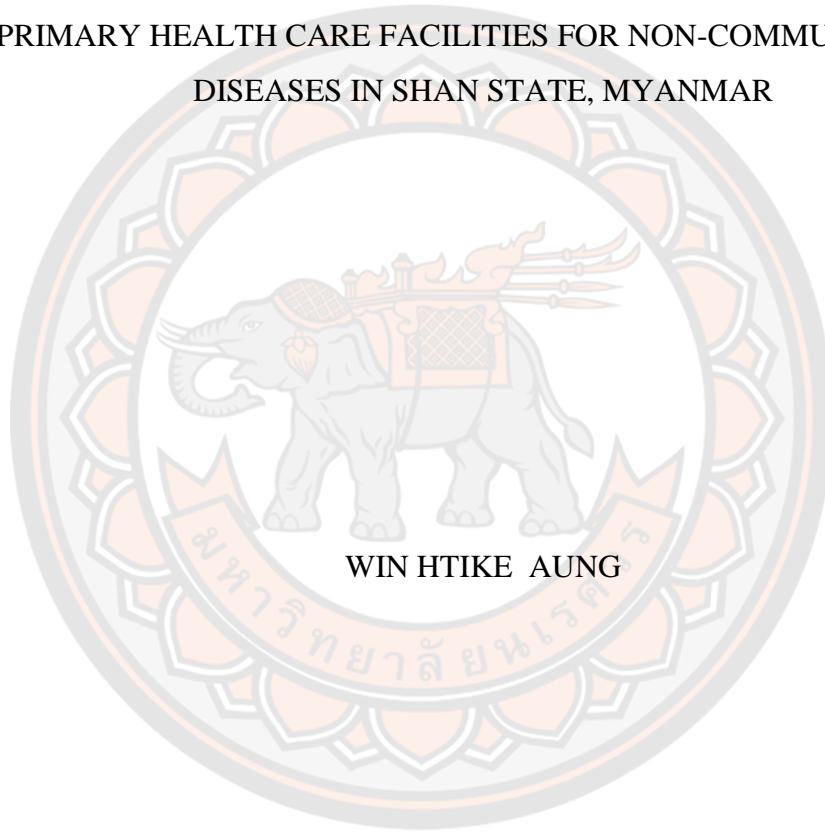




HEALTH SERVICE READINESS, AVAILABILITY, AND UTILIZATION OF  
PRIMARY HEALTH CARE FACILITIES FOR NON-COMMUNICABLE  
DISEASES IN SHAN STATE, MYANMAR



WIN HTIKE AUNG

A Thesis Submitted to the Graduate School of Naresuan University  
in Partial Fulfillment of the Requirements  
for the Master of Public Health in Public Health Program

2021

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By WIN HTIKE AUNG

has been approved by the Graduate School as partial fulfillment of the requirements for the Master of Public Health in Public Health Program of Naresuan University

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**Title** HEALTH SERVICE READINESS, AVAILABILITY, AND UTILIZATION OF PRIMARY HEALTH CARE FACILITIES FOR NON-COMMUNICABLE DISEASES IN SHAN STATE, MYANMAR

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### ABSTRACT

The main purpose of this study was to determine the health service readiness, availability, and utilization of primary health care (PHC) facilities for non-communicable diseases (NCDs) in Shan state, Myanmar. A cross-sectional survey was employed among 242 PHC facilities (48 rural health care centers; RHCs and 194 sub-rural health care centers; S-RHCs) of three districts (Taunggyi, Loilem, Linkhae) in southern Shan state, Myanmar. A questionnaire was an instrument based on the world health organization (WHO) package of essential non-communicable diseases intervention (PEN) assessment tool and framework of WHO six-building blocks of the health system for data collection. Validity of instrument by index of item-objective congruence value was 0.67-1 and reliability by Kuder-Richardson formula 21 value was 0.5-0.75.

The results shown that, in NCDs capacity readiness, about 80% of RHCs were readiness for health workforces except public health supervisor grade (I) 27.1% and about 75% of S-RHCs were readiness for workforces. 88.4% of health facilities were readiness for health information system, 87.6% were readiness for medicines, 97.9% were readiness for equipment and 83% were readiness for governance. But just 2.5% of health facilities were readiness for finance. When comparing the NCDs

capacity readiness by Chi-square or Fisher's exact test, the results found that readiness of health workforces in S-RHCs, readiness of health information system, readiness of essential medicines and equipment, and readiness of governance, were significantly ( $P$  value  $< 0.05$ ) different among three districts. NCDs service availability was compared among three districts by Chi-square was significantly ( $P$  value = 0.046) different among districts. 77.3% of health facilities were available for health services. NCDs service utilization consisted of screening rate, referral rate, and new patient rate, was compared among three districts by Kruskal-Wallis test. Screening rate and new patient rate, were significantly ( $P$  value = 0.04 and  $P$  value = 0.041 respectively) different among districts. Multiple comparisons for utilization rates were compared between three pairs of districts (Taunggyi and Loilem, Loilem and Linkhae, Taunggyi and Linkhae) by Mann-Whitney test. Between Taunggyi and Linkhae, new patient rate was significantly ( $P$  value = 0.006) higher in Linkhae district. Between Taunggyi and Loilem, screening rate and referral rate were nearly significant ( $P$  value = 0.045 and  $P$  value = 0.017) higher in Loilem. Between Linkhae and Loilem, screening rate was nearly significant ( $P$  value = 0.044) lower in Linkhae.

In conclusion, health workforces were readiness in 80% of RHCs and more than 90% of available health workforces from RHCs had already got training. Midwife was readiness in almost all S-RHCs but public health supervisor grade (II) was readiness in about 90% of S-RHCs from Taunggyi districts and only 60% of S-RHCs from Loilem and Linkhae districts. Training of available health workforces from S-RHCs was less percentage than RHCs. Health information system was readiness in about 87.6% of health facilities. For essential medicines, medicines for hypertension and diabetes were more readiness than other medicines. Essential equipment was readiness in more than 97% of health facilities. According to compare the health service readiness, availability, and utilization of PHC facilities for NCDs, NCDs capacity readiness and NCDs service availability were higher in Taunggyi district and NCDs service utilization was higher in Loilem and Linkhae districts.

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To my beloved family, my parents (Mr. Tin Soe and Mrs. Win Win Yee) gave

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Finally, I hope that my thesis was useful and valuable for those interested in my thesis and use it as a reference for future research.

WIN HTIKE AUNG

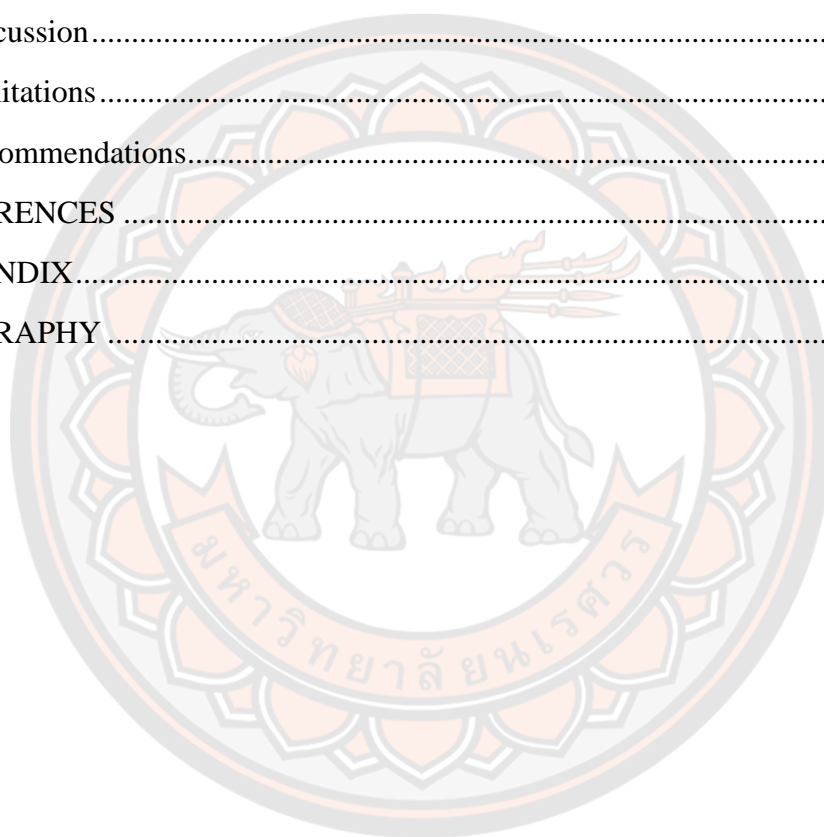


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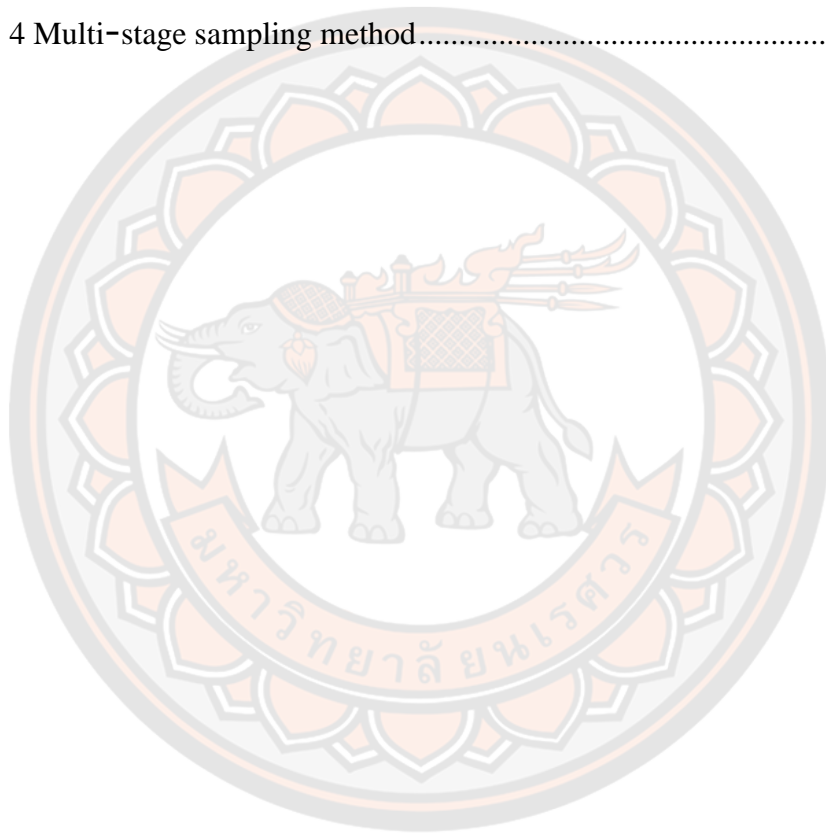


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## ABBREVIATIONS

PHC	=	Primary Health Care
NCDs	=	Non-Communicable Diseases
CDs	=	Communicable Diseases
RHC	=	Rural Health Centers
S-RHC	=	Sub-Rural Health Centers
WHO	=	World Health Organization
PEN	=	Package of Essential Non-communicable diseases interventions
MOHS	=	Ministry of Health and Sports
UHC	=	Universal Health Coverage
BHS	=	Basic Health Staffs
SARA	=	Service Availability and Readiness Assessment
BMI	=	Body Mass Index
LMIC	=	Lower- and Middle-Income Countries
CVD	=	Cardiovascular Diseases
SSS	=	Social Security Scheme
HA	=	Health Assistant
LHV	=	Lady Health Visitor
PHS-I	=	Public Health Supervisor grade (I)
PHS-II	=	Public Health Supervisor grade (II)
MW	=	Midwives

# CHAPTER I

## INTRODUCTION

### **Background and rationale**

Non-communicable diseases (NCDs) kill about 40 million people every year, equivalent to 71% of all deaths globally. Each year, 15 million people die from NCDs between the ages of 30 and 69 years, over 85% of these "premature" deaths occur in low- and middle-income countries. Cardiovascular diseases account for most NCDs deaths, 17.9 million people annually, followed by cancers (9.0 million), chronic respiratory diseases (3.9 million), and diabetes (1.6 million) (WHO, 2018b). Major NCDs are top killers in the South-East Asia region, claiming an estimated 8.5 million lives each year. One third of these deaths are premature and occur before the age of 70 years, thus affecting economically productive individuals and also for the country. Globally, NCDs deaths are projected to increase by 15% between 2010 and 2020 (to 44 million deaths) with an estimated 10.4 million deaths in South-East Asia region (WHO, 2020).

In Myanmar, NCDs are estimated to account for 68% of all deaths. Cardiovascular diseases are 25% and it is one fourth of total deaths, cancers are 13%, chronic respiratory diseases are 8%, diabetes are 4% and other NCDs are 18% respectively (WHO, 2018a). In the past time, communicable diseases (CDs) were leading causes of death in Myanmar but NCDs are more increasing trend nowadays. So, Myanmar encounter with the epidemiological transition from CDs to NCDs may cause double burden of diseases (WHO, 2010a). The ratio of NCDs to CDs is higher in countries with advanced epidemiological transition. The ratio of 12.6 is noted among high-income countries, 8.1 among upper-middle-income countries, 1.8 among lower-middle income countries (Bank, 2016).

In 2013, World health organization (WHO) announced global action plan for the prevention and control of NCDs 2013-2020 by identifying nine targets for monitoring the NCDs. The target number (1) was identified to reduce 25% of the overall mortality from cardiovascular diseases, cancer, diabetes, and chronic

respiratory diseases. Target number (8) was at least 50% of eligible people required to receive drug therapy and counselling (including glycemic control) to prevent heart attacks and strokes. Target number (9) was an 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major non-communicable diseases in both public and private facilities (WHO, 2013a). Then, WHO developed the Package of Essential Non-communicable diseases (PEN) interventions for primary care in low-resource settings, which is an innovative and action-oriented response to the problems and challenges of care for the people with NCDs. WHO PEN provides the guidance and tools to assess needs and capacity, implements essential NCDs interventions, to evaluate readiness and availability of health service system, to strengthen health systems and human resource capacity in primary health care (PHC) with a special focus on primary care level. WHO PEN is a set of cost-effective interventions and the minimum standard for NCDs to strengthen national capacity to integrate and scale up care in both population wide and individual level, including health education, promotion of healthy behaviors, early diagnosis of NCDs and their risk factors. It employs inexpensive technologies, affordable medications for prevention and treatment of cardiovascular disease, stroke, diabetes, hypertension, cancer and asthma, regular follow-up, referral and standard indicators to measure progress of implementation and impact of WHO PEN. Goals and expected outcomes of WHO PEN are to increase the utilization of PHC facilities for prevention and control of NCDs by increasing the readiness and availability of health service system (capacity building of basic health staffs and providing of guidelines, essential medicines and equipment) (WHO, 2010c).

In 2017, Ministry of Health and Sports (MOHS), Myanmar announced national strategic plan for prevention and control of NCDs (2017-2021). According to national strategic plan, Myanmar has enhanced to use PEN protocol based on WHO PEN package for treatment and referral of NCDs patients. Implementation of the WHO PEN was piloted in two townships (Hlegu and Mwawbi) of Yangon region since 2012. In 2017, the PEN package had been expanded to 20 townships across five states/regions of the country. After that, prevention of NCDs through the entry point of hypertension, diabetes, chronic respiratory diseases and cancers was found to be feasible and it was recommended that implementation of the PEN project should be

extended to the rest of the country. Then WHO PEN had been implemented by MOHS, Myanmar to the whole country (330 townships) at the end of 2019 (MOHS, 2017).

According to WHO 'Best Buys' interventions; objective number (4) is strengthen and orient health systems to address the prevention and control of NCDs and the underlying social determinants through people-centered PHC and Universal Health Coverage (UHC) (WHO, 2017). Access to essential NCDs medicines and basic health technologies in all PHC facilities is essential to ensure that those in need receive treatment and counselling. PHC is a whole-of-society approach to health and well-being centered on the needs and preferences of individuals, families and communities. It addresses the broader determinants of health and focuses on the comprehensive and interrelated aspects of physical, mental and social health and wellbeing. The concept of PHC has been repeatedly reinterpreted and redefined. In some contexts, it has referred to the provision of ambulatory or first-level of personal health care services. In other contexts, PHC has been understood as a set of priority health interventions for low-income populations (also called selective primary health care). Others have understood PHC as an essential component of human development, focusing on the economic, social and political aspects. PHC has been proven to be a highly effective and efficient way to address the main causes and risks of poor health and well-being today, as well as handling the emerging challenges that threaten health and well-being tomorrow. It has also been shown to be a good value investment, as there is evidence that quality primary health care reduces total healthcare costs and improves efficiency by reducing hospital admissions (WHO, 2019).

Myanmar transitioned to the civilian government in March, 2011. Although the democratic process has accelerated since then, many problems in the field of healthcare still exist. MOHS, Myanmar has implemented health programs more in community health after changing new government in April, 2016. However, a lot of limitations remain to provide UHC for community level. To get UHC through PHC approved, many researches are needed and there is a limited research overview on the health service system of Myanmar (MOHS, 2019). Besides, PHC approach is essential to address NCDs effectively and equitably. The need to strengthen primary care has been highlighted in the 'United Nations political declaration of the high-level

meeting of the general assembly on the prevention and control of NCDs'. There are compelling reasons to identify gaps and challenges in the delivery of care for NCDs in Myanmar before the planning and development of an efficient delivery system of care that is feasible and suitable for the country (United Nations, 2011).

The health system in Myanmar comprises a pluralistic mix of public and private systems in both financing and provision. Public health services are delivered to the communities by rural health centers (RHCs) and sub-rural health centers (S-RHCs), through the corresponding township, district and region/state health departments that provide technical assistance and support. Basic health staffs (BHS) mainly work at the RHC and S-RHC. The curriculum for training of BHS mainly emphasizes community and environmental health. PHC is traditionally orientated more towards prevention of infectious diseases and BHS usually do not have training in prevention and control of NCDs. The activities of the PEN project include strengthening of the health system with a focus on PHC, improving NCDs care throughout the country also requires strengthening of the health system at the secondary and tertiary levels. There are large gaps in policy development for essential drugs and equipment, capacity-strengthening of BHS and medical officers from both private and public sectors, development of categories of health workers required specifically for NCDs care, and an appropriate referral system and health information system (Latt, Aye, Ko, & Zaw, 2016).

Health system development and strengthening are very important to give health service for the people in the country. The assessment for the health system is needed in every aspect of health system development. According to WHO, 'The six building blocks of a health system'; making assessments and implementations on six aspects (service delivery, health workforce, health information system, access to essential medicines, financing and leadership/governance) can improve the health service coverage and health care service quality and safety. It can further improve health status of community and the country (WHO, 2010b). For conducting an assessment in health service delivery, WHO PEN has assessment tools for health system building blocks. That assessment tools can get reliable and regular information on service delivery including service availability (availability of key human and



infrastructure resources), readiness of health facilities (capacity of basic health-care, essential medicine and equipment) and utilization of health services.

