the contents were heated in a boiling water bath for 10 min. A blank was prepared without extract and another without the amylase enzyme, replaced by equal quantities of buffer. The absorbance was measured at 540 nm. The reducing sugar released from starch was estimated as maltose equivalent from a standard graph. Acarbose was used as standard. The anti-diabetic activity was determined through the inhibition of α -amylase which was expressed as a percentage of inhibition and calculated by the following equations:

$$\% \text{ Inhibition} = \frac{A_{\text{control}} - (A_{\text{sample}} - A_{\text{Blank}})}{A_{\text{control}}} \times 100$$

where % Inhibition = % α -amylase inhibition

A_{control} = absorbance without sample solution, A_{sample} = absorbance of sample

A_{Blank} = absorbance of sample + distilled water solution

The α -amylase inhibition (IC_{50}) is expressed as the test substance concentration ($\mu\text{g/mL}$) that results in a 50 % α -amylase inhibition of the sample. The IC_{50} values were calculated by linear regressive excel program. The standard deviation was also calculated by the following equation.

$$\text{Standard Deviation (SD)} = \sqrt{\frac{(\bar{x} - x_1)^2 + (\bar{x} - x_2)^2 + \dots + (\bar{x} - x_n)^2}{(n-1)}}$$

where \bar{x} = average % inhibition

$x_1 + x_2 + \dots + x_n$ = % α -amylase inhibition of test sample solution

n = number of time

(ii) Determination of α -glucosidase inhibitory activity

The α -glucosidase inhibitory activity was measured the procedure described by (Puls *et al.* 1977). The α -glucosidase was assayed using 0.4 mL of sample extract and 1mL of 0.1 M phosphate buffer (pH 6.9) containing 2 mL of α -glucosidase solution, which was then incubated at 37 °C for 10 min. After the pre-incubation period, 0.5 mL of 0.005M *p*-nitrophenyl- α -D-glucopyranoside solution was added to each well at timed intervals. The reaction mixtures were incubated at 37 °C for 5 min. After incubation, absorbance readings of the sample was recorded at 405 nm and compared with a control that had 0.4 mL of buffer solution in place of the extract. Acarbose was used as standard. The anti-diabetic activity was determined through the inhibition of α -glucosidase which was expressed as a percentage of inhibition and calculated by the following equations:

$$\% \text{ Inhibition} = \frac{A_{\text{control}} - (A_{\text{sample}} - A_{\text{Blank}})}{A_{\text{control}}} \times 100$$

where % Inhibition = % α -glucosidase inhibition

A_{control} = absorbance without sample solution, A_{sample} = absorbance of sample

A_{Blank} = absorbance of sample + distilled water solution

The α -glucosidase inhibition (IC_{50}) is expressed as the test substance concentration ($\mu\text{g/mL}$) that results in a 50 % α -glucosidase inhibition of the sample. The IC_{50} values were calculated by linear regressive excel program. The standard deviation was also calculated by the following equation:

$$\text{Standard Deviation (SD)} = \sqrt{\frac{(\bar{x} - x_1)^2 + (\bar{x} - x_2)^2 + \dots + (\bar{x} - x_n)^2}{(n-1)}}$$

where \bar{x} = average % inhibition,

n = number of times

$x_1 + x_2 + \dots + x_n$ = % α -glucosidase inhibition of test sample solution

(e) Determination of cytotoxicity of the chloroform extract

The cytotoxicity of chloroform extract of *P. aeruginosa* was investigated by using brine shrimp lethality bioassay according to the procedure described by Dockery and Tomkins, 2000. The brine shrimp (*Artemia salina*) was used in this study for cytotoxicity bioassay (Ali *et al.*, 2016). Brine shrimp cysts (0.5 g) were added to the 1.5 L of artificial sea water bottle. This experiment was carried out at the Department of Chemistry, Yangon University, Myanmar. One mL of each solution of crude extracts (1, 10, 100, 1000 ppm) was added and the plate was then kept at room temperature in the dark. After 24 h, the dead larvae were counted in each well under the magnifier. The still living larvae (A) were killed by addition of ca. 0.5 mL methanol so that subsequently the total number of the animals (G) could be determined. The control solution was prepared as the above procedure by using distilled water instead of sample solution. The mortality (M) was calculated in %. Each test row was accompanied by a brine solution (number B). The mortality rate M was calculated by using the following formula:

$$M = \left[\frac{(A - B - N)}{(G - N)} \right] \times 100$$

where M = percent of the dead larvae after 24 h

A = number of the dead larvae after 24 h

B = average number of the dead larvae in the brine solution after 24 h

N = number of the dead larvae before starting of the test.

G = total number of brine shrimps

(f) Investigation of antiproliferative activity of chloroform extract and the isolated compounds against Human Cancer Cell Lines

Antiproliferative activity of chloroform extract from the selected bacteria was investigated in *in vitro* by using cancer cell lines at Division of Natural Product Chemistry, Institute of Natural Medicine, and University of Toyama, Japan. The cell lines used were Hela (human cervix cancer cell), A549 (human lung cancer cell) and MCF7 (human breast cancer cell). K562 μ -Minimum

essential medium with L-glutamine and phenol red (α -MEM, Wako) were used for cell cultures. All media were supplemented with 10 % fetal bovine serum (FBS, sigma) and 1% antibiotic antimycotic solution (Sigma). For MCF 7 cell, 1 % of 0.1 M non-essential amino acid (NEAA, Gibco) and 1% of 1mM sodium pyruvate (Gibco) were also supplemented. The *in vitro* antiproliferative activity of the crude extracts was determined by the procedure described by (Win *et al.* 2015). The concentrations of the crude extracts were 200, 100, 10 μ g/ mL and 10, 1, 0.1 mM for positive control were prepared by serial dilution. Cell viability was calculated from the mean values of the data from three wells using the equation below and antiproliferative activity was expressed as the IC₅₀ (50 % inhibitory concentration) value. 5-fluorouracil (5FU) was used as positive control. *In vitro* antiproliferative activity of the isolated compounds was determined against MCF7 (human breast cancer cell) cell line by using CCK-8 Assay (Cell Counting Kit-8). The % cell viability was calculated according to the following equation:

$$\% \text{ Cell viability} = \left[\frac{A_{\text{test sample}} - A_{\text{blank}}}{A_{\text{control}} - A_{\text{blank}}} \right] \times 100$$

Where, $A_{\text{test sample}}$ = absorbance of test sample solution, A_{control} = absorbance of DMSO

A_{blank} = absorbance of CCK-8 reagent

3. Results and Discussion

3.1 Isolation and Selection of *P. aeruginosa* Soil Bacterial Strain

In the present work, one bacterial strain (A1) and three bacterial strains (B1, B2, B3) were respectively isolated from the clinical soil samples A and B collected from the Insein General Hospital, Yangon Region. According to the microscopic examination and biochemical tests, B2 was observed as a gram-negative bacteria with rod shape. Based on the results from phenotype and biochemical tests, the isolated bacterial strain B2 could be identified as *P. aeruginosa*. The isolated bacterial strain B2 was chosen for molecular confirmation using genotype examination with DNA sequencing technique.

3.2 Molecular Confirmation of the Selected Bacterial Strain B2 Using DNA Sequencing Technique

The DNA sequence confirmed the *P. aeruginosa* at molecular level, 16S rRNA gene region was amplified and sequenced (Amuth and Kokila, 2014). Genomic DNA was extracted from isolated bacterial strain B2 by the standard method. Sharp genomic DNA band in lane where in the sample was loaded was clearly revealed without any contamination of proteins after screening with agarose gel electrophoresis as illustrated in Figure 3.1 (a). The extracted DNA was used as a template in PCR amplification of 16S rRNA gene region by using two universal primers. The PCR products were photographed under ultraviolet light machine (Transilluminator; Uvite, UK) to detect the specific amplified product by comparing it with 100 base pairs standard DNA ladder (Figure 3.1 (b)). From the PCR result, it can be clearly seen that the size of the PCR product of genomic DNA might be expected to have 1500 bp.

Figure 3.2 shows the consensus nucleotide sequence of the amplified segment of 16S rRNA gene of *P. aeruginosa*. The DNA sequence was compared with NCBI gene bank database using BLAST algorithm. The result showing a data gave high similarity (99-100 %) homology of the search sequence with *P. aeruginosa* strain S 04 16S rRNA (accession number MT 626658.1). Therefore according to the results of phenotypic tests, biochemical tests and genotypic confirmation, the isolated bacterial strain B2 was finally identified as the strain of *P. aeruginosa*.

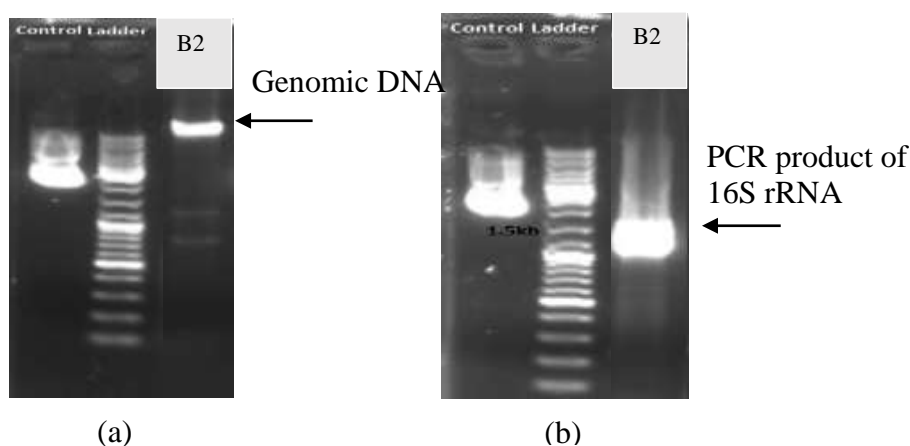


Figure 3.1 Agarose gel electrophoresis of genomic DNA and PCR products after amplification of the 16S rRNA gene

- (a) Gel image showing genomic DNA extracted from the isolated bacterial strain B2 (Ladder (250 - 10000 bp)
- (b) PCR product of 16S rRNA

? Need Verification

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ATGCAAGTCGAGCGGATGAAGGGAGCTTGCTCCTGGATTGAGCGGCGGACGGGTGAGT
AATGCCTAGGAATCTGCCTGGTAGTGGGGGATAACGTCCGGAAACGGGCGCTAATACC
GCATACGTCCTGAGGGAGAAAGTGGGGGATCTTCGGACCTCACGCTATCAGATGAGCC
TAGGTTCGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCGTAAGT
GTCTGAGAGGATGATCAGTCACACTGGAAGTGGAGACACGGTCCAGACTCCTACGGGAG
GCAGCAGTGGGGAATATTGGACAATGGGCGAAAGCCTGATCCAGCCATGCCGCGTGTG
TGAAGAAGGTCTTCGGATTGTAAAGCACTTTAAGTTGGGAGGAAGGGCAGTAAGTTAA
TACCTTGCTGTTTTGACGTTACCAACAGAATAAGCACCGGCTAACTTCGTGCCAGCAGC
CGCGGTAATACGAAGGGTGCAAGCGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTA
GGTGGTTCAGCAAGTTGGATGTGAAATCCCCGGGCTCAACCTGGGAACTGCATCCAAA
ACTACTGAGCTAGAGTACGGTAGAGGGTGGTGGAAATTTCTGTGTAGCGGTGAAATGC
GTAGATATAGGAAGGAACACCAGTGGCGAAGGCGACCACCTGGACTGATACTGACACT
GAGGTGCGAAAGCGTGGGGAGCAAACAGGATTAGATACCCTGGTAGTCCACGCCGTAA
ACGATGTCGACTAGCCGTTGGGATCCTTGAGATCTTAGTGGCGCAGCTAACGCGATAA

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GTCGACCGCCTGGGGAGTACGGCCGCAAGGTTAAAACTCAAATGAATTGACGGGGGGCC
 CGCACAAGCGGTGGAGCATGTGGTTTAATTCGAAGCAACGCGAAGAACCTTACCTGGC
 CTTGACATGCTGAGAACTTTCCAGAGATGGATTGGTGCCTTCGGGAACTCAGACACAG
 GTGCTGCATGGCTGTCGTCAGCTCGTGTCTGTGAGATG

Figure 3.2 Nucleotide sequence of the amplified segment of 16S rRNA gene of *P. aeruginosa*

3.3 Some Secondary Metabolites of the Isolated *P. aeruginosa*

According to the chemical screening on the chloroform extract of the isolated *P. aeruginosa* (B2), it was observed that various secondary metabolites such as alkaloids, α -amino acids, flavonoids, phenolic compounds, steroids, terpenoids, together with carbohydrates, organic acids and proteins were present, however, cardiac glycosides, glycosides, reducing sugars and starch were not detected. In addition, on the basis of chemical analyses, it was observed that the chloroform extract of the isolated *P. aeruginosa* contained 50.64 ± 1.5 mg GAE/g of total phenol content determined with spectrophotometric method by using Folin-Ciocalteu reagent, 24.70 ± 2.2 mg QE/g of total flavonoid determined with spectrophotometric method using aluminium chloride reagent, 50.43 ± 4.0 mg CE/g of total steroid determined by Zak's method, 4.43 ± 0.8 mg BSAE/g of total protein estimated by Biuret method and 28.4 ± 0.5 mg GE/g of total carbohydrate determined by anthrone method.

3.4 Isolation, Characterization and Identification of the Isolated Compounds

The compounds (1 to 5) separated from chloroform extract of the isolated *P. aeruginosa* were characterized by their physical properties such as melting points, R_f values, solubilities in some solvents. All of the isolated compounds were structurally identified by using 1D and 2D NMR spectroscopic techniques and mass spectrometry.

Compound 1: It is a yellow crystal (mpt. 152-157 °C, 0.24 % yield). Its R_f value was observed to be 0.6 (PE: EtOAc, 4:1 v/v). It is soluble in chloroform, methanol, ethanol, pet-ether, ethyl acetate and acetone but insoluble in water.

The integration of ^1H NMR (500 MHz, CDCl_3) spectrum presence of eight protons in the compound 1. Five double doublet signals and two multiplet proton signals were assigned to be seven alkenic methine groups ($=\text{CH}-$) due to their downfield chemical shifts. A broad signal appeared at δ_H 8.26 ppm attributed to a hydroxyl proton (OH). The ^{13}C NMR (125 MHz, CDCl_3) spectrum of compound 1 revealed the presence of twelve carbon signals including seven alkenic methine carbons ($=\text{CH}-$), four quaternary alkenic carbons ($=\text{C}-$) and one carbinol carbon. These observations revealed that compound 1 may be an aromatic compound containing one hydroxyl group. According to the observations from the H-C one bond correlation studied by HSQC spectrum, the proton-proton correlation studied by $^1\text{H}-^1\text{H}$ COSY spectrum and the long range proton-carbon correlation studied by HMBC spectrum, the 1D and 2D NMR spectral data of compound 1 were found to be similar to those of 1- hydroxy phenazine (Sinha *et. al.*, 2015) (Table 3.1).

Table 3.1 1D and 2D NMR Spectral Data of 1-Hydroxyphenazine (1) and the Reported Data

Carbon position	1-Hydroxyphenazine (CDCl ₃)				*Reported data (DMSO)	
	δ_C (ppm),HSQC	δ_H (ppm) (<i>J</i> Hz)	COSY	HMBC	δ_C (ppm)	δ_H (ppm) (<i>J</i> Hz)
1	151.76,=C-OH	-	-	-	153.9, COH	-
2	108.97,=CH -	7.26, <i>dd</i> (2.1,6.5)	H-3	1,3,4a,10a	110.8 CH	7.20, <i>dd</i> (1.0,7.5)
3	120.01,=CH -	7.77, <i>dd</i> (2.1,8.1)	H-2	1,2,4a,10a	119.4 CH	7.69, <i>dd</i> (1.0,8.5)
4	131.92,=CH -	7.87, <i>m</i>	H-3	2,4a,10a	132.3 CH	7.97, <i>m</i>
4a	143.89,=C(qC)	-	-	-	143.4 qC	-
5a	144.2,=C (qC)	-	-	-	144.1 qC	-
6	130.85, = CH -	7.86, <i>m</i>	H-7	5a,9,9a	131.4 CH	7.91, <i>m</i>
7	129.25, = CH -	8.26, <i>dd</i> (2.3,7.7)	H-6	4,4a,6	129.5 CH	8.22, <i>dd</i> (2.5,6.0)
8	130.55, = CH -	7.84, <i>dd</i> (6.6,9.5)	H-9	5a,9a,9	130.8CH	7.79, <i>dd</i> (7.5,8.5)
9	129.77, = CH -	8.31, <i>dd</i> (2.2,7.8)	H-8	8	129.8 CH	8.27, <i>dd</i> (2.5,6.0)
9a	141.25,=C(qC)	-	-	-	141.5 qC	-
10a	134.76,=C(qC)	-	-	-	136.1qC	-
OH		8.26			-	8.24

*Sinha *et al.*, 2015

From NMR spectral data, it could be assumed that there were 12 carbons, 7 protons and one hydroxyl group, resulting the partial molecular formula of C₁₂H₈O with molecular weight of *m/z* 168, and ESI-MS mass spectrum indicated the molecular weight of the isolated compound 1 to be *m/z* 196. Consequently, the remaining mass is 28, and it must contain two nitrogen atoms. So, the complete structural formula of this isolated compound 1 must be assigned as C₁₂H₈N₂O with the molecular weight 196. Since the DBE (Double Bond Equivalent) equal to 10, there will be three rings and seven double bonds present in the isolated compound 1. The melting point of the isolated compound was also observed to be identical with the reported data of 1-hydroxyphenazine (mpt. 156 – 159 °C, C₁₂H₈N₂O) (Tokyo Chemical Industry). It is one of the constituent of *P. aeruginosa* (Sinha *et al.*, 2015). All of the above information leads the compound 1 to be 1-hydroxyphenazine. Figure 3.3 shows the complete structure of compound 1 with ¹H-¹H COSY and ¹H-¹³C HMBC correlation.

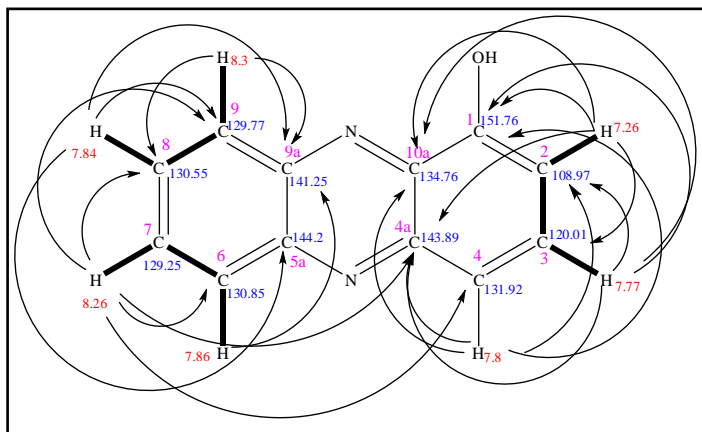


Figure 3.3. Structure of 1-hydroxyphenazine(1) [COSY (—) and HMBC (H→C) correlation]

Compound 2: It was isolated as a yellow amorphous powder (mpt. 240-246 °C) in 0.7 % of yield (36.4 mg) based on chloroform extract of *P. aeruginosa*. Its R_f value was observed to be 0.27 (n-hexane: acetone = 8:2 v/v). It is soluble in chloroform, ethyl acetate, methanol pet-ether, ethanol and acetone but insoluble in water. The integration of ^1H NMR (500 MHz, CDCl_3) spectrum the presence of only eight protons in the compound 2. The four doublet of doublet signals showed that there were four alkenic methine groups (=CH-).

Table 3.2 1D and 2D NMR Spectral Data of Phenazine-1-carboxylic acid (2) and the Reported Data

Carbon position	Phenazine-1-carboxylic acid (CDCl_3)				*Reported data (CD_3OD)	
	$\delta_{\text{C}}(\text{ppm}), \text{HSQC}$	$\delta_{\text{H}}(\text{ppm})(J, \text{Hz})$	COSY	HMBC	$\delta_{\text{C}}(\text{ppm})$	$\delta_{\text{H}}(\text{ppm})$
1	125.04, = C	-	-	2,3	124.9 C	-
2	137.5, = CH	8.99, dd(1.44, 7.07)	3	1,4,10a,	137.4 CH	8.99, dd (1.5, 7.3)
3	130.3, = CH	8.05, m	COOH		130.3 CH	8.05, m
4	135.2, = CH	8.55, dd (1.46, 8.5)	2,4	1,2,4a	135.1 CH	8.54, dd (1.5, 8.8)
4a	143.4, = C	-	3	2,10a	143.4 C	-
5a	144.2, = C	-	-	3	144.1 C	-
6	128.0, = CH	8.30, dd (1.9, 8.3)	-	6,7	128.0 CH	8.29, dd (1.8, 7.7)
7	133.3, = CH	7.99, m	7	5a,8	133.2 CH	7.99, m
8	131.8, = CH	8.03, m	6	5a	131.7 CH	8.03, m
9	130.1, = CH	8.35, dd(1.9,	9	9a	130.1 CH	8.35, dd (2.6, 7.3)

Carbon position	Phenazine-1-carboxylic acid (CDCl ₃)				*Reported data (CD ₃ OD)	
	$\delta_C(\text{ppm}), \text{HSQC}$	$\delta_H(\text{ppm})(J, H_z)$	COSY	HMBC	$\delta_C(\text{ppm})$	$\delta_H(\text{ppm})$
		8.3)				
9a	139.9, = C	-	8	7,9a	139.8 C	-
10a	140.1, = C	-	-	8,9	140.1 C	-
COOH	166.0, C=O	-	-	2,4	165.9 C	-

* Sayed *et al.*, 2008

The multiplet signals indicated the presence of another three alkenic methine groups. According to the ¹³C NMR (125 MHz, CDCl₃) spectrum of the isolated compound 2, it was found that there were twelve carbons including seven methine carbons, five quaternary carbons and one carboxylic acid or ester carbonyl carbon. The studies on H-C one bond correlation by HSQC spectrum, the proton-proton correlation by ¹H-¹H COSY spectrum and the long range proton-carbon correlation by HMBC spectrum lead to the complete structure of compound 2. The 1D and 2D NMR spectral data of compound 1 were found to be similar to those of phenazine-1-carboxylic acid (Sayed *et al.*, 2008) (Table 3.2). Mass spectrum indicated the molecular weight of the isolated compound 2 to be *m/z* 224. The melting point of compound 2 (C₁₃H₈N₂O₂, *m/z* = 224 confirmed by mass spectrum) was also observed to be consistent with that of phenazine-1-carboxylic acid (239 ~ 245 °C, C₁₃H₈N₂O₂, mol. wt. = 224) (Syn Quest Labs). On the basis of the above information, the compound 2 was assigned as phenazine-1-carboxylic acid (Figure 3.4).

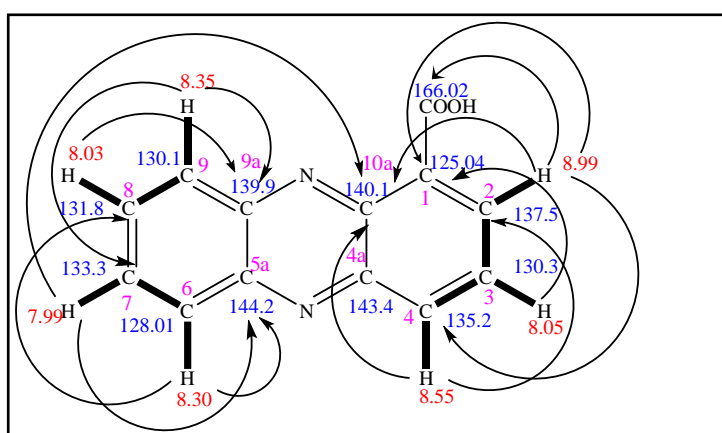


Figure 3.4. Structure of phenazine-1-carboxylic acid (2) [COSY (—) and HMBC (H→C) correlation]

Compound 3: It was isolated as a colourless solid (mpt. 161~164 °C) in 0.34 % of yield (17 mg) based on the chloroform extract of *P. aeruginosa*. Its *R_f* value was observed to be 0.4 (PE: EA, 7:3 v/v). It is soluble in chloroform, pet-ether, ethyl acetate, methanol and ethanol but insoluble in acetone. The integration of ¹H NMR (500 MHz, CDCl₃) spectrum indicated the presence of eighteen protons in the compound 3. The ¹³C NMR (125 MHz, CDCl₃) spectrum of the compound 3 revealed the presence of eleven carbon signals. The observed 1D and 2 NMR spectral data (Table 3.3) were found to be similar to those of cyclo(L-Leu-L-Pro) (Youn *et al.*, 2016), the compound 3 could be assigned as cyclo(L-Leu-L-Pro). The stereochemical configuration of compound 3, i.e.,

the beta hydrogens at δ_H 4.11 ppm and 4.01 ppm on C-6 and C-9 was confirmed using ROESY spectroscopic analysis (Table 3.3). According to ESI-MS study, the molecular weight of the isolated compound **3** was found to be m/z 210. Therefore, the complete structural formula of this isolated compound must be assigned as $C_{11}H_{18}N_2O_2$ with the molecular weight 210. Since the melting point (161~164 °C) of the compound **3** was found to be similar to that (mpt. 163 – 165 °C) (ChemSpider) of cyclo(L-Leu-L-Pro), it was structurally identified as cyclo(L-Leu-L-Pro) (Figure 3.5), a cyclic dipeptide present in *P. aeruginosa*.

Compound 4: It was obtained as a colourless solid in 0.09 % of yield (4.5 mg). Its R_f value was observed to be 0.36 (PE: EA, 7:3 v/v). It is soluble in chloroform, pet-ether, ethyl acetate, methanol and ethanol but insoluble in acetone. The integration of 1H NMR (500 MHz, $CDCl_3$) spectrum revealed the presence of eighteen protons in the compound **4**. The ^{13}C NMR (125 MHz, $CDCl_3$) spectrum of the isolated compound **4** presence eleven carbon signals.

