YANGON UNIVERSITY OF ECONOMICS

DEPARTMENT OF STATISTICS

MASTER OF APPLIED STATISTICS (MAS) PROGRAMME

DETERMINANTS OF NUTRITIONAL STATUS AMONG CHILDREN AGED THREE TO FIVE YEARS IN WAW TOWNSHIP

SU SU NYEIN

MAS - 22

DECEMBER, 2019

YANGON UNIVERSITY OF ECONOMICS

DEPARTMENT OF STATISTICS

DETERMINANTS OF NUTRITIONAL STATUS AMONG CHILDREN AGED THREE TO FIVE YEARS IN WAW TOWNSHIP

This thesis is submitted to the Board of Examination as partial fulfillment of the requirement for the Degree of Master of Applied Statistics

Approved by the Board of Examiners

Supervised by

Dr. Mya Thandar
Professor
Department of Statistics
Yangon University of Economics

Submitted by

Ma Su Su Nyein
Roll No. (22)
MAS. (Batch-1)
Yangon University of Economics

December, 2019

ACCEPTANCE

Accepted by the Board of Examiners of the Department of Statistics, Yangon University of Economics in partial fulfillment for the requirement of the Master Degree, Master of Applied Statistics.

……..

(Chairperson)

Prof. Dr Tin Win

Rector

Yangon University of Economics

……	……
(Supervisor)	(Chief Examiner)
Dr. Mya Thandar	Professor Dr. Maw Maw Khin
Professor	Professor/Head
Department of Statistics	Department of Statistics
Yangon University of Economics	Yangon University of Economics
…….	……
(Examiner)	(Examiner)
Daw Aye Aye Than	Daw Aye Aye Maw
Associate Professor (Retired)	Associate Professor
Department of Statistics	Department of Statistics
Yangon University of Economics	Yangon University of Economics

December, 2019

ABSTRACT

Nutritional issues in early childhood have potential impacts on growth of the children. Along with urbanization, feeding and nurturing practices have changed day after day and factors that determined nutritional status of children might be different from former evidences. Accordingly, this study was conducted among 363 respondents from 4 Wards and 4 Villages at *Waw* Township which was selected by stratified two stages random sampling to identify the determinants of the nutritional status among children aged 3-5 years. The findings revealed that double burden of malnutrition were evidenced among the children from this study. Due to three nutritional indicators of stunted, underweight and wasted, three binary logistics models were developed in this study. As the determinants of stunted among children aged 3-5 years, the respondents' educational status, monthly family income, and proper drinking practices of water are less likely to have stunted children in family. Also, the possibility of underweight among those children is 0.36 times reduced by completeness of immunization compared to reference category. Additionally, taking vitamin 'A' is 0.146 times less likely to be wasted among children aged 3-5 years in *Waw* Township. To reduce the risk of malnutrition in this area, provision of proper health education, strengthening the public health care strategies and effective coordination mechanism should be suggested to meet the health needs of the targeted population. Also, further nutritional researches using both of quantitative and qualitative approach would be recommended to uncover the context of malnutrition.

ACKNOWLEDGEMENTS

Firstly, I would like to express my grateful gratitude to Professor Dr. U Tin Win, Rector, University of Economics, Yangon and Professor Dr. Ni Lar Myint Htoo, Pro-Rector of Yangon University of Economics for giving permission to conduct this study for the Master of Applied Statistics course.

Also, I would like to express my sincere gratitude and heartfelt thanks to Program Director, Dr. Maw Maw Khin, Professor and Head of Statistics Department, YUE, for giving permission, valuable suggestions and encouragement to proceed with this research.

In addition, this study was accomplished by the great support and encouragement of my supervisor. I would like to express my deepest gratitude to my supervisor, Professor Dr. Mya Thandar, Department of Statistics, Yangon University of Economics for her invaluable support, guidance and suggestions throughout this research project.