Many studies especially from lower- and middle-income countries had made assessment in health service delivery for NCDs by using WHO PEN assessment tool. In Ugandan, they had made the research for capacity of public sector health facilities to prevent and control NCDs (2018). They used the questionnaire based the assessment of readiness on the standards set forth by WHO PEN. Such questionnaire was able to conduct a more detailed assessment of NCD services than WHO SARA (Service Availability and Readiness Assessment) surveys, which are intended to assess a wide-ranging spectrum of health service delivery readiness. Results of that assessment for the health facilities capacity were to address NCDs demonstrate areas of strength as well as significant gaps in the availability of equipment, medicines, and laboratory tests. Although there was variability among the different types of health facilities, none of the facilities surveyed meet the WHO PEN standards for essential tools and medicines to implement effective NCDs interventions (Rogers, Akiteng, Mutungi, Ettinger, & Schwartz, 2018).

In Saudi Arabia, they had made the research for capacity and readiness of PHC centers for implementation of the basic strategy for prevention and control of NCDs (2019). In that study, they made the assessment by the rapid standardized WHO assessment package tool (WHO PEN). The results found that the level of staff training on NCDs prevention and control strategies was reported to be inadequate, particularly for nurses and other healthcare providers. As for diagnostic equipment, diagnostic tests, essential medication, access to referral facilities and medical records most of them were available in all the PHCs among the different categories (Bawazir et al., 2019). In Zambia, they had made the study for assessing capacity and readiness to manage NCDs in primary care setting (2018). They applied a health systems approach to assess the health system's capacity to address NCDs, using an adapted WHO PEN. Results of the study were appeared to be wide heterogeneity between facilities in respect of readiness to manage NCDs. Only the first level hospitals scored a mean index higher than the 70% cut off and the medications needed to manage NCDs, urban and rural health facilities were comparably equipped (Mutale et al., 2018).

In Myanmar, there was the research for 20 pilot townships by using WHO PEN facilities assessment. That health facility assessment was made for effectiveness and understand the facilitators and barriers in the implementation of PEN, in that 20 townships in 2018. Assessment showed that 64% of the sanctioned posts were filled and found lack of adequate human resource in facilities; 90% of those appointed been trained in PEN. Key essential medicines for PEN were available in half of the facilities and were found to be wanting with frequent stock outs (Aye et al., 2020). Another report indicated that the availability of health workforce in Myanmar, doctor and population ratio (per 1000) is 0.37. Health workforce and population ratio (per 1000) is 1.47. There is lower ratio than WHO recommended minimum health workforce and population ratio (Saw et al., 2019). According to that kinds of workforce gap and challenges in other factors for service delivery of NCDs, the assessment for readiness, availability and utilization based on WHO six building blocks of a health system (health workforces, health information system, access to essential medicines, financing, leadership, service delivery and access of services) would fill in the gaps and limitations to promote and support national capacity for high-quality research and development for the prevention and control of NCDs (WHO, 2017).

Shan state is located at eastern part of Myanmar and has the specialist teaching hospital of university of medicine (Taunggyi) and state health office. So, Shan state is the center of medication and center of administration in eastern part of the country. It is the mountainous regions of the country, has many ethnic minorities groups and several culture diversity (MIMU, 2015). This area was already implemented by WHO PEN in 2018 but have not made assessment for effectiveness of this program. Consequently, this study may be the first study to assess the health service delivery for NCDs in Shan state by using the WHO PEN's assessment guidelines. The scope of study were health care providers from primary health care facilities (rural health care centers and sub-rural health care centers) in Shan state, Myanmar between January 2020 and January 2021.

In summary, NCDs are the increasing morbidity and mortality than CDs nowadays. That is not only global problem but also in Southeast Asia region, especially in lower- and middle-income countries. Complications from NCDs can

affect in health of individual and also in socioeconomic, and occur burden for country development. Myanmar is a lower-income country and one of the developing countries that the NCDs are increasing gradually same as other LMIC countries. Health system strengthening is very important point in preventing and controlling the NCDs problems. Many studies from other countries were conducted to assess NCDs health services system by using WHO PEN guidelines. However, there were few studies conducted to assess NCDs health services system in Myanmar. According to previous studies and reports from (MOHS) Myanmar, availability of health workforces, essential medicines and equipment, readiness of health service are not meet to UHC. In Myanmar, especially Shan state, to our best knowledge, no study has been conducted on assessment for health system strengthening in NCDs. Therefore, this study will fulfill some gaps of knowledge for health system strengthening in prevention and control of NCDs.

### **Research questions**

1. What are the readiness, availability and utilization situations of primary health care facilities for non-communicable diseases in Shan state, Myanmar?
2. How different for health services readiness, availability, and utilization of primary health care facilities for non-communicable diseases among districts in Shan state, Myanmar?

### **Research objectives**

1. To assess the readiness, availability, and utilization of primary health care facilities for non-communicable diseases in Shan state, Myanmar.
2. To compare health services readiness, availability, and utilization of primary health care facilities for non-communicable diseases among districts in Shan state, Myanmar.

### **Research hypothesis**

There was statistically significant different of readiness, availability and utilization of primary health care facilities for non-communicable diseases among districts in Shan State, Myanmar.

## **Operational definitions**

**1. Non-communicable Diseases (NCDs)** are four major NCDs including cardiovascular diseases, cancers, chronic respiratory diseases and diabetes. They are including in prevention and control guidelines for NCDs in Myanmar.

**2. Primary health care facilities** are the facilities located mostly in rural area and give primary health care services(outpatients/ambulatory). The primary health care facilities in this study include Rural Health Care centers (RHC) and Sub-Rural Health Care centers(S-RHC).

**3. NCDs capacity readiness** means that readiness of health workforces, health information system, access to essential medicines and equipment, financing, governance for NCDs management.

**3.1 Health workforce** means that the availability of basic health staffs and the capacity building training for screening, diagnosis and treatment of NCDs to basic health staff.

**3.2 Health information system** means that the management of data about the NCDs patient, medicines and equipment, referral system, reporting system and feedback for reporting from higher levels of responsibility.

**3.3 Access to essential medicines and equipment** means that the availability of essential medicines and equipment for screening, diagnosis, treatments and health education for NCDs.

**3.4 Healthcare financing** means that the sources of funding for NCDs' healthcare services costs, cost-sharing, donation and participation from the community.

**3.5 Governance** means that the community participation and types of support given by the communities that have the responsibility to finance, social, health volunteers, deliver and use of NCDs health services.

**4. NCDs service availability** means that available of NCDs service delivery for NCDs (diagnosis and management of diabetes, cardiovascular diseases including hypertension, chronic respiratory diseases, cancer).

**5. NCDs utilization** means that number of NCDs patients who visit to clinic including number of screening, treated and referral patients of the previous month and the previous year.

**Research significances****Health policy;**

1. The study will be an evidence for policy maker in Myanmar to formulate the health service policy for NCDs patients.
2. The finding of this study will be a database for the country to improve the guidelines for NCDs services.

**Health services;**

1. This study makes significance for health care providers in order to develop the health system at the primary health care level for non-communicable diseases patients.
2. This study is important for the health care providers in order to implement a healthcare program for improving the quality of life for non-communicable diseases patients.

**Academic implementation;**

1. The results of this study will be a database for conducting other research related to non-communicable diseases in Myanmar.
2. This study makes a significant contribution to the literature by indicating the assessment of health services system among non-communicable diseases patients.

## **CHAPTER II**

### **REVIEW OF RELATED LITERATURE AND RESEARCH**

This research was related to “health service readiness, availability, and utilization of primary health care facilities for non-communicable diseases in Shan state, Myanmar”. The purposes of this research were to assess and compare the level of readiness, availability, and utilization of primary health care facilities among districts in Shan state, Myanmar for non-communicable diseases. The researcher has studied and gathered the related document, concepts, theories, and research studies. The details of each topics are presented as follows;

#### **1. Non-communicable diseases situation**

- 1.1 NCDs situation
- 1.2 Risk factors and prevalence of NCDs
- 1.3 Prevention and control of NCDs (WHO PEN)

#### **2. Health system**

- 2.1 WHO health system building blocks
- 2.2 Myanmar health system
- 2.3 Primary health care (PHC)

#### **3. Health care services**

Readiness, availability and utilization of health care services

#### **4. Assessment of health care services for NCDs**

- 4.1 WHO PEN (Package of Essential Non-communicable Disease Interventions)
- 4.2 WHO SARA (Service Availability and Readiness Assessment)

#### **5. Related research**

#### **6. Conceptual framework**

## **Non-communicable diseases situation**

### **1. Non-communicable diseases (NCDs)**

Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behaviors factors. The main types of NCDs according to morbidity and mortality rates are cardiovascular diseases (like heart attacks, stroke and hypertension), cancers (such as breast cancer, oral cancer, cervical cancer, lung cancer), chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes (WHO, 2018b). NCDs are also defined as the diseases of long duration, and are generally slow to progress, largely caused by unhealthy lifestyles or risky behaviors: tobacco use, unhealthy diet, insufficient physical activity and harmful use of alcohol. The presence of these risky behaviors leads to metabolic changes such as overweight / obesity, raised blood pressure, raised blood glucose and raised cholesterol levels. Left uncontrolled these metabolic conditions and no reduced these risky behaviors result in chronic diseases of NCDs (MOHS, 2017).

### **2. Risk factors and prevalence of non-communicable diseases**

Rick factors of diseases are defined as “An aspect of personal behavior or lifestyle, an environmental exposure, or a hereditary characteristic that is associated with an increase in the occurrence of a particular disease, injury, or other health condition.” In non-communicable diseases, there are two categories of risk factors: behavioral risk factors (modifiable risk factors) and metabolic or physiological risk factors (MOHS, 2017).

Modifiable behavioral risk factors are tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol, all these factors can increase the risk of NCDs. Tobacco accounts for over 7.2 million deaths every year (including from the effects of exposure to second-hand smoke), and is projected to increase markedly over the next coming years. 4.1 million annual deaths have been attributed to excess salt/sodium intake of unhealthy eating behavior. More than 1.5 million annual deaths attributable to the harmful alcohol use are from NCDs, including cancer (such as liver cancers). 1.6 million deaths annually can be attributed to the risk factor of insufficient physical activity. Metabolic risk factors contribute to four key metabolic changes that

increase the risk of NCDs: raised blood pressure, overweight/obesity, hyperglycemia (high blood glucose levels) and hyperlipidemia (high levels of fat in the blood). In terms of attributable deaths, the leading metabolic risk factor globally is elevated blood pressure of hypertension (to which 19% of global deaths are attributed), followed by overweight, obesity and raised blood glucose (WHO, 2018b). Behavioral risk factors (modifiable risk factors) can also increase the risk of metabolic or physiological for NCDs.

Behavioral and metabolic risk factors, both contribute significantly to increase the morbidity and mortality of NCDs. They are often interrelated and include unhealthy diet, insufficient physical activity, smoking, excessive use of alcohol, raised blood pressure, overweight and obesity, and abnormal blood lipid levels. Raised blood pressure, dyslipidemia and smoking account for the majority cause of heart attack and strokes. Further, sociodemographic factors such as age, gender and education have been also associated with increased NCDs risk (Ahmed et al., 2019).

National STEPS survey Myanmar (2014) on the prevalence of diabetes and risk factors for NCDs reported “the prevalence of diabetes as 10.5% for the adult population aged between 25 and 64 years. The prevalence of hypertension for both sexes was 26.4%. Percentage who currently smokes tobacco was 26.1% whereas percentage who currently drinks alcohol was 19.8%. The prevalence of overweight (Body mass index; BMI >25 kg/m<sup>2</sup>) and obesity (BMI >30 kg/m<sup>2</sup>) were 22.4% and 5.5% respectively”. That survey was an extensive survey showing the magnitude of the problems of diabetes and risk factors for major NCDs for the whole country. The survey showed the higher prevalence of diabetes than the estimated prevalence of diabetes 8.8% by the International Diabetes Federation (IDF). Based on this prevalence, the total number of diabetes can be more than 2.5 million in Myanmar (STEPS, 2014). The increasing of NCDs were found in cardiovascular disease due to increase in major cardiovascular risk factors in urban and rural areas, such as smoking, obesity and diabetes mellitus (Zaw, Nwe, & Hlaing, 2017).



### **3. Prevention and control of Non-communicable diseases**

Reducing the major risk factors for NCDs; tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol, is the focus of WHO's work to prevent and control the mortality rate from NCDs. If can reduce the global impact of risk factors, can go a long way to reducing the number of deaths worldwide from NCDs. Prevention and control of NCDs is a growing issue: the burden of NCDs falls mainly on developing countries, where 82% of premature deaths from these diseases occur. Tackling the risk factors will therefore not only save lives; it will also provide a huge boost for the economic development of countries (WHO, 2018b).

In 2013, WHO announced global action plan for the prevention and control of NCDs 2013-2020 by identify nine targets for monitoring the NCDs. Objectives of that global action plan are;

1. To raise the priority accorded to the prevention and control of NCDs in global, regional and national agendas and internationally agreed development goals, through strengthened international cooperation and advocacy.
2. To strengthen national capacity, leadership, governance, multisectoral action and partnerships to accelerate country response for the prevention and control of NCDs.
3. To reduce modifiable risk factors for NCDs and underlying social determinants through creation of health-promoting environments.
4. To strengthen and orient health systems to address the prevention and control of NCDs and the underlying social determinants through people-centered primary health care and universal health coverage.
5. To promote and support national capacity for high-quality research and development for the prevention and control of NCDs.
6. To monitor the trends and determinants of NCDs and evaluate progress in their prevention and control. (WHO, 2013a)

WHO also implemented Package of Essential Non-communicable diseases interventions (WHO PEN) for prevention and control of NCDs. Implementation of WHO PEN is a key component of the objective number four of the global action plan. These tools enable early detection and management of cardiovascular diseases, diabetes, chronic respiratory diseases and cancers to prevent

life threatening complications (e.g. heart attacks, stroke, kidney failure, amputations, blindness). WHO PEN for primary care in low-resource settings is an innovative and action-oriented response to the above challenges. It is a prioritized set of cost-effective interventions that can be delivered to an acceptable quality of care, even in resource-poor settings. It reinforces health system strengthening by contributing to the building blocks of the health system. Cost effectiveness of the selected interventions help to make limited resources go further and the user-friendly nature of the tools that have been developed, empower primary care physicians as well as allied health workers to contribute to NCDs care. It should not be considered as yet another package of basic services but, rather, an important first step for integration of NCDs into PHC and for reforms that need to cut across the established boundaries of the building blocks of national health systems. WHO PEN is the minimum standard for NCDs to strengthen national capacity to integrate and scale up care of heart disease, stroke, cardiovascular risk, diabetes, cancer, asthma and chronic obstructive pulmonary disease in primary health care in low-resource settings. Most importantly, it defines a minimum set of essential NCDs interventions for any country that wishes to initiate a process of universal coverage reforms to ensure that health systems contribute to health equity, social justice, community solidarity and human rights (WHO, 2010c).

Ministry of Health and Sports (MOHS), Myanmar has adopted PEN protocol based on WHO PEN package for early screening, treatment and referral of NCDs. PEN intervention activities would be conducted to achieve the goals of PEN for closing the gap between what is needed and what is currently available to reduce the burden, healthcare costs and human suffering due to major NCDs by achieving higher coverage of essential interventions in LMIC. Key PEN intervention activities in Myanmar are:

1. Rapid assessment of township health department (township health facilities) and NCDs health situations of township
2. Development of PEN intervention action plans in townships
3. Conducting advocacy meetings or seminars that discuss NCDs issues including “Myanmar national PEN scaling up project plan” and highlight the WHO NCDs action plan
4. Training of medical officers and basic health staffs
5. Implementation of PEN protocol in townships
6. Regular supervision / monitoring and evaluation of PEN scale up activities by central and regional level supervisors and township level staffs (township medical officers / township public health officers / medical officers) (MOHS, 2017).

In Myanmar’s MOHS PEN guidelines, they are more focus in early screening and giving treatment for hypertension and diabetes in PHC facilities. In the guidelines consist of;

1. Diagnosis and treatment for hypertension and diabetes (essential medicines list, usage and side effects of medicines)
2. CVD risk estimation
3. Management and refer for asthma and chronic obstructive pulmonary disease
4. Early screening and refer for breast cancer, cervical cancer and oral cancer
5. Refer criteria and referral forms
6. Essential medicines and equipment list
7. Monthly and quarterly report forms
8. Manuals for usage of blood glucose meter and blood pressure monitoring devices
9. Counselling to patients and families
10. Follow up system for patients
11. Health education methods and materials (MOHS, 2017)

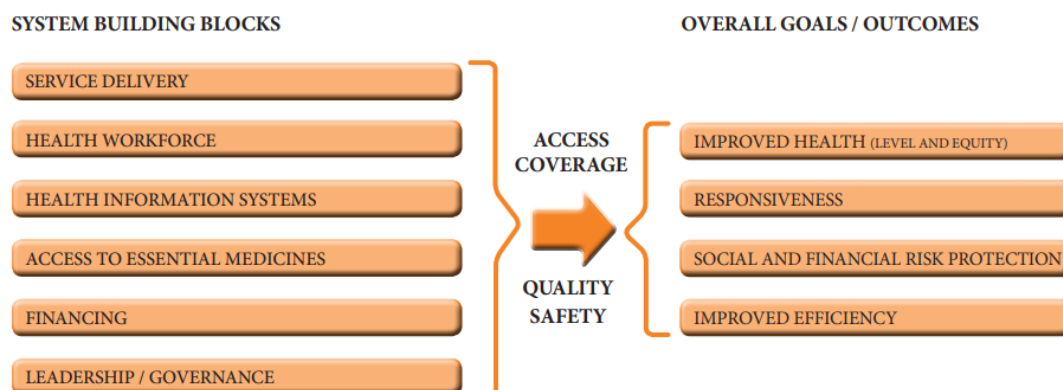
According to literature review, major four NCDs are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes. Risk factors for those major NCDs are tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol. The prevalence of NCDs and risk factors are increasing trends in developing countries including Myanmar. So, MOHS Myanmar had adopted PEN protocol based on WHO PEN package for prevention and control of rising NCDs.

### **Health system**

A health system consists of all the organizations, institutions, resources and people whose primary purpose is to improve health. Health system also includes efforts to influence determinants of health as well as more direct health-improvement activities. The health system delivers preventive, promotive, curative and rehabilitative interventions through a combination of public health actions and the pyramid of health care facilities that deliver personal health care by both state and non-state actors/organizations. A health system needs health staffs, funds, information, supplies, transportation, communications and overall guidance and direction to function. Strengthening health systems means to address the key constraints in each of these areas. A well-functioning health system working in harmony is built on having trained and motivated health workers, a well-maintained infrastructure, and a reliable supply of medicines and technologies, backed by adequate funding, strong health plans and evidence-based policies (WHO, 2007).