Table 3.3 1D and 2D NMR Spectral Data of Cyclo(L-Leu-L-Pro) (3**) and the Reported Data**

Carbon position	Cyclo(L-Leu-L-Pro) ($CDCl_3$)					*Reported data ($CDCl_3$)	
	δ_C (ppm),HSQC	δ_H (ppm)	COSY	HMBC	ROESY	δ_C (ppm)	δ_H (ppm)
1	166.21,C=O	-	-	-		168.9(CO)	-
3	45.45,CH ₂ (sp^3)	3.56 (<i>m</i>)	4	4,5,6		45.4(CH ₂)	3.56(<i>m</i>)
4	22.70,CH ₂ (sp^3)	2.02 (<i>m</i>)	3,5	4,7		23.6(CH ₂)	2.01(<i>m</i>)
5	28.04,CH ₂ (sp^3)	2.34 (<i>m</i>)	6	4,3,6	6(CH β)	29.1(CH ₂)	2.30, 2.31(<i>m</i>)
6	58.93,CH(sp^3)	4.11 (<i>t</i> ,8.2)	5	7,5		60.3(CH)	4.27(<i>dt</i> ,9.3,1.5)
7	170.3,C=O	-	-	-		172.8(CO)	-
8	-	6.36(1H, <i>s</i> , NH)	-	-		-	6.36(1H, <i>s</i> ,NH)
9	53.35,CH(sp^3)	4.01 (<i>m</i>)	10	1,10,11		54.6(CH)	4.13(<i>m</i>)
10	38.50,CH ₂ (sp^3)	1.52 (<i>m</i>)	11	1,12	9(CH β)	39.4(CH ₂)	1.53(<i>m</i>)
11	24.58 ,CH(sp^3)	1.77 (<i>m</i>)	10,1, 12'	10,12		25.8(CH)	1.88(<i>m</i>)
12	23.23,CH ₃ (sp^3)	0.99 (<i>d</i> ,6.59)	11	10,11		23.3(CH ₃)	0.99(<i>d</i> ,6.59)
12'	21.18,CH ₃ (sp^3)	0.94 (<i>d</i> ,6.52)	11	10,11		22.2(CH ₃)	0.95(<i>d</i> ,6.52)

* Youn *et. al.*, 2016

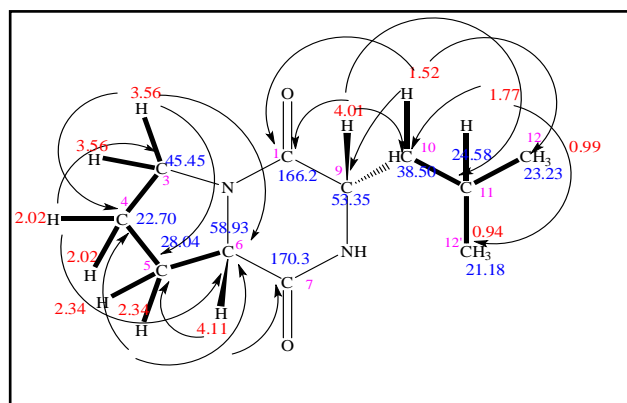


Figure 3.5. Structure of cyclo-(L-Leu-L-Pro) (3) [COSY (—) and HMBC (H→C) correlation]

Since all of the observed 1D and 2D NMR spectral data (Table 3.4) were found to be similar to those of cyclo(D-Pro-D-Leu) (Youn *et al.*, 2016), the compound **4** could be assigned as cyclo(D-Pro-D-Leu). The stereochemical configuration of compound **4**, i.e., the alpha hydrogens at δ_H 4.03 ppm and 4.12 ppm on C-5 and C-10 was confirmed using ROESY spectrum since it was not observed through space interactions between each of these two methine protons with any other protons. The studies on H-C one bond correlation by HSQC spectrum, the proton-proton correlation by ^1H - ^1H COSY spectrum and the long range proton-carbon correlation by HMBC spectrum result the complete structure of compound **4** as shown in Figure 3.6. Based on the 1D and 2D NMR spectral data and mass spectrum, the compound **4** was assigned to have molecular formula $\text{C}_{11}\text{H}_{18}\text{N}_2\text{O}_2$ with the molecular weight of m/z 210. Consequently, the compound **4** was identified as cyclo(D-Pro-D-Leu).

Compound 5: It was isolated as a yellow oil in 0.18 % (9.4 mg) of yield by silica gel column chromatographic separation of chloroform extract of *P. aeruginosa*. Its R_f value was observed to be 0.6 (PE:EA:MeOH, 1.8:8:0.2 v/v). It is soluble in chloroform, pet-ether, ethyl acetate, methanol and ethanol but insoluble in water. The integration of ^1H NMR (500 MHz, CDCl_3) spectrum presence of sixteen protons in the compound **5**.

Table 3.4 1D and 2D NMR Spectral Data of Cyclo(D-Pro-D-Leu) (4) and the Reported Data

Carbon position	Cyclo(D-Pro-D-Leu) (CDCl_3)					*Reported data(CDCl_3)	
	$\delta_C(\text{ppm}), \text{HSQC}$	$\delta_H(\text{ppm})$	COSY	HMBC	ROESY	$\delta_C(\text{ppm})$	$\delta_H(\text{ppm})$
1	166.2, C=O	-	-	-	-	168.9(CO)	-
3	45.49, $\text{CH}_2(sp^3)$	3.58 (<i>m</i>)	4	4,5,6		45.4(CH_2)	3.56(<i>m</i>)
4	22.72, $\text{CH}_2(sp^3)$	2.08 (<i>m</i>)	3,5	1,4,6,7		23.6(CH_2)	2.01(<i>m</i>)
5	28.10, $\text{CH}_2(sp^3)$	2.36 (<i>m</i>)	6	4,3,6	6(CH, α)	29.1(CH_2)	2.30, 2.31(<i>m</i>)
6	58.97, $\text{CH}(sp^3)$	4.12 (<i>t</i> , 8.2)	5	7,5		60.3 (CH)	4.27(<i>dt</i> , 9.3,1.5)

Carbon position	Cyclo(D-Pro-D-Leu) (CDCl ₃)					*Reported data(CDCl ₃)	
	δ_C (ppm),HSQC	δ_H (ppm)	COSY	HMBC	ROESY	δ_C (ppm)	δ_H (ppm)
7	170.3, C=O	-	-	-		172.8(CO)	-
8	-	5.92 (1H, s, NH)	-	-		-	6.36 (1H,s,NH)
9	53.36, CH(<i>sp</i> ³)	4.03(dd,3.29, 3.87)	10	1,10		54.6 (CH)	4.13(<i>m</i>)
10	38.61,CH ₂ (<i>sp</i> ³)	1.53 (<i>m</i>)	11	1,12	9(CH, α)	39.4(CH ₂)	1.53(<i>m</i>)
11	24.70 ,CH(<i>sp</i> ³)	1.76 (<i>m</i>)	10,12	10,12		25.8 (CH)	1.88(<i>m</i>)
12	23.27,CH ₃ (<i>sp</i> ³)	1.01 (<i>d</i> ,6.59)	11	10,11		23.3(CH ₃)	0.99(<i>d</i> ,6.59)
12'	21.17,CH ₃ (<i>sp</i> ³)	0.96 (<i>d</i> ,6.52)	11	10,11		22.2(CH ₃)	0.95(<i>d</i> ,6.52)

* Youn *et al.*, 2016

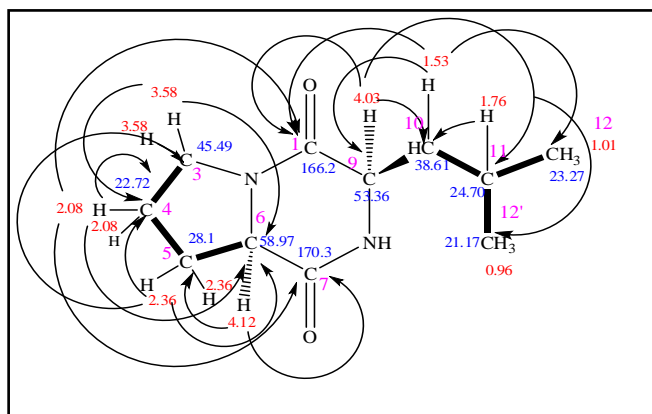


Figure 3.6. Structure of cyclo-(D-Pro-D-Leu) (4) [COSY (—) and HMBC (H→C) correlation]

The ¹³C NMR (125 MHz, CDCl₃) spectrum of the compound **5** revealed the presence of ten carbon signals including two methyl carbons, four *sp*³ methylene carbons, two *sp*³ methine carbons and two carbonyl carbons. From the study on one bond H-C correlation by HSQC spectrum the results showed that there were three sets of diastereotopic protons (-CH₂-). Furthermore, ¹H-¹H correlations and the long range proton-carbon correlations were also examined by using ¹H-¹H COSY and HMBC spectra. According to the ROESY NMR spectrum of compound **5**, it was not observed through space interactions between the methine proton at δ_H 3.94 ppm (δ_C 60.36 ppm) as well as the methine proton at δ_H 4.08 ppm (δ_C 58.79 ppm) with any other protons. Therefore, these two methine protons could be assumed not to be in the same space with other protons, and these two protons could be assigned as the alpha hydrogens. The 1D and 2D NMR spectral data of compound **5** were observed to be consistent with the reported data of cyclo(D-Pro-L-Val) (Kwon *et al.*, 2001) (Table 3.5), and the compound **5** was structurally elucidated as shown in Figure 3.7. The molecular weight of the isolated compound **5** was found to be *m/z* 196 determined by ESI-MS

spectrometry. Therefore, finally compound **5** was assigned as cyclo(D-Pro-L-Val) (C₁₀H₁₆N₂O₂) (Figure 3.7).

Table 3.5 1D and 2D NMR Spectral Data of Cyclo(D-Pro-L-Val) (**5**) and the Reported Data

Carbon position	Cyclo(D-Pro-L-Val) (CDCl ₃)					*Reported data (CDCl ₃)	
	δ_c (ppm), HSQC	δ_H (ppm)	COSY	HMBC	ROESY	δ_c (ppm)	δ_H (ppm)
1	170.03, C=O	-	-	8		169.9(CO)	-
3	60.36, -CH(<i>sp</i> ³)	3.94 (<i>m</i>)	-	4,10,11,12	3(CH, α)	60.3(CH)	3.94(1H, <i>m</i>)
4	164.89, C=O	-	-	3		164.8(CO)	-
6	58.79, -CH(<i>sp</i> ³)	4.08(<i>m</i>)	7,8	7,1	6(CH, α)	58.7(CH)	4.09(1H, <i>m</i>)
7	28.50, -CH ₂ (<i>sp</i> ³)	2.08(<i>m</i>), Ha 2.3(<i>m</i>), Hb	6,8	6,8,9		28.3(CH ₂)	2.05(1Ha, <i>m</i>) 2.39(1Hb, <i>m</i>)
8	22.33, -CH ₂ (<i>sp</i> ³)	1.91(<i>m</i>), Ha 2.02(<i>m</i>), Hb	7,9	7,9 1,6,7,8		22.2(CH ₂)	1.90(1Ha, <i>m</i>) 2.05(1Hb, <i>m</i>)
9	45.12, -CH ₂ (<i>sp</i> ³)	3.55(<i>m</i>), Ha 3.65(<i>m</i>), Hb	8	7,8		44.9(CH ₂)	3.55,(1Ha, <i>m</i>) 3.65,(1Hb, <i>m</i>)
10	28.33, CH(<i>sp</i> ³)	2.64 (<i>m</i>)	11	3,11,12		28.4(CH)	2.64(2H, <i>m</i>)
11	16.02, -CH ₃ (<i>sp</i> ³)	0.92 (<i>d</i> ,6.9)	10,12	10,12		15.9(CH ₃)	0.92(3H, <i>d</i> ,6.9)
12	19.21, -CH ₃ (<i>sp</i> ³)	1.07 (<i>d</i> ,7.5)	11	10,11		19.2(CH ₃)	1.07(3H, <i>d</i> , 7.5)

* Kwon *et al.*, 2001

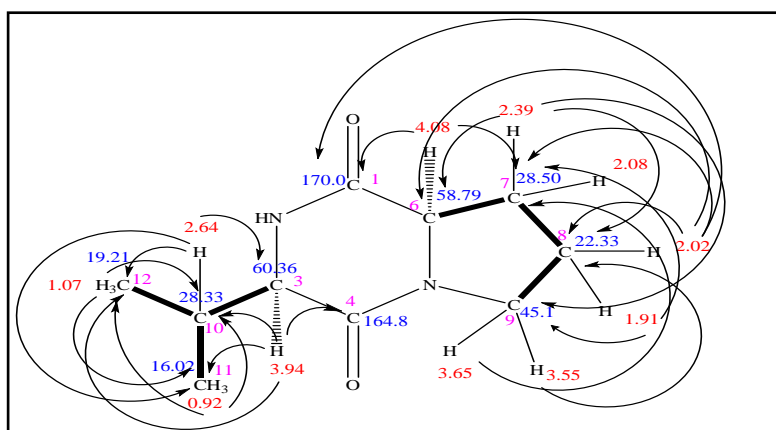


Figure 3.7. Structure of cyclo-(D-Pro-L-Val) (**5**) [COSY (—) HMBC (H→C) correlation]

3.5 Biological Activities of Chloroform Extract and the Isolated Compounds of *P. aeruginosa*

3.5.1 Antimicrobial Activity of Chloroform Extract and the Isolated Compounds of *P. aeruginosa*

The chloroform extract of *P. aeruginosa* and isolated compounds (**1** to **5**) were observed to possess antimicrobial activity against seven different pathogenic microbes such as *A. tumefacines*,

B. subtilis, *B. pumilus*, *C. albicans*, *E. coli*, *P. aeruginosa* and *S. aureus* using agar well diffusion method. This method is based on zone diameter including the well diameter, in millimeter (mm). The chloroform extract of *P. aeruginosa* was found to have high potency in antimicrobial activity against all tested microorganisms with the inhibition zone diameters ranged between 20 mm ~ 40 mm. Two isolated phenazines: compound **1** and compound **2** also exhibit high activity against all of the tested microorganisms with the inhibition zone diameters ranged above 20 mm whereas the remaining three isolated dicyclopeptides, diketoperazines (compound **3**, compound **4** and compound **5**) showed mild antimicrobial activity with inhibition zone diameters between 10 mm ~ 14 mm but they did not against all of the tested microorganisms. The compound **3** did not show activity against *B. pumilus*. The compound **4** exhibited activity against *B. pumilus*, *E. coli*, *P. aeruginosa* and *S. aureus*. The compound **5** showed activity against *B. pumilus*, *B. subtilis* and *P. aeruginosa*. The results are shown in Table 3.6.

Table 3.6 Inhibition Zone Diameters of Chloroform Extract of the Isolated *P. aeruginosa* and the Isolated Compounds against Seven Microorganisms by Agar Well Diffusion Method

Microorganisms	Inhibition zone diameters (mm) of samples						Control
	chloroform	1	2	3	4	5	
<i>A. tumefacines</i>	38(+++)	28(+++)	26(+++)	12(+)	-	-	-
<i>B. pumilus</i>	40(+++)	30(+++)	27(+++)	-	14(+)	14(+)	-
<i>B. subtilis</i>	20(+++)	32(+++)	26(+++)	12(+)	-	14(+)	-
<i>C. albicans</i>	40(+++)	28(+++)	31(+++)	14(++)	-	-	-
<i>E. coli</i>	36(+++)	32(+++)	20(+++)	12(+)	12(+)	-	-
<i>P. aeruginosa</i>	38(+++)	21(+++)	18(++)	14(+)	12(+)	12(+)	-
<i>S. aureus</i>	40(+++)	23(+++)	15(++)	14(+)	12(+)	-	-

Agar well – 10 mm, 10 mm ~ 14 mm = (+) low activity,

15 mm ~ 19 mm = (++) medium activity, 20 mm and above = (+++) high activity

1 = 1-hydroxyphenazine **2** = phenazine-1-carboxylic acid, **3** = cyclo(L-Leu-L-Pro)

4 = cyclo(D-Pro-D-Leu), **5** = cyclo (D-Pro-L- Val)

3.5.2 Antioxidant activity of chloroform extract of the isolated *P. aeruginosa*

The antioxidant activity was measured in terms of hydrogen donating or radical scavenging ability of the chloroform extract of *P. aeruginosa* by using the stable radical DPPH. Determination of antioxidant activity using DPPH (2, 2- diphenyl-1-picrylhydrazyl) radical scavenging assay bases on the change in absorbance of crude extract solution in various concentrations. In this study, five different concentrations of 160 µg mL⁻¹, 80 µg mL⁻¹, 40 µg mL⁻¹ and 20 µg mL⁻¹ of the extract were prepared by two-fold serial dilutions with ethanol solvent. Gallic acid, an antioxidant was used as a standard and ethanol used as a solvent. The absorbance of the solutions was measured at the wavelength of 517 nm by using spectrophotometer. Decrease in absorbance indicates

increase in radical scavenging activity. The extract or its constituents decolorized due to hydrogen donating ability when mixed with DPPH. The radical scavenging activity of crude extract was expressed in terms of % RSA and IC₅₀ (50 % inhibitory concentration). When the concentrations of samples increased the % RSA also increased. It can be suggested that one requires to scavenge effectively radicals the more concentrated crude extract will be used. The result is shown in Table 3.7. The chloroform extract of *P. aeruginosa* was found to have IC₅₀ of 128.6 µg/mL. It was weaker than the standard gallic acid (IC₅₀ = 1.08 µg/mL) in antioxidant activity since the lower the IC₅₀ values, the higher the antioxidant activity of the sample occurs.

Table 3.7 Radical Scavenging Activity of Chloroform Extract of the *P. aeruginosa*

Sample	% RSA (mean ±SD) in different concentrations (µg/mL)				IC ₅₀ (µg/mL)
	20	40	80	160	
CHCl ₃ extract	16.00±2.88	17.60±2.12	40.53±3.23	56.27±2.01	128.6

3.5.3 Ferric reducing antioxidant power of chloroform extract of the isolated *P. aeruginosa*

The ferric reducing antioxidant power was also studied on the chloroform extract of *P. aeruginosa* by using cyanoferrate method. This method is associated with change in the absorption, which can be followed spectroscopically. This method bases on the change in absorbance of crude extract solution in various concentrations. In this study, five different concentrations of 1000 µgmL⁻¹, 500 µgmL⁻¹, 250 µgmL⁻¹, 125 µgmL⁻¹ and 62.5 µgmL⁻¹ of the extract were prepared by two-fold serially dilution with distilled water. Quercetin was used as a standard and by mixing with distilled water. The absorbance of the solutions was measured out at the wavelength of 700 nm using spectrophotometer. Decrease in absorbance indicates increase in ferric reducing antioxidant activity. In this assay, the higher antioxidative compounds convert the oxidation form of the iron (Fe⁺³) in ferric chloride to ferrous (Fe⁺²). The ferric reducing antioxidant power of crude extract was expressed in terms of % FRAP and IC₅₀ (50 % inhibitory concentration). When the concentrations of sample increased, the % FRAP also increased. The IC₅₀ value, the ferric reducing antioxidant power of the sample was observed to be IC₅₀ = 248.16 µg/mL, as shown in Table 3.8. The ferric reducing potency was found to be weaker than the potency of standard quercetin (IC₅₀ = 0.71 µg/mL).

Table 3.8 Reducing Power of the Chloroform Extract of isolated *P. aeruginosa*

Sample	% Reducing power (mean ±SD) in different concentrations(µg/mL)					IC ₅₀ (µg /mL)
	62.5	125	250	500	1000	
CHCl ₃ extract	36.17±3.1	37.97±3.3	50.26±4.1	65.29±0.39	66.15±2.65	248.16

3.5.4 Antidiabetic activity of chloroform extract of the isolated *Pseudomonas aeruginosa*

Based on the *in vitro* assay model, the antidiabetic activity of chloroform extract of *P. aeruginosa* was determined by using α-amylase and α-glucosidase inhibitory assays. The sample demonstrated a relatively high α-amylase and α-glucosidase inhibitory activity with IC₅₀ values of

31.76 µg/mL and 19.5 µg/mL, respectively (Tables 3.9 and 3.10). Since the lower the IC₅₀ values, the higher the activity of the sample occurred, the α-amylase and α-glucosidase inhibition properties were found to be weaker than the enzyme inhibition potency of standard acarbose which showed IC₅₀ of 0.015 µg/mL for α-amylase inhibition, and IC₅₀ of 0.04 µg/mL for α-glucosidase inhibition. Therefore, the chloroform extract from isolated *P. aeruginosa* was observed to show lower anidiabetic activity than the standard acarbose.

Table 3.9 α-Amylase Inhibition % and IC₅₀ of Chloroform Extract of the Isolated *P. aeruginosa*

Sample	% Inhibition in different concentrations (µg/mL)					IC ₅₀ (µg /mL)
	6.25	12.5	25	50	100	
CHCl ₃ extract	24.95±1.1	27.43±3.7	37.04±5.7	86.18±17.6	107.5±2.9	31.76

Table 3.10 α-Glucosidase Inhibition % and IC₅₀ of Chloroform Extract of the Isolated *P. aeruginosa*

Sample	% Inhibition in different concentrations (µg/mL)					IC ₅₀ (µg/mL)
	6.25	12.5	25	50	100	
CHCl ₃ extract	5.62±1.6	24.94±0.7	69.74±0.2	84.26±0.3	98.26±1.5	19.5

3.5.5 Cytotoxicity of chloroform extract of the isolated *P. aeruginosa*

In the determination of the cytotoxicity of chloroform extract of *P. aeruginosa* using brine shrimp (*Artemia salina*) cytotoxicity bioassay, the cytotoxicity of the sample was expressed in term of mean ± SEM (standard error mean) and LD₅₀ (50 % lethality dose). The resultant cytotoxicity of sample at different doses (1000, 100, 10 and 1µg/ mL) is shown in Table 3.11. In this experiment, standard potassium dichromate (K₂Cr₂O₇) and caffeine were chosen because K₂Cr₂O₇ is well-known toxic agent used in this assay and caffeine is a natural product. According to the results of brine shrimp cytotoxicity bioassay, the tested sample has cytotoxic effect with the LD₅₀ value of 1.90 µg/mL and it was observed to be toxic comparable to K₂Cr₂O₇ (LD₅₀ = 1.50 µg/mL).

Table 3.11 Cytotoxicity of Chloroform Extract of the Isolated *P. aeruginosa*

Sample	Dead % in different concentrations (µg/mL) of samples				LD ₅₀ (µg/mL)
	1	10	100	1000	
CHCl ₃ extract	46.66 ± 0.57	80 ± 0.10	90 ± 0.10	100 ± 0.10	1.90
*Caffeine	0±0	0±0	9.58 ± 0.91	12.73 ± 0.41	>1000
* K ₂ Cr ₂ O ₇	48.63 ± 0.19	73.13 ± 0.47	74.67 ± 0.11	100 ± 0.10	1.50

*standard

3.5.6 Antiproliferative activity of chloroform extract of the isolated *P. aeruginosa* against human cancer cell lines

Antiproliferative activity is the activity relating to a substance used to prevent or retard the spread of cells, especially malignant cells, into surrounding tissues. Antiproliferative activity of the sample was studied in *in vitro* against human cancer cell lines. Screening of antiproliferative activities of chloroform extract of *P. aeruginosa* was done against three human cancer cell lines such as A549 (human lung cancer cell line), MCF7 (human breast cancer cell line) and Hela (human cervix cancer cell line). Antiproliferative activity was expressed as the IC₅₀ (50 % inhibitory concentration) value. 5-Fluorouracil was used as positive control. The antiproliferative activity of crude extract is summarized in Table 3.13. It was observed that the chloroform extract has the antiproliferative activity against human lung cell A549 (IC₅₀ = 12.18 µg/mL) comparable to the standard 5-FU (IC₅₀ = 10.2 µg/mL) (Table 3.14). Then, the chloroform extract has the antiproliferative activity against human breast cancer cell MCF7 (IC₅₀ = 49.93 µg/mL) and human cervix cancer cell Hela (IC₅₀ = 16.59 µg/mL) (Table 3.12). However, since the lower the IC₅₀ values, the higher the antiproliferative activity, the chloroform extract was weaker than standard 5-fluorouracil in antiproliferative activity against breast cancer cell (IC₅₀ = 11.5 µg/mL) and human cervix cancer cell (IC₅₀ = 6.93 µg/mL) (Table 3.13).

Table 3.12 Antiproliferative Activity of Chloroform Extract of the Isolated *P. aeruginosa* against Human Lung, Breast and Cervix Cancer Cell Lines

Human cancer cell lines	% Cell survival in different concentrations of chloroform extract				IC ₅₀ (µg/mL)
	10 µg/mL	20 µg/mL	100 µg/mL	200 µg/mL	
A549	55.90± 0.2	47.91 ±0.1	37.01 ± 0.5	35.20± 0.7	12.18
MCF7	78.01± 0.5	63.03 ± 0.2	45.33 ± 0.6	43.12±0.1	49.93
Hela	65.22 ± 0.6	45.32 ± 0.5	35.62 ± 0.2	37.15 ± 0.7	16.59

A549 =Human lung cancer cell line, MCF7=Human breast cancer cell line, Hela=Human cervix cancer cell line

Table 3.13 Antiproliferative Activity of the Standard 5-Fluorouracil against Human Lung, Breast and Cervix Cancer Cell Lines

Human cancer lines	% Cell survival in different concentrations of 5-fluorouracil					IC ₅₀ (µg/mL)
	2 µg/mL	10 µg/mL	20 µg/mL	100 µg/mL	200 µg/mL	
A549	86.23±0.3	65.12±0.2	44.21±0.5	30.33±0.3	33.01±0.2	10.2
MCF7	78.32±0.2	61.94±0.8	37.22±0.7	10.29±1.0	8.42± 0.2	11.5
Hela	68.13±0.5	48.20±1.0	47.08±0.7	39.53±0.5	27.58±0.3	6.93

3.5.7 Antiproliferative activity of the isolated compounds against human breast cancer MCF7 cells

In the screening of antiproliferative activity of the isolated compounds (**1** to **5**) against MCF7 (human breast cancer cell line), it was expressed as the IC₅₀ (50 % inhibitory concentration)

value, and 5-fluorouracil was used as positive control. The results are summarized in Table 3.14. All of the five isolated compounds were observed to possess the antiproliferative activity against MCF7 with the IC_{50} of 14.12 $\mu\text{g/mL}$ for 1-hydroxyphenazine (**1**), 14.91 $\mu\text{g/mL}$ for phenazine-1-carboxylic acid (**2**), 176.46 $\mu\text{g/mL}$ for cyclo (L-Leu-L-Pro (**3**), 87.72 $\mu\text{g/mL}$ for cyclo(D-Pro-D-Leu) (**4**) and 196.54 $\mu\text{g/mL}$ for cyclo(D-Pro-L-Val) (**5**). Therefore, the both of phenazines compounds (**1** and **2**) were found to possess similar activity and both had higher antiproliferative potency than the three cyclopeptides (**3**, **4** and **5**). However, since the lower the IC_{50} values, the higher the antiproliferative activity, in antiproliferative activity, all isolated compounds were observed to be weaker than standard 5-fluorouracil ($IC_{50} = 11.5 \mu\text{g/mL}$) in antiproliferative activity against MCF7 cell.

Table 3.14 Antiproliferative Activity of the Isolated Compounds against Human Breast Cancer Cell MCF7

Isolated compounds	% Cell survival in different concentrations of each sample				IC_{50} ($\mu\text{g/mL}$)
	10 $\mu\text{g/mL}$	20 $\mu\text{g/mL}$	100 $\mu\text{g/mL}$	200 $\mu\text{g/mL}$	
1	51.94 \pm 2.40	47.22 \pm 1.77	10.29 \pm 0.07	9.13 \pm 0.14	14.1
2	74.86 \pm 0.64	45.55 \pm 1.20	13.49 \pm 0.07	12.81 \pm 0.35	15.0
3	87.97 \pm 0.49	77.66 \pm 7.92	66.50 \pm 0.71	44.93 \pm 0.57	176.4
4	78.97 \pm 1.48	59.90 \pm 3.11	48.21 \pm 0.99	44.64 \pm 0.64	87.7
5	102.90 \pm 3.39	94.28 \pm 6.28	67.20 \pm 9.97	49.38 \pm 1.27	196.5
*5-Fluorouracil	61.94 \pm 0.8	37.22 \pm 0.7	10.29 \pm 1.0	8.42 \pm 0.2	11.5

1 = 1-hydroxyphenazine, **2** = phenazine-1-carboxylic acid, **3** = cyclo(L-Leu-L-Pro)

4 = cyclo(D-Pro-D-Leu), **5** = cyclo (D-Pro-L- Val) * standard

4. Conclusion

From the overall assessment of the present work concerning with the investigation of chemicals and biological activities of *P. aeruginosa* bacteria isolated from clinical soil, the following inferences could be deduced.

The *P. aeruginosa* was characterized and identified by microscopic examination, biochemical tests and DNA sequencing technique. In DNA sequencing technique used for the molecular confirmation of isolated *P.aeruginosa* bacterial strain, 16S rRNA was amplified using universal primers and produced an amplified product of 1500 bp and sequenced using similar primers. The DNA sequence was compared with NCBI gene bank database using BLAST algorithm. The result showed a high similarity (99-100) % homology of the search sequence with *P. aeruginosa* strain S 04.

After the isolated *P. aeruginosa* was cultured on nutrient broth medium in a large scale, chloroform extract was prepared from the bacterial culture. It was then applied to investigate the chemical constituents and some biological activities. The chloroform extract of *P. aeruginosa* was observed to possess various secondary metabolites such as alkaloids, α -amino acids,

carbohydrates, flavonoids, phenolic compounds, steroids and terpenoids. It was also found to contain 50.64 ± 1.5 mg GAE/g of total phenol, 24.70 ± 2.2 mg QE/g of total flavonoid, 50.43 ± 4.0 mg CE/g of total steroid, 4.43 ± 0.8 mg BSAE/g of protein and 28.4 ± 0.5 mg GE/g of carbohydrate. From the chloroform extract of *P. aeruginosa*, five compounds: two phenazines: 1-hydroxyphenazine (**1**, 0.24 %, m.pt 152-157°C) and phenazine-1-carboxylic acid (**2**, 0.7 %, m.pt 240-246 °C), and three diketopiperazines: cyclo(L-Leu-L-Pro) (**3**, 0.34 %, m.pt 164-164 °C), cyclo(D-Pro-D-Leu) (**4**, 0.09 %) and cyclo(D-Pro-L-Val) (**5**, 0.18 %) were isolated using the chromatographic separation technique. The isolated compounds were structurally elucidated using ^1H NMR, ^{13}C NMR, ^1H - ^1H COSY, HSQC, HMBC, ROESY spectroscopic and MS spectrometric methods and also by comparing with their reported data.

The chloroform extract of *P. aeruginosa* was found to be high in antimicrobial activity against all tested microorganisms with the inhibition zone diameter ranged between 20 ~ 40 mm against *B. subtilis*, *S. aueru*, *P. aeruginosa*, *B. pumilus*, *C. albicans*, *E. coli* and *A. tumefacines*. It may be due to the presence of the flavonoids and phenols. The isolated compounds (1 to 5) showed mild antimicrobial activities against all of the tested microorganisms. The chloroform extract of *P. aeruginosa* was found not to be a good antioxidant due to its high IC_{50} values ($\text{IC}_{50} = 128.6$ $\mu\text{g/mL}$ in DPPH free radical scavenging activity and $\text{IC}_{50} = 248.16$ $\mu\text{g/mL}$ in ferric reducing power). Since the chloroform extract of *P. aeruginosa* inhibited α -amylase ($\text{IC}_{50} = 31.76$ $\mu\text{g/mL}$) and α -glucosidase ($\text{IC}_{50} = 19.5$ $\mu\text{g/mL}$) enzymes, it could be inferred that the chloroform extract possessed the antidiabetic potency.

According to the results of brine shrimp cytotoxicity bioassay, it was observed that the chloroform extract of *P. aeruginosa* has very high cytotoxic effect with the LD_{50} value of 1.90 $\mu\text{g/mL}$ indicating that the chloroform extract may have high potency of anticancer property. It was also found that the chloroform extract has high antiproliferative activity against human lung cancer cell A549 ($\text{IC}_{50} = 12.18$ $\mu\text{g/mL}$), comparable to the standard 5-fluorouracil ($\text{IC}_{50} = 10.2$ $\mu\text{g/mL}$) followed the antiproliferative activity against human cervix cancer Hela ($\text{IC}_{50} = 16.59$ $\mu\text{g/mL}$) and human breast cancer MCF7 ($\text{IC}_{50} = 49.93$ $\mu\text{g/mL}$). However, the chloroform extract was weaker than standard 5-fluorouracil in antiproliferative activity. Among five isolated compounds, 1-hydroxyphenazine (**1**, $\text{IC}_{50} = 14.12$ $\mu\text{g/mL}$) and phenazine-1-carboxylic acid (**2**, $\text{IC}_{50} = 14.91$ $\mu\text{g/mL}$) were found to possess good antiproliferative activity against human breast cancer cell MCF7 whereas cyclo(L-Leu-L-Pro) (**3**, $\text{IC}_{50} = 176.46$ $\mu\text{g/mL}$), cyclo(D-Pro-D-Leu) (**4**, $\text{IC}_{50} = 87.72$ $\mu\text{g/mL}$) and cyclo(D-Pro-L-Val) (**5**, $\text{IC}_{50} = 196.54$ $\mu\text{g/mL}$) have mild activity.

In conclusion, from the present work, it can be inferred that the chloroform extract of *P. aeruginosa* and the isolated compounds especially 1-hydroxyphenazine (**1**) and phenazine-1-carboxylic acid (**2**) may be useful in the formulation of antibacterial and antifungal agents for the treatment of the diseases infected by the tested microorganisms. In addition, it could be revealed that the chloroform extract of *P. aeruginosa* possessed good antiproliferative activity against human lung cancer cell and humn cervix cancer cell, and the isolated compounds: 1-hydroxyphenazine (**1**) and phenazine-1-carboxylic acid (**2**) possessed good activity against human breast cancer cell MCF7 and they may be useful as anticancer agents. Hence, it is expected that the finding of this research work will contribute to the development of antimicrobial agents and

anticancer agents from the source of soil microorganism *P. aeruginosa*. The present report is a new one concerned with the evaluation of bioactive natural products from microorganisms.

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**AN INVESTIGATION INTO THE IMPACT OF
CONTEXTUALIZED INSTRUCTION IN LEARNING PHYSICS
AT THE HIGH SCHOOL LEVEL IN MYANMAR**

- 1. Abstract**
- 2. Introduction**
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Acknowledgements

References

(၂-၇) AN INVESTIGATION INTO THE IMPACT OF CONTEXTUALIZED INSTRUCTION IN LEARNING PHYSICS AT THE HIGH SCHOOL LEVEL IN MYANMAR

Su Mon Aung*

Abstract

The main purpose of this study is to investigate the impact of contextualized instruction on students' achievement in learning high school physics in Myanmar. The research design adopted had been the explanatory sequential mixed methods design (QUAN→qual design). For the quantitative study, nonequivalent control group design was used. To follow up on quantitative results, descriptive case study and purposive sampling were used. The research instruments viz. were pretest, posttest, materials including unit plans and lesson plans, classroom observational guide, attitude questionnaires and interview guide were used. By using the simple random sampling method, four basic education high schools from Yangon Region were selected. In quantitative research findings, the findings of physics achievement on conceptual understanding, physics process skills and overall physics achievement showed that experimental groups who received contextualized instruction with the proposed instructional design were significantly higher than the control groups who did not. Then, there was a strong relationship between students' overall physics achievement and their attitudes towards contextualized instruction. The predicting factors were experience, preference and academic value. In addition, there was a strong relationship between students' overall physics achievement and their attitudes towards the proposed instructional design of contextualized instruction. The predicting factors were interpersonal skills, conceptual understanding and physics process skills. Moreover, there was also a strong relationship between students' overall physics achievement and their attitudes towards the impact of contextualized instruction. The predicting factors were students' attitudes towards the instructional materials, evaluation system and classroom environment. Concerning qualitative research findings, the results revealed that teachers and students preferred, well performed and are willing to apply the proposed instructional design of contextualized instruction. Therefore, the research findings proved that the proposed instructional design of contextualized instruction contributes to a positive impact on high school physics teaching and learning in Myanmar.

Keywords: Contextualize, Instruction, Design, Instructional Design, Contextualized Instruction, Physics

Introduction

In building a modern developed nation, science education is also essential for Myanmar. The most important objective of school science instruction, especially in physics instruction, is to make the pupils aware of the scientific methods of procedure and to inculcate scientific attitude of mind. The science teacher should always encourage an attitude of discovery. With the careful consideration of the great importance of physics in the national development, which coincide with one of the objectives of physics teaching in Myanmar by the Ministry of Education, to know and understand the application of the basic knowledge and skills of physics to daily-life phenomena and national production and efforts being made by government, it is construed that contextualized instruction will help in making the laudable objectives and those efforts feasible. According to Schell (2001), when students view their lessons as authentically contextualized, they may become

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engaged at a deeper level and provided the teacher is to be an effective facilitator. Therefore, the main intention of this study is to develop an effective contextualized instruction which involves placing physics material within a real-life context in an effort to improve students' conceptual understanding, physics process skills and overall physics achievement.

Objectives of the Research

1. To develop an instructional design for contextualized instruction for the improvement of teaching and learning physics.
2. To compare the physics achievement of high school students who receive through contextualized instruction with those who do not receive it.
3. To investigate the impact of contextualized instruction on teaching and learning physics.
4. To make suggestions and recommendations based on the research results for the improvement of teaching and learning physics.

Research Questions

1. Are there any significant differences in physics achievement on conceptual understanding of the students who received contextualized instruction and those who did not?
2. Are there any significant differences in physics achievement on physics process skills of the students who received contextualized instruction and those who did not?
3. Are there any significant differences in overall physics achievement of the students who received contextualized instruction and those who did not?
4. Is there a difference in overall physics achievement among school 1, school 2, school 3 and school 4?
5. Are there any significant relationships between students' overall physics achievement and their attitudes towards contextualized instruction?
6. Do students' attitudes towards contextualized instruction: experience, preference and academic value predict overall physics achievement?
7. Are there any significant relationships between students' overall physics achievement and their attitudes towards the proposed instructional design of contextualized instruction?
8. Do students' attitudes towards the proposed instructional design of contextualized instruction: interpersonal skills, conceptual understanding and physics process skills predict overall physics achievement?
9. Are there any significant relationships between students' overall physics achievement and their attitudes towards the impact of contextualized instruction?
10. Do students' attitudes towards the impact of contextualized instruction: instructional materials, evaluation system and classroom environment predict overall physics achievement?

Statement of the Problem

Most of the physics classrooms in Myanmar, teachers explain the equation first and then explaining the meaning of the equation, instead of explaining the phenomenon than trying to formulate them into the laws of physics. This routine problem tasks and the traditional evaluation cause students to have a low ability in problem solving skills. This research is constructed to fill this gap. Students' conceptual understanding in physics would be incomplete without having mathematical problem solving skills. However, if the students view understanding physics as applying formulae to solve problems, little will be gained in terms of conceptual understanding. Therefore, this study attempts to develop an instructional design to cultivate the students' problem solving attitude of mind and scientific inquiry skills instead of merely transmitting information to them. In addition, all the students have misconceptions about physics. They acquired many of the physics concepts early in life by inadequate observation and false assumptions that do not reflect reality. Therefore, in conducting this study, physics concepts, laws and facts are taught by using contextualized practical activities with the help of contextualized worksheets and workbook to overcome these misconceptions in physics.

The analysis of the study content of high school physics in Myanmar shows that syllabi are quite dense and overloaded with many topics. At the end of the lessons, the teachers can only give problems to solve and homework assignments. As a result, the quality of physics teaching, in particular, its practical, experimental component, dramatically decreased and the students fail to see the inter-dependent relationship that exists between the academic contents of physics subjects offered in school and their applicability in real life. Consequently, there is low transfer of what is learned in the school to the real-world. This is the gap that this study is construed to fill. Finally, in order to implement the objectives of teaching physics in Myanmar, this study mainly emphasizes the experiencing contextualized activities for the students not only in the classroom but also in the laboratory. Therefore, this study would be beneficial to both high school physics teachers and physics students as this study would provide an instructional design for contextualized instruction by which students are prepared to develop the 21st century skills for learning.

Definitions of the Key Terms

Contextualize: Contextualize means to consider something in relation to the situation in which it happens or exists (Hornby, 2015).

Instruction: Instruction is the intentional facilitation of learning towards identified learning goals (Smith & Ragan, 1990).

Design: The term design means a systematic or intensive planning and ideation process prior to the development of something or the execution of some plan in order to solve a problem (Smith & Ragan, 1990).

Instructional Design: Instructional design is defined as the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation (Smith & Ragan, 1990).

Contextualized Instruction: Contextualized instruction is a way to introduce content using a variety of active learning techniques designed to help students connect what they already know to

what they are expected to learn, and to construct new knowledge from the analysis and synthesis of this learning process (Hudson & Whisler, 2007).

Physics: Physics is defined as the scientific study of matter and energy and the relationships between them, including the study of forces, heat, light, sound, electricity and the structure of atoms (Hornby, 2015).

Scope of the Study

The first phase of this study (quantitative study) is limited to Grade Ten physics students and senior physics teachers from the selected schools in Yangon Region during the academic year 2019-2020. The second phase of the study (qualitative study) is limited to Grade Ten physics students and senior physics teachers from the selected schools in which senior physics teachers' teaching learning activities are linked with contextualized instruction. It is also limited to the content areas of describing motion, forces, work and energy, heat, temperature and measurement of heat from Grade Ten Physics textbook prescribed by the Basic Education Curriculum, Syllabus and Textbook Committee, 2019.

Review of Related Literature

Philosophical Considerations: Firstly, in developing an instructional design for contextualized instruction, pragmatism, progressivism, constructivism and contextualism are deeply taken into philosophical considerations.

Learning Theories: As the second part of theoretical considerations, Kohler's learning theory, Piaget's cognitive learning theory, Vygotsky's socio-cultural learning theory, Bruner's concept formation and Ausubel's learning theory are also taken into considerations in developing an instructional design for contextualized instruction.

Psychological Theories: As the third part of theoretical considerations, motivation theory, Kolb's learning styles and brain research are also essential in developing an instructional design for contextualized instruction.

Background Teaching Models: There are four background teaching models that supposed the proposed instructional design of contextualized instruction. They are Glaser's basic teaching model, Khin Zaw's multimodal model, Landa's algorithmic model and Roth's conceptual change instructional model.

Developing an Instructional Design of Contextualized Instruction

Based on the conceptual framework and theoretical considerations, the proposed instructional design of contextualized instruction is developed as in the following Figure 1.

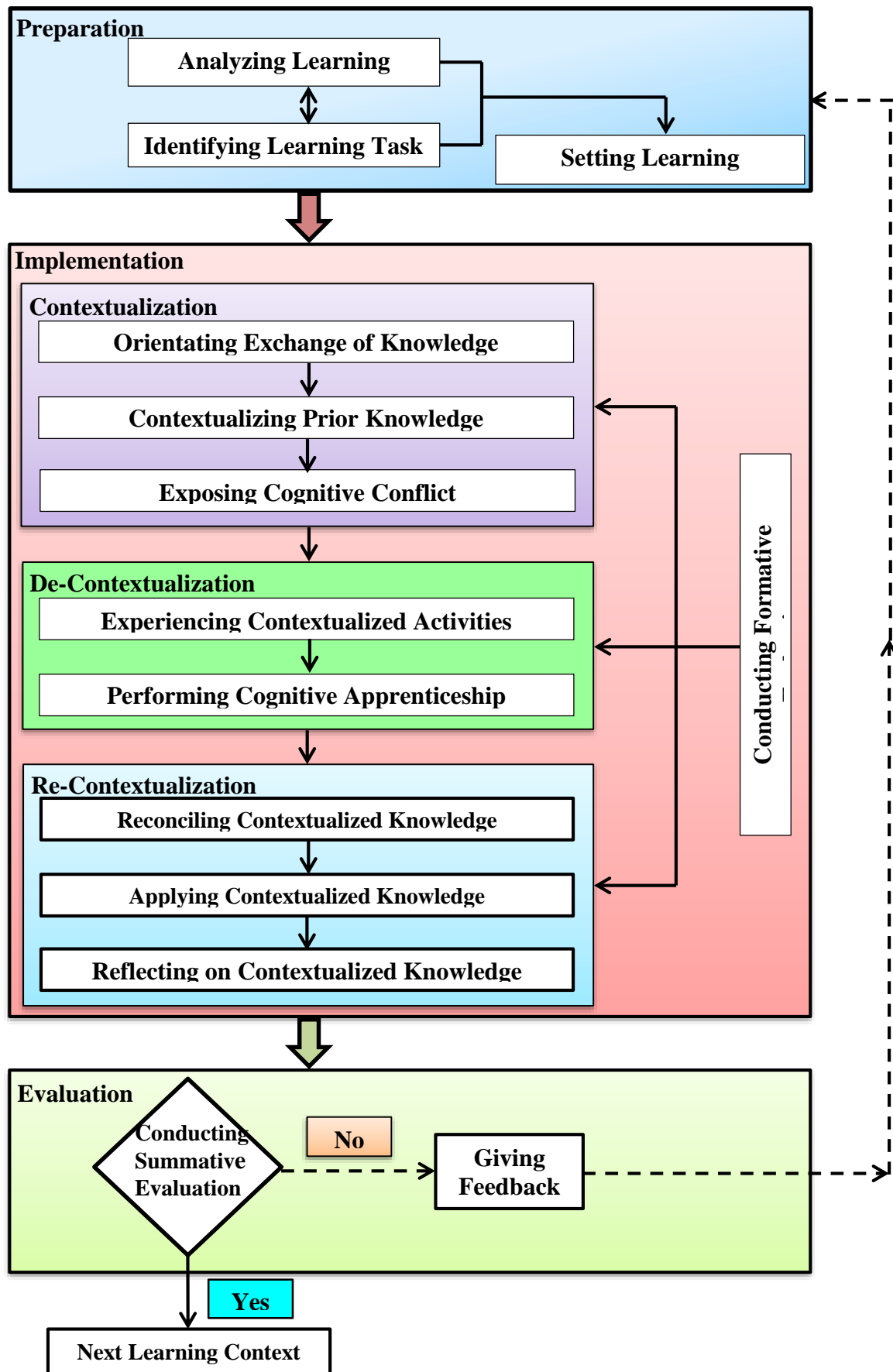


Figure 1 Proposed Instructional Design of Contextualized Instruction

Research Method

Research Design. This study adopted a mixed methods design. Specifically, the explanatory sequential mixed methods design (QUAN→qual design) was employed for this study.

Quantitative Research Design. In this study, random assignment of participants to experimental and control groups is prohibited. Therefore, one of the quasi-experimental designs, nonequivalent group pretest-posttest control and comparison group design was used.

Population and Sample Size for Quantitative Research. By using simple random sampling, the population and sample size for the quantitative study are as follows.

Table 1 Population and Sample Size for Selected Schools (Quantitative Study)

Region	District	Township	School	No. of Population	No. of Sample
Yangon	East	South Okkalapa	No. (1) BEHS South Okkalapa	205	105
	West	Hlaing	No. (1) BEHS Hlaing	172	101
	North	Dala	No. (1) BEHS Dala	310	115
	South	Mingaladon	No. (12) BEHS (Branch) Mingaladon	100	100
	Total			787	421

Quantitative Research Instruments. The research instruments used in collecting data for quantitative study were pretest, posttest and physics process skills test and materials including unit plans, lesson plans and contextualized workbook.

Analysis of Quantitative Data. In this study, hypothesis testing was conducted by using statistical tests namely, one-way analysis of variance (ANOVA), one-way analysis of covariance (ANCOVA), Pearson product moment correlation and multiple regression.

Qualitative Research Design. In this study, since face-to-face techniques were intended to use to collect data from participants, interactive designs were adopted. Specifically, case study method which is one of the interactive qualitative designs was used to follow up on quantitative results.

Population and Sample Size for Qualitative Research. By using purposive sampling, the population and sample size of the qualitative study was four physics teachers and 210 physics students from experimental groups.

Qualitative Research Instruments. A combination of data collection techniques **P** interviews, questionnaires surveys and observation **P**was used to collect qualitative data.

Analysis of Qualitative Data. In this study, thematic analysis was conducted by using the interview data and note taking documents.

Research Findings

Quantitative Research Findings of Physics Achievement on Conceptual Understanding

In an attempt to answer the first research question, one-way analysis of covariance (ANCOVA) was used to analyze the data from posttest.

Table 2 Results of Pretest Scores on Conceptual Understanding in Four Schools

School	Group	N	M	SD	MD	F	p
S1	Experimental	53	13.0	3.11	1.75	9.743	.002**
	Control	52	11.25	2.61			
S2	Experimental	50	17.10	3.82	-.21	.092	.762 (ns)
	Control	51	17.31	3.22			
S3	Experimental	57	11.49	2.97	.20	.120	.729 (ns)
	Control	58	11.29	3.14			
S4	Experimental	50	14.90	3.62	-.06	.007	.934 (ns)
	Control	50	14.96	3.57			

Note. S1 = No. (1) Basic Education High School, South Okkalapa; S2 = No. (1) Basic Education High School, Hlaing; S3 = No. (1) Basic Education High School, Dala; S4 = No. (12) Basic Education High School (Branch), Mingaladon. ns = not significant. ** $p < .01$.

Analysis of the Posttest Scores on Conceptual Understanding in S1. The following Table 3 shows the analysis of covariance results for posttest scores in S1.

Table 3 Analysis of Covariance (ANCOVA) Results for Posttest Scores in S1

Level	Group	N	M	SD	MD	F	p
Knowledge	Experimental	53	2.66	.99	0.33	3.38	.069 (ns)
	Control	52	2.33	1.04			
Comprehension	Experimental	53	10.02	3.07	1.64	7.39	.008**
	Control	52	8.38	3.08			
Application	Experimental	53	10.85	1.09	1.77	38.59	.000***
	Control	52	9.08	1.77			
Analysis	Experimental	53	3.85	.79	1.96	176.63	.000***
	Control	52	1.88	.68			
Synthesis	Experimental	53	3.68	.85	1.93	151.51	.000***
	Control	52	1.75	.74			
Evaluation	Experimental	53	3.45	.97	1.57	70.41	.000***
	Control	52	1.88	.86			
Total	Experimental	53	35.60	3.29	10.29	195.23	.000***
	Control	52	25.31	4.24			

Note. ns = not significant ** $p < .01$. *** $p < .001$.

As described in Table 3, it can be interpreted that the formal instruction could improve the knowledge level posttest scores like contextualized instruction in S1. But at the comprehension, application, analysis, synthesis and evaluation level questions, there was a significant difference

between the experimental group and the control group. Therefore, it can be interpreted that the use of contextualized instruction with the proposed instructional design had a significant effect on students' physics achievement in S1.

Analysis of the Posttest Scores on Conceptual Understanding in S2. The following Table 4 describes the analysis of covariance results for posttest scores in S2.

Table 4 Analysis of Covariance (ANCOVA) Results for Posttest Scores in S2

Level	Group	N	M	SD	MD	F	p
Knowledge	Experimental	50	3.22	.86	.32	4.29	.061 (ns)
	Control	51	2.90	.64			
Comprehension	Experimental	50	11.10	1.27	.65	8.07	.005**
	Control	51	10.45	.923			
Application	Experimental	50	11.72	1.18	3.21	137.36	.000***
	Control	51	8.51	1.52			
Analysis	Experimental	50	3.94	.84	2.31	222.28	.000***
	Control	51	1.63	.66			
Synthesis	Experimental	50	3.66	.82	1.69	79.10	.000***
	Control	51	1.97	1.06			
Evaluation	Experimental	50	3.90	.84	1.98	104.65	.000***
	Control	51	1.92	.94			
Total	Experimental	50	37.59	2.73	10.17	375.26	.000***
	Control	51	27.37	2.54			

Note. ns = not significant. ** $p < .01$. *** $p < .001$.

According to the results from Table 4, it can be interpreted that the formal instruction could improve the knowledge level posttest scores like contextualized instruction in S2. For the comprehension, application, analysis, synthesis and evaluation level questions, there was a significant difference between the experimental group and the control group. Therefore, it can be interpreted that the use of contextualized instruction with the proposed instructional design had a significant effect on students' physics achievement in S2.

Analysis of the Posttest Scores on Conceptual Understanding in S3. The following Table 5 shows the analysis of covariance results for posttest scores in S3.

Table 5 Analysis of Covariance (ANCOVA) Results for Posttest Scores in S3

Level	Group	N	M	SD	MD	F	p
Knowledge	Experimental	57	3.02	.95	.42	5.97	.016*
	Control	58	2.60	.88			
Comprehension	Experimental	57	10.00	1.46	.91	8.60	.004**
	Control	58	9.09	1.86			
Application	Experimental	57	10.16	2.86	4.07	61.77	.000***
	Control	58	6.09	2.67			
Analysis	Experimental	57	3.44	.14	1.41	64.43	.000***

Level	Group	N	M	SD	MD	F	p
Synthesis	Control	58	2.03	.12	1.77	93.24	.000***
	Experimental	57	3.82	.93			
Evaluation	Control	58	2.05	1.03	2.00	167.89	.000***
	Experimental	57	4.02	.77			
Total	Control	58	23.81	4.70	10.65	185.16	.000***
	Experimental	57	34.46	3.54			

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Comparison of the posttest mean scores of the experimental and control groups using one-way ANCOVA showed that there was a significant difference between the performances of the two groups at the knowledge, comprehension, application, analysis, synthesis and evaluation level questions. Therefore, it can be interpreted that the use of contextualized instruction with the proposed instructional design had a significant effect on students' physics achievement in S3.

Analysis of the Posttest Scores on Conceptual Understanding in S4. The following Table 6 shows the analysis of covariance results for posttest scores in S4.

Table 6 Analysis of Covariance (ANCOVA) Results for Posttest Scores in S4

Level	Group	N	M	SD	MD	F	p
Knowledge	Experimental	50	2.02	.89	.38	5.96	.063 (ns)
	Control	50	1.64	.63			
Comprehension	Experimental	50	9.96	1.41	1.06	10.26	.002**
	Control	50	8.90	1.85			
Application	Experimental	50	10.32	2.51	5.32	109.64	.000***
	Control	50	5.00	2.60			
Analysis	Experimental	50	3.18	.98	1.42	69.45	.000***
	Control	50	1.76	.69			
Synthesis	Experimental	50	3.12	.92	1.30	49.60	.000***
	Control	50	1.82	.92			
Evaluation	Experimental	50	3.52	1.05	1.82	110.20	.000***
	Control	50	1.70	.61			
Total	Experimental	50	32.12	3.69	11.30	211.85	.000***
	Control	50	20.82	4.11			

Note. ns = not significant. ** $p < .01$. *** $p < .001$.