#### **1. WHO Health system building blocks**

Health system strengthening is very important for giving effective health care to the community and increasing health status of the country. Multidimensional factors such as health staffs, funds, information, supplies, transportation, communications and policies affect the health system strengthening. World Health Organization (WHO) implemented the framework of health system to increase health system strengthening. That WHO framework of health system building blocks to measure the health systems capacity, including inputs factors, processes and outputs, and to relate these to indicators for goals/outcome of health system (WHO, 2010b).



**Figure 1 WHO Health Systems Framework**

**Source:** (WHO, 2010b)

### **1. Service delivery**

Strengthening of health service delivery is vital to the achievement of the good health system. Service provision or delivery is an immediate output from the inputs of the health system, such as the health workforce, procurement and supplies, and financing. Increased inputs should lead to improved service delivery and enhanced access to services. Ensuring availability of health services that meet a minimum quality standard and securing access to them are key functions of a health system. Service delivery is a fundamental input to population health status, along with other factors, including social and environment determinants of health. The precise organization and content of health services will differ from one country to another, but in any well-functioning health system, the network of service delivery should have the following key characteristics;

1. **Comprehensiveness:** A comprehensive range of health services is provided, appropriate to the needs of the target population, including preventative, curative, palliative and rehabilitative services and health promotion activities.

2. **Accessibility:** Services are directly and permanently accessible with no undue barriers of cost, language, culture, or geography. Health services are close to the people, with a routine point of entry to the service network at primary care level

(not at the specialist or hospital level). Services may be provided in the home, the community, the workplace, or health facilities as appropriate.

3. Coverage: Service delivery is designed so that all people in a defined target population are covered, i.e. the sick and the healthy, all income groups and all social groups.

4. Continuity: Service delivery is organized to provide an individual with continuity of care across the network of services, health conditions, levels of care, and over the life-cycle.

5. Quality: Health services are of high quality, i.e. they are effective, safe, centered on the patient's needs and given in a timely fashion.

6. Person-centeredness: Services are organized around the person, not the disease or the financing. Users perceive health services to be responsive and acceptable to them. There is participation from the target population in service delivery design and assessment. People are decision makers and partners in their own health care.

7. Coordination: Local area health service networks are actively coordinated, across types of provider, types of care, levels of service delivery, and for both routine and emergency preparedness. The patient's primary care provider facilitates the route through the needed services, and works in collaboration with other levels and types of provider. Coordination also takes place with other sectors (e.g. social services) and partners (e.g. community organizations).

8. Accountability and efficiency: Health services are well managed so as to achieve the core elements described above with a minimum wastage of resources. Managers are allocated the necessary authority to achieve planned objectives and held accountable for overall performance and results. Assessment includes appropriate mechanisms for the participation of the target population and civil society (WHO, 2010b).

## **2. Health workforce**

The health workforce can be defined as “all people engaged in actions whose primary intent is to enhance health”. These human resources include clinical staffs, such as physicians, nurses, pharmacists and dentists, public health staffs, such as public health officers, midwife and lady health visitor, as well as management and

support staff, i.e. those who do not deliver services directly but are essential to the performance of health systems, such as managers, ambulance drivers and accountants. Shortage of health workers can be perceived from the inadequate numbers and skills mix of people being trained or maldistribution of their deployment, as well as losses caused by death, retirement, career change or out-migration. Various permutations and combinations of what constitutes the health workforce may exist according to the country's situation and the means of monitoring. Human resources for health include individuals working in the private and public sectors, those working full-time or part-time, those working at one job or holding jobs at two or more locations, and those who are paid or provide services on a voluntary basis. They include workers in different domains of health systems, such as curative, preventive and rehabilitative care services as well as health education, promotion and research. Capacity building of health workforces is also important for effective health delivery system. Capacity building of health workforces includes university, institute, college, training and refresher training. Effective policies for educational institutes are vital role in producing of health workforces for health care delivery system (WHO, 2010b).

### **3. Health information system**

Sound and reliable information is the foundation of decision-making across all health system building blocks. It is essential for health system policy development and implementation, governance and regulation, health research, human resources development, health education and training, service delivery and financing. The health information system provides the underpinnings for decision-making and has four key functions; data generation, compilation, analysis and synthesis, communication and use. The health information system collects data from health and other relevant sectors, analyses the data and ensures their overall quality, relevance and timeliness, and converts the data into information for health-related decision-making. Health information such as reporting, feedbacks, updated guidelines and precautions are important in health system strengthening (WHO, 2010b).

#### **4. Access to essential medicines**

A well-functioning health system ensures equitable access to essential medical products, vaccines and technologies of assured quality, safety, efficacy and cost-effectiveness, and their scientifically sound and cost-effective use. To achieve these objectives, the following facts are needed;

1. National policies, standards, guidelines and regulations that support policy,
2. Information on prices, the status of international trade agreements and the capacity to set and negotiate prices,
3. Reliable manufacturing practices when they exist in-country and quality assessment of priority products,
4. Procurement, supply and storage, and distribution systems that minimize leakage and other waste, and
5. Support for rational use of medicines, commodities and equipment, through guidelines and strategies to assure adherence, reduce resistance, maximize patient safety and training (WHO, 2010b).

Country level essential medicines list and guidelines are needed to increase accessible of essential medicines and equipment. Essential medicines list for this study was adopted from national list of essential medicines (MOHS, Myanmar) and Myanmar's PEN guidelines (MOHS, 2016).

#### **5. Health systems financing**

Health financing refers to the function of a health system concerned with the mobilization, accumulation and allocation of money to cover the health needs of the people, individually and collectively in the health system. The purpose of health financing is to make funding available, as well as to set the right financial incentives to providers, to ensure that all individuals have access to effective public health and personal health care. Health financing is fundamental to the ability of health systems to maintain and improve human welfare. At the extreme, without the necessary funds no health workers would be employed, no medicines would be available and no health promotion or prevention would take place. However, financing is much more than a simple generation of funds (WHO, 2010b).



The current health financing model in Myanmar is mainly based on out of pocket payments method. In 2014, 50.7% of total expenditure on health was paid for out of pocket, while 45.4% came from the government (free of charge for health services in public health facilities), 0.5% from the Social Security Scheme (SSS), and 3.4% from other private sources (Myint, Pavlova, & Groot, 2019). Health insurance system is the important role in effective health financing system. The only health insurance system currently in place in Myanmar is the SSS. The SSS is regulated through the Ministry of Labour and paid for their employee by employers of middle and large companies. Healthcare services covered by the SSS are provided in two hospitals in Yangon, one hospital in Mandalay and in 77 SSS clinics throughout the country. SSS cover few percent of health financing, there is no effective health insurance system in Myanmar until now (Van Rooijen, Myint, Pavlova, & Groot, 2018).

## **6. Leadership/governance**

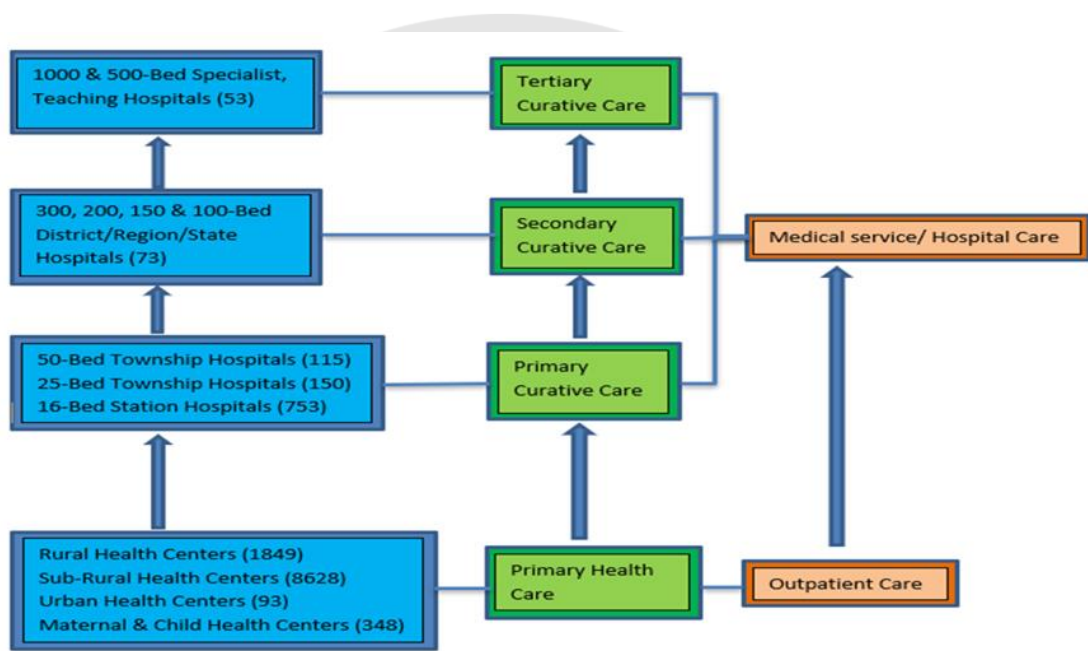
Governance in health is being increasingly regarded as a salient theme on the development agenda. Leadership and governance in building a health system involve ensuring that strategic policy frameworks exist and are combined with effective oversight, coalition-building, regulation, attention to system design and accountability. The need for greater accountability arises both from increased funding and a growing demand to demonstrate results. Accountability is therefore an intrinsic aspect of governance that concerns the management of relationships between various stakeholders in health, including individuals, households, communities, firms, governments, non-governmental organizations, private firms and other entities that have the responsibility to finance, monitor, deliver and use health services. Accountability involves in understanding of how services are supplied, financing to ensure that adequate resources are available to deliver essential services, performance around the actual supply of services, receipt of relevant information to evaluate or monitor performance, enforcement, such as imposition of sanctions or the provision of rewards for performance. Governance also include cooperation and communication with social organizations, local community and other related departments (WHO, 2010b).

## 2. Myanmar health system

Myanmar is a Southeast Asian country with 51 million population, 70.0% of country's population reside in rural areas. It is divided into total 14 states and regions such as seven states, seven regions and one capital territory (Nay Pyi Taw Council territory) which are further subdivided into 74 districts with 330 townships. In Myanmar health care system, there are seven departments under ministry of health and sports (MOHS); 1) department of public health, 2) department of medical services, 3) department of health professional resource development and management, 4) department of medical research, 5) department of food and drug administration, 6) department of traditional medicine and 7) department of sports. The department of public health is mainly responsible for primary healthcare and basic health services such as nutrition promotion, environmental sanitation, maternal and child health, school health, prevention and control of infectious diseases, prevention and control of non-communicable diseases, and health education. In the rural areas, primary health care services are provided by the Rural Health Centers (RHCs) and Sub-Rural Health Centers (S-RHC). Each RHC is manned by the Basic Health Staff (BHS) which include one health assistant (HA), one lady health visitor (LHV), one public health supervisor-II (PHS-II) and two midwives (MWs). Each S-RHC is manned by one midwife (MW) and one public health supervisor-II (PHS-II). In the urban areas, health care services are mainly provided by public and private hospitals and clinics. Urban Health Centers and Maternal and Child Health Centers provide primary health care services in the urban areas. They are manned by medical officer(s) and others BHS. These BHS play a key role in the implementation of NCD prevention and control activities. In Myanmar, basic health staffs (BHS) are major community-based health workforce responsible for providing comprehensive health care services. With the ultimate aim of ensuring health and longevity for the citizens, the basic health staff (BHS) down to the grassroots level are providing promotive, preventive, curative and rehabilitative services through primary health care approach. Infrastructure for service delivery is based upon RHCs and S-RHCs to provide primary health care services to the rural community. Those who need special care are referred to station hospital, township hospital, district hospital and to specialist hospital successively. At the peripheral level, the township level and primary health care level actual

provision of health services to the community is undertaken. The main areas of service delivery and support activities of MOHS, Myanmar are presented as;

1. health service delivery using primary health care strategy,
2. services for the target population group,
3. promoting and protecting healthy communities and
4. prevention, control and management of communicable diseases and non-communicable diseases (MOHS, 2014).



**Figure 2 Health care system (Myanmar)**

**Source:** (MOHS, 2014)

### **3. Primary health care (PHC)**

Primary health care (PHC) addresses the majority of a person's health needs throughout their lifetime. This includes physical, mental and social well-being and it is people-centered rather than disease-centered. PHC is a whole-of-society approach that includes health promotion, disease prevention, treatment, rehabilitation and palliative care. A primary health care approach includes three components: meeting people's health needs throughout their lives, addressing the broader determinants of health through multisectoral policy and action, and empowering individuals, families and communities to take charge of their own health. The principles of PHC were first outlined in the Declaration of Alma-Ata in 1978, a seminal milestone in global health. Forty years later, global leaders ratified the Declaration of Astana at 'the Global Conference on Primary Health Care' which took place in Astana, Kazakhstan in October 2018. PHC, because it is about how best to provide health care and services to everyone, everywhere, is the most efficient and effective way to achieve health for all (WHO, 2019).

In Myanmar, almost 70% of the population resides in rural areas. Basic health staffs from RHCs and S-RHCs are the main health care providers for rural population. Generally, one rural health center (RHC) has four sub-rural health centers (S-RHC). The basic health staffs are responsible for non-communicable diseases, maternal and child health, school health, nutritional promotion, immunization, community health education, environmental sanitation, disease surveillance and control, treatments of common illnesses, referral services, birth and death registration, and training of volunteer health workers (community health workers and auxiliary midwives). These health workers face many challenges in their effort to reach out to the remote villages, with inadequate resources and support (MOHS, 2014).

**Table 1 Primary health care facilities and workforce (Myanmar)**

<b>Health Facility</b>	<b>Health care providers</b>	<b>Health care services</b>
- Township hospital (25/50-beds)	- Township medical officer (TMO)	- Primary curative care, - Initial review of high-risk patients and all secondary prevention cases,
- Station hospital (16-beds)	- Station medical officer (SMO)	- Review of complex cases referred from RHC and S-RHC
- Rural health center	- Health assistant (HA), Lady	- Risk screening,
- Urban Health center	Health Visitor (LHV), Public Health Supervisor I (PHS I), Midwife (MW), Public Health Supervisor II (PHS II)	- Assessment and management - Health education and Counselling on risk factors, - Providing lifestyle interventions, - Referral of acute and serious events to hospital
- Sub-rural health center	- Midwife (MW), Public Health Supervisor II (PHS II)	

**Source:** (MOHS, 2014)

According to literature review, primary health care facilities are the main health care providers in health service delivery of Myanmar health care system. Rural health centers and sub-rural health centers are essential primary health care facilities for prevention and control of NCDs. Assessment of primary health care facilities by WHO's health system building blocks in six areas (service delivery, health workforce, health information system, access to essential medicines, health systems financing, leadership/governance) can strengthen the health system for prevention and control of NCDs.

## **Health care services**

### **Readiness, Availability and Utilization of health care services**

**Readiness;** Service Readiness refers to the overall capacity of health facilities to provide general and specific health services. Readiness is defined as the availability of components required to provide health services such as basic amenities, basic equipment, standard precautions, laboratory tests, medicines, commodities, trained staff, guidelines and equipment (WHO, 2013b).

**Availability;** Service Availability refers to the physical presence of the delivery of services, encompassing health infrastructure, core health personnel, and service utilization. This does not include more complex dimensions such as geographic barriers, travel time, and user behavior, which require more complex input data (WHO, 2013b).

**Utilization;** Health Care Utilization refers to the use of health care services. People use health care for many reasons including preventing and curing health problems, promoting maintenance of health and well-being, or obtaining information about their health status and prognosis (Carrasquillo, 2013).

According to literature review, assessment of health care services for NCDs are needed to focus in three areas of NCDs capacity readiness, NCDs service availability and NCDs utilization.

## **Assessment of health care services for NCDs**

### **1. WHO PEN (Package of Essential Non-communicable Disease Interventions)**

The WHO Package of Essential Non-communicable Disease Interventions (WHO PEN) for primary care in low-resource settings is an innovative and action-oriented set of cost-effective interventions that can be delivered to an acceptable quality of care, even in resource-poor settings. These tools will enable early detection and management of cardiovascular diseases, diabetes, chronic respiratory diseases and cancer to prevent life threatening complications (e.g. heart attacks, stroke, kidney failure, amputations, blindness). Goals of WHO PEN are to close the gap between what is needed and what is currently available to reduce the burden, health-care costs and human suffering due to major NCDs by achieving higher coverage of essential interventions in LMIC.

WHO PEN has the assessment tool for health service delivery status and it includes;

1. Human resources; Availability of human resources for managing major NCDs, health workers trained on NCDs management
2. Equipment; Availability of basic equipment for managing major NCDs
3. Infrastructure/services; screening and laboratory tests
4. Medicines
5. Utilization of services
6. Referral of patients
7. Record keeping/medical information system
8. Financing and administration
9. Community links (WHO, 2010c)

## **2. WHO SARA (Service Availability and Readiness Assessment)**

The SARA survey is designed to generate a set of core indicators on key inputs and outputs of the health system, which can be used to measure the progress in health system strengthening over time. Tracer indicators aim to provide objective information about whether or not a facility meets the required conditions to support provision of basic or specific services with a consistent level of quality and quantity. SARA is designed as a systematic survey to assess health facility service delivery. The objective of the survey is to generate reliable and regular information on service delivery including service availability, such as the availability of key human and infrastructure resources, and on the readiness of health facilities to provide basic health-care interventions relating to family planning, child health services, basic and comprehensive obstetric care, HIV/AIDS, tuberculosis, malaria and non-communicable diseases. SARA surveys include;

1. Service availability; health infrastructure, health workforce, service utilization
2. General service readiness; basic amenities, basic equipment, standard precautions for infection prevention, diagnostic capacity, essential medicines

3. Service-specific readiness; Family planning, antenatal care, basic obstetric care, comprehensive obstetric care, child health immunization, child health preventative and curative care, adolescent health services, lifesaving commodities for women and children, malaria diagnosis or treatment, tuberculosis services, HIV counselling and testing, HIV/AIDS care and support services, antiretroviral prescription and client management, prevention of mother-to-child transmission of HIV, sexually transmitted infections diagnosis or treatment, non-communicable diseases diagnosis or management (diabetes, cardiovascular disease, chronic respiratory disease and cervical cancer screening), basic and comprehensive surgical care, blood transfusion and laboratory capacity (WHO, 2013b).

According to review literatures, the questionnaires of this study had based on WHO PEN assessment tool after comparison between WHO PEN assessment tool and WHO SARA survey. Because WHO PEN tool is more specific and simplicity assessment for NCDs than WHO SARA. WHO SARA survey is broad and assess to various diseases not only assess the specific diseases of NCDs.

### **Related research**

There are many studies which conduct related to health service delivery for NCDs. Some of them are;

Aye et al., 2020 conducted a research about the experiences from the pilot implementation of the package of essential NCDs interventions (PEN) in Myanmar. The result showed that the proportion of NCD risk populations (current smokers, tobacco chewers and heavy alcoholics were 17.5%, 26.3% and 5.3% respectively, 30.6% had BMI more than 25 kg/m<sup>2</sup>, hypertension 35.2%, diabetes 17.1%, CVD risk score >20% is 14.8%. Human resource availability is 64.0%, 90.0% of those appointed have been trained in PEN, essential medicines were available in half of the facilities. Confidence of the health care staffs in managing NCDs and perceived benefits of the project were some of the strengths (Aye et al., 2020).

Rogers et al., 2018 conducted a research about the capacity of Ugandan public sector health facilities to prevent and control NCDs. The result showed that the health facilities capacity was to address NCDs demonstrate areas of strength as well as significant gaps in the availability of equipment, medicines, and laboratory tests.



Although there was variability among the different types of health facilities, none of the facilities surveyed meet the WHO-PEN standards for essential tools and medicines to implement effective NCD interventions (Rogers et al., 2018).

Pakhare, Kumar, Goyal, & Joshi, 2015 conducted a research about the assessment of primary care facilities for cardiovascular disease preparedness in Madhya Pradesh, India. The result showed that the availability of facilities was least in laboratory services, and human resource domains followed by drugs, and better in equipment and point-of-care supply domains. Across these domains, availability of items in community health centers (CHCs) was (37.1, 49.0, 56.1, 67.9 and 80.9% respectively) and in PHCs was (11.8, 18.2, 44.2, 55.1, and 55.3% respectively) (Pakhare, Kumar, Goyal, & Joshi, 2015).

Jacobs, Hill, Bigdeli, & Men, 2016 conducted a research about the managing NCDs at health district level in Cambodia: a systems analysis and suggestions for improvement. The result showed that there was agreement amongst all interviewees that NCDs were prevalent, including all health systems building blocks and the referral system, was inadequately developed. Medicines supply was erratic and the quantity provided for few patients to be treated, for a short period only, mainly at secondary or tertiary level (Jacobs, Hill, Bigdeli, & Men, 2016).

Bawazir et al., 2019 conducted a research about the capacity and readiness of primary health care centers for implementation of the basic strategy for prevention and control of NCDs in Saudi Arabia. The result showed that the level of staff training on NCDs prevention and control strategies was reported to be inadequate, particularly for nurses and other healthcare providers. As for diagnostic equipment, diagnostic tests, essential medication, access to referral facilities and medical records most of them were available in all the PHCs among the different categories. Availability of basic diagnostic equipment and diagnostic tests; 16 items of diagnostic equipment surveyed, 10 were available and functioning in almost all the PHC facilities. Access to essential medicines for NCDs in PHC facilities and referral facilities; available in all PHC facilities. Index of readiness to integrate and manage NCDs in PHC centers; the most 2 domains (equipment availability, and essential services) with an overall score of 92% and 73%, respectively, counselling sessions, and availability of

medicines, 66% for each, the availability of diagnostic investigations below the 70% cut-off (Bawazir et al., 2019).

Mutale et al., 2018 conducted a research about the assessing capacity and readiness to manage NCDs in primary care setting: Gaps and opportunities based on adapted WHO PEN tool in Zambia. The result showed that only 6 out of the 46 facilities were deemed ready to manage NCDs. Facility index or district index below 70% off was considered as 'not ready' to manage NCDs. There appeared to be wide heterogeneity between facilities in respect of readiness to manage NCDs. Only the first level hospitals scored a mean index higher than the 70% cut off; With regard to medications needed to manage NCDs, urban and rural health facilities were comparably equipped (Mutale et al., 2018).

After reviewed literatures, this study aimed to assess health service readiness, availability, and utilization of primary health care facilities for NCDs in Shan state, Myanmar by WHO PEN assessment tools.

### Conceptual Framework

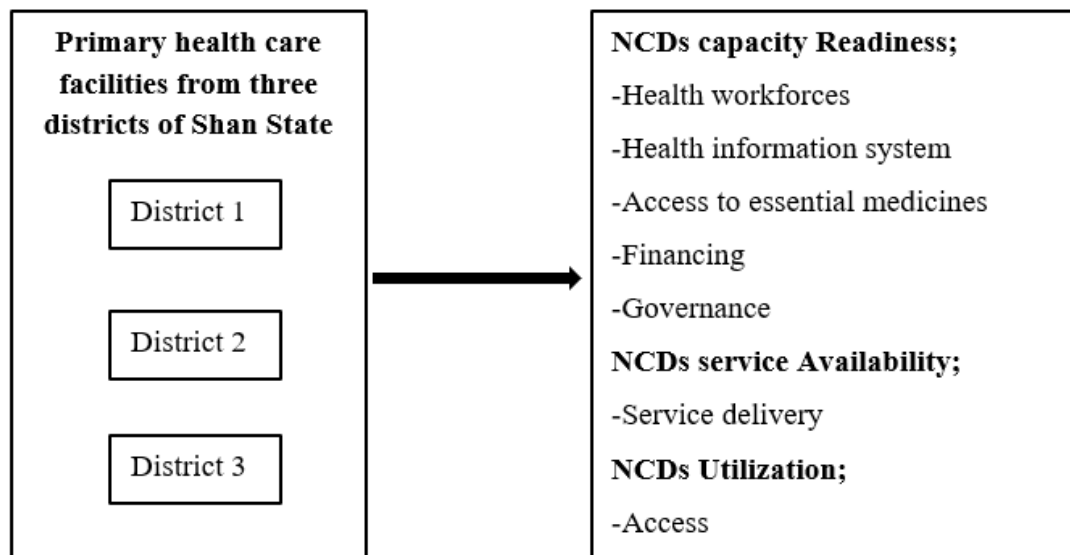


Figure 3 Conceptual Framework

## **CHAPTER III**

### **RESEARCH METHODOLOGY**

The research was about “Health service readiness, availability, and utilization of primary health care facilities for non-communicable diseases in Shan state, Myanmar”. The purposes of this research were to assess and compare the level of readiness, availability, and utilization of primary health care facilities for non-communicable diseases among districts in Shan state, Myanmar.

#### **Research design**

This study design is the cross-sectional study. Data were collected from health care providers working at the primary health care facilities of three districts in Shan state, Myanmar.

#### **Research area**

This research was conducted in Myanmar. Shan state was selected to be the research area because it is the biggest state of the country and it has many ethnic minorities groups and several culture diversities. It also has the specialist teaching hospital of university of medicine (Taunggyi) and Shan state health office. Shan state is the center of medication and center of administration in eastern part of the country. In addition, Shan state was already implemented the WHO PEN program in 2018 but have not made any assessment for effectiveness of that program in Shan state.

#### **Population**

Total primary health care facilities of Shan state, Myanmar are 206 rural health care centers and 923 sub-rural health care centers (Total = 1,129 PHC facilities).

## Sample

The sample for this research was 242 primary health care facilities (48 rural health care centers and 194 sub-rural health care centers) of three districts (Taunggyi, Loilem, Linkhae) in southern Shan state, Myanmar by using the sampling method as follows;

### Sample size calculation

The sample size had been calculated by using formula ‘finite population proportion’ as below; (Daniel & Cross, 2012)

$$n = \frac{Np(1-p)z_{1-\frac{\alpha}{2}}^2}{d^2(N-1) + p(1-p)z_{1-\frac{\alpha}{2}}^2}$$

Whereas,

n = Sample size

N = Population (1129)

z = 95% CI (1.96)

d = Sample error, (which was set at 10% of proportion) = 0.064

$\alpha$  = 0.05

p = Proportion of health workforce availability for NCDs was assumed to be 64% = 0.64 (Aye et al., 2020).

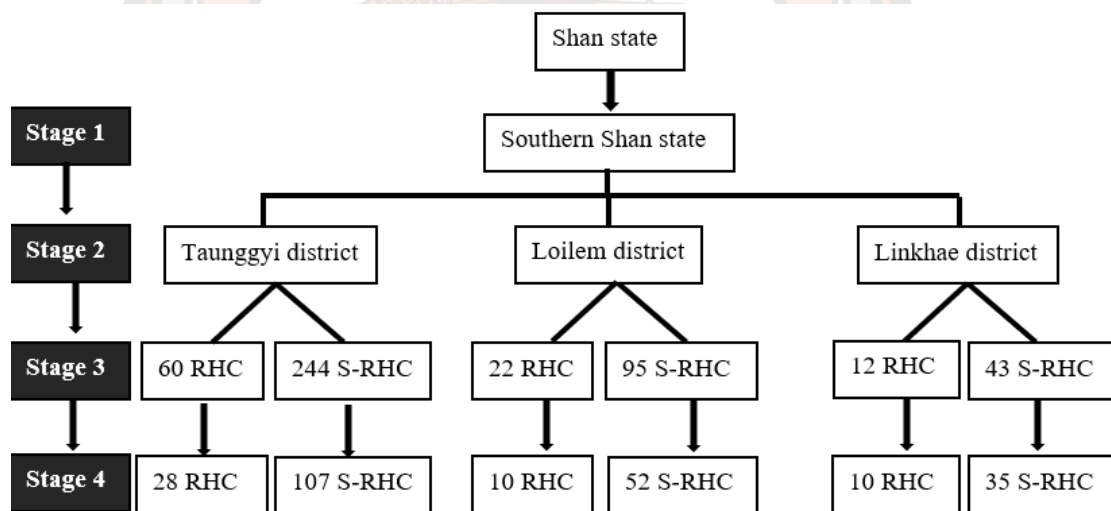
Thus, the sample size was 182, added the response rate 30%, and then got 242 primary health care facilities for this research.

### Sampling method

The sample size of the research had conducted by using multi-stage sampling method. Firstly, southern Shan state was purposively selected to be the research area because it has the specialist teaching hospital of university of medicine (Taunggyi) and Shan state health office. So, southern Shan state is the center of medication and center of administration in eastern part of the country. It is the mountainous regions of the country, has many ethnic minorities groups and several culture diversities (MIMU, 2015).

Second stage, three districts of southern Shan state (Taunggyi, Loilem, Linkhae) were selected by stratified random sampling according to the geographical setting (urban, sub-urban and rural). These districts also have different situations in health care according to transportation, hard-to-reach areas and health care facilities. All areas in Taunggyi district (urban) can reach around the year and also has 500 bedded specialist hospital. But some areas from Loilem (sub-urban) and Linkhae (rural) districts cannot reach in raining season. Loilem district has 200 bedded district hospital and Linkhae district has 50 bedded district hospital.

Third stage, RHC and S-RHC from those three districts were selected by stratified random sampling and total health care facilities are 94 RHC and 382 S-RHC. Fourth stage, 48 RHC and 194 S-RHC were selected by simple random sampling according to proportion allocation and lottery method.



**Figure 4 Multi-stage sampling method**

**Sampling method;** Multi-stage sampling

1. Purposive sampling - Southern Shan state
2. Stratified random sampling - Three districts of southern Shan state
3. Stratified random sampling - RHC and S-RHC
4. Simple random sampling according to proportion allocation - RHC and S-RHC by lottery method

**Inclusion criteria**

1. Primary health care facilities which are giving NCDs treatments and located in rural area.
2. Representatives from primary health care facilities are health care providers aged 20 years and over, both males and females. They can understand the information sheet, consent form for participants which are written by English language and can answer the question.
3. Health care providers as representatives from primary health care facilities need to be responsible person in NCDs management.

**Research variables****Independent variables**

Primary health care facilities (rural health care centers and sub-rural health care centers) from 3 districts Shan state, Myanmar.

**Dependent variables**

NCDs capacity Readiness; Workforces, Health information system, Access to Essential medicines, Financing, Governance

NCDs service Availability; Service delivery

NCDs Utilization; Access

**Research instruments**

Research instrument for this study was the questionnaires to data collection. Questionnaires development based on WHO PEN (Package of Essential Non-communicable diseases) assessment tools and also referenced on framework of WHO six building blocks of health system. (Details of questionnaire were showed in appendix)

Questionnaires consist total 4 sections and 72 questions.

**Section 1 (General characteristics of primary health care facilities)** consist 6 questions. Questions are asking name of township, name of district, type of facility (RHC or S-RHC), number of populations (male and female) in the facility's catchment area. Data from section one are used in calculation of utilization rate for primary health care facilities and comparing readiness, availability and utilization among three districts.

**Section 2 (NCDs capacity readiness)** consists 5 subtitles and 43 questions.

All questions from each subtitle changed to dichotomous values as 'yes or no' questions. If the answer was 'yes', researcher gave one score for that question. Then summed up the score from each question and divided by number of questions.

For **readiness of health workforces**; there are five questions. Calculated by formula;

$$\left( \frac{\text{sum up of score from each question}}{\text{number of questions}} \right) = \left( \frac{a+b+c+d+e}{5} \right)$$

If the result is one, it means 100% readiness. (That facility is readiness in health workforces)

If the result is less than one, it means less than 100% readiness. (That facility is unreadiness in health workforces)

For **readiness of health information system**; there are six questions. Calculated by formula;

$$\left( \frac{\text{sum up of score from each question}}{\text{number of questions}} \right) = \left( \frac{a+b+c+d+e+f}{6} \right)$$

If the result is one, it means 100% readiness. (That facility is readiness in health information system)

If the result is less than one, it means less than 100% readiness. (That facility is unreadiness in health information system)

For **readiness of access to essential medicines**; there are seven questions. Calculated by formula;

$$\left( \frac{\text{sum up of score from each question}}{\text{number of questions}} \right) = \left( \frac{a+b+c+d+e+f+g}{7} \right)$$

If the result is one, it means 100% readiness. (That facility is readiness in essential medicines)

If the result is less than one, it means less than 100% readiness. (That facility is unreadiness in essential medicines)

For **readiness of access to equipment**; there are ten questions.

Calculated by formula;

$$\left( \frac{\text{sum up of score from each question}}{\text{number of questions}} \right) = \left( \frac{a+b+c+d+e+f+g+h+i+j}{10} \right)$$

If the result is one, it means 100% readiness. (That facility is readiness in equipment)

If the result is less than one, it means less than 100% readiness. (That facility is unreadiness in equipment)

For **readiness of health financing**; there are three questions.

Calculated by formula;

$$\left( \frac{\text{sum up of score from each question}}{\text{number of questions}} \right) = \left( \frac{a+b+c}{3} \right)$$

If the result is one, it means 100% readiness. (That facility is readiness in health financing)

If the result is less than one, it means less than 100% readiness. (That facility is unreadiness in health financing)

For **readiness of governance**; there are seven questions.

Calculated by formula;

$$\left( \frac{\text{sum up of score from each question}}{\text{number of questions}} \right) = \left( \frac{a+b+c+d+e+f+g}{7} \right)$$

If the result is one, it means 100% readiness. (That facility is readiness in governance)



If the result is less than one, it means less than 100% readiness. (That facility is unreadiness in governance)

**Section 3 (NCDs service availability)** consists 14 questions. All questions from NCDs service availability is dichotomous values as ‘yes or no’ questions. If the answer was ‘yes’, gave one score for that question. Then summed up the score from each question and divided by number of questions (14).

Calculated by formula;

$$\left( \frac{\text{sum up of score from each question}}{\text{number of questions}} \right) = \left( \frac{1+2+3+ \dots +14}{14} \right)$$

If the result is one, it means 100% availability. (That facility has NCDs service availability)

If the result is less than one, it means less than 100% availability. (That facility do not has NCDs service availability)

**Section 4 (NCDs utilization)** consists 9 questions. Questions are asking the numbers of target population for screening, screening patients, new patients, frequency of visits for NCDs patients and referral patients. Data from section four are used in calculation of utilization rate (screening rate, referral rate and new patient rate) with some data from section one by using the following formulas.

Screening rate per 1000 population are calculated by the formula;

$$\left( \frac{\text{Number of screening}}{\text{Target population for screening}} \times 1000 \right)$$

Referral rate per 1000 population are calculated by the formula;

$$\left( \frac{\text{Number of referral}}{\text{Number of visits}} \times 1000 \right)$$

New patient rate per 1000 population are calculated by the formula;

$$\left( \frac{\text{Number of new patients}}{\text{Total population}} \times 1000 \right)$$

**Measuring the validity and reliability of the research instruments by;**

**Inspection content validity;** Questionnaire was submitted and inspected by three experts from different fields to determine the content validity, construct validity and suitable for the content before using with the samples.

Three experts are;

1. Associate Professor from public health (academic expert)
2. Assistant Professor from health system management (academic expert)
3. Director of public health office (professional expert)

After experts' feedback, IOC (Index of item-Objective Congruence) was calculated by (Rovinelli & Hambleton, 1977)

$$IOC = \sum R / n$$

**IOC:** means the congruence between the scale objective and the items in the scale to measure of health services readiness, availability, and utilization of primary health care facilities.

**R:** means the total scores of the agreement of experts in each item.

**n:** means the total number of experts.

<b>Questions</b>	<b>IOC</b>
Section 1. General characteristics of primary health care facilities	-
Section 2. NCDs capacity readiness	1 - 0.67
Section 3. NCDs service availability	1 - 0.67
Section 4. NCDs utilization	1 - 0.67

After experts' agreement, all criteria and the items were employed for a pilot study.

**Reliability evaluation;** Questionnaire was determined the confidence by pilot study in one district of Shan state, Myanmar which area was not included in the study.

Forty sample with the same characteristics in different research area of the study.

The result of pilot study was evaluated for reliability by Kuder–Richardson Formula 21 (KR-21). (Kuder & Richardson, 1937)

$$[n/(n-1) * [1-(M*(n-M)/(n*Var))]]$$

**n** = sample size

**Var** = variance for the test

**M** = mean score for the test

Questions	KR-21
Section 1. General characteristics of primary health care facilities	-
Section 2. NCDs capacity readiness	0.75
Section 3. NCDs service availability	0.50
Section 4. NCDs utilization	-

### Data collection

This study design was the cross-sectional and data were collected by using questionnaires to health care providers who give NCDs management (midwife in sub-rural health centers and health assistant in rural health centers) from 242 primary health care facilities of 3 districts. Firstly, training for data collection was given to research assistants (health assistant from each townships) and took data collection by them in their respective township. After three weeks, questionnaires were sent back and respond rate was 100%. Surveillance or supervision to one RHC and one sub-RHC from one township of each 3 districts for data reliability and questionnaires completeness. (Total= 3 RHCs and 3 sub-RHCs)

**Data analysis**

Data were analyzed by SPSS software. For NCDs capacity readiness, each variable (health workforces, health information system, access to essential medicines, financing, governance) was analyzed firstly by frequency and percentage. Some variables were analyzed by mean, standard deviation (SD), median, maximum and minimum. And then, compared these variables among three districts by Chi-square or Fisher's exact test.