The results in Table 6 showed that there was a significant difference between the experimental and the control groups for the comprehension, application, analysis, synthesis and

evaluation level questions except at the knowledge level questions. Therefore, the use of contextualized instruction with the proposed instructional design had a significant effect on students' physics achievement in S4.

Quantitative Findings for Physics Achievement on Physics Process Skills

The second part of the quantitative research findings seek to answer the second research question by using one-way ANCOVA to analyze the data from posttest scores on physics process skills.

Table 7 Results of Pretest Scores on Physics Process Skills in Four Schools

School	Group	N	M	SD	MD	F	p
S1	Experimental	53	20.21	3.57	1.82	6.61	.012*
	Control	52	18.29	4.07			
S2	Experimental	50	19.48	3.86	-.56	.615	.435 (ns)
	Control	51	20.04	3.27			
S3	Experimental	57	19.46	3.78	.16	.047	.828 (ns)
	Control	58	19.29	4.23			
S4	Experimental	50	19.50	3.44	.18	.058	.810 (ns)
	Control	50	19.32	4.01			

Note. S1 = No. (1) Basic Education High School, South Okkalapa; S2 = No. (1) Basic Education High School, Hlaing; S3 = No. (1) Basic Education High School, Dala; S4 = No. (12) Basic Education High School (Branch), Mingaladon, ns = not significant. * $p < .05$.

In this study, to analyze the data from posttest on physics process skills, one-way ANCOVA was used.

Table 8 Analysis of Covariance (ANCOVA) Results for Posttest Scores on Physics Process Skills in Four Schools

School	Group	N	M	SD	MD	F	p
S1	Experimental	53	30.38	6.24	11.55	105.02	.000***
	Control	52	18.83	5.10			
S2	Experimental	50	35.50	6.27	7.17	31.05	.000***
	Control	51	28.33	6.47			
S3	Experimental	57	35.14	6.16	15.30	211.57	.000***
	Control	58	19.84	5.03			
S4	Experimental	50	30.16	3.85	7.12	52.11	.000***
	Control	50	23.04	5.77			

Note. *** $p < .001$.

When pretest scores on physics process skills was considered as a covariate, it was found that there were significant differences between the experimental and control groups for the posttest scores on process skills at ($p = .001$) level. Therefore, it can be interpreted that the use of contextualized instruction with the proposed instructional design significantly enhanced the

students' ability to conducting the physics experiment, handling of data, computation of results and reporting the physics experiment.

Quantitative Research Findings of Overall Physics Achievement

The quantitative research findings of overall physics achievement seek to answer the third research question by using one-way ANCOVA was used to analyze the data from overall posttest scores.

Table 9 Analysis of Covariance (ANCOVA) Results for Pretest Scores on Overall Physics Achievement in Four Schools

School	Group	N	M	SD	MD	F	p
S1	Experimental	53	33.21	5.05	2.17	5.89	.017**
	Control	52	31.04	4.04			
S2	Experimental	50	36.58	5.85	- .77	.51	.476 (ns)
	Control	51	37.35	4.99			
S3	Experimental	57	30.95	4.74	.36	.15	.699 (ns)
	Control	58	30.59	5.25			
S4	Experimental	50	34.40	5.23	.12	.01	.908 (ns)
	Control	50	34.28	5.11			

Note. S1 = No. (1) Basic Education High School, South Okkalapa; S2 = No. (1) Basic Education High School, Hlaing; S3 = No. (1) Basic Education High School, Dala; S4 = No. (12) Basic Education High School (Branch), Mingaladon. ns = not significant. ** $p < .01$.

The comparison of posttest mean scores on overall physics achievement in the four selected schools is displayed in Table 10.

Table 10 Analysis of Covariance (ANCOVA) Results for Posttest Scores on Overall Physics Achievement in Four Schools

School	Group	N	M	SD	MD	F	p
S1	Experimental	53	62.04	7.96	17.91	140.62	.000***
	Control	52	44.13	6.26			
S2	Experimental	50	72.54	7.28	14.50	105.29	.000***
	Control	51	58.04	6.98			
S3	Experimental	57	66.47	8.05	22.81	301.41	.000***
	Control	58	43.66	5.82			
S4	Experimental	50	57.64	7.81	13.48	84.79	.000***
	Control	50	44.16	6.71			

Note. *** $p < .001$.

According to the results presented in Table 10, it can be interpreted that the use of contextualized instruction with the proposed instruction design significantly enhanced the students' conceptual understanding in physics and physics process skills.

One-Way Analysis of Variance (ANOVA) Results for Overall Physics Achievement among Four Schools. In an attempt to answer the fourth research question, one-way ANOVA was used to determine the significance of contextualized instruction among four schools on overall physics achievement.

Table 11 Analysis of Variance (ANOVA) Result of Posttest Scores on Overall Physics Achievement among Four Schools

		Sum of Squares	df	Mean Square	F	Sig.
Overall Physics Achievement	Between Groups	6120.420	3	2040.140	33.600	.000***
	Within Groups	12508.075	206	60.719		
	Total	18628.495	209			

Note. *** $p < .001$.

The results presented in Table 11 demonstrate that there was a significant difference in the overall physics achievement among four schools. Gravetter and Wallnau (2013) pointed that if the results from ANOVA indicated that at least one of the sample means differs significantly from the others, a post hoc test can be computed. To make more detailed information in which schools performed better than others, the post-hoc test by Tukey HSD method was used.

Table 12 Results of Tukey HSD Multiple Comparisons for Overall Physics Achievement among Four Schools

Categories	(I) School	(J) School	Mean Differences (I – J)	p
Overall Physics Achievement	S1	S2	–10.502*	.000***
		S3	–4.436 *	.017*
		S4	4.398*	.024*
	S2	S1	10.502*	.000***
		S3	6.066*	.000***
		S4	14.900*	.000***
	S3	S1	4.436*	.017*
		S2	–6.066*	.000***
		S4	8.834*	.000***
	S4	S1	–4.398*	.024*
		S2	–14.900*	.000***
		S3	–8.834*	.000***

Note. * $p < .05$. *** $p < .001$.

It can be seen that school 2 performed better than all of the other schools.

Relationship between Overall Physics Achievement and Students' Attitudes towards Contextualized Instruction

In an attempt to answer the fifth research question, Pearson product-moment correlation was used to explore the relationship between overall physics achievement and students' attitudes towards contextualized instruction.

Table 13 Correlation between Overall Physics Achievement and Students' Attitudes towards Contextualized Instruction

Variables	Overall Physics Achievement	Experience	Preference	Academic Value
Overall Physics Achievement	1	.643**	.693**	.558**
Experience		1	.683**	.507**
Preference			1	.622**
Academic Value				1

Note. ** Correlation is significant at the 0.01 level (2 – tailed).

Using the Pearson-product moment correlation from Table 13, a strong statistically significant correlation was found between overall physics achievement and preference and experience towards contextualized instruction. And there was a moderate correlation between overall physics achievement and academic value towards contextualized instruction. Therefore, it can be interpreted that the stronger the students' attitudes towards the contextualized instruction were received, the higher the overall physics achievement.

Regression Analysis of Predictions of Students' Attitudes towards Contextualized Instruction for Overall Physics Achievement

In an attempt to answer the sixth research question, multiple regression analysis was used to see what impact multiple variables have on an outcome.

Table 14 Regression Analysis Summary for the Variables from Students' Attitudes towards Contextualized Instruction Predicting Overall Physics Achievement

Variables	<i>B</i>	<i>β</i>	<i>t</i>	<i>R</i>	<i>R</i> ²	<i>Adj R</i> ²	<i>F</i>
Overall Physics Achievement	32.364		13.166***	.742	.551	.545	84.333***
Predictor Variables							
Experience	.852	.291	4.510***				
Preference	.758	.390	5.478***				
Academic Value	.504	.168	2.792***				

Note. Constant = Dependent variable: Overall Physics Achievement, *** $p < .001$.

From the above table, the best predictor was preference towards contextualized instruction ($\beta = .390^{***}$, $p < .001$). Then, the second predictor was experience ($\beta = .291^{***}$, $p < .001$) and the last predictor was academic value ($\beta = .168^{***}$, $p < .05$). Based on these regression findings for experience, preference and academic value towards contextualized instruction predicting overall physics achievement, the regression equation can be defined as follows:

$$PA = 32.364 + .853 X1 + .758 X2 + .504 X3$$

Where: PA = Overall Physics Achievement

X1 = Experience

X2 = Preference

X3 = Academic Value

The multiple regression model of predicting students' attitudes towards contextualized instruction for overall physics achievement obtained from applying regression analysis was shown in Figure 2.

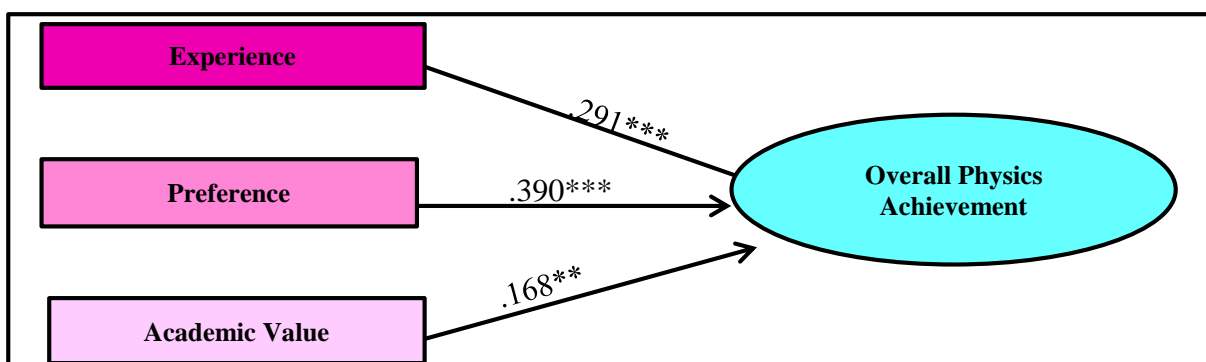


Figure 2 Multiple Regression Model of Predicting Students' Attitudes towards Contextualized Instruction for Overall Physics Achievement

Relationship between Overall Physics Achievement and Students' Attitudes towards the Proposed Instructional Design of Contextualized Instruction. In an attempt to answer the seventh research question, Pearson product-moment correlation was used.

Table 15 Correlation between Overall Physics Achievement and Students' Attitudes towards the Proposed Instructional Design of Contextualized Instruction

Variables	Overall Physics Achievement	Interpersonal Skills	Conceptual Understanding	Physics Process Skills
Overall Physics Achievement	1	.770**	.757**	.747**
Interpersonal Skills		1	.754**	.754**
Conceptual Understanding			1	.750**
Physics Process Skills				1

Note. ** Correlation is significant at the 0.01 level (2 – tailed).

According to the strength of correlation stated by Gay, Mills and Airasian (2012), a strong statistically significant correlation was found between overall physics achievement and the students' attitudes towards the proposed instructional design of contextualized instruction. Therefore, it can be interpreted that students who possessed the interpersonal skills, conceptual understanding and physics process skills through contextualized instruction tended to have the best overall physics achievement.

Regression Analysis of Predictions of Students' Attitudes towards the Proposed Instructional Design of Contextualized Instruction for Overall Physics Achievement. In an attempt to answer the eighth research question, multiple regression analysis was used to see what impact multiple variables have on an outcome.

Table 16 Regression Analysis Summary for the Variables from Students' Attitudes towards the Proposed Instructional Design of Contextualized Instruction Predicting Overall Physics Achievement

Variables	<i>B</i>	β	<i>t</i>	<i>R</i>	<i>R</i> ²	<i>Adj R</i> ²	<i>F</i>
Overall Physics Achievement	8.371		2.650***	.830	.689	.684	152.128***
Predictor Variables							
Interpersonal Skills	1.418	.348	5.299***				
Conceptual Understanding	1.274	.299	4.592***				
Physics Process Skills	.808	.261	3.998***				

Note. Constant = Dependent variable: Overall Physics Achievement, *** $p < .001$.

In regression analysis summary, beta column (β) indicated that the best predictor was interpersonal skills ($\beta=.348***$, $p < .001$). Then, the second predictor was conceptual understanding ($\beta = .299***$, $p < .001$) and the last predictor was physics process skills ($\beta = .261***$, $p < .05$). Based on these regression findings for interpersonal skills, conceptual understanding and physics process skills towards the proposed instructional design of contextualized instruction predicting overall physics achievement, the regression equation can be defined as follows:

$$PA = 8.371 + .1.418 X_1 + 1.274 X_2 + .808 X_3$$

Where: PA = Overall Physics Achievement

X_1 = Interpersonal Skills

X_2 = Conceptual Understanding

X_3 = Physics Process Skills

The multiple regression model was shown in Figure 3.

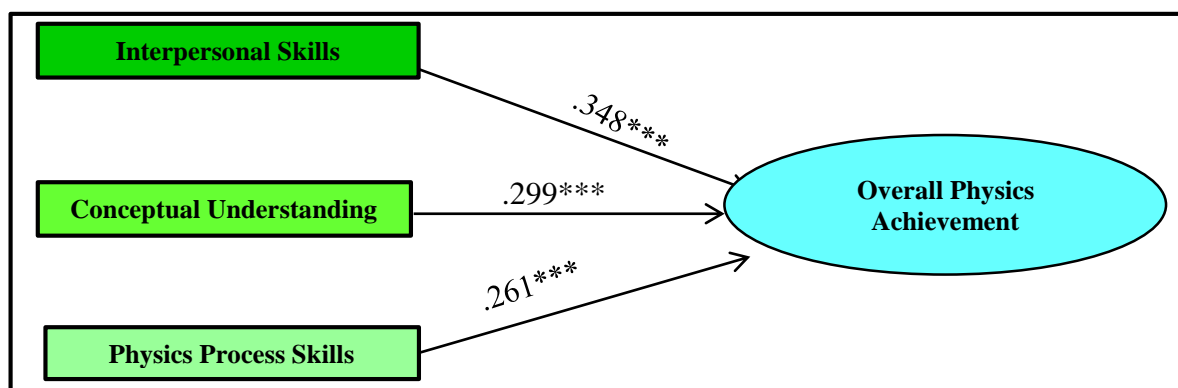


Figure 3 Multiple Regression Model of Predicting Students' Attitudes towards the Proposed Instructional Design of Contextualized Instruction for Overall Physics Achievement

Relationship between Overall Physics Achievement and Students' Attitudes towards the Impact of Contextualized Instruction

In an attempt to answer the ninth research question, Pearson product-moment correlation was used.

Table 17 Correlation between Overall Physics Achievement and Students' Attitudes towards the Impact of Contextualized Instruction

Variables	Overall Physics Achievement	Instructional Materials	Evaluation System	Classroom Environment
Overall Physics Achievement	1	.596**	.551**	.479**
Instructional Materials		1	.600**	.524**
Evaluation System			1	.383**
Classroom Environment				1

Note. ** Correlation is significant at the 0.01 level (2 – tailed).

According to the strength of correlation stated by Gay, Mills and Airasian (2012), a moderate correlation was found between overall physics achievement and instructional materials, classroom environment and evaluation system towards contextualized instruction. Therefore, it can be interpreted that the stronger the students' attitudes towards the impact of contextualized instruction were received, the higher the overall physics achievement.

Regression Analysis of Predictions of Students' Attitudes towards the Impact of Contextualized Instruction for Overall Physics Achievement

In an attempt to answer the tenth research question, multiple regression analysis was used to see what impact multiple variables have on an outcome.

Table 18 Regression Analysis Summary for the Variables from Students' Attitudes towards the Impact of Contextualized Instruction Predicting Overall Physics Achievement

Variables	<i>B</i>	β	<i>t</i>	<i>R</i>	<i>R</i> ²	<i>Adj R</i> ²	<i>F</i>
Overall Physics Achievement	25.778		7.456***	.666	.443	435	54.644***
Predictor Variables							
Instructional Materials	.641	.321	4.529***				
Evaluation System	.807	.281	4.297***				
Classroom Environment	.607	.203	3.308**				

Note. Constant = Dependent variable: Overall Physics Achievement, *** $p < .001$.

As depicted in the table of regression analysis summary, the best predictor was instructional materials towards contextualized instruction ($\beta = .321^{***}$, $p < .001$). Then, the second predictor was evaluation system ($\beta = .281^{***}$, $p < .001$) and the last predictor was classroom environment ($\beta = .203^{**}$, $p < .05$). Based on these regression findings for instructional materials, evaluation system and classroom environment predicting overall physics achievement, the regression equation can be defined as follows:

$$PA = 25.778 + .641 X_1 + .807 X_2 + .607 X_3$$

Where: PA = Overall Physics Achievement

X_1 = Instructional Materials

X_2 = Evaluation System

X_3 = Classroom Environment

The multiple regression model was shown in Figure 4.

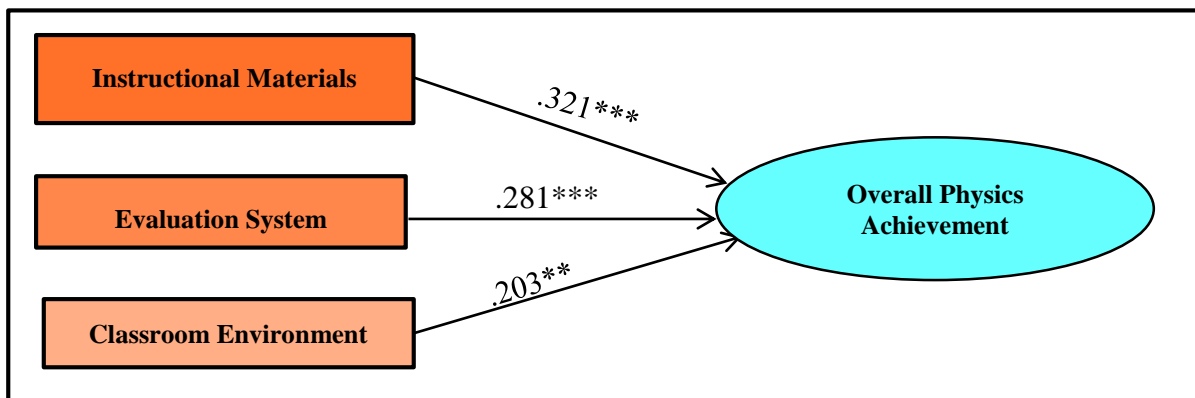


Figure 4 Multiple Regression Model of Predicting Students' Attitudes towards the Impact of Contextualized Instruction for Overall Physics Achievement

Qualitative Research Findings

Findings from Classroom Observational Guide for Physics Teachers. According to Creswell (2016), observing is the process of gathering open-ended, firsthand information by watching people and places at a research site. In this study, classroom observational guide for both physics teachers and students. The following figure shows the results of classroom observational guide for physics teachers.

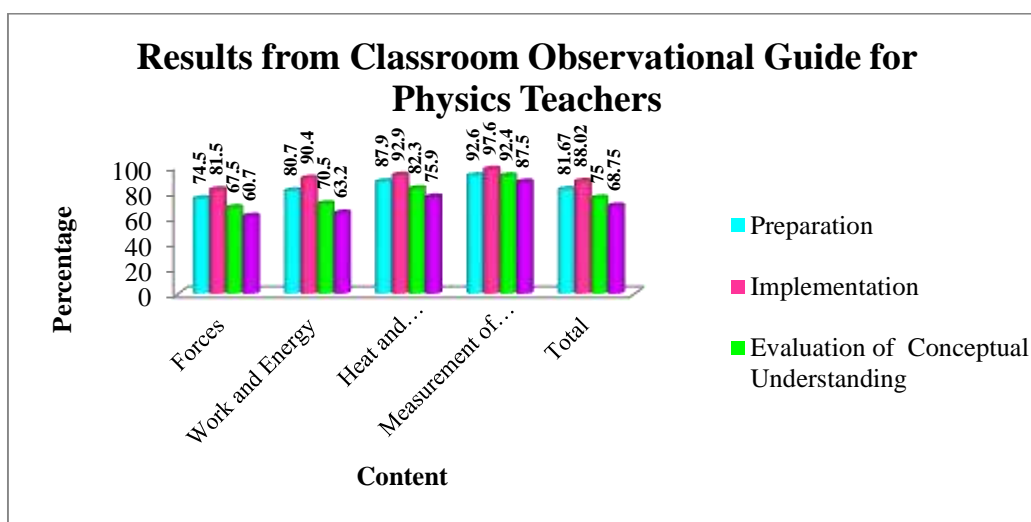


Figure 5 Graphical Illustration of Results from Classroom Observational Guide for Physics Teachers

As illustrated in the Figure 5, it can be assumed that the teachers who taught the experimental groups are gradually able to prepare, implement and evaluate the contextualized lessons.

Findings from Classroom Observational Guide for Physics Students. The following figure shows the results of classroom observational guide for physics teachers.

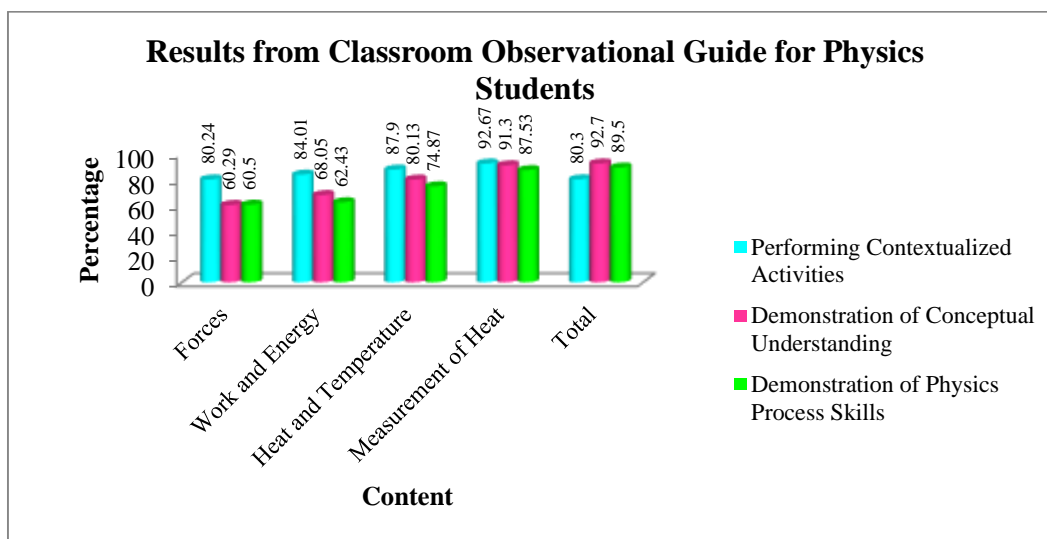


Figure 6 Graphical Illustration of Results from Classroom Observational Guide for Physics Students

As illustrated in the Figure 6, it can be assumed that the students from the experimental groups are gradually able to perform the contextualized activities and demonstrate their abilities in conceptual understanding and physics process skills.

Findings from Questionnaires. The results of the findings from teachers' attitudes towards contextualized instruction, the proposed instructional design of contextualized instruction and the impact of contextualized instruction showed that most of the teachers had positive attitudes towards the impact of contextualized instruction. Similarly, most of the students had positive attitudes towards the impact of contextualized instruction.

Findings from Interview. The following table shows the results of thematic analysis from interview of teachers and students.

Table 19 Results of Thematic Analysis from Interview Data

Teachers' Interview Data		Students' Interview Data	
Main Themes	Sub Themes	Main Themes	Sub Themes
Features of Contextualized Instruction	Components of Contextualized Instruction <ul style="list-style-type: none"> - Constructivism - Inquiry - Questioning - Learning Community - Modelling - Reflection - Authentic Assessment 	Features of Contextualized Instruction	Components of Contextualized Instruction <ul style="list-style-type: none"> - Constructivism - Inquiry - Questioning - Learning Community - Modelling - Reflection - Authentic Assessment
Instructional Design of Contextualized Instruction	Preparation <ul style="list-style-type: none"> - Analyzing Learning Context - Identifying Learning Task - Setting Learning Objectives 		
	Implementation <ul style="list-style-type: none"> - Contextualization - De-Contextualization - Re-Contextualization - Conducting Formative Evaluation 		
	Evaluation <ul style="list-style-type: none"> - Summative evaluation 		
Impact of Contextualized Instruction	Contributions of Contextualized Instruction Instructional Materials <ul style="list-style-type: none"> - Assessment rubric for contextualized practical activities - Contextualized problem solving worksheets 	Impact of Contextualized Instruction	Contributions of Contextualized Instruction Instructional Materials <ul style="list-style-type: none"> - Assessment rubric for contextualized practical activities - Contextualized problem solving worksheets

Teachers' Interview Data		Students' Interview Data	
Main Themes	Sub Themes	Main Themes	Sub Themes
	<ul style="list-style-type: none"> - Contextualized practical records - Contextualized work book - Real learning materials - Printed learning materials <p>Evaluation System</p> <ul style="list-style-type: none"> - Conceptual Understanding - Problem Solving - Physics Process Skills <p>Classroom Environments</p> <ul style="list-style-type: none"> - Learner-centered Environment - Knowledge-centered Environment - Assessment-centered Environment - Community-centered Environment 		<ul style="list-style-type: none"> - Contextualized practical records - Contextualized work book - Real learning materials - Printed learning materials <p>Evaluation System</p> <ul style="list-style-type: none"> - Conceptual Understanding - Problem Solving - Physics Process Skills <p>Classroom Environments</p> <ul style="list-style-type: none"> - Learner-centered Environment - Knowledge-centered Environment - Assessment-centered Environment - Community-centered Environment
	<p>Difficulties of Contextualized Instruction</p> <p>Instructional Materials</p> <ul style="list-style-type: none"> - Quality of instructional materials <p>Evaluation System</p> <ul style="list-style-type: none"> - Unfamiliar with the new physics vocabularies - Permitted time <p>Classroom Environments</p> <ul style="list-style-type: none"> - Changing classroom setting - Having large class size - Exposing contextualized questions and problems 		<p>Difficulties of Contextualized Instruction</p> <p>Instructional Materials</p> <ul style="list-style-type: none"> - Quality of instructional materials <p>Evaluation System</p> <ul style="list-style-type: none"> - Unfamiliar with the new physics vocabularies - Permitted time <p>Classroom Environments</p> <ul style="list-style-type: none"> - Changing classroom setting - Having large class size - Exposing contextualized questions and problems

Discussion

Firstly, the primary purpose of this study is to investigate the impact of contextualized instruction in learning physics at the high school level in Myanmar. According to the first objective of this study, the proposed instructional design was firstly developed. This proposed instruction design can be described as encompassing three instructional phases, namely, preparation, implementation and evaluation. The purpose of this design is to develop conceptual understanding, problem-solving and inquiring mind and scientific attitude towards physics. The results from this study also proved to verify the purpose of this proposed instructional design of contextualized instruction. For the second research objective, pretest and posttest on conceptual understanding and physics process skills were used to assess this relative effectiveness of contextualized instruction.

According to the results from the pretest scores on conceptual understanding in four selected schools, no significant difference was observed between the experimental and control groups. But no significant difference was observed between the experimental and control groups at knowledge level questions on school 1, school 2 and school 4 except on school 3. The results from the analysis of covariance (ANCOVA) for posttest scores in all schools showed that the experimental groups performed significantly better than the control groups at comprehension, application, analysis, synthesis and evaluation level questions. Therefore, it can be interpreted that the use of contextualized instruction with the proposed instructional design had a significant effect not only on lower level thinking skills but also on higher-order thinking skills of students in all schools. This result is in line with the study of Haryanto (2019) that the students who received contextualized learning experiences improved higher order thinking skills than those of the students who did not receive.

On the questions for assessing physics process skills, the pretest scores revealed that there was no significant difference between the experimental and control groups in all selected schools. The results of the one-way analysis of covariance (ANCOVA) for posttest scores showed that the experimental groups performed significantly higher than the control groups in the acquisition of physics process skills. Therefore, it can be interpreted that the use of contextualized instruction with the proposed instructional design had a significant effect on students' achievement in physics process skills. This finding is in agreement with the study conducted by Kurnianingsih (2017) that science process skills in science learning through contextual approach with model of learning cycle gained an average of good category.

On the overall physics achievement, no significant difference was observed in all schools for pretest. However, the ANCOVA results for overall posttest scores in all schools showed that the use of contextualized instruction with the proposed instructional design positively contributed to the improvement of students' conceptual understanding and physics process skills. In determining the significance of contextualized instruction among four schools on overall physics achievement by one-way ANOVA, school 2 performed better than all of the other schools.

By means of descriptive statistics, the results from investigating the impact of contextualized instruction also pointed out that the participated teachers agree to the items in contributions of contextualized instruction more strongly. At the end of attitude questionnaires for teachers, three open-ended questions: about the contributions, difficulties in using contextualized instruction and about suggestions for the other teachers who want to apply contextualized instruction to their physics classroom, were added. All participated teachers propounded that the proposed instructional design for contextualized instruction made provision for teaching of physics at the high school level.

Based on the student's responses on questionnaires, the results from Pearson-product moment correlation revealed that a statistically significant relationship was found between the dimensions of students' attitudes towards contextualized instruction and overall physics achievement. In this case, multicollinearity can be avoided and the results from the multiple regression analysis stated that the best predictor was preference, the second predictor was experience and the last predictor was academic value. There was also a relationship between the students' attitudes towards the proposed instructional design of contextualized instruction and their overall physics achievement.

The results from the multiple regression analysis for this case stated that the best predictor was interpersonal skills, the second predictor was conceptual understanding and the last predictor was physics process skills.

By using the Pearson-product moment correlation, a statistically significant relationship was found between the dimensions of students' attitudes towards the impact of contextualized instruction and overall physics achievement. The results from the multiple regression analysis stated that the best predictor was instructional materials, the second predictor was evaluation system and the last predictor was classroom environment. From the results of three open-ended questions, students also agreed that they were able to retain the concepts learned from contextualized instruction because they easily grasped the relevant of topic.

Then, in investigating the impact of contextualized instruction, questionnaires on physics students was also used. The three open-ended questions were added at the end of attitude questionnaires for students. By means of proposed instructional design for contextualized instruction, students described that they got confidence regarding their ability to explain what they have observed in contextualized practical activities. To assess the treatment verification, participant observation was also conducted throughout the treatment. It was observed that at the very first lesson, the participated teachers experienced difficulty in teaching pedagogy because they are unfamiliar with the proposed instructional design of contextualized instruction. And also in students, it was observed that they experienced difficulty in communication within group works. At first, they were too shy to speak in front of the class and afraid of making mistakes.

The use of one-on-one interview to determine students' views and opinions on the application of contextualized instruction with the proposed instructional design proved effective in obtaining the conceptual understanding and physics process skills. All the interviewed students claimed that this contextualized instruction increased their motivation and enjoyment of physics learning. From the interview, the teachers also expressed that they want to use contextualized instruction which has demonstrated to increase students' motivation and enjoyment of physics. The fourth objective of this study is to make suggestions and recommendations for the improvement of teaching and learning physics. Therefore, based on the findings of the study, the suggestions and recommendations are provided in the subsequent sections.

Suggestions

Suggestions for Physics Teachers: According to results from the interviews, a pedagogical model for the contextualized instruction should be used for the teachers in their classrooms. According to Whitelegg and Parry (1999), it is important for the teachers to identify more clearly what constitutes a contextual approach to teaching. Moreover, it is important to take the professional development into account because the involvement of teachers in the production of contextualized learning materials is needed. And it is suggested that teachers should be provided with a variety of instructional materials and resources for both laboratory and classroom.

As pointed out in Teacher Competency Standards Framework, TCSF (2020), it is suggested that the upper secondary teachers need to understand what motivates the students and their needs to be active and independent in their learning. In order to implement the contextualized instruction in Myanmar, it is suggested that the teacher-student ratio should be reduced. In the responses of

open-ended questions, most of the teachers expressed that they are overloaded with many tests and tasks. Thus, they cannot provide the students with practical activities to improve their physics process skills. Therefore, it is suggested that teachers need enough time to prepare their lessons not only for students' conceptual understanding in physics but also for developing physics process skills.

In addition, it is suggested that learning environments for contextualized instruction should be student-centered to the degree to which they are concurrently knowledge-centered, learner-centered, assessment-centered and community-centered as in implementing contextualized instruction. According to Taylor and Dana (2003), students' scientific understanding was related to both teachers' use of meaningful learning activities such as meaningful practical activities and teachers' subject matter knowledge. Therefore, it is suggested that for students' achievement in physics and motivation, teachers should try to exhibit effective physics teacher characteristics like enthusiasm, organizing meaningful learning activities, answering students' questions, subject matter knowledge, preparation for lessons, use of examples and use of experiments frequently during lessons.

Physics subject is a learning which explains the natural phenomenon in a simple way and it tries to connect between facts found in that phenomenon. Therefore, it is suggested that the physics teacher should make the students realize that the process in physics is not only learning about the academic process but also to comprehend the environment. Generally, the high school students are between the ages of 11 to 15 years. Students at this level are capable to perform logical operations wisely through firmly based on a limited learning experience. With respect to the development of high school students, therefore, it is suggested that teachers should apply a variety of learning strategies to ensure that the students' physics process skills are developed effectively.

Suggestions for Physics Students: Dewey (1938) stated that students acquire knowledge by processing experience. Therefore, it is suggested that students should be provided with contextualized experiences like contextualization, decontextualization, recontextualization, thinking about, reflecting on and making sense of experience to acquire knowledge or to consolidate and internalize information in a way that is both meaningful and conceptual coherent for them.

As pointed out by Ministry of Education, MOE (2016), the practical component of the high school physics curriculum complement the theoretical component. Therefore, it is suggested that students' learning physics should be promoted through a variety of activities such as experiments not only in physics laboratory but also in the classrooms. In addition, students' laboratory report should be graded. In addition, it is suggested that students should be provided with contextualized materials to learn abstract concepts and eliminate misconceptions in physics.

Suggestions for School Administrators: The purpose of Myanmar's national education system is to equip the students, youth and adult learners with the knowledge and skills they need to succeed in the 21st century (MOE, 2016). Therefore, physics education should be able to foster awareness that physics is not just academic activities but rather to understand the environment. Effective teaching and learning of sciences can be influenced by the availability of laboratory equipment, chemicals and materials, and substantial textbooks (Molyayonge & Park, 2017). Therefore, it is suggested that for the successful implementation of contextualized instruction in learning physics,

the number of instructional materials should be increased by the administrators. And teachers and students should be allowed to use the physics laboratory and the library widely. In addition, it is suggested that as school administrators, it should be supported with enough classrooms for reducing large class size. In addition, students' grade should be determined by assessing both from theoretical component of physics and from practical component of physics.

In addition, according to the research findings by the Tukey HSD method, school 2 performed better than school 1, school 3 and school 4. This is due to the fact that physics teacher from school 2 had more physics teaching experiences than other physics teachers. Therefore, it is suggested that for effective physics teaching, physics teachers should be assigned to teach only physics. The teaching experience should be considered to assign for the physics achievement in the high schools. According to the results from the quantitative study supported by the qualitative study, there were significant differences in conceptual understanding and physics process skills in physics between high school students who receive contextualized instruction and those who do not. Therefore, it is suggested that a physics teacher should use contextualized instruction to overcome the problems related physics in the classrooms and to develop higher-order thinking skills and physics process skills.

Recommendations

It is hoped that this study will make a number of contributions to the improvement of physics teaching methodology at the high school level in Myanmar, especially in the development, implementation and the effect of contextualized instruction on students' performance. First, it is recommended that the physics teachers provide the students with opportunities to explore applicable socio-scientific problems before teaching physics concepts. Second, it is recommended that the physics teachers encourage their students to make self-reflections through evaluation of previously learnt physics ideas, theory, laws and principles and at the end of the instruction, it is needed to give students the opportunities to make self-reflection for enhanced conceptual understanding and the development of higher-order thinking skills. Third, due to reduced memory load, it is recommended that the physics teachers should introduce content in small quantities which could be easily grasped by the students when teaching abstract physics topics.

Fourth, it is therefore recommended that curriculum developers and educators try to increase the socio-relevance of physics and physics education by involving students in decisions about the context of curriculum materials, in order to increase their accessibility and motivational value to students. Fifth, it is highly recommended that teacher training institutions should incorporate new physics teaching approaches for large classrooms in their physics education curricula for students' performance. Sixth, it is recommended that further research should be carried out by using wide content area of physics such as, light, waves and optics, electricity, and modern physics.

Seventh, it is recommended that further replication of this study with larger class sizes, classes operating during the same academic year and classes at other basic education high schools would yield results more generalizable to the typical high school course. Eighth, it is recommended for further studies that at least two observers may be involved in the implementation process in order to guarantee the reliability of observations. Ninth, it is recommended that contextualized

instruction should be investigated and compared with other methodologies for further studies and researches.

To sum up, in building a modern developed nation, science education is also essential for Myanmar. Physics lies at the heart of science education. Therefore, physics teaching methodology should be given as a major task of science education. It is highly recommended to conduct further research in physics teaching methodology for the improvement of science education in Myanmar.

Summary

Based on the conceptual framework of this study, the proposed instructional design of contextualized instruction was at first developed. Then the contextualized workbook for students and learning materials were developed. After developing the proposed instructional design and related materials, quantitative and qualitative research methods were used to investigate the impact of contextualized instruction. By providing contextualized instruction in learning physics, it was found that it helps the students in looking for the meaning of what they are learning through synchronizing the academic subjects and the context of their daily life. In other words, contextualized instruction with the proposed instructional design motivates the students to choose their own learning and to connect knowledge and its application with every context found in their lives.

Regarding the data obtained through statistical computation and interviews it is obvious that contextualized instruction is useful to help the students to get better conceptual understanding and physics process skills. By applying contextualized instruction with the proposed instructional design, teacher can relate the materials with the real-world situation outside the classroom, and motivate the students to link the knowledge they learn to its application in their lives. The research findings highlighted that contextualized instruction with the proposed instructional design can make a significant contribution to the students and teachers to develop conceptual understanding, physics process skills and overall physics achievement in teaching and learning physics.

The researcher forwards this final recommendation that, for those pedagogues wanting to cultivate their students' higher-order thinking skills and scientific processing capacity, it would be imperative to choose the student centered method of physics teaching wherein the highest educational concept of pedagogic neutrality is utilized to the full.

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AN ANALYTICAL STUDY OF THE EFFECT OF CLASSROOM EMOTIONAL CLIMATE ON MOTIVATING LEARNERS AND THEIR MORAL MATURITY

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(၂-၈) AN ANALYTICAL STUDY OF THE EFFECT OF CLASSROOM EMOTIONAL CLIMATE ON MOTIVATING LEARNERS AND THEIR MORAL MATURITY

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Abstract

The main aim of the present study is to explore the effect of classroom emotional climate on motivating learners and their moral maturity. The specific objectives are to explore the emotional climate of students in classroom, to assess students' motivational orientations, to explore levels of moral maturity of students, to investigate the effect of classroom emotional climate on learners' motivation, to investigate the effect of classroom emotional climate on moral maturity and to explore factors influencing on classroom emotional climate and moral maturity of students. In this study, an explanatory sequential mixed-methods design was used. Data were collected from about 1932 high school students by using stratified random sampling technique. What Is Happening in this Class? (WIHIC) Questionnaire, Motivated Strategies for Learning Questionnaire (MSLQ) and Moral Maturity Scale were used as the instruments in this study. The overall results showed that most of high school students fell into moderate classroom emotional climate level group. Data analysis involved the use of descriptive and inferential statistics. The results revealed that female students possessed better classroom emotional climate, motivation and moral maturity than male students. The results of ANOVA pointed out that there was statistically significant difference in moral maturity and motivation by classroom emotional climate levels. The result of correlation showed that classroom emotional climate was positively correlated with motivation and moral maturity. It can be predicted that students who possess high classroom emotional climate have high moral maturity and more motivation in learning.

Keywords: Classroom Climate, Emotional Climate, Motivation, Morality, Moral Maturity, Motivating Learners

1. Introduction

At the beginning of the year teachers have the goal of establishing a classroom environment that is favorable for helping all students work cooperatively in order to learn. Classroom that encourage emotional well-being create an atmosphere for both learning and emotional development. Classroom climate is a broad construct, made up of students' feelings about their instructor and peers.

Baer and Bandura (1963) identified Social Learning Theory, where people learn behaviors through the observation of other people, and in turn imitate behaviors they see modeled by others. In this case, if teachers portray a positive climate within their classroom, students tend to respond to this positivity and react to it in the same manner, social learning theory of Bandura, supports a learning environment where everyone feels safe.

Some teachers have successfully chosen strategies in their classroom that create a positive climate in the classroom for students. Some teachers though, may find it hard to choose the right classroom management strategies to create a positive classroom climate. Classroom climate affects a student's attitude towards other students in the class, the teacher and the activities they do. A

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positive classroom climate will reduce the student anxiety, while a negative classroom climate has the opposite effect, increasing student anxiety. When students misbehave, they are disruptive to their classmates and teacher, less engaged in lessons, and consequently perform worse in school (Finn, Pannozzo, & Voelkl, 1995; Freiberg, Huzinec, & Templeton, 2009). A key aspect of teacher student interactions pertains to the teacher's ability to cultivate an emotionally supportive classroom climate which is the focus of this study.

1.1 Purposes of the Study

This study attempts to explore the effect of classroom emotional climate on motivating learners and their moral maturity.

The specific objectives are as follows;

- to explore the emotional climate of students in classroom,
- to assess students' motivational orientations,
- to explore levels of moral maturity of students,
- to investigate the effect of classroom emotional climate on learners' motivation,
- to investigate the effect of classroom emotional climate on moral maturity
- to explore factors influencing on classroom emotional climate and moral maturity of students

1.2 Definitions of Key Terms

Classroom Climate: the intellectual, social, emotional, and physical environments in which students learn (Ambrose et al., 2010).

Emotional Climate: the quality of social and emotional interactions in a shared space (e.g. classroom, school, organization, etc.) between two people or groups (e.g. students and teachers) (Brackett, Rivers et al., 2012).

Motivation: the process through which people initiate, guide and maintain themselves in order to achieve goals (Nevid, 2013).

Morality: the science of the ethical rules controlling the attitudes of individuals and an art ensuring the adaptation of these elements to the life (Baird & Astington, 2004).

Moral Maturity: a psychological feature that ensures that moral elements are adopted and become part of the conscience and that the individual prefers not to demonstrate immoral behaviours even when he/she is alone (Sengun, 2008).

Operational Definition of Motivating Learners: stimulating students to learn by external factors such as rewards or incentives and supporting of students' autonomy, relevance, relatedness, competence and self-efficacy.

2. Review of Related Literature

The classroom is a primary micro context in which students and teachers interact. The quality of social and emotional interactions in the classroom between and among students and teachers (e.g., teacher and peer support, student autonomy) creates the classroom emotional climate

(Daniels & Shumow, 2003; Pianta, La Paro, & Hamre, 2008). Classroom emotional climate is expected to influence learning outcomes for students (Stuhlman & Pianta, 2009).

According to the Teaching Through Interactions Framework (Hamre & Pianta, 2007), classrooms characterized as high in classroom emotional climate have (a) teachers who are sensitive to students' needs; (b) teacher–student relationships that are warm, caring, nurturing, and congenial; (c) teachers who take their students' perspectives into account; and (d) teachers who refrain from using sarcasm and harsh disciplinary practices. Such classrooms also are ones in which the teacher fosters student comfort and enjoyment by regularly expressing warmth toward, respect for, and interest in students and by encouraging their cooperation with one another. Teachers in classrooms high in classroom emotional climate also are aware of their students' emotional and academic needs and respond to their students by choosing age-appropriate activities that both encourage self-expression and cater to their interests and points of view.

In contrast, classrooms with a negative emotional climate (i.e., low classroom emotional climate) are ones in which teachers and students share little emotional connection and regularly disregard, disrespect, taunt, humiliate, threaten, or even physically lash out at one another. Teachers in such classrooms do not design or apply lessons with students' perspectives or cognitive capabilities in mind, nor do these teachers divert from a lesson plan when students' boredom, discomfort, or confusion arises. Classroom emotional climates characterized as “neutral” have teachers and students who provide inconsistent regard for each other. The teacher may be moderately warm, respectful, and aware of students' emotions but also may be controlling or dismissive at times. Students in these classrooms sometimes share with and assist one another or laugh and smile with their teacher, but at other times are insensitive and uncertain about how to approach their teacher.

Theobald (2006) asserted that one of the greatest challenges for teachers in this century is to provide a learning environment that stimulates students' motivation to learn. Motivation is the internal circumstance that instigates and focuses goal-oriented behaviour (Schunk, 2004). In studying students' motivation to learn science, researchers have examined “why students strive to learn science, how intensively they strive, and what beliefs, feelings, and emotions characterize them in this process” (Glynn, Taasobshirazi & Brickman, 2009). Research has indicated that motivated students are the key to successful learning engagement in classrooms (Pajares & Schunk, 2001). In order to improve their academic achievement, these students are more likely to increase class attendance, participate in class activities, ask questions and advice, join study groups and increase their study time.

Moral maturity refers to the sum of ethical qualities that give the richest, most necessary, and fullest meaning to the state of being competent and top in terms of moral feelings, thoughts, judgments, attitudes and behaviours. Moral maturity is the level of excellence that enables the individual to feel any immorality and deviation in his feelings, thoughts, judgments, attitudes and behaviours immediately in his conscience. It is expected that an individual with a moral dimension is a good person who is reliable, responsible, respectful, equitable, self-controlling, empathic, and a good citizen who fits all laws and rules (Şengün and Kaya, 2007). According to Topçu (2016), the most important task in moral education is to be a model. He underlined that teachers and administrators should be good models to students. Indeed, the school has more influence than the

family in moral education. He emphasized that this education should be given to young people with love, not fear. According to Lickona (1991), moral maturity has three dimensions: moral sentiment, moral consideration and moral behaviour. Maturity in these dimensions indicates the moral maturity status and levels of individuals. Moral maturity requires the internalization of moral values, the holding of those moral values and its roots in the conscience (Uysal, 2004).

3. Research Method

3.1 Sampling

The participants for this study were chosen by using stratified random sampling technique. Firstly, two states (Mon and Rakhine) and three regions: (Mandalay, Sagaing and Bago) (30% of total states and regions) were selected. And then, 4 high schools under Department of Basic Education from each selected state and region. Therefore, altogether 18 high schools were chosen and then nearly 100 high school students from each high school were selected. Finally, 1932 students participated in this study.

3.2 Research Method

In this study, an explanatory sequential mixed-method design was used.

3.3 Research Instrumentation

WIHIC questionnaire consists 7 scales and 56 items. The seven scales are student cohesiveness, teacher support, involvement, task orientation, investigation, cooperation, and equity. The purpose of the study is to measure high school students' classroom emotional climate. The WIHIC has personal and Class forms to measure the perceptions of students about classroom, and to measure the emotions of students about the actual environment of the classroom. The What Is Happening in this Class? (WIHIC) instrument which is a well-used questionnaire in classroom environment research (Fraser et al., 2013). The questionnaire is designed to measure students' perception of their classroom environment in various educational contexts. According to the piloting result, the internal consistency of WIHIC Questionnaire is 0.907.

The MSLQ is a popular instrument that had been used by numerous researchers to measure high school students' self-regulation (Duncan & McKeachie, 2005). This instrument comprises two parts, a motivation section and a learning strategies section. The motivation section consists of six scales and 31 items that assess intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy for learning and performance and text anxiety. According to the piloting result, the internal consistency of MSLQ Questionnaire is 0.829.

The Moral Maturity Scale developed by Şengün and Kaya (2007) was used as data collection instrument in the study. The Moral Maturity Scale consisting of 66 items is of the five-point Likert type and has a reliability value of .89. The highest score that can be taken from the scale is 330, the lowest score is 66. Scale items are graded as "yes, always", "most of the time", "occasional", "very rare", "no, never". Positive points are scored by giving 5 points to the "yes, always" option, 4 points to the "most of the time" option, 3 points to the "occasional" option, 2 points to the "very rare" option and 1 point to the "no, never" option. Scoring for negative items is done in the opposite direction.

4. Data Analysis and Research Findings

4.1 Analysis of Classroom Emotional Climate Level of High School Students

4.1.1 Descriptive Statistics of Classroom Emotional Climate

Descriptive analyses revealed that the mean and standard deviation of high school students' classroom emotional climate were 207.91 and 26.51 respectively. According to the norms of Fraser et al., What Is Happening in this Class? WIHIC Questionnaire, the scores for all respondents were calculated on their responses to the 56 measures on the WIHIC. The maximum possible scores is 280 and minimum possible score is 0. The mean WIHIC score for respondents was 207.91 and standard deviation (SD) was 26.51. The respondents' scores ranged from a low of 5 to a high of 280. Respondents with scores in the range of 0 to 181 were considered low classroom emotional climate. Scores in the range of 182 to 234 represented moderate classroom emotional climate in respondents. Students with high classroom emotional climate scores ranged from 235 to 280 (Fraser et al., 1996).

Table 1. Descriptive Statistics of High School Students' Classroom Emotional Climate

	Mean	SD	N	Minimum	Maximum
Classroom Emotional Climate	207.91	26.51	1932	96	272

Results revealed that n = 309, 15.99% of the students had low level of classroom emotional climate and n = 311, 16.09% of students had high level of classroom emotional climate. The majority of respondents were scored as possessing moderate classroom emotional climate (n = 1312, 67.9%) (see Table 2). Figure 1 illustrates the distribution of respondents WIHIC scores in range of low, moderate, and high.

Table 2. Frequency and Percentage of High School Students' Classroom Emotional Climate Levels

Classroom Emotional Climate Level	Frequency	Percentage
Low	309	15.99%
Moderate	1312	67.9%
High	311	16.09%

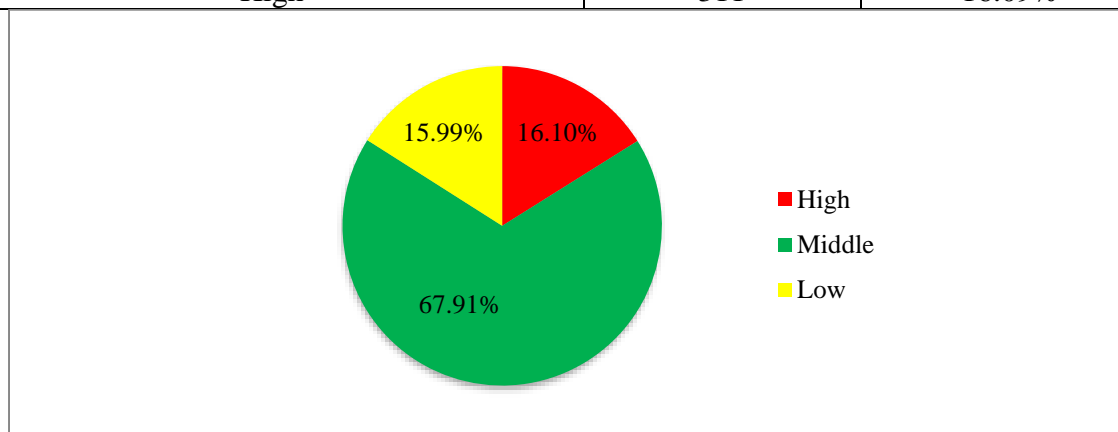


Figure 1. Percentage of High School Students on Classroom Emotional Climate Level

4.1.2 Comparison of High School Students' Classroom Emotional Climate by Gender

According to Table (3), the mean score of female students was more than that of male students. This mean that female students were high in classroom emotional climate than male students. To confirm the result, the independent sample t test was used. The results revealed that gender difference was found to be on classroom emotional climate. This finding is consistent with girls' higher secondary schools had higher classroom emotional climate as compared to boys' higher secondary schools (Komal Singh, 2016).

Table 3. Mean Comparison of High School Students' Classroom Emotional Climate by Gender

Gender	Mean	SD	<i>t</i>	<i>p</i>
Male	205.18	26.759	-4.458***	.000
Female	210.53	26.004		
Total	207.91	26.505		

Note: ***The mean difference is significant at 0.001 level.

And then, the differences between seven classroom emotional climate components on gender were investigated. Table 4 revealed that the mean differences between classroom emotional climate components on gender. Among seven components, the mean scores of female students were significantly higher than that of male students in student cohesiveness, involvement, task orientation, cooperation, and equity. This finding evidently pointed out that female students more know, help and are supportive of one another, have attentive interest, participate in discussions, perform additional work and enjoy the class, complete activities planned and to stay on the subject matter, involved in cooperative learning and are treated equally by the teacher are significantly more than male students.

Table 4. Mean Comparisons of Male and Female Students' Classroom Emotional Climate Components

Classroom Emotional Climate Components	Gender	Mean	SD	<i>t</i>	<i>df</i>	<i>p</i>
Student Cohesiveness	Male	32.27	4.672	-3.130**	1930	.002
	Female	32.93	4.587			
	Total	32.61	4.639			
Teacher Support	Male	28.07	5.625	-.641	1930	.521
	Female	28.24	5.849			
	Total	28.16	5.739			
Involvement	Male	23.36	5.374	-2.084*	1930	.037
	Female	23.87	5.287			
	Total	23.62	5.335			
Investigation	Male	27.17	5.750	-.231	1930	.817
	Female	27.23	5.816			
	Total	27.20	5.782			
Task Orientation	Male	32.99	5.467	-6.665***	1930	.000
	Female	34.46	4.162			
	Total	33.74	4.900			

Classroom Emotional Climate Components	Gender	Mean	SD	<i>t</i>	<i>df</i>	<i>p</i>
Cooperation	Male	29.52	5.623	-6.595***	1930	.000
	Female	31.17	5.424			
	Total	30.36	5.583			
Equity	Male	31.79	6.179	-2.952**	1930	.003
	Female	32.62	6.191			
	Total	32.22	6.197			

*The mean difference is significant at 0.05 level.