For NCDs service availability, each variable was analyzed firstly by frequency and percentage. And then, NCDs service availability was calculated by sum up percentage of all variables and compared NCDs service availability among three districts by Chi-square or Fisher's exact test.

For NCDs service utilization, each variable (Target population for screening, number of screening, new patients, number of visits and number of referral) was analyzed firstly by mean, standard deviation (SD), median, maximum and minimum. And then, screening rate, referral rate and new patient rate were calculated and compared among three districts by Kruskal-Wallis test. Finally, analyzed the multiple comparison for utilization rate between three pairs of districts (Taunggyi district and Loilem district, Loilem district and Linkhae district, Taunggyi district and Linkhae district) by Mann-Whitney test.

**Ethical consideration**

Submitted thesis proposal, protocol synopsis for ethical review, self-assessment form, conflict of interest and funding form, information sheets for research participants, human subject protection (HSP) certification and questionnaires to get ethics certificate approved from institutional review board (IRB) of Naresuan University. NU-IRB certified with the number 0603.01.13(1)/NU-IRB 3820 for this study at 31<sup>st</sup> October 2020.

## **CHAPTER IV**

### **RESEARCH RESULTS**

The research was conducted about “Health service readiness, availability, and utilization of primary health care facilities for non-communicable diseases in Shan state, Myanmar”. A cross-sectional survey was employed among 242 primary health facilities in the research area. The purposes of this research were to assess and compare the level of readiness, availability, and utilization of primary health care facilities among districts in Shan state, Myanmar for non-communicable diseases. The quantitative data were conducted on samples through a questionnaire by face to face interview. Data were processed by using the SPSS program (Statistic Package for Social Science), which included the statistical and data analysis to present as below:

1. General characteristics of primary health care facilities
2. Readiness of Health Workforces
3. Readiness of Health Information System
4. Readiness of Medicines
5. Readiness of Equipment
6. Readiness of Financing
7. Readiness of Governance
8. NCDs Service Availability
9. NCDs Utilization
10. Comparison for Readiness and Availability
11. Median Comparison for Utilization Rate (per 1000 population)
12. Multiple Comparison for Utilization Rate

**Table 2 General characteristics of primary health care facilities**

	<b>Taunggyi</b> <b>(n = 135)</b>	<b>Loilem</b> <b>(n = 62)</b>	<b>Linkhae</b> <b>(n = 45)</b>	<b>Total</b> <b>(n = 242)</b>
Facility				
<b>n (%)</b>				
Rural Health Center	28 (20.7%)	10 (16.1%)	10 (22.2%)	48 (19.8%)
Sub-Rural Health Center	107 (79.3%)	52 (83.9%)	35 (77.8%)	194 (80.2%)
Total	892010	232126	90759	1214895
Population				
<b>Mean ± SD</b>	6607.48±5607.97	3743.97±2550.28	2016.87±1395.6	5020.23±4796.17
<b>Median (Max, Min)</b>	4936 (32871, 962)	2937 (14064, 1166)	1347 (6198, 152)	3531 (32871, 152)
Male population	433890	110681	42229	586800
<b>Mean ± SD</b>	3214±2728.77	1785.18±1290.62	938.42±702.2	2424.79±2349.15
<b>Median (Max, Min)</b>	2375 (16013, 499)	1347 (7369, 544)	585 (3102, 74)	1769 (16013, 74)
Female population	458121	121569	48530	628120
<b>Mean ± SD</b>	3393.49±2884.15	1959.18±1271.39	1078.44±701.06	2595.54±2452.47
<b>Median (Max, Min)</b>	2603 (16858, 458)	1573 (7318, 622)	770 (3096, 78)	1801.5 (16858, 78)

As shown in Table 2, 242 primary health care facilities met the criteria for inclusion in this study. About 20% were Rural Health Center (RHC) and 80% were Sub-Rural Health Center (S-RHC) in each district (Taunggyi district, Loilem district and Linkhae district). The number of primary health care facilities in each district was unequal because facilities were selected by sampling method according to proportion allocation of RHC and S-RHC from these districts. Mean of total population for all health facility was 5020.23 ± 4796.17. In Taunggyi district, mean of total population

was  $6607.48 \pm 5607.97$ , there has high population density and it was the highest value compare with other two districts (Loilem district; Mean =  $3743.97 \pm 2550.28$  and Linkhae district; Mean =  $2016.87 \pm 1395.6$ ).

**Table 3 Readiness of Health Workforces in RHCs**

<b>Health Workforces in RHC</b>	<b>Taunggyi (n = 28)</b>	<b>Loilem (n = 10)</b>	<b>Linkhae (n = 10)</b>	<b>Total (n = 48)</b>
Availability of HA <b>n (%)</b>	25 (89.3%)	8 (80%)	10 (100%)	43 (89.6%)
Numbers of HA	25	8	10	43
<b>Mean <math>\pm</math> SD</b>	$0.89 \pm 0.32$	$0.8 \pm 0.42$	$1 \pm 0.00$	$0.9 \pm 0.31$
<b>Median (Max, Min)</b>	1 (1, 0)	1 (1, 0)	1 (1, 1)	1 (1, 0)
Training of available HA, <b>n (%)</b>	24 (96%)	8 (100%)	10 (100%)	42 (97.7%)
Numbers of trained HA	24	8	10	42
<b>Mean <math>\pm</math> SD</b>	$0.86 \pm 0.36$	$0.8 \pm 0.42$	$1 \pm 0.00$	$0.88 \pm 0.33$
<b>Median (Max, Min)</b>	1 (1, 0)	1 (1, 0)	1 (1, 1)	1 (1, 0)
Availability of PHS (I) <b>n (%)</b>	9 (32.1%)	2 (20%)	2 (20%)	13 (27.1%)
Numbers of PHS (I)	9	2	2	13
<b>Mean <math>\pm</math> SD</b>	$0.32 \pm 0.48$	$0.2 \pm 0.42$	$0.2 \pm 0.42$	$0.27 \pm 0.45$
<b>Median (Max, Min)</b>	0.00 (1, 0)	0.00 (1, 0)	0.00 (1, 0)	0.00 (1, 0)

<b>Health Workforces in RHC</b>	<b>Taunggyi (n = 28)</b>	<b>Loilem (n = 10)</b>	<b>Linkhae (n = 10)</b>	<b>Total (n = 48)</b>
Training of available PHS (I), n (%)	8 (88.9%)	2 (100%)	2 (100%)	12 (92.3%)
Numbers of trained PHS (I)	8	2	2	12
<b>Mean ± SD</b>	0.29 ± 0.46	0.2 ± 0.42	0.2 ± 0.42	0.25 ± 0.44
<b>Median (Max, Min)</b>	0.00 (1, 0)	0.00 (1, 0)	0.00 (1, 0)	0.00 (1, 0)
Availability of LHV n (%)	23 (82.1%)	9 (90%)	8 (80%)	40 (83.3%)
Numbers of LHV	23	9	8	40
<b>Mean ± SD</b>	0.82 ± 0.39	0.9 ± 0.32	0.8 ± 0.42	0.83 ± 0.38
<b>Median (Max, Min)</b>	1 (1, 0)	1 (1, 0)	1 (1, 0)	1 (1, 0)
Training of available LHV, n (%)	22 (95.7%)	9 (100%)	7 (87.5%)	38 (95%)
Numbers of trained LHV	22	9	7	38
<b>Mean ± SD</b>	0.79 ± 0.42	0.9 ± 0.32	0.7 ± 0.48	0.79 ± 0.41
<b>Median (Max, Min)</b>	1 (1, 0)	1 (1, 0)	1 (1, 0)	1 (1, 0)
Availability of MW n (%)	27(96.4%)	10(100%)	10(100%)	47(97.9%)
Numbers of MW	44	11	13	68
<b>Mean ± SD</b>	1.57 ± 1.2	1 ± 0.32	1.3 ± 0.48	1.42 ± 0.96
<b>Median (Max, Min)</b>	1(7, 0)	1 (2, 1)	1 (2, 1)	1 (7, 0)



<b>Health Workforces in RHC</b>	<b>Taunggyi (n = 28)</b>	<b>Loilem (n = 10)</b>	<b>Linkhae (n = 10)</b>	<b>Total (n = 48)</b>
Training of available MW, n (%)	24 (88.9%)	9 (90%)	8 (80%)	41(87.2%)
Numbers of trained MW	36	10	8	54
<b>Mean ± SD</b>				
<b>Median (Max, Min)</b>	1.29 ± 1.08 1 (6, 0)	1 ± 0.47 1 (2, 0)	0.8 ± 0.42 1 (1, 0)	1.13 ± 0.89 1 (6, 0)
Availability of PHS (II) n (%)	26(92.9%)	8 (80%)	8 (80%)	42 (87.5%)
Numbers of PHS (II)	39	8	8	55
<b>Mean ± SD</b>	1.39 ± 1.1	0.8 ± 0.42	0.8 ± 0.42	1.15 ± 0.92
<b>Median (Max, Min)</b>	1 (6, 0)	1 (1, 0)	1 (1, 0)	1 (6, 0)
Training of available PHS (II), n (%)	24(92.3%)	8(100%)	7 (87.5%)	39 (95.3%)
Numbers of trained PHS (II)	36	8	7	51
<b>Mean ± SD</b>	1.29 ± 1.12	0.8 ± 0.42	0.7 ± 0.48	1.06 ± 0.93
<b>Median (Max, Min)</b>	1 (6, 0)	1 (1, 0)	1 (1, 0)	1 (6, 0)

As shown in Table 3, health workforces in Rural Health Center (RHC) were Health Assistant (HA), Public Health Supervisor Grade I (PHS I), Lady Health Visitor (LHV), Midwife (MW) and Public Health Supervisor Grade II (PHS II). Availability of PHS 1 was 27.1% of RHCs and it was the lowest percentage among other health workforces. 32.1% of RHCs from Taunggyi district, 20% from Loilem district and 20% from Linkhae district were available of PHS I. Mean number of PHS I in RHCs was  $0.27 \pm 0.45$  and it was nearly same value in every district. Availability of MW was about 97.9% of RHCs from three districts and it was the highest percentage among other health workforces. Mean number of MW in RHCs was  $1.42 \pm 0.96$  and it was nearly same value in each district. HA (89.6%), LHV (83.3%) and PHS II (87.5%) of RHCs were available in three districts.

Training of available workforces was more than 90% average for all kinds of health workforces. 97.7% for HA, 92.3% for PHS I, 95% for LHV, 87.2% for MW and 95.3% for PHS II of RHCs had already got the training.

**Table 4 Readiness of Health Workforces in S-RHCs**

<b>Health Workforces in S-RHC</b>	<b>Taunggyi (n = 107)</b>	<b>Loilem (n = 52)</b>	<b>Linkhae (n = 35)</b>	<b>Total (n = 194)</b>
Availability of MW n (%)	107 (100%)	51 (98.1%)	35 (100%)	193 (99.5%)
Numbers of MW	107	51	35	193
<b>Mean ± SD</b>	1 ± 0	0.98 ± 0.14	1 ± 0	0.99 ± 0.07
<b>Median (Max, Min)</b>	1 (1, 1)	1 (1, 0)	1 (1, 1)	1 (1, 0)
Training of available MW, n (%)	101 (94.4%)	37 (72.6%)	28 (80%)	166 (86%)
Numbers of trained MW	101	37	28	166
<b>Mean ± SD</b>	0.94 ± 0.23	0.71 ± 0.46	0.8 ± 0.41	0.86 ± 0.35
<b>Median (Max, Min)</b>	1 (1, 0)	1 (1, 0)	1 (1, 0)	1 (1, 0)
Availability of PHS(II) n (%)	96 (89.7%)	31 (59.6%)	21 (60%)	148 (76.3%)
Numbers of PHS (II)	96	31	21	148
<b>Mean ± SD</b>	0.9 ± 0.31	0.6 ± 0.5	0.6 ± 0.5	0.76 ± 0.43
<b>Median (Max, Min)</b>	1 (1, 0)	1 (1, 0)	1 (1, 0)	1 (1, 0)
Training of available PHS (II), n (%)	94 (97.9%)	29 (93.6%)	19 (90.5%)	142 (96%)
Numbers of trained PHS (II)	94	29	19	142
<b>Mean ± SD</b>	0.88 ± 0.33	0.56 ± 0.50	0.54 ± 0.51	0.73 ± 0.44
<b>Median (Max, Min)</b>	1 (1, 0)	1 (1, 0)	1 (1, 0)	1 (1, 0)

As shown in Table 4, health workforces in Sub-Rural Health Center (S-RHC) were Midwife (MW) and Public Health Supervisor Grade II (PHS II). MW 99.5% and PHS (II) 76.3% were available in S-RHCs. Mean number of MW in S-RHCs was  $0.99 \pm 0.07$  and mean number of PHS II in S-RHCs was  $0.76 \pm 0.43$ . 86% of available MW and 96% of available PHS (II) from S-RHCs had already got training.

**Table 5 Readiness of Health Information System**

Health Information System, n (%)	Taunggyi (n = 135)	Loilem (n = 62)	Linkhae (n = 45)	Total (n = 242)
Patient record-form	135 (100%)	62 (100%)	45 (100%)	242 (100%)
Patient register	135 (100%)	61 (98.4%)	45 (100%)	241 (99.6%)
Stocks for medicines and equipment	135 (100%)	60 (96.8%)	45 (100%)	240 (99.2%)
Referral form	134 (99.3%)	61 (98.4%)	41 (91.1%)	236 (97.5%)
Report to higher level	135 (100%)	61 (98.4%)	45 (100%)	241 (99.6%)
Feedback from township/state health office	135 (100%)	52 (83.9%)	35 (77.8%)	222 (91.7%)

As shown in Table 5, for the readiness of health information system, there were six variables (Patient record-form, Patient register, Stocks/Ledger for medicines and equipment, Referral form, Report and Feedback). The patient record-form (Filling and Keeping) was readiness in 100% of health facility from three districts. The feedback from township/state health office (for Reporting) was readiness in 91.7% of health facility; Taunggyi district (100%), Loilem district (83.9%) and Linkhae district (77.8%). It was the lowest percentage among other variables in the readiness of health information system. Readiness for the patient register (Filling and Keeping) was 99.6%, the stocks/ledger for medicines and equipment (Filling and Keeping) was 99.2%, the referral form (Availability and Using) was 97.5% and the report to higher level (Monthly, Quarterly, Yearly) was 99.6% of health facility. In Taunggyi district, almost 100% of health facility were readiness for all six

variables and it was the higher readiness of health information system than other two districts.

**Table 6 Readiness of Medicines**

<b>Medicines n (%)</b>	<b>Taunggyi (n = 135)</b>	<b>Loilem (n = 62)</b>	<b>Linkhae (n = 45)</b>	<b>Total (n = 242)</b>
Gliclazide	135 (100%)	61 (98.4%)	44 (97.8%)	240 (99.2%)
Metformin	134 (99.3%)	62 (100%)	44 (97.8%)	240 (99.2%)
Amlodipine	134 (99.3%)	62 (100%)	45 (100%)	241 (99.6%)
Atenolol	111 (82.2%)	52 (83.9%)	40 (88.9%)	203 (83.9%)
Enalapril	132 (97.8%)	51 (82.3%)	41 (91.1%)	224 (92.6%)
Aspirin	134 (99.3%)	48 (77.4%)	38 (84.4%)	220 (90.9%)
Atorvastatin	131 (97%)	44 (71%)	35 (77.8%)	210 (86.8%)

As shown in Table 6, readiness of medicines consisted seven kinds of medicines including Gliclazide, Metformin, Amlodipine, Atenolol, Enalapril, Aspirin and Atorvastatin. Gliclazide was available in 99.2% of health facility. Metformin and Amlodipine were also available in more than 99% of health facility. Enalapril was available in 92.6%, Aspirin was available in 90.9% of health facility. Atenolol was available in 83.9% and it was the lowest percentage of readiness in compare with other six medicines. Atorvastatin was available in 86.8% of health facility.

**Table 7 Readiness of Equipment**

<b>Equipment n (%)</b>	<b>Taunggyi (n = 135)</b>	<b>Loilem (n = 62)</b>	<b>Linkhae (n = 45)</b>	<b>Total (n = 242)</b>
Blood pressure measuring devices	135 (100%)	62 (100%)	45 (100%)	242 (100%)
Weighing machines	135 (100%)	61 (98.4%)	45 (100%)	241 (99.6%)
Glucometer	135 (100%)	61 (98.4%)	45 (100%)	241 (99.6%)
Glucometer test strips	127 (94.1%)	60 (96.8%)	39 (86.7%)	226 (93.4%)
Measuring tape	134 (99.3%)	59 (95.2%)	45 (100%)	238 (98.3%)
Stethoscope	134 (99.3%)	60 (96.8%)	45 (100%)	239 (98.8%)
Lancet	132 (97.8%)	62 (100%)	45 (100%)	239 (98.8%)
WHO CVD risk score chart	132 (97.8%)	54 (87.1%)	43 (95.6%)	229 (94.6%)
Health education material	134 (99.3%)	61 (98.4%)	45 (100%)	240 (99.2%)
PEN Manual	135 (100%)	54 (87.1%)	45 (100%)	234 (96.7%)

As shown in Table 7, readiness of equipment consisted ten kinds of equipment. Blood pressure measuring devices were available in all health facility. Weighing machines were available in 99.6% of health facility and Glucometers were also available in 99.6% of health facility. Glucometer test strips were available in (93.4%), Measuring tape (98.3%), Stethoscope (98.8%), Lancet (98.8%), WHO CVD (Cardiovascular Diseases) risk score chart (94.6%), Health education material (99.2%) and BHS (Basic Health Staff) PEN Manual (96.7%) of health facilities.

**Table 8 Readiness of Financing**

<b>Financing n (%)</b>	<b>Taunggyi (n = 135)</b>	<b>Loilem (n = 62)</b>	<b>Linkhae (n = 45)</b>	<b>Total (n = 242)</b>
Free of charge services	128 (94.8%)	56 (90.3%)	42 (93.3%)	226 (93.4%)
Contribution/donations from the community	4 (3%)	4 (6.5%)	5 (11.1%)	13 (5.4%)
Community health fund	9 (6.7%)	2 (3.2%)	3 (6.7%)	14 (5.8%)

As shown in Table 8, readiness of financing had three variables. Free of charge services were readiness in 93.4% of health facility. Contribution/donations from the community and other partners were readiness in 5.4% of health facility; 3% in Taunggyi district, 6.5% in Loilem district and 11.1% in Linkhae district. Health fund from community were readiness in 5.8% of health facility; 6.7% in Taunggyi district, 3.2% in Loilem district and 6.7% in Langkho district. Readiness percentage of these two variables were much different from variable of free of charge services.