**The mean difference is significant at 0.01 level

***The mean difference is significant at 0.001 level.

4.2 Analysis of Motivation of High School Students

4.2.1 Descriptive Statistics of High School Students' Motivation

Descriptive analyses revealed that the mean and standard deviation of high school students' motivation were 175.44 and 18.38, respectively.

Table 5. Descriptive Statistics of High School Students' Motivation

	Mean	SD	N	Minimum	Maximum
Motivation	175.44	18.38	1932	63	227

Table 6. Descriptive Statistics of High School Students' Motivation Components

Motivation Components	Mean (%)	SD
Intrinsic Goal Orientation	77.53%	3.169
Extrinsic Goal Orientation	86.78%	3.523
Task Value	83.5%	4.634
Control of Learning Beliefs	85.89%	3.456
Self-Efficacy for Learning and Performance	77%	6.496
Test Anxiety	77.68%	5.050

Table 6 showed that the mean percentage of extrinsic goal orientation was the highest compared with other motivation components. It was found that high school students who are high in extrinsic goal orientation engaged in learning task.

4.2.2 Comparison of High School Students' Motivation by Gender

The results showed that the mean score of female students (178.50) was significantly higher than that of male students (172.26). To investigate the differences of motivation by gender, t-test was used. According to the t-test result, there was a significant difference between male and female students on motivation. It was found that female high school students have more motivation than male high school students. So, female students had more motivation than male students (see Table 7).

Table 7. Mean Comparison of High School Students' Motivation by Gender

Gender	N	Mean	SD	t	p
Male	946	172.26	20.368	-7.571***	.000
Female	986	178.50	15.659		
Total	1932	175.44	18.381		

***The mean difference is significant at 0.001 level.

And then, the differences between six motivation components on gender were investigated. Table 10 revealed that the mean differences between motivation components on gender. Among six components, the mean scores of female students were significantly higher than that of male students in intrinsic goal orientation, extrinsic goal orientation, task value, control of learning belief, self-efficacy for learning and performance and test anxiety. This finding evidently pointed out that female students' goals and value beliefs for a course, their beliefs about their skill to succeed in a course, and their anxiety about tests in a course significantly more than male students.

Table 8. Mean Comparison of High School Students' Motivation by Gender

Motivation Components	Gender	Mean	SD	t	df	p
Intrinsic Goal Orientation	Male	21.40	3.320	-4.244***	1930	.000
	Female	22.01	2.988			
	Total	21.71	3.169			
Extrinsic Goal Orientation	Male	23.64	3.994	-8.237***	1930	.000
	Female	24.94	2.864			
	Total	24.30	3.523			
Task Value	Male	34.43	5.158	-6.047***	1930	.000
	Female	35.69	3.972			
	Total	35.07	4.634			
Control of Learning Beliefs	Male	23.76	3.506	-3.758***	1930	.000
	Female	24.34	3.384			
	Total	24.06	3.456			
Self-Efficacy for Learning and Performance	Male	42.45	7.077	-4.506***	1930	.000
	Female	43.77	5.814			
	Total	43.12	6.496			
Test Anxiety	Male	26.58	5.093	-5.178***	1930	.000
	Female	27.77	4.942			
	Total	27.19	5.050			

***The mean difference is significant at 0.001 level.

4.2.3 Comparison of High School Students' Motivation by Classroom Emotional Climate Levels

According to Table (9), the students from high classroom emotional climate had more motivation than students from other two levels. The results of ANOVA pointed out that there were statistically significant difference among classroom emotional climate levels on motivation.

Table 9. Mean Comparison of High School Students' Motivation by Classroom Emotional Climate Levels

CEC Levels	Low CEC	Moderate CEC	High CEC	<i>F</i>	<i>p</i>
N	309	1312	311		
Mean	160.89	176.18	186.81	187.835***	.000
(SD)	21.700	16.025	14.406		

***The mean difference is significant at 0.001 level.

4.3 Analysis of Moral Maturity of High School Students

4.3.1 Descriptive Statistics of High School Students' Moral Maturity

Descriptive analyses revealed that the mean and standard deviation of high school students' moral maturity were 270.21 and 29.201, respectively. According to the norms of Segun and Kaya, the scores for all respondents were calculated on their responses to the 66 measures on the Moral Maturity Scale. The maximum possible score is 330 and minimum possible score is 0. The mean of moral maturity score for respondents was 270.21 and standard deviation (SD) was 29.201. The respondents' scores ranged from a low of 5 to a high of 330. Respondents with scores in the range of 0 to 241 were considered low moral maturity. Scores in the range of 242 to 299 represented moderate moral maturity in respondents. Students with high moral maturity score ranged from 300 to 330 (Segun & Kaya, 2007).

Table 10. Descriptive Statistics of High School Students' Moral Maturity

	Mean	SD	N	Minimum	Maximum
Moral Maturity	270.21	29.201	1932	121	333

4.3.2 Comparison of Moral Maturity by Gender

According to the *t*-test result, there was a significant difference between male and female students on moral maturity. It was found that female high school students have higher moral maturity than male students. This finding is inconsistent with Naciye Guven's (2017) research finding in which female students have a higher level of moral maturity than male students but not a significant difference on moral maturity level of sex students.

Table 11. Comparison of High School Students' Moral Maturity by Gender

Gender	N	Mean	SD	<i>t</i>	<i>p</i>
Male	946	265.44	31.942	-7.121***	.000
Female	986	274.79	25.493		
Total	1932	270.21	29.201		

Note. ***The mean difference is significant at 0.001 level.

4.3.3 Comparison of High School Students' Moral Maturity by Classroom Emotional Climate Level

And then, the mean comparisons of high school students' moral maturity by classroom emotional climate level were explored. The results of ANOVA pointed out that there were significantly difference among classroom emotional climate levels on moral maturity (see Table 12).

Table 12. Mean Comparison of High School Students' Moral Maturity by Classroom Emotional Climate Levels

CEC Levels	Low CEC	Moderate CEC	High CEC	<i>F</i>	<i>p</i>
N	309	1312	311	158.594***	.000
Mean	251.42	269.92	290.12		
(SD)	29.085	27.440	23.164		

Note. ***The mean difference is significant at 0.001 level.

4.3.4 Comparison of High School Students' Moral Maturity Level by Classroom Emotional Climate level

To investigate the relationship between levels of classroom emotional climate and levels of moral maturity, cross tabulation was conducted (see Table 13).

Table 13. Frequency of High School Students on Classroom Emotional Climate Level by Moral Maturity Level

Variable			Moral Maturity Level			Total
			Low	Moderate	High	
Classroom Emotional Climate Level	Low	Count	113	187	9	309
		%	5.8%	9.7%	0.5%	16%
	Moderate	Count	181	984	147	1312
		%	9.4%	50.9%	7.6%	67.9%
	High	Count	10	180	121	311
		%	0.5%	9.3%	6.3%	16.1%
Total		Count	304	1351	277	1932

Generally, out of 1932 students, 309 low classroom emotional climate students (16%) in this study produced 5.8% of low moral maturity, 9.7% of moderate moral maturity and 0.5 % of high moral maturity. And 1312 moderate classroom emotional climate students (67.9%) produced 9.4% of low moral maturity, 50.9% of moderate moral maturity and 7.6% of high moral maturity. Similarly, 311 of high classroom emotional climate students (16.1%) produced 0.5% of low moral maturity, 9.3% of moderate moral maturity and 6.3% of high moral maturity (see Table 13). Therefore, it can be said that students' levels of moral maturity were likely to be related with levels of classroom emotional climate.

4.4 Relationship of Classroom Emotional Climate, Moral Maturity and Motivation of High School Students

To investigate how the components of classroom emotional climate were correlated with components of motivation were calculated correlation coefficients.

Table 14. Inter-correlation between Components of Classroom Emotional Climate and Components of Motivation

CM CCEC	IGO	EGO	TV	COLB	SEL	TA
SC	.158**	.166**	.240**	.104**	.296**	.019
TS	.158**	.161**	.250**	.102**	.258**	.020
IVT	.143**	.095**	.192**	.052*	.266**	-.014
IGT	.257**	.198**	.310**	.124**	.448**	-.031
TO	.274**	.280**	.396**	.202**	.453**	.093**
CP	.254**	.267**	.364**	.218**	.358**	.134**
EQ	.259**	.221**	.345**	.200**	.452**	-.006

Note. *Correlation is significant at 0.05 level.

**Correlation is significant at 0.01 level.

SC = Student Cohesiveness, TS = Teacher Support, IVT = Involvement, IGT = Investigation, TO = Task Orientation, CP = Cooperation, EQ = Equity, IGO = Intrinsic Goal Orientation, EGO = Extrinsic Goal Orientation, TV = Task Value, COLB = Control of Learning Beliefs, SEL = Self-Efficacy for Learning and Performance, TA = Test Anxiety

As already mentioned in Table 14, components of classroom emotional climate were significant positively correlated with intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, and self-efficacy for learning and performance. Task orientation and cooperation were significant positively correlated with test anxiety.

4.4.1 Multiple Regression Analysis of Classroom Emotional Climate Components on Motivation

The following regression analyses were conducted to measure the influence of classroom emotional climate components on motivation. A seven step hierarchical multiple regression analysis was used to assess how much additional variance in motivation can be explained by incrementally adding predictor variables to the equation. Hierarchical multiple regression was chosen because theoretical relevance was given priority over statistical considerations. Variables that explained motivation were entered seven steps. In Step 1, "Motivation" was the dependent variable and student cohesiveness was the independent variable. In Step 2, student cohesiveness and teacher support were entered into the Step 2 equation. The process was repeated at Step 3 with student cohesiveness, teacher support and involvement, at Step 4 with student cohesiveness, teacher support, involvement and investigation, at Step 5 with student cohesiveness, teacher

support, involvement, investigation and task orientation, at Step 6 with student cohesiveness, teacher support, involvement, investigation, task orientation and cooperation and at Step 7 with student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation and equity. Before the hierarchical multiple regression analysis was performed, the independent variables were examined for collinearity. Results of variance inflation factor VIF (all less than 2.0) and collinearity tolerance (all greater than .717) suggested that the estimated β s are well established in the following regression model.

Table 15. Standardized Beta Coefficients from Hierarchical Multiple Regression Analysis of Classroom Emotional Climate Components on Motivation

Predictors	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
1.SC	.260***	.194***	.177***	.153***	.081***	.015	-.005
2.TS		.175***	.155***	.114***	.087***	.077***	.042
3.IVT			.058*	-.069**	-.062**	-.096***	-.094***
4.IGT			.	.305***	.192***	.176***	.152***
5.TO					.316***	.257***	.228***
6.CP						.223***	.196***
7.EQ							.163***
8.R ²	.067	.094	.096	.163	.237	.268	.286
9.Adj R ²	.067	.093	.095	.161	.235	.266	.283
10.R ² Change	.067***	.026***	.002*	.066***	.074***	.031***	.018***
11.F value	F(1,1930) = 139.381 $p < 0.000$	F(2,1929) = 99.762 $p < 0.000$	F(3,1928) = 68.370 $p < 0.000$	F(4,1927) = 93.496 $p < 0.000$	F(5,1926) = 119.347 $p < 0.000$	F(6,1925) = 117.453 $p < 0.000$	F(7,1924) = 109.857 $p < 0.000$

Note. * Correlation is significant at 0.05 level.

**Correlation is significant at 0.01 level.

***Correlation is significant at 0.001 level.

The results of the regression analysis showed that student cohesiveness was able to account for 6.7 % of the variance in motivation when entered at Step 1, $R^2 = .067$, $F = (1, 1930) = 139.381$, $p < 0.000$. The combination of student cohesiveness and teacher support was able to account for 9.3% of the variance in motivation when entered at Step 2, $R^2 = .094$, $F = (2, 1929) = 99.762$, $p < 0.000$. The combination of student cohesiveness, teacher support and involvement was able to account for 9.5% of the variance in motivation when entered at Step 3, $R^2 = .096$, $F = (3, 1928) = 68.370$, $p < 0.000$. The combination of student cohesiveness, teacher support, involvement and investigation was able to account for 16.1% of the variance in motivation when entered at Step 4, $R^2 = .163$, $F = (4, 1927) = 93.496$, $p < 0.000$. The combination of student cohesiveness, teacher support, involvement, investigation and task orientation was able to account for 23.5% of the variance in motivation when entered at Step 5, $R^2 = .237$, $F = (5, 1926) = 119.347$, $p < 0.000$. The combination of student cohesiveness, teacher support, involvement, investigation, task orientation and cooperation was able to account for 26.6% of the variance in motivation when entered at Step 6, $R^2 = .268$, $F = (6, 1925) = 117.453$, $p < 0.000$. The combination of student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation and equity was able to account for 28.3% of the variance in motivation when entered at Step 7, $R^2 = .286$, $F = (7, 1924) = 109.857$, $p < 0.000$. At Step 7, the β results revealed that task orientation ($\beta = .228$, $p < 0.001$), cooperation ($\beta = .196$, $p < 0.001$), and equity ($\beta = .163$, $p < 0.001$) were positive and significant predictors of

high school students' motivation. Investigation ($\beta = -.094, p < 0.00$) and involvement ($\beta = -3.769, p < 0.001$) were negative and significant predictors of high school students' motivation.

Based on the results, the adjusted R-square increased from .067 to .283 with the addition of subsequent sets of variables. The multiple R^2 was .283, which means that the total contribution by the combined set of classroom emotional climate accounted for approximately 28.3% of the variance of motivation. Thus, the collective relationship between motivation and the set of predictor variables can be characterized as moderately strong. The β results showed that involvement, investigation, task orientation, cooperation, and equity were key predictors on motivation. However, student cohesiveness and teacher support were not significant predictors on motivation (see Table 15).

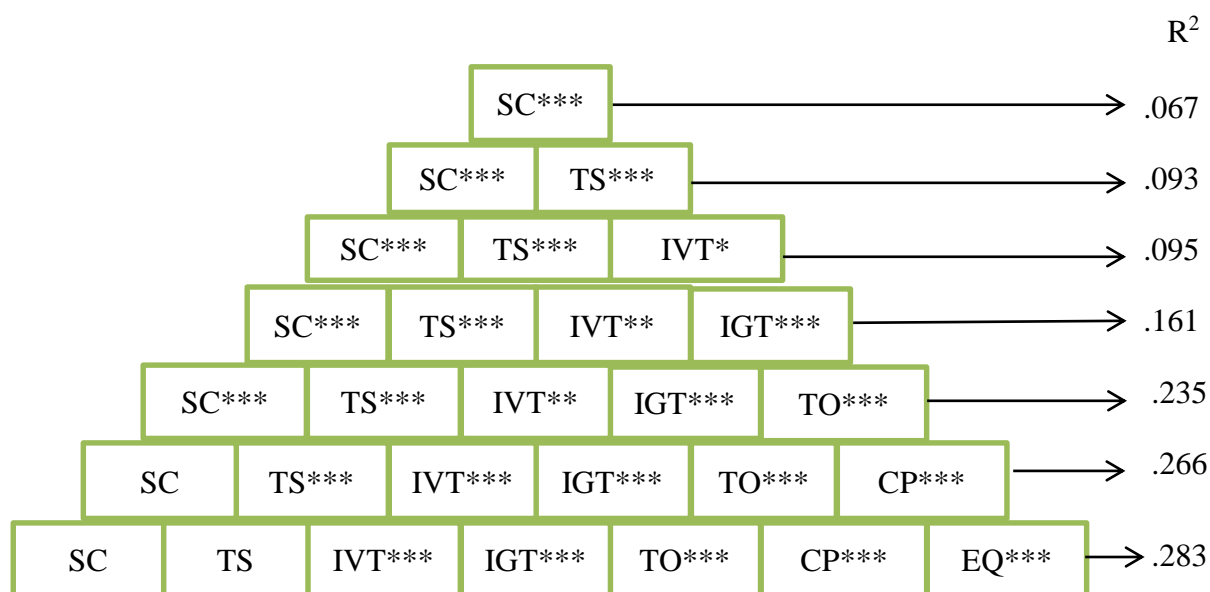


Figure 2. Predictive Models of Components of Classroom Emotional Climate on Motivation of High School Students

Moreover, to investigate how the components of classroom emotional climate were correlated with moral maturity of high school students, it was calculated correlation.

Table 16. Inter-correlation for Components of Classroom Emotional Climate and Moral Maturity of High School Students

Variables	SC	TS	IVT	IGT	TO	CP	EQ
MM	.305**	.200**	.191**	.287**	.438**	.415**	.357**

Note. ** Correlation is significant at 0.01 level.

SC = Student Cohesiveness, TS = Teacher Support, IVT = Involvement, IGT = Investigation, TO = Task Orientation, CP = Cooperation, EQ = Equity, MM = Moral Maturity

According to Table 16, the components of classroom emotional climate and moral maturity were moderately positively correlated.

4.4.2 Multiple Regression Analysis of Classroom Emotional Climate Components on Moral Maturity

The following regression analyses were conducted to measure the influence of classroom emotional climate components on moral maturity. A seven step hierarchical multiple regression analysis was used to assess how much additional variance in moral Maturity can be explained by incrementally adding predictor variables to the equation. Hierarchical multiple regression was chosen because theoretical relevance was given priority over statistical considerations. Variables that explained moral maturity were entered seven steps. In Step 1, "Moral Maturity" was the dependent variable and student cohesiveness was the independent variable. In Step 2, student cohesiveness and teacher support was entered into the Step 2 equation. The process was repeated at Step 3 with student cohesiveness, teacher support and involvement, at Step 4 with student cohesiveness, teacher support, involvement and investigation, at Step 5 with student cohesiveness, teacher support, involvement, investigation and task orientation, at Step 6 with student cohesiveness, teacher support, involvement, investigation, task orientation and cooperation and at Step 7 with student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation and equity. Before the hierarchical multiple regression analysis was performed, the independent variables were examined for collinearity. Results of variance inflation factor VIF (all less than 2.0) and collinearity tolerance (all greater than .731) suggested that the estimated β s are well established in the following regression model.

Table 17. Standardized Beta Coefficients from Hierarchical Multiple Regression Analysis of Classroom Emotional Climate Components on Moral Maturity

Predictors	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
1.SC	.305***	.267***	.254***	.237***	.159***	.089***	.072**
2.TS		.100***	.084***	.054*	.026	.015	-.015
3.IVT			.045	-.046	-.039	-.074**	-.073**
4.IGT			.	.218***	.096***	.079***	.059*
5.TO					.342***	.279***	.255***
6.CP						.238***	.215***
7.EQ							.137***
8.R ²	.093	.102	.103	.137	.224	.259	.272
9.Adj R ²	.093	.101	.102	.135	.222	.257	.269
10.R ² Change	.093***	.009***	.001	.034***	.087***	.036***	.012***
11.F value	F(1,1930) = 139.381 <i>p</i> < 0.000	F(2,1929) = 99.762 <i>p</i> < 0.000	F(3,1928) = 68.370 <i>p</i> < 0.000	F(4,1927) = 93.496 <i>p</i> < 0.000	F(5,1926) = 119.347 <i>p</i> < 0.000	F(6,1925) = 117.453 <i>p</i> < 0.000	F(7,1924) = 109.857 <i>p</i> < 0.000

Note. *Correlation is significant at 0.05 level.

**Correlation is significant at 0.01 level.

***Correlation is significant at 0.001 level.

The results of the regression analysis showed that student cohesiveness was able to account for 9.3 % of the variance in motivation when entered at Step 1, $R^2 = .093$, $F = (1, 1930) = 139.381$, $p < 0.000$. The combination of student cohesiveness and teacher support was able to account for 10.1% of the variance in motivation when entered at Step 2, $R^2 = .102$, $F = (2, 1929) = 99.762$, $p < 0.000$. The combination of student cohesiveness, teacher support and involvement was able to account for 10.2% of the variance in motivation when entered at Step 3, $R^2 = .103$, $F = (3, 1928) = 68.370$, $p < 0.000$. The combination of student cohesiveness, teacher support, involvement and investigation was able to account for 13.5% of the variance in motivation when entered at Step 4, $R^2 = .137$, $F = (4, 1927) = 93.496$, $p < 0.000$. The combination of student cohesiveness, teacher support, involvement, investigation and task orientation was able to account for 22.2% of the variance in motivation when entered at Step 5, $R^2 = .224$, $F = (5, 1926) = 119.347$, $p < 0.000$. The combination of student cohesiveness, teacher support, involvement, investigation, task orientation and cooperation was able to account for 25.7% of the variance in motivation when entered at Step 6, $R^2 = .259$, $F = (6, 1925) = 117.453$, $p < 0.000$. The combination of student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation and equity was able to account for 26.9% of the variance in motivation when entered at Step 7, $R^2 = .272$, $F = (7, 1924) = 109.857$, $p < 0.000$. At Step 7, the β results revealed that student cohesiveness ($\beta = .072$, $p < 0.01$), investigation ($\beta = .059$, $p < 0.05$), task orientation ($\beta = .255$, $p < 0.001$), cooperation ($\beta = .215$, $p < 0.001$), and equity ($\beta = .137$, $p < 0.001$) were positive and significant predictors of high school students' moral maturity. Involvement ($\beta = -.073$, $p < 0.01$) was negative and significant predictors of high school students' moral maturity.

Based on the results, the adjusted R-square increased from .093 to .269 with the addition of subsequent sets of variables. The multiple R^2 was .269, which means that the total contribution by the combined set of classroom emotional climate accounted for approximately 26.9% of the variance of moral maturity. Thus, the collective relationship between moral maturity and the set of predictor variables can be characterized as moderately strong. The β results showed that student cohesiveness, involvement, investigation, task orientation, cooperation, and equity were key predictors on moral maturity. However, teacher support was not significant predictors on moral maturity (see Table 17).

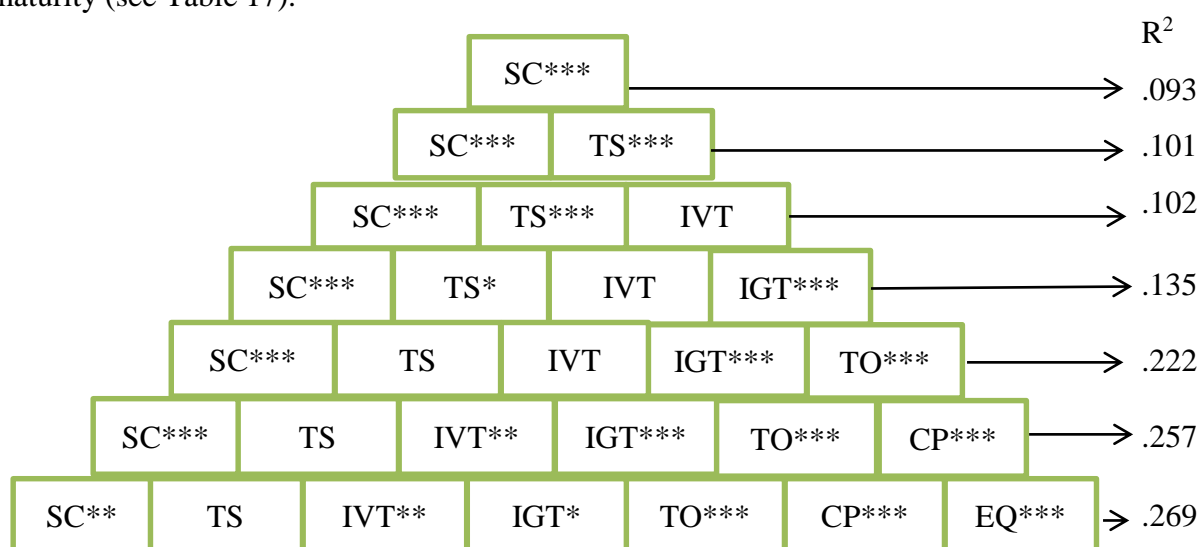


Figure 3. Predictive Models of Components of Classroom Emotional Climate on Moral Maturity of High School Students

Table 18. Correlation Among Classroom Emotional Climate, Motivation and Moral Maturity

	Classroom Emotional Climate	Motivation	Moral Maturity
Classroom Emotional Climate	1	.474***	.45***
Motivation		1	.456***
Moral Maturity			1

Note. ***Correlation is significant at the 0.001 level.

The result can be predicted that classroom emotional climate would be positively correlated with moral maturity and motivation (see Table 18). It can be predicted that students who possess high classroom emotional climate have high moral maturity and more motivation in learning. This finding is consistent with the results of Guivernau and Duda (2002). The result can be predicted that learners' motivation would be positively correlated with moral maturity (see Table 18). It can be predicted that students who have more motivation in learning possess high moral maturity. This finding is consistent with the results of Sheikh, Sana (2007).

4.4.3 Predictors of Motivation and Moral Maturity of High School Students

To identify the best model for predicting the high school students' motivation and moral maturity, simple linear regression analysis was conducted. Regression analysis revealed that model significantly explained the high school students' motivation; $F = 558.795$, $p = .000$, R^2 for model was 0.225 and adjusted R^2 was 0.224. Table 19 displays the intercept, unstandardized regression coefficient (B), and standardized regression coefficient β for model. According to the result, classroom emotional climate contributed 22.4% variance to motivation of high school students.

Table 19. Regression Analysis for Prediction of Motivation

Variable	B	β	t	R	R^2	$Adj R^2$	F
Predictor of Motivation	107.126		36.770***	.474 ^a	.225	.224	558.795***
Classroom Emotional Climate	.329	.474	23.639***				

Note. *** $p < .001$

Motivation = 107.126 + 0.329 Classroom Emotional Climate

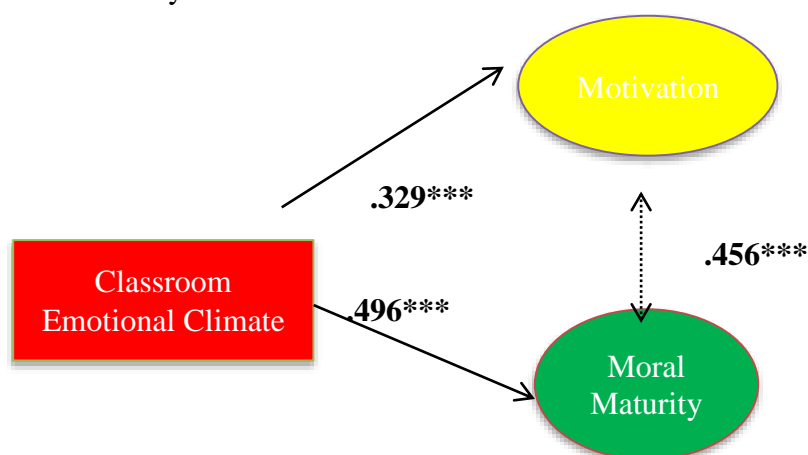
Further detailed analyses and computations were undertaken to test the predictive power of classroom emotional climate on moral maturity of high school students. The result of regression analysis pointed out that classroom emotional climate is significant predictor of high school students' moral maturity (see Table 19). Classroom Emotional Climate is significantly predicted moral maturity of high school students, $F = 489.505$, $p = .000$, R^2 for model was 0.202 and adjusted R^2 was 0.202. This indicated that 20.2% of the variance in high school students' moral maturity was explained by the model.