**Table 9 Readiness of Governance**

<b>Governance n (%)</b>	<b>Taunggyi (n = 135)</b>	<b>Loilem (n = 62)</b>	<b>Linkhae (n = 45)</b>	<b>Total (n = 242)</b>
Community participation	117 (86.7%)	44 (71%)	41 (91.1%)	202 (83.5%)
Supports given by community	133 (98.5%)	48 (77.4%)	45 (100%)	226 (93.4%)
Health committee with community	53 (39.3%)	23 (37.1%)	12 (26.7%)	88 (36.4%)
Social organizations	17 (12.6%)	10 (16.1%)	6 (13.3%)	33 (13.6%)
Village health volunteers/Auxiliary Midwife	96 (71.1%)	23 (37.1%)	34 (75.6%)	153 (63.2%)
Vehicle for patient transfer	26 (19.3%)	14 (22.6%)	13 (28.9%)	53 (21.9%)
Peer health education	28 (20.7%)	10 (16.1%)	12 (26.7%)	50 (20.7%)

As shown in Table 9, readiness of governance consisted seven variables. Community participation was readiness in 83.5% of health facility. Supports given by community was readiness in 93.4% of health facility and types of supports were Health committee with community (36.4%), Social organizations (13.6%), Village health volunteers / Auxiliary Midwife (63.4%), Vehicle for patient transfer (21.9%) and Peer health education (20.7%) readiness respectively of health facilities.

**Table 10 NCDs Service Availability**

<b>NCDs Service Availability, n (%)</b>	<b>Taunggyi (n = 135)</b>	<b>Loilem (n = 62)</b>	<b>Linkhae (n = 45)</b>	<b>Total (n = 242)</b>
Measurement of Blood Pressure	135 (100%)	62 (100%)	45 (100%)	242 (100%)
Blood Glucose Test	135 (100%)	62 (100%)	45 (100%)	242 (100%)
Measurement of Weight	135 (100%)	62 (100%)	45 (100%)	242 (100%)
Measurement of Height	131 (97%)	62 (100%)	45 (100%)	238 (98.3%)
Calculation of BMI	135 (100%)	62 (100%)	45 (100%)	242 (100%)
Assessment of 10 years CVD risk	119 (88.1%)	56 (90.3%)	45 (100%)	220 (90.9%)
Health Education	135 (100%)	62 (100%)	45 (100%)	242 (100%)
Diagnosis and management for diabetes	134 (99.3%)	62 (100%)	45 (100%)	241 (99.6%)
Diagnosis and management for cardiovascular diseases	134 (99.3%)	61 (98.4%)	45 (100%)	240 (99.2%)
Diagnosis and management for chronic respiratory diseases	116 (85.9%)	52 (83.9%)	30 (66.7%)	198 (81.8%)
Assessment and referral of suspected cancers	110 (81.5%)	36 (58.1%)	35 (77.8%)	181 (74.8%)
Referral Function	135 (100%)	60 (96.8%)	44 (97.8%)	239 (98.8%)
Outpatient's beds for ill/severe patient	117 (86.7%)	55 (88.7%)	34 (75.6%)	206 (85.1%)
System for loss of follow up patients	132 (97.8%)	61 (98.4%)	36 (80%)	229 (94.6%)

As shown in Table 10, availability of health services had 14 variables. Check-up of blood pressure, check the blood glucose test, measurement of weight, calculation of BMI and health education/counselling were available services in all health facility. Diagnosis and management for diabetes and cardiovascular diseases including hypertension were available in more than 99% of health facility. Diagnosis and management for chronic respiratory diseases were available in 81.8%, assessment and referral of suspected cancers were available in 74.8% of health facility. Referral Function (98.8%), outpatient's beds for ill/severe patient before referral (85.1%) and the system for loss of follow up patients (94.6%) were available of health facility.

**Table 11 NCDs Utilization**

NCDs Utilization	Taunggyi (n=135)		Loilem (n=62)		Linkhae (n=45)		Total (n=242)	
	Mean (SD)	Median (Max,Min)	Mean (SD)	Median (Max,Min)	Mean (SD)	Median (Max,Min)	Mean (SD)	Median (Max,Min)
Target population for screening/year	1491.24 ± 1063.66	1127 (5092, 189)	759.95 ± 405.83	600 (1812, 193)	449.98 ± 349.48	309 (2032, 28)	1110.26 ± 941.98	845 (5092, 28)
Number of screening/year	261.73 ± 196.25	199 (986, 15)	180.03 ± 112.69	124 (550, 55)	71.67 ± 58.89	58 (330, 2)	205.45 ± 174.77	154.5 (986, 2)
New patients/year	30.61 ± 22.49	28 (98, 1)	22.35 ± 17.39	16 (69, 1)	13.18 ± 12.15	12 (78, 0)	25.25 ± 20.74	19 (98, 0)
Number of visits/year	91.93 ± 67.32	87 (307, 4)	77.55 ± 61.53	59.5 (319, 5)	50.27 ± 71.13	35 (480, 4)	80.5 ± 68.18	60 (480, 4)
Number of referral/year	2.57 ± 3.94	1 (27, 0)	1.81 ± 4.1	0.00 (24, 0)	0.67 ± 1.13	0.00 (4, 0)	2.02 ± 3.69	1 (27, 0)

As shown in Table 11, utilization had five variables; target population for screening per year, number of screening per year, new patients per year, number of visits per year, number of referrals per year. Mean value of target population for screening per year was 1110.26 ± 941.98 in health facility; 1491.24 ± 1063.66 in Taunggyi district, 759.95 ± 405.83 in Loilem district and 449.98 ± 349.48 in Linkhae district respectively. Mean value of numbers screening per year was 205.45 ± 174.77 in health facility; 261.73 ± 196.25 in Taunggyi district, 180.03 ± 112.69 in Loilem district and 71.67 ± 58.89 in Linkhae district respectively. Mean value of new patients



per year was  $25.25 \pm 20.74$  in health facility;  $30.61 \pm 22.49$  in Taunggyi district,  $22.35 \pm 17.39$  in Loilem district and  $13.18 \pm 12.15$  in Linkhae district respectively. Mean value of numbers of visits per year was  $80.5 \pm 68.18$  in health facility;  $91.93 \pm 67.32$  in Taunggyi district,  $77.55 \pm 61.53$  in Loilem district and  $50.27 \pm 71.13$  in Linkhae district respectively. Mean value of numbers of referral per year was  $2.02 \pm 3.69$  in health facility;  $2.57 \pm 3.94$  in Taunggyi district,  $1.81 \pm 4.1$  in Loilem district and  $0.67 \pm 1.13$  in Linkhae district respectively. According to compare mean values among three districts, all variables in utilization were different among three districts.

**Table 12 Comparison for Readiness and Availability**

Variables n (%)	Taunggyi (n = 135)	Loilem (n = 62)	Linkhae (n =45)	P value
<b>NCDs capacity readiness</b>				
<b>Health workforce (RHC) (n = 48)</b>				
Availability	5(55.6%)	2(22.2%)	2(22.2%)	1.000 <sup>a</sup>
Training of available	5(55.6%)	2(22.2%)	2(22.2%)	1.000 <sup>a</sup>
<b>Health workforce (S-RHC) (n = 194)</b>				
Availability	96(65.3%)	30(20.4%)	21(14.3%)	<0.001 <sup>b</sup> *
Training of available	91(69.5%)	22(16.8%)	18(13.7%)	<0.001 <sup>b</sup> *
<b>Health Information (n = 242)</b>				
	134(62.6%)	49(22.9%)	31(14.5%)	<0.001 <sup>b</sup> *
<b>Medicines and Equipment (n = 242)</b>				
Medicines	128(60.4%)	48(22.6%)	36(17%)	0.001 <sup>b</sup> *
Equipment	134(56.5%)	58(24.5%)	45(19%)	0.030 <sup>a</sup> *
<b>Finance (n = 242)</b>				
	3(50%)	1(16.7%)	2(33.3%)	0.633 <sup>a</sup>
<b>Governance (n = 242)</b>				
	116(57.7%)	44(21.9%)	41(20.4%)	0.009 <sup>b</sup> *
<b>Availability</b>				
<b>NCDs service availability (n = 242)</b>				
	111(59.4%)	47(25.1%)	29(15.5%)	0.046 <sup>b</sup> *

a = Fisher's Exact test, b = Chi-square,

\* Significant at the level of P value < 0.05

As shown in Table 12, readiness had five main variables (Health workforce, Health Information, Medicines and Equipment, Finance, Governance). For the readiness of health workforces (RHC), firstly analyzed each district by descriptive (frequency and percentage) and then comparing among three districts were analyzed by Fisher's Exact test, P value was 1.000 and it was not significant different among three districts. For the readiness of health workforces (S-RHC), firstly analyzed each district by descriptive (frequency and percentage) and then comparing among three districts were analyzed by Chi-square test, P value was less than 0.001 and it was significant different among three districts. For the readiness of health information, firstly analyzed each district by descriptive (frequency and percentage) and then comparing among three districts were analyzed by Chi-square test, P value was less than 0.001 and it was significant different among three districts.

For the readiness of medicines, firstly analyzed each district by descriptive (frequency and percentage) and then comparing among three districts were analyzed by Chi-square test, P value was 0.001 and it was significant different among three districts. For the readiness of equipment, analyzed each district by descriptive (frequency and percentage) and then comparing among three districts were analyzed by Fisher's Exact test, P value was 0.030 and it was significant different among three districts. For the readiness of finance, firstly analyzed each district by descriptive (frequency and percentage) and then comparing among three districts were analyzed by Fisher's Exact test, P value was 0.633 and it was not significant different among three districts. For the readiness of governance, firstly analyzed each district by descriptive (frequency and percentage) and then comparing among three districts were analyzed by Chi-square test, P value was 0.009 and it was significant different among three districts. Governance was readiness in 83.1% of health facility.

Availability was the total value of 14 variables form table (10). Firstly, analyzed each district by descriptive (frequency and percentage) and then comparing among three districts were analyzed by Chi-square test, P value was 0.046 and it was significant different among three districts.

**Table 13 Median Comparison for Utilization Rate (per 1000 population)**

Utilization rate	Taunggyi (n = 135)		Loilem (n = 62)		Linkhae (n = 45)		Total (n = 242)		P value <sup>a</sup>
	Mean (SD)	Median (Max, Min)	Mean (SD)	Median (Max, Min)	Mean (SD)	Median (Max, Min)	Mean (SD)	Median (Max, Min)	
Screening rate	189.05 ± 95.38	187.1 (690, 23)	294.48 ± 259.65	192.39 (1000, 42)	167.26 ± 82.02	178.14 (541, 22)	212.01 ± 160.12	187.82 (1000, 22)	0.04 *
Referral rate	32.69 ± 62.63	12.82 (529, 0)	20.92 ± 38.56	0 (175, 0)	23.26 ± 47.46	0 (250, 0)	27.92 ± 54.76	6.32 (529, 0)	0.05
New patient rate	5.43 ± 3.70	4.58 (22, 0)	7.54 ± 7.35	4.14 (31, 0)	7.29 ± 4.42	6.23 (18, 0)	6.32 ± 5.09	4.7 (31, 0)	0.041 *

a = Kruskal-Wallis test,

\* Significant at the level of P value < 0.05

As shown in Table 13, comparison of three utilization rate among three districts consisted three types of rates (Screening rate, Referral rate and New patient rate). Screening rate was calculated by formula of per 1000 population ( $\frac{\text{Number of screening}}{\text{Target population for screening}} \times 1000$ ). Median of health facilities was 187.82 and comparing median among three districts by Kruskal-Wallis test, P value was 0.04 and it was significant different among three districts. Referral rate was calculated by formula of per 1000 population ( $\frac{\text{Number of referral}}{\text{Number of visits}} \times 1000$ ). Median of health facilities was 6.32 and comparing median among three districts by Kruskal-Wallis test, P value was 0.05 and it was not significant different among three districts. New patient rate was calculated by formula of per 1000 population ( $\frac{\text{Number of new patients}}{\text{Total population}} \times 1000$ ). Median of health facility was 4.7 and comparing median among three districts by Kruskal-Wallis test, P value was 0.041 and it was significant different among three districts.

**Table 14 Multiple Comparison for Utilization Rate**

Districts	Taunggyi and Loilem	Loilem and Linkhae	Taunggyi and Linkhae
Screening rate (P value) <sup>a</sup>	0.045	0.044	0.681
Referral rate (P value) <sup>a</sup>	0.017	0.890	0.179
New patient rate (P value) <sup>a</sup>	0.359	0.066	0.006 *

a = Mann-Whitney test,

\*Acceptable of Bonferroni Correction  $\alpha = 0.05/3 = 0.01667$

As shown in Table 14, multiple comparison for utilization rate among three districts had three pairs (Taunggyi district and Loilem district), (Loilem district and Linkhae district) and (Taunggyi district and Linkhae district). Multiple comparison for utilization rate among three pairs were analyzed by Mann-Whitney Test. Acceptable of Bonferroni Correction alpha was ( $0.05/3 = 0.01667$ ), after calculated according to three times analysis and type I error. For screening rate, P value between Taunggyi district and Loilem district was 0.045, it was not significant different. P value between Loilem district and Linkhae district was 0.017, it was also not significant different. P value between Taunggyi district and Langkho district was 0.359, it was also not significant different. For referral rate, P value between Taunggyi district and Loilem district was 0.044, it was not significant different. P value between Loilem district and Linkhae district was 0.890, it was also not significant different. And also, P value between Taunggyi district and Langkho district was 0.066, it was also not significant different. For new patient rate, P value between Taunggyi district and Loilem district was 0.681, it was not significant different. P value between Loilem district and Langkho district was 0.179, it was also not significant different. But P value between Taunggyi district and Langkho district was 0.006, it was significant different.

## CHAPTER V

### DISCUSSION

The research was conducted about “Health service readiness, availability, and utilization of primary health care facilities for non-communicable diseases in Shan state, Myanmar”. A cross-sectional survey was employed among 242 primary health care facilities in the research area. The purposes of this research were to assess and compare the level of readiness, availability, and utilization of primary health care facilities among districts in Shan state, Myanmar for non-communicable diseases.

The sample for this research was primary health care facilities (rural health care centers and sub-rural health care centers) of three districts (Taunggyi, Loilem, Linkhae) in southern Shan state, Myanmar. The total sample size for this research was 242 primary health care facilities (48 rural health care centers and 194 sub-rural health care centers) that was calculated by using ‘finite population proportion’ formula and added response rate for 30%.

Research instrument was the questionnaire based on WHO PEN (Package of Essential Non-communicable diseases) assessment tool and framework of WHO six building blocks of health system. Questionnaire divided into four parts including general characteristics of primary health care facilities, NCDs capacity readiness, NCDs service availability and NCDs service utilization. The questionnaire was assessed for content validity (IOC) by three experts who were employed as assessors to determine the content validity, construct validity and suitable for the content before using with the samples. After expert’s agreement, all criteria and the items were employed for a pilot study. IOC (Index of item-Objective Congruence) was performed and the validity value was 1 - 0.67 (Rovinelli & Hambleton, 1977). In addition, questionnaire was also tested for reliability by pilot study. Forty sample in the pilot study had similar characteristics to the samples. The result of pilot study was evaluated for reliability by using the Kuder–Richardson Formula 21 (KR-21) and the reliability value was 0.5 - 0.75 (Kuder & Richardson, 1937).

Researcher conducted the quantitative data collection by using questionnaires to health care providers (midwife in sub-rural health centers and health assistant in rural health centers) from 242 primary health care facilities of 3 districts. Data was analyzed by using SPSS software (statistic package for social sciences). For NCDs capacity readiness, each variable (health workforces, health information system, access to essential medicines, financing, governance) were analyzed firstly by frequency and percentage. Some variables were analyzed by mean, standard deviation (SD), median, maximum and minimum. Then, were compared these variables among three districts by Chi-square or Fisher's exact test. For NCDs service availability, each variable was analyzed firstly by frequency and percentage. And then, NCDs service availability was calculated by sum up percentage of all variables and compared NCDs service availability among three districts by Chi-square or Fisher's exact test. For NCDs service utilization, each variable (Target population for screening, number of screening, new patients, number of visits and number of referral) was analyzed firstly by mean, standard deviation (SD), median, maximum and minimum. And then, screening rate, referral rate and new patient rate were calculated and compared among three districts by Kruskal-Wallis test. Finally, analyzed the multiple comparison for utilization rate between three pairs of districts (Taunggyi district and Loilem district, Loilem district and Linkhae district, Taunggyi district and Linkhae district) by Mann-Whitney test.

## **Conclusion**

The results of the health service readiness, availability, and utilization of primary health care facilities for non-communicable diseases in Shan state, Myanmar are presented as followed:

**Part 1:** General characteristics of primary health care facilities consisted the number of townships, number of facilities, total population, male population and female population. As the result, about 20% were Rural Health Center (RHC) and 80% were Sub-Rural Health Center (S-RHC) in each district (Taunggyi district, Loilem district and Linkhae district). Mean of total population for all health facility was  $5020.23 \pm 4796.17$ . In Taunggyi district, mean of total population was  $6607.48 \pm 5607.97$ , there had high population density and it was the highest value compare with other two

districts (Loilem district; Mean =  $3743.97 \pm 2550.28$  and Linkhae district; Mean =  $2016.87 \pm 1395.6$ ).

**Part 2:** NCDs capacity readiness had five variables (Health workforce, Health Information, Medicines and Equipment, Finance, Governance). For the readiness of health workforces (S-RHC), comparing among three districts was analyzed by Chi-square test, P value was less than 0.001 and it was significant different among three districts. For the readiness of health information, comparing among three districts was analyzed by Chi-square test, P value was less than 0.001 and it was significant different among three districts.

For the readiness of medicines, comparing among three districts was analyzed by Chi-square test, P value was 0.001 and it was significant different among three districts. For the readiness of equipment, comparing among three districts was analyzed by Fisher's Exact test, P value was 0.030 and it was significant different among three districts. For the readiness of governance, comparing among three districts was analyzed by Chi-square test, P value was 0.009 and it was significant different among three districts.

**Part 3:** NCDs service availability had 14 variables (measurement of blood pressure, blood glucose test, measurement of weight, measurement of height, calculation of BMI, assessment of 10 years CVD risk, health education, diagnosis and management for diabetes, diagnosis and management for cardiovascular diseases including hypertension, diagnosis and management for chronic respiratory diseases, assessment and referral of suspected cancers, referral function, outpatient's beds for ill/severe patient and system for loss of follow up patients). Check-up of blood pressure, check the blood glucose test, measurement of weight, calculation of BMI and health education/counselling were available in all health facility. Diagnosis and management for diabetes and cardiovascular diseases including hypertension was available in more than 99% of primary health care facilities. Diagnosis and management for chronic respiratory diseases was available in 81.8%, assessment and referral of suspected cancers was available in 74.8% of primary health care facilities. Availability of referral function was (98.8%), outpatient's beds for ill/severe patient before referral was (85.1%) and the system for loss of follow up patients was (94.6%)

of health facility. Comparing among three districts was analyzed by Chi-square test, P value was 0.046 and it was significant different among three districts.

**Part 4:** NCDs service utilization had five variables (target population for screening, number of screening, new patients, number of visits, number of referral). Mean value of target population for screening per year was  $1110.26 \pm 941.98$  in health facility. Mean value of numbers screening per year was  $205.45 \pm 174.77$  in health facility. Mean value of new patients per year was  $25.25 \pm 20.74$  in health facility. Mean value of numbers of visits per year was  $80.5 \pm 68.18$  in health facility. Mean value of numbers of referral per year was  $2.02 \pm 3.69$  in health facility. According to compare mean values among three districts, all variables in utilization were different among three districts.

Comparison of three utilization rate among three districts consisted three types (Screening rate, Referral rate, New patient rate). Median of screening rate was 187.82. Comparing median among three districts by Kruskal-Wallis test, P value was 0.04 and it was significant different among three districts. Median of referral rate was 6.32. Comparing median among three districts by Kruskal-Wallis test, P value was 0.05 and it was not significant different among three districts. Median of new patient rate was 4.7. Comparing median among three districts by Kruskal-Wallis test, P value was 0.041 and it was significant different among three districts.

Multiple comparison for utilization rate among three districts had three pairs (Taunggyi district and Loilem district), (Loilem district and Linkhae district) and (Taunggyi district and Linkhae district). Multiple comparison for utilization rate among three pairs was analyzed by Mann-Whitney Test. For screening rate and referral rate, three was no significantly different of three pairs. For new patient rate, P value between Taunggyi district and Langkho district was 0.006, it was significant different but other two pairs were not significantly different.



## Discussion

In terms of statistical analysis and findings, health service readiness, availability, and utilization of primary health care facilities for non-communicable diseases in Shan state, Myanmar can be discussed the finding of this study as below:

### General characteristics of primary health care facilities

General characteristics of primary health care facilities was consisted with the number of townships, number of facilities, total population, male population and female population. Taunggyi district had highest population density (Mean =  $6607.48 \pm 5607.97$ ) among three districts, it seems obvious that many areas of Taunggyi district is urban and people want to live in urban area for improvement of their social-economic. There has also 500 bedded specialist/teaching hospital and university of medicine. The mean population and standard deviation of Loilem district was  $3743.97 \pm 2550.28$ . This district was considered as the sub-urban area and there has 200 bedded district hospital. Linkhae district had lowest population density (Mean =  $2016.87 \pm 1395.6$ ), this might be many areas of Linkhae district are mostly in rural, mountainous area and has some difficulty in transportation and telecommunication (MIMU, 2015).

### NCDs capacity readiness

NCDs capacity readiness had five variables from WHO six-building blocks of health system; health workforces, health information system, essential medicines and equipment, financing and governance. These five variables were inputs for health system strengthening according to WHO's framework (WHO, 2010b).

**Readiness of health workforces:** Health workforces were divided into two levels of facilities; including RHC and S-RHC, because of the different organizational setup and workforce capacity. In RHC, there are five kinds of health workforces including Health Assistant (HA), Public Health Supervisor Grade I (PHS I), Lady Health Visitor (LHV), Midwife (MW) and Public Health Supervisor Grade II (PHS II). Comparing the availability and training of health workforces in RHCs, P-values were 1.000 and were not significantly different among three districts. Health workforces were readiness in about 80% of RHC except PHS (I) 27.1%. Each health workforce in RHC was available at least one person but PHS (I) had just mean

number of  $0.27 \pm 0.45$ . More than 90% of all available health workforces of RHC level had already got the training except for MW (87.2%).

In S-RHC, there has two kinds of health workforces (MW and PHS (II)). Comparing the availability and training of health workforces in S-RHCs, P-values were  $< 0.001$  and were significant different among three districts. Taunggyi district had about 90% readiness of health workforces and it was higher than other districts, this might be most people want to make jobs in urban area for their social-economic. Available of MW was in almost all health facilities because MWs are the most important role for giving health services in primary health care level (MOHS, 2014). PHS (II) was available in 89.7% of health facilities in Taunggyi districts and other two districts were about 60%. In S-RHC level, the available health workforces had got the training for NCDs management less than RHC level. This might be MW and PHS (II) from S-RHCs are usually trained in township level, but HA, PHS (I) and LHV from RHCs are usually trained in state level. There are different management levels and systems for giving the training between state and township level. This study was consistent with other studies by using the same instrument, WHO PEN questionnaire to assess the readiness of health service for non-communicable diseases in Myanmar which conducted by Aye et al., 2020. Results of that study were human resource availability was 64.0%, 90.0% of those appointed had been trained in PEN.

**Readiness of health information system:** In health information system had six variables. Comparing the readiness of health information system, P-value was  $< 0.001$  and was significantly different among three districts. Health facilities from Taunggyi district were almost all readiness for health information system, it seems obvious that it has more urban area and more develop than other districts, there has also the state health office for close monitoring about the reporting and feedback. 91.1% of health facilities from Linkhae district were readiness for referral system and it was lower percentage than others, this might be it has difficulty in transportation and telecommunication for referral to hospital or higher-level facility. 83.9% of health facilities in Loilem district and 77.8% of health facilities in Linkhae district were readiness of feedback system that was lower than Taunggyi district, because they are more distant from state health office and only have district health offices. The study was consistent with other studies by assessing in primary health care level to know the

capacity and readiness for prevention and control of NCDs in Saudi Arabia by Bawazir et al., 2019. Result of that study was the medical records were mostly available in all the PHCs.

**Readiness of essential medicines and equipment:** In readiness of essential medicines, there had seven kinds of medicines from the essential national drugs list for NCDs management in Myanmar. Gliclazide and Metformin are the essential medicines for treatment of diabetes. Amlodipine, Atenolol and Enalapril are the essential medicines for hypertension treatment. Aspirin are for prevention and treatment of CVDs and Atorvastatin are for treatment for high cholesterol. Readiness of Gliclazide, Metformin, Amlodipine, Atenolol were higher percentage than other medicines, this might be Myanmar's MOHS PEN guidelines more focus on treatment of hypertension and diabetes (MOHS, 2017). Readiness of some medicines (Enalapril, Aspirin and Atorvastatin) were less availability in Loilem and Linkhae than Taunggyi.

Medicines are mostly distribution from central and state level health office, there should be similar percentage in readiness of essential medicines but there might be the different management for medicines and transportation difficulty among three districts. Comparing the readiness of medicines, P-value was 0.001 and was significantly different among districts.

In readiness of equipment, there had 10 kinds of equipment from the essential equipment list of MOHS's PEN guideline (MOHS, 2017). More than 97% all health facilities were readiness of equipment. Comparing the readiness of equipment, P-value was 0.030 and was significantly different among districts. The study was consistent with other studies by using the same instrument, WHO PEN questionnaire to assess the capacity of public sector health facilities to prevent and control NCDs in Ugandan by Rogers et al., 2018. That study showed that none of the facilities surveyed meet the WHO-PEN standards for essential tools and medicines to implement effective NCD interventions.

**Readiness of finance:** In financing readiness, there had three kinds of variables. Finance was not focused many in this study because health system for all health services are free of charge system in Myanmar and budgets of buying medicines and equipment for health services are mostly use in central and state level. Primary health care facilities are usually distributed of medicines and equipment from central and state health offices. In 2014, 50.7% of total expenditure on health was paid for out of pocket, while 45.4% came from the government (free of charge), 0.5% from the Social Security Scheme (SSS), and 3.4% from other private sources. The only health insurance system currently in place in Myanmar is the SSS. The SSS is regulated through the Ministry of Labour and it cannot cover the health financing of the country (Myint et al., 2019). Results of the study were free of charge system was readiness in 93.4% of health facilities, donations/contributions from community was just 5.4% and community health fund was 5.8% readiness of health facilities. It seems obvious that there is no enough health insurance system in Myanmar, so that usually has not had enough budget for health services and weakness in financing management. It can shortage of medicines and equipment, health workforce's capacity. This suggest that the effective health insurance system is needed to implement in Myanmar's health care system.

**Readiness of governance:** In readiness of governance, there had seven kinds of variables. Comparing the readiness of governance, P-value was 0.009 and was significantly different among three districts. Community participation was about 80% readiness in Taunggyi and Linkhae districts, but 71% in Loilem district. Community supports was 77.4% readiness in Loilem district and it was lower than other two districts. This might be different readiness level of governance in three districts by different management style and communication skills of health workforces in primary health facilities. For the readiness of finance and readiness of governance, the study was consistent with other studies by using the same instrument, WHO PEN questionnaire to assess the capacity and readiness to manage NCDs in primary care setting based on adapted WHO PEN tool in Zambia by Mutale et al., 2018. Results of that study showed that only 6 out of the 46 facilities were deemed ready to manage NCDs.

### **NCDs service availability**

NCDs service availability consisted 14 kinds of health services for NCDs management. Service availability is the pathway for inputs of NCDs capacity readiness to get outcome of NCDs service utilization. Comparing the NCDs service availability, P-value was 0.046 and was significantly different among three districts. Especially in diagnosis and management for chronic respiratory diseases (81.8%) and assessment and referral of suspected cancers (74.8%), Taunggyi district had more availability of health services than others two, this might be transportation and telecommunication different between urban and rural areas. Outpatient's beds for ill/severe patient availability was 85.1%, and Linkhae district had less availability than others because of different management style. Availability of follow up health service was 94.6%, but 80% in Linkhae district due to transportation and telecommunication challenges (MIMU, 2015). The study was consistent with other studies by assessing in primary health care level for NCDs management in India by Pakhare, Kumar, Goyal, & Joshi, 2015. The result showed that the availability of facilities was least in laboratory services, and human resource domains followed by drugs, and better in equipment and point-of-care supply domains. Across these domains, availability of items in community health centers (CHCs) was 37.1, 49.0, 56.1, 67.9 and 80.9% respectively and in PHCs was 11.8, 18.2, 44.2, 55.1, and 55.3% respectively.

### **NCDs service utilization**

NCDs service utilization consisted five kinds of variables and service utilization is the outcomes of NCDs capacity readiness and NCDs service availability according to WHO six-building blocks of health system. For analyzing and comparing the NCDs service utilization among three districts, firstly calculated the three utilization rates such as screening rate, referral rate and new patient rate. Screening rate's P-value was 0.04 and was significantly different and Loilem district had the highest among three districts. Taunggyi district had lower screening rate, this might be people usually go to the township and teaching/specialist hospitals for screening than primary health facilities. Linkhae district had also lower screening rate due to transportation problems for screening in primary health facilities. Referral rate's P-value was 0.05 and was not significantly different among three districts. New

patient rate's P-value was 0.041 and was significantly different among three districts and Taunggyi district had less new patient rate than others two, it seems obvious that there had lower screening rate in Taunggyi district and people usually go to public and private hospitals to get health services than primary health facilities.

Three utilization rates were also compared among three districts by three pairs (Taunggyi district and Linkhae district, Taunggyi district and Loilem district, Linkhae district and Loilem district). For first pair (Taunggyi district and Linkhae district), new patient rate's P-value was 0.006 and was significantly different and Linkhae district had higher rate, this might be people usually go to hospital than primary health facilities in Taunggyi district but people usually use primary health facilities in Linkhae district. For second pair (Taunggyi district and Loilem district), screening rate's P-value was 0.045 and referral rate's P-value was 0.017, were nearly significant higher in Loilem district, this might be people from that area mostly use primary health facilities than Taunggyi district. For third pair (Linkhae district and Loilem district), screening rate's P-value was 0.044 and was nearly significant lower in Linkhae district due to transportation and telecommunication difficulties. The study was consistent with other studies by comparing among three districts for readiness, availability and utilization of primary care of non-communicable diseases in Vietnam by (Duong, Minh, Ngo, & Ellner, 2019). Results of that study were patient utilization of CHCs was approximately 223 visits per month or 8 visits per day and found a statistically significant difference (P value < 0.05) for NCD service availability, medication availability and CHC utilization among the 3 provinces studied.

In conclusion, health workforces were readiness in 80% of RHCs and more than 90% of available health workforces from RHCs had already got training. MW was readiness in almost all S-RHC but PHS (II) was readiness in about 90% of S-RHC from Taunggyi districts and only 60% of S-RHC from Loilem and Linkhae districts. Training of available health workforces from S-RHC were less percentage than RHC. Health information system was readiness in 87.6% of health facilities. For essential medicines, medicines for hypertension and diabetes were more readiness than other medicines. Essential equipment was readiness in more than 97% of health facilities. According to compare the health service readiness, availability, and utilization of primary health care facilities for non-communicable diseases, NCDs

capacity readiness and NCDs service availability are higher in Taunggyi district and NCDs service utilization is higher in Loilem and Linkhae districts.

### **Limitations**

1. This study selected the samples were primary health care centers from three districts of Shan state and it cannot cover the situation of the whole country about health service system for NCDs.

2. This study was cross-sectional survey and used the questionnaire for data collection and analysis, had not used the qualitative methods such as in-depth interview and FGD (Focus Group Discussion), only assess the level of health service system and it cannot know details about the capacity of health care workers, situation of medicines and equipment, health information system, health financing and governance.

3. This study was descriptive design and it cannot know the predictive factors for service delivery in prevention and control of NCDs.

### **Recommendations**

The findings of this study found that readiness of health workforces, health information system, essential medicines and equipment are more readiness percentage than health financing and governance. So, effective health insurance is needed for increasing the readiness of health financing and cooperation/communication with community and other organizations are important for improve readiness of governance. According to compare the health service readiness, availability, and utilization of primary health care facilities for non-communicable diseases, there has different level of readiness, availability, and utilization among districts. Strengthening of the health system for prevention and control of NCDs should emphasis in the areas with lower level of readiness, availability, and utilization.

**Health policy**

1. The government should pay attention to the readiness of health services in primary health care facilities by providing the basic health staffs to play a role for giving primary health care in the community.
2. The policy maker should implement the health insurance system and provide the essential packages to prevent shortage of budget, medicines, equipment and human capacity.
3. The related government sectors should support expediency and provide the opportunity for basic health staffs to get capacity building.

**Health services**

1. Health care workers should report the requirement and problems (especially in health services availability for CVDs' risk, CRDs and cancers) in giving health services to get more level of readiness for NCDs health services.
2. Village health volunteer (VHV) and assistant midwife (AMW) should be trained in every villages to get more participation and cooperation of community.

**Future research**

1. Research area should be extended in the whole country in order to compare the findings for solving the problem and readiness of primary health facilities in giving NCDs health care.
2. Research should be determined deeply about factors affecting the readiness of health services for NCDs by health staff by in-depth interview (Qualitative Research) to find the genuine problems or obstacles in order to solve the exact problems.



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# APPENDIX

## Ethics Approval

COA No. 440/2020		AF 08-09/5.0
IRB No. P2-0253/2563		

**คณะกรรมการจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยอัสสัมชัญ**  
99 หมู่ 9 ตำบลท่าโพธิ์ อำเภอเมือง จังหวัดพิษณุโลก 65000 เบอร์โทรศัพท์ 05596 8721

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**หนังสือรับรองโครงการวิจัยครั้งแรก**

คณะกรรมการจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยอัสสัมชัญ ดำเนินการให้การรับรองโครงการวิจัยตามแนวทางหลักจริยธรรมการวิจัยในคนที่เป็นมาตรฐานสากล ได้แก่ Declaration of Helsinki, The Belmont Report, CIOMS Guideline และ International Conference of Harmonization in Good Clinical Practice หรือ ICH-GCP

**ชื่อโครงการ** : ความพร้อม ความเพียงพอ และการใช้บริการสุขภาพที่หน่วยบริการปฐมภูมิของผู้ป่วยโรคไม่ติดต่อเรื้อรังในวัยรุ่นชาย สาธารณรัฐแห่งสหภาพเมียนมา

**ผู้วิจัยหลัก** : นพ. Win Htike Aung

**สังกัดหน่วยงาน** : คณะสาธารณสุขศาสตร์

**วิธีทบทวน** : แบบเร่งรัด (Expedited Review)

**รายงานความก้าวหน้า** : รายงานความก้าวหน้าอย่างน้อย 1 ครั้ง/ปี หรือรายงานฉบับสมบูรณ์หากดำเนินการเป็นโครงการเสร็จสิ้นก่อน 1 ปี

**เอกสารรับรอง**

1. AF 01-10 เวอร์ชัน 1.0 วันที่ 24 กรกฎาคม 2563
2. AF 02-10 เวอร์ชัน 1.0 วันที่ 24 กรกฎาคม 2563
3. AF 03-10 เวอร์ชัน 1.0 วันที่ 24 กรกฎาคม 2563
4. AF 04-10 เวอร์ชัน 1.0 วันที่ 24 กรกฎาคม 2563
5. AF 05-10 เวอร์ชัน 1.0 วันที่ 24 กรกฎาคม 2563
6. Protocol Synopsis for Ethical Review เวอร์ชัน 2.0 วันที่ 27 ตุลาคม 2563
7. Thesis Proposal เวอร์ชัน 1.0 วันที่ 24 กรกฎาคม 2563
8. Principal Investigator and HSP Certification
9. Questionnaire เวอร์ชัน 2.0 วันที่ 27 ตุลาคม 2563
10. Research Budgets เวอร์ชัน 1.0 วันที่ 24 กรกฎาคม 2563

ลงนาม   
(รองศาสตราจารย์สุทัศน์ เข็มวัฒนา)  
รองประธานคณะกรรมการจริยธรรมการวิจัยในมนุษย์  
มหาวิทยาลัยอัสสัมชัญ

วันที่รับรอง : 31 ตุลาคม 2563  
วันที่หมดอายุ : 31 ตุลาคม 2564  
ทั้งนี้ การรับรองนี้มีเงื่อนไขดังที่ระบุไว้ด้านหลังทุกข้อ (ดูด้านหลังของเอกสารรับรองโครงการวิจัย)

**Questionnaire for “Health service readiness, availability, and utilization of  
primary health care facilities for non-communicable diseases”**

**Please  select your answers in box for each question.**

**Section 1: General characteristics of primary health care facilities**

No.	Questions	Results
	Date	.....
Facility identification		
1	Name of Township	.....
2	Name of District	<input type="checkbox"/> Taunggyi <input type="checkbox"/> Loilem <input type="checkbox"/> Langkho
3	Type of facility	<input type="checkbox"/> RHC (Rural Health Center) <input type="checkbox"/> S-RHC (Sub-Rural Health Center) / SC (Sub-center)
4	Total number of Populations in the facility’s catchment area	.....
5	Total number of Male Populations in the facility’s catchment area	.....
6	Total number of Female Populations in the facility’s catchment area	.....