Table 20. Regression Analysis for Prediction of Moral Maturity

Variables	<i>B</i>	β	<i>t</i>	<i>R</i>	<i>R</i> ²	<i>Adj R</i> ²	<i>F</i>
Predictor of Moral Maturity	167.188		35.616***	.450 ^a	.202	.202	489.505***
Classroom Emotional Climate	.496	.450	22.125***				

Note. *** $p < .001$

Moral Maturity = 167.188 + .496 Classroom Emotional climate

**Figure 4.** Model for Prediction the Effect of Classroom Emotional Climate on Motivation and Moral Maturity of High School Students

Note. The dotted line represents the correlations between two variables.

The straight lines represent the *B* weights.

Based on the result of the simple linear regression analysis, model for prediction the effect of classroom emotional climate on motivation and moral maturity of high school students was depicted in the Figure 4. According to the model, classroom emotional climate support the motivation and moral maturity of high school students. Moreover, these domains were inter-correlated with each other and the relationship between motivation and moral maturity was also moderately strong.

5. Qualitative Study

The data obtained from interviews with students were used to study the significant factors which influence on the motivation and moral maturity of high school students.

5.1 Participants of the Qualitative Study

From the total of 1932 high school students, 16 students were selected by using purposive sampling technique according to levels of classroom emotional climate and levels of moral maturity. Due to the explanatory sequential mixed-methods design, participants selected for the qualitative phase of the study were determined based on the results of the initial quantitative phase. It is expected to find out students' classroom emotional climate and their moral maturity. Therefore, in this research, researcher divided students into four groups based on the results of the

initial quantitative results. Among them, first group was high classroom emotional climate students and high moral maturity students, second group was high classroom emotional climate students and low moral maturity students, third group was low classroom emotional climate students and high moral maturity students, and fourth group was low classroom emotional climate students and low moral maturity students. The sixteen participants in this interview study were into four groups: four high CEC and high MM group, four high CEC and low MM group, four low CEC and high MM group and four low CEC and low MM group (see Table 21).

Table 21. Criteria for Selecting the Qualitative Sample

Moral Maturity	Classroom Emotional Climate	
	High	Low
High	4	4
Low	4	4

5.2 Instrumentation

Students have been selected for qualitative study were interviewed with semi-structured to explore the factors that are related to moral maturity of students. The interview questions were constructed based on the following facts;

- (1) Classroom conditions
- (2) Relationships with Teachers and Peers in Class
- (3) Motivation towards learning
- (4) Specific - Moral and immoral qualities and behaviors in classroom
- (5) Behavioral - Immoral or advised to lie about something, handling the situation
- (6) Situational - handling moral and immoral behaviors/conditions

5.3 Qualitative Data Collection Procedures

In qualitative study, researcher provided and reviewed by reading aloud to the participant the interview consent letter. Researcher explained the purpose of the research, the presence of their participation, their right to answer the interview, researcher take responsibility about their response, any risks cannot be found, and benefits about their participation in this research study. The researcher reminded the participant that the interview would be recorded and transcribed. During the interview, researcher asked questions and participants replied answers about the questions. Researcher took notes and recorded about their response. As this interview was the semi-structured interview, participants could answer as he or she saw and replied answers as an extended responses. The researcher was able to follow up with additional questions on that topic or generate an original question not listed in the interview guide. The researcher was sensitive to be careful about participants' time and limited the interview within the allotted time.

5.4 Qualitative Data Analysis Procedure

One measure of classroom conditions is the fact that society play an important role in students' moral maturity. Students spend an incredible amount of time in classroom. Classroom

has a great impact on students' moral maturity. In a positive classroom climate, students feel comfortable at classroom, feel safe to talk to their teachers when they face problems, feel appreciated, or being involved in decision making at classroom, they will have greater confidence and a more positive attitude. The way they feel toward peers and teachers at classroom will affect their moral life.

One measure of teachers and peers relationship studied the fact that interactions with teachers and peers play a central role in supporting young adolescents' academic motivation and moral maturity. Teachers must address students' academic, emotional and social needs to maintain a supportive and optimal learning environment. Teachers are uniquely positioned to shape multiple domains of their students' development including their morality and motivation to learn. It is important to acknowledge that peers play a crucial and positive role in child and adolescent development, and it may argued that they more often contribute to each other's development in positive ways. Peers often provide valuable resources (e.g., help) and can offer emotional support during emotionally stressful times.

One measure of motivation towards learning is the fact that many factors motivate students' to learn. These factors may be intrinsic or extrinsic. Teachers can increase students' motivation to learn. While students may have an innate desire to learn, the external support provided by the teacher has a significant impact on students' learning. The teachers' role in motivation includes, but is not limited to, creating an environment conducive in learning.

To analyze the qualitative data, the researcher reviewed the purpose of the study and findings of the quantitative data. The results of the interview were combined to interpret in order to get understanding of the factors of classroom emotional climate which is impact on moral maturity of high school students. To express participants' response, codes were used in the documentations. The following abbreviations and their corresponding meanings were used: CEC for classroom emotional climate and MM for moral maturity. Among 16 students of the qualitative study, four cases of students were summarized to illustrate drafts for them.

Code – Participant 1

Gender – Female

Type – High Classroom Emotional Climate and High Moral Maturity

Her classroom is comfortable, clean, neat, caring and nurturing classrooms. It is important for her to have good relationship with peers because she can ask her friends for help when she needs help. She was taken care of her in the classroom because she can answer when teachers ask questions. She kept the whole classroom clean and clear and the teachers' explanations made her want to learn. She wants to be intimate if she has to change something in the classroom. She's best moral quality is to reward the right words. Behaviors that promote good behaviour in the classroom include helping each other and paying attention in teaching. Behaviors that cause immorality in the classroom include ridicule without help when others are in trouble. Essential behaviors in the classroom include listening attentively to teaching and helping one another. She did not have a difficult moral decision. She often consulted her friends when she had problems with her morals. One of the circumstances that prompted her to commit immorality was to lie but she refused at all. She pretends that she don't know if she saw a friend's cheating in an exam. A child needs a blood

transfusion, but his parents' religion prohibits it. The boy will die without the transfusion. Therefore, she would talk to the parents to save the child's life.

Code – Participant 2

Gender – Male

Type – Low Classroom Emotional Climate and Low Moral Maturity

His classroom is comfortable environment. Teachers are not caring him because he can't speak politely. It is important for him to have good relationship with peers because friends help each other. The teacher makes sure that he understands the lesson. Friends stimulate the desire to learn in the classroom. He wants to change dirty classroom to attend regular class. His best moral quality is to be smart without quarreling. Behaviors that promote good behaviour in the classroom include respect for elders. Behaviors that cause immorality in the classroom include stealing money and books. Essential behaviors in the classroom include listening to the teacher; explain the difficult questions to others. It is difficult to decide cheating exam is good or not. He often consulted his teacher when he had problems with his morals. One of the circumstances that prompted him to commit immorality was that it is recommended using tobacco but he explained the disadvantages. He was allowed his friend to cheat and he told him that he also cheat the lessons. A child needs a blood transfusion, but his parents' religion prohibits it. The boy will die without the transfusion. Therefore, he will not donate his blood because his religion not to allow for him

Code – Participant 3

Gender – Male

Type – High Classroom Emotional Climate and Low Moral Maturity

His classroom is very clean, neat and tidy and it is very convenient for him to live in. Teacher treats students equally. It is important for him to have good relationship with peers because helping each other is the good behaviour. He was taken care of teacher in the classroom because teachers treat their students equally. Valuable knowledge stimulates the desire to learn in the classroom. He would like to try good grade in all subjects. His best moral quality is good habits. Behaviors that promote good behaviour in the classroom include clever and polite for elders. Behaviors that cause immorality in the classroom include using drugs. Essential behaviors in the classroom include greeting each other for entering the classroom and giving respect to the teacher. He had a difficult moral decision to tell lying or not. He often consulted his parents when he had problems with his morals. If he commits an offense against his peers, he will discuss with his friends. A child needs a blood transfusion, but his parents' religion prohibits it. The boy will die without the transfusion. Therefore, he will donate his blood because he felt sorry for the baby.

Code – Participant 4

Gender – Male

Type – Low Classroom Emotional Climate and High Moral Maturity

His classroom is comfortable, clean, neat, caring and nurturing classrooms. It is not important for him to have good relationship with peers because he can live without friends and do not need their help. He was taken care of teacher in the classroom because he can answer when

teachers ask questions. He kept the whole classroom clean and clear and the teachers' explanations made him want to learn. He does not change anything if he has to change something in the classroom. His best moral quality is politeness. Behaviors that promote good behaviour in the classroom include listening and paying attention in teaching. Behaviors that cause immorality in the classroom include careless and contempt. Essential behaviors in the classroom include listening attentively to teaching and helping to each other. He had a difficult moral decision that is to decide which subject starts to study. He often consulted his teachers when he had problems with his morals. He told teacher about him if he saw a friend cheating an exam. A child needs a blood transfusion, but his parents' religion prohibits it. The boy will die without the transfusion. Therefore, he will send him to hospital to save the child's life.

Findings mentioned above describe that several factors have impact upon the learners' motivation and moral maturity. Peer pressure, school culture, teachers, personal value and society and culture are important factors on learners' moral maturity. When a group norms promote positive behaviour, such as getting good grades, these peer influences can be beneficial. Unfortunately, some peer groups will take on antisocial behavioral norms that reinforce delinquent behaviour. Therefore, peer affects learners' moral maturity. Moral education that helps choose the right path in life. It comprises some basic principles such as truthfulness, honesty, charity, hospitality, tolerance, love, kindness and sympathy. Moral education makes students perfect.

Teachers teach students the moral values and behaviors, and act as a role model for showing students the desirable characters and traits in the classroom and also the society. They also teach students to respect the rights of other persons and teach them about the acceptance of responsibility for one's action. Teachers own conduct is helpful in shaping students' moral behaviour. This finding is consistent with Kotaiah (2014) in his research stated that teachers play a vital role in fostering the moral qualities of the students regardless what subjects they teach. School culture increases students' motivation. In a school where accomplishment is highly regarded and appreciated, students will feel more motivated to work and study hard and to make changes.

A number of studies had indicated that peer pressure has a great impact on students' behaviour. As children reach adolescence, peer groups gain a special power to influence their behaviour, thanks in part to developmental changes that emphasize the vital importance of being accepted among friends and associates (Steinberg & Monahan, 2007). During the high school years, teachers may notice groups of students using tobacco, alcohol, or other drugs or engaging in other risky behaviour.

Conclusion

A comparatively more female students were found to be higher in classroom emotional climate, moral maturity and motivation than male students. Classroom emotional climate would be positively correlated with motivation and moral maturity. It can be predicted that students who possess high classroom emotional climate have high moral maturity and more motivation in learning.

A high classroom emotional climate and a high moral maturity of students in group one. In group two, students are high classroom emotional climate but low moral maturity because they have peer pressure and they sometimes experience group bullying. Peers encouraged them to do

bad things give no guidance and ignore advice from parents. They are influenced by different cultural backgrounds. The fact that they have low moral maturity. In group three, students had low classroom emotional climate and high moral maturity because education influences good morality on individuals, school culture influence an individual to do things that are right and to have good behaviors, teachers encourage students to have good ethics, their personal values direct what to say, how to behave, how to treat oneself and others, and what life choices people make, and then society and culture serve as make sources of good behaviour. In group four, students were found to experience low classroom emotional climate and low moral maturity. These students experience peer aggression, humiliation, threats and physical punishment in class so that they have weak rapport with discipline problems.

According to this research, teachers who should build positive relationship with students. The quality of teacher-student relationship can influence students' motivation. The teachers should get closer to and understand their students deeply so that they will be able to help them to learn and develop their morality. It is important for teachers to create a positive classroom emotional climate. Caring for students does have positive effect on motivation. Teachers who care for their students are always sensitive and considerate of their feeling. Teaching profession is a sacred profession. The teachers are responsible to play important roles in developing students' morality. They serve as moral model, moral mentor, inculcating moral values, creator of caring environment, facilitator, counselor and communicator between students and their parents besides teaching subjects course.

Personal values that motivate people's actions and serve as guiding principles in their lives. Every student has values, but each student has a different value set. These differences are affected by an individual's culture, person's upbringing, life experiences, and a range of other influences.

The classroom atmosphere is crucial role for the moral maturity and motivation of adolescents. Stakeholders should participate in decision making by including teachers and students in planning, shaping, and sustaining solutions for boosting students' morale.

Implications

The student-teacher relationship has a great positive influence in the development of student academic and social development. However, the students who have good relationships and get fully support from the teachers have the chance of performing better in their studies, and students who perform worse usually they have conflict and bad relationship with teachers. The students that get full support, guidance, and constructive criticism from their teachers are more likely to develop a strong personal connection that results in the student feeling free and talking more often about anything to his or her teacher. The students are likely to trust the teacher, and show more interest in teaching and learning activities that lead the students to achieve more in school subjects and have good behaviour. The good student-teacher relationship promotes and motivates the student to develop more desire to learn. The teaching instructions are more emphasis to be appropriate to students and must cater all students' level of understanding. This also encourages students to think and be able to analyze things, and use feedback effectively and encourage the students to use prior knowledge to existing experience. Promoting positive learning environment makes the students emotionally and academically supported, and gives the students the chance for development.

These findings have some implications. First, schools should assume cohesive communities. Today's mobile parents often do not know who their neighbors are or who the parents of their children's friends are. Isolated from each other, parents are often unsure about what rules are appropriate for their children and are consequently insecure about exercising their authority. Schools must bring parents together for face to face communication that will allow them to discover their shared values. Schools can do this by forming small parent support groups, which meet periodically at school or in a parent's home. Parents get support from other parents to set curfews, curtail teen drinking, and regulate the television and movies their children watch. Parents could have to note that their interpersonal relationships and direct interest about their children to be moral mature person. Both the home and the school need to cooperate in making the learners to be well adjusted emotionally and more motivation about learning. Second, friendships are incredibly important during adolescence. Teen friendships help young people feel a sense of acceptance and belonging. Moreover, teenage relationships with peers support the development of compassion, caring, and empathy.

Very little research has been done on classroom emotional climate in a Myanmar context and thus this research contributes to the already existing body of knowledge internationally as well as building a body of knowledge for the Myanmar context. This research serves as a platform for further research to identify other factors that may be indicators of classroom emotional climate in Myanmar, such as leadership and educator dedication, which international studies have shown are factors that contribute to the climate within schools. Classroom emotional climate data can be used to improve the school effectiveness of the participating schools based on a valid and reliable questionnaire by targeting the areas that learners indicated need improvement.

Limitations of the Study

Firstly, this study only focused on seven possible indicators of classroom emotional climate but literature indicates that there are other factors, such as leadership, community and teacher dedication, which may contribute to the climate within a school. Secondly, that the questionnaire was only administered to students and not to educators and principals as well. Thus only the perceptions of students were identified and this study could have benefited if the educators and the principal were also asked to fill in a questionnaire to obtain a complete account of the classroom climate based on all the views of the parties participating in the school system. Thirdly, the sample size of eighteen classrooms from seven townships may have been too small for this study.

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၂၀၂၁ ခုနှစ်အတွက် မြန်မာနိုင်ငံဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုအတွက်
ပါရဂူကျမ်း/ သုတေသနလုပ်ငန်း အစီရင်ခံစာများစာရင်း

စဉ်	ပါရဂူကျမ်း/သုတေသနလုပ်ငန်း အစီရင်ခံစာအမည်	ဘာသာရပ်	ကျမ်းပြုစုသူ
၁	ထွန်းရွှေခိုင် (မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင် ကြီးကျမ်းနှင့် အခြားရာဇဝင်ဆိုင်ရာ စာပေများ နှိုင်းယှဉ်လေ့လာချက်*	Myanmar	Dr Ni Ni Khaing Associate Professor, National Management Degree College
၂	The Sceptical Trend and Its Contribution to Western Philosophy*	Philosophy	Dr Thet Thet Myint Associate Professor, Pyay University
၃	The Correlates and consequences of post- traumatic stress disorder among disaster victims in Myanmar*	Psychology	Dr Tin Tin Lecturer, Monywa University
၄	Myanmar- China- India Trilateral Relations Since 2011*	International Relation	Dr Tin Tin Mar San Lecturer Yangon University of Foreign Language
၅	Study on the Useful Application of Areca Nut Husk Fibre as a Composite with Natural Rubber	Chemistry	Dr Thwe Thwe Soe Lecturer Yangon Institute of Education
၆	Chemical and Pharmacological Study of Bioactive Secondary Metabolites from <i>Pseudomonas Aeruginosa</i> *	Chemistry	Dr Su Swe Su Lecturer,yadanabon University
၇	Analysis of Some Heavy Metal Concentrations in Muscle Tissue of Three Fish Species, Water and Sediment of Thanlwin River Segment, Mon State	Zoology	Dr Ye Ye Win, Lecturer, Taungoo University
၈	Seasonal Prevalence of <i>Aedes Aegypti</i> (Linnaeus, 1762) Larvae in Various Water Storage Containers in Six Areas of Hinthada District, Ayeyarwady Region*	Zoology	Dr Min Zaw Latt, Lecturer, Hinthada University

စဉ်		ပါရဂူကျမ်း/သုတေသနလုပ်ငန်း အစီရင်ခံစာအမည်	ဘာသာရပ်	ကျမ်းပြုစုသူ
၉	၃	Etho-Ecology and Phylogeography of Long-Tailed <i>Macaque</i> , <i>Macaca Fascicularis Aurea</i> l. Geoffroy [1831] From Kaw Goon and Ya Thae Pyan Caves in Kayin State, Myanmar	Zoology	Dr Phyu Pyar Tin Lecturer Mawlamyine University
၁၀	၄	Socio and Molecular Ecology of White-Handed Gibbon, <i>Hylobates Lar</i> (Linnaeus, 1771) at Ywar Kaing Kaung Village in Dawna Mountain Range Corridor, Hpa-an District in Kayin State, Myanmar	Zoology	Dr No No Wai Lecturer Dagon University
၁၁	၅	Nutritional Value of Small Indigenous Fish Species and Fishery Products in Bawle Kyun, Htantabin Township, Yangon Region	Zoology	Dr Htike Htike Lin Lecturer West Yangon University
၁၂	၆	Species Diversity and Distribution of Fishes in Lower Segment of Thanlwin River and its Tributary, Hpa-an Township in Kayin State	Zoology	Dr Khin Lin Lin Kyaw Lecturer, Hpa-An University
၁၃	၁	An Investigation into the Impact of Contextualized Instruction in Learning Physics at the High School Level in Myanmar*	Curriculum and Methodology	Dr Su Mon Aung Lecturer Yangon University of Education
၁၄	၁	Reading Habits, Perception of Media and Information Literacy of Student Teachers Across Teacher Education Institutions in Myanmar	Educational Psychology	Dr Su Mon Oo Lecturer Yangon Unniversity of Education
၁၅	၂	An Analytical Study of the Effect of Classroom Emotional Climate on Motivating Learners and their Moral Maturity*	Educational Psychology	Dr Ei Thinzar Ko Assistant Lecturer Yangon University of Education
၁၆	၃	Development of a Balanced Scoring Algorithmic Model for General Science at Secondary Level	Educational Psychology	Dr Myint Myint Mar Lecturer (Ret) Yangon University of Education

* ဆုရ သုတေသနလုပ်ငန်း အစီရင်ခံစာဖြစ်ပါသည်။

မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ချုပ်

(ခ) ဂုဏ်ပြုလွှာမှတ်တမ်း (ဝိဇ္ဇာပညာရပ်)

ဂုဏ်ပြုလွှာမှတ်တမ်း (သိပ္ပံပညာရပ်)

ဂုဏ်ပြုလွှာမှတ်တမ်း (လူမှုရေးပညာရပ်)

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
ပညာရေးဝန်ကြီးဌာန
မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်တပ်၊



မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ချုပ်
(ဝိဇ္ဇာ ပညာရပ်)


----- အား -----

သုတေသနလုပ်ငန်းအတွက် - - - ခုနှစ်၊ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံ
ပညာရှင်အဖွဲ့ချုပ် (ဝိဇ္ဇာ ပညာရပ်) ကို ချီးမြှင့်သည်။

ပြည်ထောင်စုဝန်ကြီး
ပညာရေးဝန်ကြီးဌာန

----- ခုနှစ်၊ ----- လ ----- ရက်

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
ပညာရေးဝန်ကြီးဌာန
မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့



မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့အစည်း
(သိပ္ပံ ပညာရှင်)

----- အား

သုတေသနလုပ်ငန်းအတွက် ----- စုနှစ်၊ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံ
ပညာရှင်အဖွဲ့အစည်း (သိပ္ပံ ပညာရှင်) ကို ချီးမြှင့်သည်။

----- စုနှစ်၊ ----- လ ----- ရက်

ပြည်ထောင်စုဝန်ကြီး
ပညာရေးဝန်ကြီးဌာန

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ

ပညာရေးဝန်ကြီးဌာန

မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့



မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့
(လူမှုရေး ပညာရပ်)

----- အား

သုတေသနလုပ်ငန်းအတွက် - - - စုနှစ်၊ မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံ
ပညာရှင်အဖွဲ့အစည်း (လူမှုရေး ပညာရပ်) ကို ချီးမြှင့်သည်။

----- စုနှစ်၊ ----- လ ----- ရက်

ပြည်ထောင်စုဝန်ကြီး
ပညာရေးဝန်ကြီးဌာန

**“မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ချုပ်” ရရှိသူ
ပုဂ္ဂိုလ်များ၏ ကိုယ်ရေးအကျဉ်း**

ဒေါက်တာတင်တင်မာစန်း၏ ကိုယ်ရေးအကျဉ်း



ဒေါက်တာတင်တင်မာစန်းကို ၁၉၇၈ ခုနှစ် ဇန်နဝါရီလရက်နေ့တွင် မွေးဖွားခဲ့ပါသည်။ (၇) ဒဂုံတက္ကသိုလ်မှ ၂၀၀၃ ခုနှစ်တွင် BA (IR)ဘွဲ့ကို လည်းကောင်း၊ ၂၀၀၉ ခုနှစ်တွင် MA (IR)ဘွဲ့ကို လည်းကောင်း၊ ရန်ကုန်တက္ကသိုလ်မှ ၂၀၁၅ ခုနှစ်တွင် M.Res (IR)ဘွဲ့ကိုလည်းကောင်း၊ Diploma (English) ဒီပလိုမာဘွဲ့ကိုလည်းကောင်း၊ ၂၀၂၁ ခုနှစ်တွင် Ph.D (IR) ဘွဲ့ကိုလည်းကောင်းရရှိခဲ့ပါသည်။

ဒေါက်တာတင်တင်မာစန်းသည် ရန်ကုန်နိုင်ငံခြားဘာသာတက္ကသိုလ်၊ နိုင်ငံတကာဆက်ဆံရေး ပညာဌာနတွင် ၂၀၁၂ခုနှစ်၊ စက်တင်ဘာလရက်နေ့မှစတင်၍ နည်းပြအဖြစ် တာဝန်ထမ်းဆောင်(၁၀) ခဲ့ပါသည်။ ဒေါက်တာတင်တင်မာစန်းသည် မြန်မာ-တရုတ်-အိန္ဒိယ နိုင်ငံများ၏ နိုင်ငံတကာဆက်ဆံရေး များနှင့် နိုင်ငံခြားရေးမူဝါဒများနှင့် သက်ဆိုင်သောသုတေသနများ၊ မြန်မာ့နိုင်ငံခြားရေးမူဝါဒဆိုင်ရာ စာတမ်းများကိုလည်း ပြုစုရေးသားခဲ့ပါသည်။

ဒေါက်တာ သက်သက်မြင့်၏ ကိုယ်ရေးအကျဉ်း



ဒေါက်တာ သက်သက်မြင့်ကို ၁၉၆၆ ခုနှစ်၊ ဇွန်လ (၂၄) ရက်နေ့တွင် အဘဦးကျော်မြင့်၊ အမိ ဒေါ်မြသောင်းတို့မှ ပဲခူးတိုင်းဒေသကြီး သာယာဝတီခရိုင်၊ ကြို့ပင်ကောက်မြို့တွင် မွေးဖွားခဲ့ပါသည်။ ၁၉၈၂ ခုနှစ်တွင် အဆင့်မြင့်ပညာ တက္ကသိုလ်ဝင်တန်းအောင်မြင်ခဲ့ပြီး ဝိဇ္ဇာဘွဲ့ကို (ဒဿနိကဗေဒ ဘာသာရပ်)ဖြင့် ၁၉၈၆ ခုနှစ်တွင် အဝေးရောက်သင်ယူကာ ရန်ကုန်တက္ကသိုလ်မှ ရရှိခဲ့ပါသည်။ ဝိဇ္ဇာဘွဲ့ကို မဟာအရည်အချင်းစစ်ဖြင့် အောင်မြင်ခဲ့သဖြင့် နေ့သင်တန်းသို့ ကူးပြောင်းကာ မဟာအရည်အချင်း (အပိုင်း က + ခ) ကို ဆက်လက်တက်ရောက်ပြီး မဟာဝိဇ္ဇာဘွဲ့ကို ၁၉၉၅ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ ရရှိခဲ့ပါသည်။

ထိုမှတဆင့် ၁၉၉၅ ခုနှစ်တွင် တက္ကသိုလ်ဆရာမ (နည်းပြ) ရာထူးဖြင့် အလုပ်စတင်ဝင်ရောက်ကာ တွဲဖက်ပါမောက္ခ အဆင့်မြင့်ပါရဂူဘွဲ့ကို ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ ထပ်မံရရှိခဲ့ပြီး ယခုပါမောက္ခရာထူးဖြင့် ဟင်္သာတတက္ကသိုလ်၊ ဒဿနိကဗေဒဌာနတွင် တာဝန်ထမ်းဆောင်နေပါသည်။ လက်ရှိအလုပ်လုပ်နေစဉ်အတွင်း ဌာနနှင့်ပတ်သက်သော သုတေသနစာတမ်းများ၊ တက္ကသိုလ်မှထုတ်ဝေသော သုတေသနဂျာနယ်များတွင် သုတေသနစာစောင်များရေးသားခြင်း၊ ပါရဂူဘွဲ့ပြုလုပ်နေစဉ် အတွင်း Seminar များ ဖတ်ကြားခြင်း၊ ဝိဇ္ဇာ/သိပ္ပံ Ph.D ကျမ်းပြိုင်ပွဲတွင် ပါဝင်ယှဉ်ပြိုင်မှုများဆောင်ရွက်ခဲ့ပါသည်။

ယခု (၂၀၂၄-၂၀၂၅) ပညာသင်နှစ်တွင် သရေခေတ္တရာ၊ ပျူလူမျိုးတို့နှင့်ပတ်သက်သော ရှေးဟောင်းယဉ်ကျေးမှုများကို ရသရှုထောင့်မှ လေ့လာသည့် (Project) ကို ပြုလုပ်နေဆဲဖြစ်ပါသည်။

နောက်ဆက်တွဲ (ဂ-၃)

ဒေါက်တာ တင်တင်၏ ကိုယ်ရေးအကျဉ်း



ဒေါက်တာတင်တင်ကို ၁၉၈၁ ခုနှစ်၊ ဖေဖော်ဝါရီလ၊ (၁၄) ရက်နေ့တွင် အဘဦးအိုင်ဝယ်၊ အမိဒေါ်လှကျင်တို့မှ ရှမ်းပြည်မြောက်ပိုင်း၊ မဘိမ်းမြို့နယ်၊ နမ့်ပုံးပုံးရွာတွင် မွေးဖွားခဲ့ပါသည်။ ၂၀၀၄ ခုနှစ်တွင် အဝေးသင်သင်တန်း မုံရွာတက္ကသိုလ်မှ မဟာအရည်အချင်းစစ်သင်တန်း တက်ရောက်ရန် အဆင့်မီဖြင့် BA ဘွဲ့၊ ၂၀၀၇ ခုနှစ်တွင် MA ဘွဲ့ ရရှိခဲ့ပါသည်။

ဒေါက်တာ တင်တင်သည် ရန်ကုန်အဝေးသင်တက္ကသိုလ်၊ စိတ်ပညာဌာနတွင် ၂၀၁၂ ခုနှစ်၊ စက်တင်ဘာလ၊ (၁၇) ရက်နေ့မှစတင်၍ နည်းပြအဖြစ် တာဝန်ထမ်းဆောင်ခဲ့ပြီး၊ နည်းပြရာထူးတူဖြင့် မုံရွာတက္ကသိုလ်၊ ရန်ကုန်တက္ကသိုလ် တို့တွင်ဆက်လက်တာဝန် ထမ်းဆောင်ခဲ့ပါသည်။ ၂၀၁၆ ခုနှစ်၊ ဩဂုတ်လ၊ (၁၂) ရက်နေ့တွင် လက်ထောက်ကထိက ရာထူးဖြင့် မုံရွာတက္ကသိုလ်၌ တာဝန် ထမ်းဆောင်ခဲ့ပါသည်။ ၂၀၁၈-၂၀၁၉ ခုနှစ်တွင် လူမှုဝန်ထမ်းဦးစီးဌာနမှ ကြီးမှူးဆောင်ရွက်သော ECI (Early Childhood Intervention) အစောပိုင်းအရွယ် ကလေးငယ်များ ဖွံ့ဖြိုးမှုအတွက် Child Psychologist အဖြစ် တစ်နှစ် တွဲဖက်တာဝန်ထမ်းဆောင်ခဲ့ပါသည်။ ၂၀၁၉ ခုနှစ်၊ ဒီဇင်ဘာလ၊ (၁၆) ရက်နေ့တွင် ကထိက ရာထူးဖြင့် စစ်တွေတက္ကသိုလ်သို့ ပြောင်းရွှေ့တာဝန်ထမ်းဆောင်ခဲ့ပါသည်။ ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ ပါရဂူဘွဲ့ကို ရရှိခဲ့ပါသည်။

ဒေါက်တာ တင်တင်သည် ၂၀၂၁ ခုနှစ်၊ ဇန်နဝါရီလ၊ (၂၉) ရက်နေ့မှ ယနေ့အထိ မုံရွာ တက္ကသိုလ်တွင် ကထိက ရာထူးဖြင့် တာဝန်ထမ်းဆောင်လျက်ရှိပါသည်။

ဒေါက်တာ နီနီခိုင်၏ ကိုယ်ရေးမှတ်တမ်းအကျဉ်း



ဒေါက်တာနီနီခိုင်ကို စစ်တွေမြို့တွင် အဖဦးသိန်းစောဦး အမိဒေါ်သာညိုဖြူတို့မှ ၁၉၆၉ ခု၊ စက်တင်ဘာလ ၂၉ ရက်နေ့တွင် မွေးဖွားခဲ့ပါသည်။ မူလတန်း၊ အလယ်တန်းနှင့် အထက်တန်းတို့ကို စစ်တွေမြို့တွင် ပညာဆည်းပူးခဲ့ပါသည်။ ဝိဇ္ဇာ(မြန်မာစာ)ဘွဲ့ကို စစ်တွေဒီဂရီကောလိပ်မှ (၁၉၉၂) ခုနှစ်တွင် ရရှိခဲ့ပါသည်။ မဟာဝိဇ္ဇာ (မြန်မာစာ) ဘွဲ့ကို (၁၉၉၈) ခုနှစ်တွင်လည်းကောင်း၊ ပါရဂူ (မြန်မာစာ) ဘွဲ့ကို (၂၀၂၁) ခုနှစ် တွင် လည်းကောင်း ရန်ကုန်တက္ကသိုလ်မှ ရရှိခဲ့ပါသည်။ နည်းပြရာထူးကို ၁၉၉၈ ခုနှစ်တွင် စစ်တွေတက္ကသိုလ်၌စတင် တာဝန်ထမ်းဆောင်ခဲ့ပြီး၂၀၀၆ ခုနှစ်တွင် လက်ထောက်ကထိက ရာထူးကို ဆက်လက်တိုးမြှင့်ထမ်းဆောင်ခဲ့ပါသည်။ ရန်ကုန်တက္ကသိုလ်တွင်၂၀၁၂ ခုနှစ်၌ ကထိက ရာထူးကိုတိုးမြှင့်ထမ်းဆောင်ခဲ့ပြီး စစ်တွေတက္ကသိုလ်သို့ ပြောင်းရွှေ့ထမ်းဆောင်ခဲ့ပါသည်။ တွဲဖက်ပါမောက္ခ ရာထူးကို ၂၀၂၁ ခုနှစ်တွင် အမျိုးသားစီမံခန့်ခွဲမှုပညာဒီဂရီ ကောလိပ်၊ မြန်မာစာဌာန၌ တိုးမြှင့်ထမ်းဆောင်ခဲ့ပြီးယနေ့အချိန်ထိ ဆက်လက်တာဝန်ထမ်းဆောင်လျက်ရှိပါသည်။

ဒေါက်တာနီနီခိုင်သည် မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့မှ ကြီးမှူးကျင်းပသည့် (၂၂)ကြိမ်မြောက် သုတေသနညီလာခံတွင် “ထွန်းရွှေခိုင်(မဟာဝိဇ္ဇာ)၏ ရခိုင်မဟာရာဇဝင် ကြီးကျမ်းနှင့် အခြား ရာဇဝင်ဆိုင်ရာစာပေများနှိုင်းယှဉ်လေ့လာချက်” ကျမ်းဖြင့်(၁၆)ကြိမ်မြောက် မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့် သိပ္ပံပညာရှင်အဖွဲ့ဆု(ဝိဇ္ဇာပညာရပ်ဆု)ကို ရရှိခဲ့ပါသည်။ ဒေါက်တာနီနီခိုင်၏ “ရခိုင်ရာဇဝင်ဆိုင်ရာစာပေများမိတ်ဆက်”စာတမ်းကို Volume 5, No.1 December, 2018 Sittway University Research Journal တွင်လည်းကောင်း၊ “ရခိုင်မင်းသမီးချင်း ၏မင်းဆက်ရာဇဝင်စီစဉ်တင်ပြပုံ”စာတမ်း ကို Vol-6, December, 2019 Sittway University Research Journal တွင် လည်းကောင်း ပုံနှိပ်ထုတ်ဝေခဲ့ပါသည်။ “ရခိုင်ခေတ်ဦးအာနန္ဒစန္ဒြေကျောက်စာမိတ်ဆက်” စာတမ်းကို Vol-3, No.1 March, 2023 National Management Degree College Research Journal တွင်ဖော်ပြထုတ်ဝေခဲ့ပါသည်။ “ရခိုင်ပေစာသုဝဏ္ဏသာမပျို့လင်္ကာလေ့လာချက်”စာတမ်းကို ရခိုင်တင်းခွန်ဂျာနယ်အမှတ်(၃)တွင် ပုံနှိပ်ထုတ်ဝေခဲ့ပါသည်။

ဒေါက်တာ မင်းဇော်လတ်၏ ကိုယ်ရေးမှတ်တမ်းအကျဉ်း



ဒေါက်တာ မင်းဇော်လတ်ကို ၁၉၈၉ ခုနှစ်၊ မေလ(၄)ရက်နေ့တွင် မွေးဖွားခဲ့ပါသည်။ ၂၀၁၁ ခုနှစ်တွင် ဟင်္သာတတက္ကသိုလ်မှ B.Sc (Hons) ဘွဲ့ကိုလည်းကောင်း၊ ၂၀၁၂ ခုနှစ်တွင် M.Sc (Zoology) ဘွဲ့ကိုလည်းကောင်း၊ ၂၀၁၆ ခုနှစ်တွင် M.Res (Zoology) ဘွဲ့ကိုလည်းကောင်း ရရှိခဲ့ပါသည်။ ၂၀၂၃ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ ပါရဂူဘွဲ့ ရရှိခဲ့ပါသည်။

ဒေါက်တာ မင်းဇော်လတ်သည် ပညာရေးဝန်ကြီးဌာန၊ အခြေခံပညာဦးစီးဌာနတွင် ၂၀၁၄ ခုနှစ်၊ ဇူလိုင်လ(၁)ရက်နေ့မှ ၂၀၁၅ ခုနှစ်၊ ဖေဖော်ဝါရီလ(၂)ရက်နေ့ထိ မူပြုရာထူးဖြင့် တာဝန်ထမ်းဆောင်ခဲ့ပါသည်။ ထိုမှဆက်လက်၍ အဆင့်မြင့်ပညာဦးစီးဌာန၊ ဟင်္သာတတက္ကသိုလ်၊ သတ္တဗေဒဌာနတွင် ၂၀၁၅ ခုနှစ်၊ ဖေဖော်ဝါရီလ(၃)ရက်နေ့မှ စတင်၍ သရုပ်ပြအဖြစ် တာဝန်ထမ်းဆောင်ခဲ့ပြီး၊ ရန်ကုန်တက္ကသိုလ်၊ မြိတ်တက္ကသိုလ်တို့တွင်လည်း တာဝန်ထမ်းဆောင်ခဲ့ပါသည်။

ဒေါက်တာ မင်းဇော်လတ်သည် သတ္တဗေဒအထူးပြု၊ မစ္ဆာဗေဒဘာသာရပ်နှင့် သက်ဆိုင်သော သုတေသနများ၊ ဆေးပညာဆိုင်ရာ ကမ္ဘီလဗေဒဘာသာရပ်နှင့် သက်ဆိုင်သော သုတေသနစာတမ်းများကိုလည်း ပြုစုရေးသားခဲ့ပါသည်။

ဒေါက်တာ စုဆွေစု၏ ကိုယ်ရေးမှတ်တမ်းအကျဉ်း



ဒေါက်တာစုဆွေစုကို ၁၉၈၆ ခုနှစ်၊ ဇွန်လ၊ ၂၄ ရက်နေ့၊ မန္တလေးမြို့တွင် မွေးဖွားခဲ့ပါသည်။ ၂၀၀၇ ခုနှစ်တွင် ရတနာပုံတက္ကသိုလ်မှ သိပ္ပံဂုဏ်ထူးတန်းဘွဲ့ B.Sc (Hons) ကိုလည်းကောင်း၊ ၂၀၁၀ ခုနှစ်တွင် မန္တလေးတက္ကသိုလ်မှ မဟာသိပ္ပံဘွဲ့ MSc ကိုလည်းကောင်း၊ ၂၀၁၁ ခုနှစ်တွင် မန္တလေးတက္ကသိုလ်မှ မဟာသုတေသနဘွဲ့ M.Res ကိုလည်းကောင်း၊ ၂၀၂၁ ခုနှစ်တွင် ရန်ကုန်တက္ကသိုလ်မှ ပါရဂူဘွဲ့ (PhD) ကို ရရှိခဲ့ပါသည်။

ဒေါက်တာစုဆွေစုသည် ဓာတုဗေဒဌာန၊ မုံရွာတက္ကသိုလ် ၁၀-၉-၂၀၁၂ မှ ၃၁-၈-၂၀၁၅ ထိ၊ သရုပ်ပြရာထူး ၁-၉-၂၀၁၅ မှ ၂၃-၃-၂၀၂၀ ထိ ဓာတုဗေဒဌာန၊ ရန်ကုန်တက္ကသိုလ်တွင် လက်ထောက် ကထိက ရာထူးများဖြင့် တာဝန်ထမ်းဆောင်ခဲ့ပါသည်။ ၂၄-၃-၂၀၂၀ မှ ၅-၁-၂၀၂၄ ထိ ဓာတုဗေဒဌာန၊ ရတနာပုံတက္ကသိုလ်တွင် ကထိကရာထူးဖြင့် တာဝန်ထမ်းဆောင်ခဲ့ပြီး ၈-၁-၂၀၂၄ မှ ယနေ့ထိ ဓာတုဗေဒဌာန၊ ပဲခူးတက္ကသိုလ်တွင် ကထိကရာထူးဖြင့် တာဝန်ထမ်းဆောင်နေဆဲ ဖြစ်ပါသည်။

ဒေါက်တာစုဆွေစု သည် အောက်တိုဘာလ၊ ၂၀၂၁ ခုနှစ်တွင် “Molecular Confirmation of the Soil Bacterial *Pseudomonas aeruginosa* and Evaluation of Some Bioactive Secondary Metabolites” ခေါင်းစဉ်ဖြင့် မြန်မာနိုင်ငံဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့မှ ချီးမြှင့်သော သုတေသနစာတမ်းဆု ကိုလည်းကောင်း၊ ဒီဇင်ဘာလ၊ ၂၀၂၂ ခုနှစ်တွင် “Chemical and Pharmacological Study of Bioactive Secondary Metabolites from *Pseudomonas Aeruginosa*” ခေါင်းစဉ်ဖြင့် (၁၆) ကြိမ်မြောက် မြန်မာနိုင်ငံဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့ဆုကိုလည်းကောင်း ရရှိခဲ့ပါသည်။

ဒေါက်တာ စုမွန်အောင်၏ ကိုယ်ရေးမှတ်တမ်းအကျဉ်း



ဒေါက်တာစုမွန်အောင်ကို ၁၉၉၀ ခုနှစ်၊ ဧပြီလ (၁) ရက်နေ့တွင် မွေးဖွားခဲ့ပါသည်။ ၂၀၀၆ ခုနှစ်တွင် တက္ကသိုလ်ဝင်တန်းစာမေးပွဲကို အ.ထ.က (၁) အိမ်မဲ၊ အိမ်မဲမြို့၊ ဧရာဝတီတိုင်းဒေသကြီးမှ (သင်္ချာ၊ ဓာတုဗေဒ၊ ရူပဗေဒ) ဘာသာရပ်ဂုဏ်ထူးများဖြင့် အောင်မြင်ခဲ့ပါသည်။ ရန်ကုန်ပညာရေးတက္ကသိုလ်၌ ၂၀၀၆ ခုနှစ်မှ ၂၀၁၀ ခုနှစ်ထိ ပညာသင်ယူခဲ့ပြီး ၂၀၁၀ခုနှစ်တွင် BEd ပညာရေးဘွဲ့ကို (qualified) ဖြင့် ရရှိခဲ့ပါသည်။ ၂၀၁၅ ခုနှစ်တွင် MEd မဟာပညာရေးဘွဲ့ကို အထူးအောင် (Credit) ဖြင့် ရရှိခဲ့ပါသည်။ ၂၀၂၁ ခုနှစ် တွင် PhD ပါရဂူဘွဲ့ကို ရရှိခဲ့ပါသည်။

ဒေါက်တာစုမွန်အောင်သည် အခြေခံပညာဦးစီးဌာနတွင် ၂၀၁၁ ခုနှစ်မှ ၂၀၁၇ ခုနှစ်အထိ အလယ်တန်းပြ၊ အထက်တန်းပြတာဝန်များကို ထမ်းဆောင်ခဲ့ပါသည်။ ရန်ကုန်ပညာရေးတက္ကသိုလ်၊ သင်ရိုးညွှန်းတမ်းနှင့် သင်ပြနည်းဌာန၌ ၁၄-၉-၂၀၁၇ မှစ၍ နည်းပြတာဝန်များကိုလည်းကောင်း၊ ၁-၃-၂၀၁၉ မှစ၍ လက်ထောက်ကထိက တာဝန်များကိုလည်းကောင်း ထမ်းဆောင်ခဲ့ပါသည်။ ယခု လက်ရှိတွင် ရန်ကုန်ပညာရေးတက္ကသိုလ်၊ သင်ရိုးညွှန်းတမ်းနှင့် သင်ပြနည်းဌာန၌ ကထိကတာဝန်များကို ထမ်းဆောင်လျက်ရှိပါသည်။

ဒေါက်တာစုမွန်အောင်သည် ရူပဗေဒသင်ပြနည်းဘာသာရပ်နှင့် သက်ဆိုင်သော သုတေသနများ၊ သိပ္ပံသင်ပြနည်းနှင့် သက်ဆိုင်သော သုတေသနများ၊ သိပ္ပံစာသင်ခန်းအတွင်း၌ ကျောင်းသား၊ ကျောင်းသူများ၏ တီထွင်ဖန်တီးနိုင်စွမ်းနှင့် သက်ဆိုင်သော သုတေသနများ၊ ဆရာအတတ်သင် ပညာရေးနှင့် သက်ဆိုင်သော သုတေသနများကို ရေးသား ပြုစုခဲ့ပါသည်။ ဒေါက်တာစုမွန်အောင်သည် ၂၁ ကြိမ်မြောက် မြန်မာနိုင်ငံဝိဇ္ဇာနှင့် သိပ္ပံပညာရှင်အဖွဲ့ သုတေသနညီလာခံတွင် သင်ရိုးညွှန်းတမ်းနှင့် သင်ပြနည်း ဘာသာရပ်အတွက် အကောင်းဆုံးသုတေသန စာတမ်းဆုကိုလည်းကောင်း၊ ၂၂ ကြိမ်မြောက် မြန်မာနိုင်ငံဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ သုတေသနညီလာခံတွင် သင်ရိုးညွှန်းတမ်းနှင့် သင်ပြနည်း ဘာသာရပ်အတွက် အကောင်းဆုံးသုတေသန စာတမ်းဆုကိုလည်းကောင်း၊ ၁၆ ကြိမ်မြောက် မြန်မာနိုင်ငံဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အဖွဲ့ဆုကို လည်းကောင်းရရှိခဲ့ပါသည်။ ၂၀၂၃ ခုနှစ်၊ အောက်တိုဘာလတွင် စင်္ကာပူနိုင်ငံ National Institute of Education (NIE) ၌ ကျင်းပသည့် “Graduate Student Conference GSC 2023” တွင် ရူပဗေဒသင်ပြနည်း ဘာသာရပ်နှင့်သက်ဆိုင်သော သုတေသနစာတမ်းကို စင်္ကာပူနိုင်ငံသို့ သွားရောက် ဖတ်ကြားခဲ့ပါသည်။

ဒေါက်တာ အိသဉ္ဇာကို၏ ကိုယ်ရေးမှတ်တမ်းအကျဉ်း



ဒေါက်တာအိသဉ္ဇာကို ကို ၁၉၈၉ ခုနှစ် ဒီဇင်ဘာလ (၃) ရက်နေ့တွင် အဘဦးလေးကို အမိ ဒေါ်သန်းသန်းဌေးတို့မှ ဖွားမြင်သည်။ မွေးဖွားရာဇာတိမှာ မော်လမြိုင်မြို့နယ်၊ မွန်ပြည်နယ်ဖြစ်ပါသည်။ ၂၀၀၆ခုနှစ်တွင် မွန်ပြည်နယ်၊ မော်လမြိုင်မြို့၊ အမှတ်(၁၀) အခြေခံပညာအထက်တန်းကျောင်းမှ တက္ကသိုလ်ဝင်တန်းစာမေးပွဲကို ဂုဏ်ထူးသုံးဘာသာဖြင့် အောင်မြင်ခဲ့သည်။ ဒေါက်တာအိသဉ္ဇာကိုသည် ပညာရေးဘွဲ့ကို ၂၀၁၀ခုနှစ်တွင် ရရှိခဲ့ပြီး မဟာပညာရေးဘွဲ့ (Guidance and Counselling) ကို ၂၀၁၄ ခုနှစ်တွင် ရရှိခဲ့သည်။ ၂၀၂၁ခုနှစ်တွင် ရန်ကုန်ပညာရေးတက္ကသိုလ်မှ ပညာရေး ပါရဂူဘွဲ့ကိုရရှိခဲ့ပါသည်။

ဒေါက်တာအိသဉ္ဇာကိုသည် အမှတ်(၁၁) အခြေခံပညာအထက်တန်းကျောင်း၊ မော်လမြိုင်တွင် ၂၀၁၁ခုနှစ်၊ ဇွန်လ (၁) ရက်နေ့မှစတင်၍ အလယ်တန်းပြရာထူးဖြင့် ၃နှစ်ကြာတာဝန်ထမ်းဆောင်ခဲ့သည်။ ထို့နောက် အထက်တန်းကျောင်း (ခွဲ) ဓမ္မသာ၊ ကျိုက်မရောမြို့နယ်တွင် ၂၀၁၄ ခုနှစ်၊ ဇွန်လ (၂) ရက် နေ့မှစတင်၍ အထက်တန်းပြရာထူးဖြင့် (၁) နှစ်ကြာတာဝန်ထမ်းဆောင်ခဲ့ပြီး၊ အမှတ်(၂) အခြေခံပညာအထက်တန်းကျောင်း၊ မော်လမြိုင်တွင် ၂၀၁၅ ခုနှစ် ဇူလိုင်လ (၃၀) ရက်နေ့မှစတင်၍ (၅)နှစ်ကြာတာဝန်ထမ်းဆောင်ခဲ့သည်။

ဒေါက်တာအိသဉ္ဇာကိုသည် ရန်ကုန်ပညာရေးတက္ကသိုလ်၊ ပညာရေးစိတ်ပညာဌာနတွင် နည်းပြ အဖြစ် ၂၀၂၀ခုနှစ်၊ဇွန်လ (၂၄)ရက်နေ့မှစတင်၍တာဝန်ထမ်းဆောင်ခဲ့ပြီး ၂၀၂၁ခုနှစ်၊ နိုဝင်ဘာလ (၁)ရက် နေ့မှစတင်၍ ယနေ့အထိ ရန်ကုန်ပညာရေးတက္ကသိုလ်၊ ပညာရေးစိတ်ပညာဌာနတွင် လက်ထောက် ကထိက အဖြစ်တာဝန် ထမ်းဆောင်လျက်ရှိပါသည်။

မြန်မာနိုင်ငံဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင် အဖွဲ့မှ ချီးမြှင့်သော (၁၆) ကြိမ်မြောက် မြန်မာနိုင်ငံဝိဇ္ဇာနှင့် သိပ္ပံပညာရှင်အဖွဲ့ဆု ကို ၂၀၂၂ ခုနှစ်တွင် An Analytical Study of the Effect of Classroom Emotional Climate on Motivating Learners and Their Moral Maturity ပါရဂူကျမ်းခေါင်းစဉ်ဖြင့် ရရှိခဲ့သည်။

မြန်မာနိုင်ငံ ဝိဇ္ဇာနှင့်သိပ္ပံပညာရှင်အမှုဆောင်အဖွဲ့

ဥက္ကဋ္ဌ - ဒေါက်တာသက်လွင်

ဒုတိယ ဥက္ကဋ္ဌများ- ဒေါက်တာမောင်ကျော်၊ ဒေါက်တာဦးဝင်း

အတွင်းရေးမှူး- ဒေါက်တာ ဝင်းထွန်း

တွဲဖက်အတွင်းရေးမှူး- ဒေါက်တာတင်မောင်ထွန်း၊ ဒေါက်တာအေးအေးခိုင်၊ ဒေါက်တာတင်တင်ထွေး

အဖွဲ့ဝင်များ

ဒေါက်တာမျိုးသန့်တင်	ဒေါ်ကယ်ရယ်အင်ချစ်သာ	ဒေါက်တာလှဖေ
ဒေါက်တာဒေါ်သန်းနွဲ့	ဒေါက်တာခင်သန်းဦး	ဒေါက်တာမောင်သင်း
ဒေါက်တာတင်ညို	ဒေါ်ခင်လတ်	

ပါရဂူကျမ်း သုတေသနလုပ်ငန်း အစီရင်ခံစာနှင့် သုတေသနစာတမ်းများ ထုတ်ဝေရေး ကော်မတီ

ဒေါက်တာသက်လွင်	ဥက္ကဋ္ဌ	ဒေါက်တာမောင်ကျော်	ဒုတိယဥက္ကဋ္ဌ
ဒေါက်တာဦးဝင်း	ဒုတိယဥက္ကဋ္ဌ	ဒေါက်တာလှဖေ	အဖွဲ့ဝင်
ဒေါက်တာဒေါ်သန်းနွဲ့	အဖွဲ့ဝင်	ဒေါက်တာမောင်သင်း	အဖွဲ့ဝင်
ဒေါက်တာတင်ညို	အဖွဲ့ဝင်	ဒေါက်တာမျိုးသန့်တင်	အတွင်းရေးမှူး
ဒေါ်ကယ်ရယ်အင်ချစ်သာ	အဖွဲ့ဝင်	ဒေါက်တာခင်သန်းဦး	တွဲဖက်အတွင်းရေးမှူး
ဒေါ်ခင်လတ်	အဖွဲ့ဝင်		

စာတည်းအဖွဲ့

ဒေါက်တာမောင်ကျော်	ဥက္ကဋ္ဌ	ဒေါက်တာလှဖေ	အဖွဲ့ဝင်
ဒေါက်တာမျိုးသန့်တင်	အဖွဲ့ဝင်	ဒေါက်တာမောင်သင်း	အဖွဲ့ဝင်
ဒေါက်တာဒေါ်သန်းနွဲ့	အဖွဲ့ဝင်	ဒေါက်တာအေးအေးခိုင်	အဖွဲ့ဝင်
ဒေါက်တာတင်ညို	အဖွဲ့ဝင်	ဒေါက်တာဦးဝင်း	အတွင်းရေးမှူး
ဒေါက်တာခင်သန်းဦး	အဖွဲ့ဝင်	ဒေါ်ကယ်ရယ်အင်ချစ်သာ	တွဲဖက်အတွင်းရေးမှူး
ဒေါ်ခင်လတ်	အဖွဲ့ဝင်		

နိုင်ငံတကာ ပညာရှင်အဖွဲ့များနှင့် ဆက်သွယ်ညှိနှိုင်းရေးမှူးများ

ဒေါ်ကယ်ရယ်အင်ချစ်သာ	ဒေါက်တာမောင်ကျော်
ဒေါက်တာမျိုးသန့်တင်	ဒေါက်တာတင်မောင်ထွန်း
ဒေါက်တာဒေါ်သန်းနွဲ့	ဒေါက်တာတင်တင်ထွေး
ဒေါက်တာတင်ညို	