## **Section 2: NCDs capacity Readiness**

<b>No.</b>	<b>Questions</b>	<b>Results</b>
<b>HEALTH WORKFORCES</b>		
<b>Availability of Health Workforces (Health Staff)</b>		
1	Does this facility have the Health Assistant (HA)?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers.....
2	Does this facility have the Public Health Supervisor Grade I (PHS I)?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers.....
3	Does this facility have the Lady Health Visitor (LHV)?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers.....
4	Does this facility have the Midwife (MW)?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers.....
5	Does this facility have the Public Health Supervisor Grade II (PHS II)?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers.....
<b>Training for Health Workforces (2019-2020)</b>		
6	Are the Health Assistant (HA) trained on Non-communicable diseases (NCD) management?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers of (HA) who has already got training.....
7	Are the Public Health Supervisor Grade I (PHS I) trained on Non-communicable diseases (NCD) management?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers of (PHS I) who has already got training.....
8	Are the Lady Health Visitor (LHV) trained on Non-communicable diseases (NCD) management?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers of (LHV) who has already got training.....

No.	Questions	Results
9	Are the Midwife (MW) trained on Non-communicable diseases (NCD) management?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers of (MW) who has already got training.....
10	Are the Public Health Supervisor Grade II (PHS II) trained on Non-communicable diseases (NCD) management?	<input type="checkbox"/> NO <input type="checkbox"/> YES If “YES”, Numbers of (PHS II) who has already got training.....
<b>HEALTH INFORMATION SYSTEM</b>		
11	Does the Health staff make the Patient record-form (Filling and Keeping)?	<input type="checkbox"/> NO <input type="checkbox"/> YES
12	Does the Health staff make the Patient register (Filling and Keeping)?	<input type="checkbox"/> NO <input type="checkbox"/> YES
13	Does the Health staff make the Stocks/Ledger for medicines and equipment (Filling and Keeping)?	<input type="checkbox"/> NO <input type="checkbox"/> YES
14	Does the Health staff make the Referral form (Availability and Using)?	<input type="checkbox"/> NO <input type="checkbox"/> YES
15	Does the Health staff make the Report to higher level (Monthly, Quarterly, Yearly)?	<input type="checkbox"/> NO <input type="checkbox"/> YES
16	Does the Health staff get the feedback from township/state health office (for Reporting)?	<input type="checkbox"/> NO <input type="checkbox"/> YES
<b>ACCESS TO ESSENTIAL MEDICINES AND EQUIPMENT</b>		
<b>ESSENTIAL MEDICINES (Availability of Medicines in the Facility)</b>		
17	Gliclazide	<input type="checkbox"/> Always available <input type="checkbox"/> Sometimes available <input type="checkbox"/> No available at all
18	Metformin	<input type="checkbox"/> Always available <input type="checkbox"/> Sometimes available <input type="checkbox"/> No available at all

No.	Questions	Results
19	Amlodipine	<input type="checkbox"/> Always available <input type="checkbox"/> Sometimes available <input type="checkbox"/> No available at all
20	Atenolol	<input type="checkbox"/> Always available <input type="checkbox"/> Sometimes available <input type="checkbox"/> No available at all
21	Enalapril	<input type="checkbox"/> Always available <input type="checkbox"/> Sometimes available <input type="checkbox"/> No available at all
22	Aspirin	<input type="checkbox"/> Always available <input type="checkbox"/> Sometimes available <input type="checkbox"/> No available at all
23	Atorvastatin	<input type="checkbox"/> Always available <input type="checkbox"/> Sometimes available <input type="checkbox"/> No available at all
<b>EQUIPMENT (Availability of Equipment in the Facility)</b>		
24	Blood pressure measuring devices (Mercury/ Aneroid/ Digital)	<input type="checkbox"/> NO <input type="checkbox"/> YES
25	Weighing machines	<input type="checkbox"/> NO <input type="checkbox"/> YES
26	Glucometer	<input type="checkbox"/> NO <input type="checkbox"/> YES
27	Glucometer test strips (with valid expiration date)	<input type="checkbox"/> NO <input type="checkbox"/> YES
28	Measuring tape	<input type="checkbox"/> NO <input type="checkbox"/> YES
29	Stethoscope	<input type="checkbox"/> NO <input type="checkbox"/> YES
30	Lancet	<input type="checkbox"/> NO <input type="checkbox"/> YES



No.	Questions	Results
31	WHO CVD (Cardiovascular Diseases) risk score chart	<input type="checkbox"/> NO <input type="checkbox"/> YES
32	Health education material for NCDs (Pamphlets/ Vinyl/ Posters)	<input type="checkbox"/> NO <input type="checkbox"/> YES
33	BHS (Basic Health Staff) PEN Manual	<input type="checkbox"/> NO <input type="checkbox"/> YES
<b>FINANCING</b>		
34	Are the services free of charge?	<input type="checkbox"/> NO <input type="checkbox"/> YES
35	Are there any contribution/donations from the community and other partners?	<input type="checkbox"/> NO <input type="checkbox"/> YES
36	Is there any health fund from community?	<input type="checkbox"/> NO <input type="checkbox"/> YES
<b>GOVERNANCE</b>		
37	Are there any community participation to support NCDs services provided at facilities?	<input type="checkbox"/> Very High <input type="checkbox"/> High <input type="checkbox"/> Middle <input type="checkbox"/> Little <input type="checkbox"/> No
38	Does the facility get the supports given by community?	<input type="checkbox"/> NO <input type="checkbox"/> YES
39	Does the facility have the Health committee with community?	<input type="checkbox"/> NO <input type="checkbox"/> YES
40	Does the facility communicate with the Social organizations?	<input type="checkbox"/> NO <input type="checkbox"/> YES
41	Does the community have the Village health volunteers/Auxiliary Midwife?	<input type="checkbox"/> NO <input type="checkbox"/> YES
42	Does the community have the Vehicle for patient transfer/referral?	<input type="checkbox"/> NO <input type="checkbox"/> YES
43	Does the people from the community give the Peer health education?	<input type="checkbox"/> NO <input type="checkbox"/> YES

**SECTION 3: NCDs service Availability (service delivery)**

No.	Questions	Results
<b>Does the facility provide activity as below to the population according to the guideline?</b>		
1	Does this facility Check-up of Blood Pressure?	<input type="checkbox"/> NO <input type="checkbox"/> YES
2	Does this facility check the Blood Glucose Test?	<input type="checkbox"/> NO <input type="checkbox"/> YES
3	Does this facility check the Measurement of Weight?	<input type="checkbox"/> NO <input type="checkbox"/> YES
4	Does this facility check the Measurement of Height?	<input type="checkbox"/> NO <input type="checkbox"/> YES
5	Does this facility check the Calculation of BMI?	<input type="checkbox"/> NO <input type="checkbox"/> YES
6	Does this facility check the Assessment of 10 years CVD (Cardiovascular Diseases) risk?	<input type="checkbox"/> NO <input type="checkbox"/> YES
7	Does this facility give the Health Education/Counselling?	<input type="checkbox"/> NO <input type="checkbox"/> YES
8	Does this facility offer the diagnosis and management for diabetes?	<input type="checkbox"/> NO <input type="checkbox"/> YES
9	Does this facility offer the diagnosis and management for cardiovascular diseases including hypertension?	<input type="checkbox"/> NO <input type="checkbox"/> YES
10	Does this facility offer the diagnosis and management for chronic respiratory diseases?	<input type="checkbox"/> NO <input type="checkbox"/> YES
11	Does this facility offer the assessment and referral of suspected cancers?	<input type="checkbox"/> NO <input type="checkbox"/> YES
12	Does this facility have the Referral Function?	<input type="checkbox"/> NO <input type="checkbox"/> YES
13	Does this facility have the outpatient's beds for ill/severe patient before referral?	<input type="checkbox"/> NO <input type="checkbox"/> YES
14	Does this facility have the system for loss of follow up patients?	<input type="checkbox"/> NO <input type="checkbox"/> YES

**SECTION 4: NCDs Utilization (Access)**

No.	Questions	Results
1	Number of Target population (age more than 40 years old) for Screening (Last year)	
2	Number of NCDs Screening per month (Last month)	
3	Number of NCDs Screening per year (Last year)	
4	Number of NCDs New Patient per month (Last month)	
5	Number of NCDs New Patient per year (Last year)	
6	Total Number of Visits for NCDs Patients per month (Last month)	
7	Total Number of Visits for NCDs Patients per year (Last year)	
8	Number of Referral NCDs Patient per month (Last month)	
9	Number of Referral NCDs Patient per year (Last year)	



**Inspection content validity of questionnaire with Index of Item Objective  
Congruence (IOC) evaluation form**

No.	Questions	Expert opinion			IOC
		Expert 1	Expert 2	Expert 3	
<b>NCDs capacity Readiness (Health Workforces)</b>					
1.	Does this facility have the Health Assistant ?	+1	0	+1	0.67
2.	Does this facility have the Public Health Supervisor Grade I ?	+1	+1	0	0.67
3.	Does this facility have the Lady Health Visitor ?	+1	+1	+1	1
4.	Does this facility have the Midwife ?	+1	+1	+1	1
5.	Does this facility have the Public Health Supervisor Grade II ?	+1	+1	+1	1
6.	Are the Health Assistant trained on Non-communicable diseases (NCD) management?	+1	+1	+1	1
7.	Are the Public Health Supervisor Grade I trained on Non-communicable diseases (NCD) management?	+1	+1	0	0.67
8.	Are the Lady Health Visitor trained on Non-communicable diseases (NCD) management?	+1	+1	+1	1
9.	Are the Midwife trained on Non-communicable diseases (NCD) management?	+1	+1	+1	1
10.	Are the Public Health Supervisor Grade II trained on Non-communicable diseases (NCD) management?	+1	+1	+1	1
<b>NCDs capacity Readiness (Health Information System)</b>					
11.	Does the Health staff make the Patient record-form (Filling and Keeping)?	+1	+1	+1	1
12.	Does the Health staff make the Patient register (Filling and Keeping)?	+1	+1	+1	1
13.	Does the Health staff make the Stocks/Ledger for medicines and equipment (Filling and Keeping)?	+1	+1	+1	1
14.	Does the Health staff make the Referral form (Availability and Using)?	+1	+1	+1	1

No.	Questions	Expert opinion			IOC
		Expert 1	Expert 2	Expert 3	
15.	Does the Health staff make the Report to higher level (Monthly, Quarterly, Yearly)?	+1	+1	+1	1
16.	Does the Health staff get the feedback from township/state health office (for Reporting)?	+1	+1	+1	1
<b>NCDs capacity Readiness (Essential medicines and equipment)</b>					
17.	Gliclazide	+1	+1	+1	1
18.	Metformin	+1	+1	+1	1
19.	Amlodipine	+1	+1	+1	1
20.	Atenolol	+1	+1	+1	1
21.	Enalapril	+1	+1	+1	1
22.	Aspirin	+1	+1	+1	1
23.	Atorvastatin	+1	+1	+1	1
24.	Blood pressure measuring devices (Mercury/ Aneroid/ Digital)	+1	+1	+1	1
25.	Weighing machines	+1	+1	+1	1
26.	Glucometer	+1	+1	+1	1
27.	Glucometer test strips (with valid expiration date)	+1	+1	+1	1
28.	Measuring tape	+1	+1	+1	1
29.	Stethoscope	+1	+1	+1	1
30.	Lancet	+1	+1	+1	1
31.	WHO CVD (Cardiovascular Diseases) risk score chart	+1	+1	+1	1
32.	Health education material for NCDs (Pamphlets/ Vinyl/ Posters)	+1	+1	+1	1
33.	BHS (Basic Health Staff) PEN Manual	+1	+1	+1	1
<b>NCDs capacity Readiness (Financing)</b>					
34.	Are the services free of charge?	+1	+1	0	0.67
35.	Are there any contribution/donations from the community and other partners?	+1	+1	+1	1
36.	Is there any health fund from community?	+1	+1	+1	1

No.	Questions	Expert opinion			IOC
		Expert 1	Expert 2	Expert 3	
<b>NCDs capacity Readiness (Governance)</b>					
37.	Are there any community participations to support NCDs services provided at facilities?	+1	+1	+1	1
38.	Does the facility get the supports given by community?	+1	+1	+1	1
39.	Does the facility have the Health committee with community?	+1	+1	+1	1
40.	Does the facility communicate with the Social organizations?	+1	+1	+1	1
41.	Does the community have the Village health volunteers/Auxiliary Midwife?	+1	+1	+1	1
42.	Does the community have the Vehicle for patient transfer/referral?	+1	+1	+1	1
43.	Does the people from the community give the Peer health education?	+1	+1	+1	1
<b>NCDs service Availability</b>					
1.	Does this facility Check-up of Blood Pressure?	+1	+1	+1	1
2.	Does this facility check the Blood Glucose Test?	+1	+1	+1	1
3.	Does this facility check the Measurement of Weight?	+1	+1	+1	1
4.	Does this facility check the Measurement of Height?	+1	+1	+1	1
5.	Does this facility check the Calculation of BMI?	+1	+1	+1	1
6.	Does this facility check the Assessment of 10 years CVD (Cardiovascular Diseases) risk?	+1	+1	+1	1
7.	Does this facility give the Health Education/Counselling?	+1	+1	+1	1
8.	Does this facility offer the diagnosis and management for diabetes?	+1	+1	+1	1
9.	Does this facility offer the diagnosis and management for cardiovascular diseases including hypertension?	+1	+1	+1	1

No.	Questions	Expert opinion			IOC
		Expert 1	Expert 2	Expert 3	
10.	Does this facility offer the diagnosis and management for chronic respiratory diseases?	+1	+1	+1	1
11.	Does this facility offer the assessment and referral of suspected cancers?	+1	+1	+1	1
12.	Does this facility have the Referral Function?	+1	+1	+1	1
13.	Does this facility have the outpatient's beds for ill/severe patient before referral?	+1	+1	0	0.67
14.	Does this facility have the system for loss of follow up patients?	+1	+1	+1	1
<b>NCDs Utilization</b>					
1.	Number of Target population (age more than 40 years old) for Screening (Last year)	+1	+1	+1	1
2.	Number of NCDs Screening per month (Last month)	0	+1	+1	0.67
3.	Number of NCDs Screening per year (Last year)	0	+1	+1	0.67
4.	Number of NCDs New Patient per month (Last month)	0	+1	+1	0.67
5.	Number of NCDs New Patient per year (Last year)	0	+1	+1	0.67
6.	Total Number of Visits for NCDs Patients per month (Last month)	+1	+1	+1	1
7.	Total Number of Visits for NCDs Patients per year (Last year)	+1	+1	+1	1
8.	Number of Referral NCDs Patient per month (Last month)	+1	+1	+1	1
9.	Number of Referral NCDs Patient per year (Last year)	+1	+1	+1	1

**Reliability evaluation of questionnaire with Kuder–Richardson Formula 21  
(KR-21) evaluation form**

**NCDs capacity Readiness**

No.	Questions	Corrected item- Total Correlation	KR-21 if Item Deleted
1.	Does this facility have the Health Assistant ?	0.378	0.733
2.	Does this facility have the Public Health Supervisor Grade I ?	0.300	0.735
3.	Does this facility have the Lady Health Visitor ?	0.346	0.733
4.	Does this facility have the Midwife ?	0.000	0.746
5.	Does this facility have the Public Health Supervisor Grade II ?	0.424	0.730
6.	Are the Health Assistant trained on Non-communicable diseases (NCD) management?	0.405	0.731
7.	Are the Public Health Supervisor Grade I trained on Non-communicable diseases (NCD) management?	0.406	0.729
8.	Are the Lady Health Visitor trained on Non-communicable diseases (NCD) management?	0.358	0.732
9.	Are the Midwife trained on Non-communicable diseases (NCD) management?	0.252	0.739
10.	Are the Public Health Supervisor Grade II trained on Non-communicable diseases (NCD) management?	0.397	0.730
11.	Does the Health staff make the Referral form (Availability and Using)?	-0.081	0.750
12.	Gliclazide	0.621	0.714
13.	Metformin	-0.242	0.771
14.	Amlodipine	0.039	0.753
15.	Atenolol	0.321	0.734
16.	Enalapril	0.700	0.698
17.	Aspirin	0.009	0.756
18.	Atorvastatin	0.367	0.730
19.	Glucometer test strips (with valid expiration date)	0.029	0.746



No.	Questions	Corrected item- Total Correlation	KR-21 if Item Deleted
20.	Health education material for NCDs (Pamphlets/ Vinyl/ Posters)	0.194	0.742
21.	BHS (Basic Health Staff) PEN Manual	0.155	0.743
22.	Are the services free of charge?	-0.054	0.749
23.	Are there any contribution/donations from the community and other partners?	0.032	0.746
24.	Is there any health fund from community?	0.032	0.746
25.	Are there any community participations to support NCDs services provided at facilities?	0.660	0.698
26.	Does the facility get the supports given by community?	0.464	0.728
27.	Does the facility have the Health committee with community?	0.203	0.742
28.	Does the facility communicate with the Social organizations?	0.138	0.744
29.	Does the community have the Village health volunteers/Auxiliary Midwife?	0.167	0.744
30.	Does the community have the Vehicle for patient transfer/referral?	0.300	0.735
31.	Does the people from the community give the Peer health education?	0.089	0.747
<b>KR-21</b>			<b>0.745</b>

**NCDs service Availability**

No.	Questions	Corrected item- Total Correlation	KR-21 if Item Deleted
1.	Does this facility check the Assessment of 10 years CVD (Cardiovascular Diseases) risk?	0.177	0.495
2.	Does this facility offer the diagnosis and management for chronic respiratory diseases?	0.241	0.468
3.	Does this facility offer the assessment and referral of suspected cancers?	0.390	0.387
4.	Does this facility have the Referral Function?	-0.084	0.567
5.	Does this facility have the outpatient's beds for ill/severe patient before referral?	0.608	0.167
6.	Does this facility have the system for loss of follow up patients?	0.177	0.495
<b>KR-21</b>			<b>0.504</b>

## BIOGRAPHY

**Name-Surname** Win Htike Aung

**Date of Birth**

**Address**

**Current Workplace** Team leader (Non-Communicable Diseases Control Unit, State Public Health Department, Taunggyi, Shan State) (13-7-2016 to Present)

- Participated in State Public Health Forum (Shan State)
- Planning for health education and exhibitions
- Organizing health promotion activities

Township Health Officer (State Public Health Department, Taunggyi, Shan State) (6-5-2015 to 12-7-2016)

- Assisting in state-level meetings
- Assisting in the logistic management system
- Supervision and monitoring of rural health center and sub-center

Assistant Surgeon (Loilem General Hospital, Loilem, Shan State) (28-3-2013 to 5-5-2015)

- Assistant to the consultant from Medicine, Surgery, Obstetrics and Gynecology and Child Departments
- Emergency Medical Officer in together with the function of Forensic Department

**Current Position** Team leader (Non-Communicable Diseases Control Unit, State Public Health Department, Taunggyi, Shan State, Myanmar)

**Work Experience** Bachelor in Medicine and Bachelor in Surgery (M.B., B.S)