Besides, I would like to offer sincere thanks to respectful teachers, Dr. Daw Cing Do Nem (Professor, Department of Statistics, YUE), Dr. Daw Aye Thida (Associate Professor, Department of Statistics, YUE), Daw Khin Nu Win, (Associate Professor, Department of Statistics, YUE) and all teachers from Department of Statistics, YUE for their intensive teaching, support and guidance for research knowledge.

Also, I would like to express my gratitude to U Htun Aung Kyaw (Honorary Professor, Department of English, Military Institute of Nursing and Paramedical Sciences) for the invaluable support for academic writing of this thesis.

Last but not least, I would like to thank all respondents who participated in this study. And I would like to express my special thanks to Basic Health Staff from respective study settings for invaluable help for collecting the data. Lastly, I never forget to thank all colleagues from Master of Applied Statistics (Batch-1).

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BDHS	-	Bangladesh Demographic and Health Survey
CI	-	Confidence Interval
DDS	-	Dietary Diversity Score
df	-	Degree of Freedom
FAO	-	Food and Agricultural Organization
FGPs	-	Food Guide Pyramids
HAZ	-	Height for age
H-L	-	Hosmer and Lemeshow
KAP	-	Knowledge, Attitudes and Practices
LRA	-	Logistic Regression Analysis
MDHS	-	Myanmar Demographic Health Survey
ME	-	Marginal Effect
MRA	-	Multiple Regression Analysis
MUAC	-	Mid-upper arm circumference
OLS	-	Ordinary Least Square
OR	-	Odds Ratio
aOR	-	Adjusted Odds Ratio
ref	-	Reference Category
SAM	-	Severe Acute Malnutrition
SD	-	Standard Deviation
SE	-	Standard Error
UNEP	-	United Nations Environmental Programme
UNICEF	-	United Nations Children's Fund
WAZ	-	Weight for age
WHZ	-	Weight for height
WHO	-	World Health Organization
YUE	-	Yangon University of Economics

CHAPTER I

INTRODUCTION

1.1 Introduction

Good nutrition provides energy, and nutrients are essential to sustain life and promote physical, social, emotional, and cognitive development. To gain full potential of child's growth throughout life, good nutrition is essential by eating the right amounts, the right variety of safe and good quality foods compatible with the daily nutritional requirements (Food and Agriculture Organization (FAO), 2003). Malnutrition is implicated due to inadequate dietary intake, the presence of disease or the interaction between these two factors (World Health Organization (WHO, 1997). It becomes a significant determinant of various types of morbidity especially in children under five years old.

In addition, as the child feeding practices were changed day after day along with modernization, the influencing factors of child nutritional status might be different from former evidences. Moreover, the cultural norms, customs and beliefs still influence child feeding practices of Myanmar family. During the huge advancement time period to a mix of breast milk and solid foods between six and nine months of age, 33% of infants are fed with both breast milk and other foods inappropriately. It was evidenced that only 15% of infants under six months are exclusively breastfed (UNICEF, 2009). Also, Food and Agricultural Organization expressed that 17% of families are food insecure (FAO, 2009).

Accordingly, the contribution factors of nutritional status among children aged 3-5 years are to be explored along with the changes in feeding patterns. Based on these issues, this study was conducted among 3-5 years children at *Waw* Township to identify the factors contributing to child nutritional status using binary logistic regression.

1.2 Rationale of the Study

Along with optimizing the childhood periods, childhood under-nutrition has been associated with 50% of all childhood deaths in the developing world (United Nations Children's Fund (UNICEF), 2018). Over one-third of child deaths are due to undernutrition, mostly from increased severity of disease. Globally, 151 million children under five year of age (22%) were stunted and 51 million were wasted. Particularly, two out of five stunted children in the world and more than half of all wasted children in the world live in Southern Asia (World Health Organization (WHO), UNICEF, & World Bank, 2018).

Also, Myanmar is still the third-most malnourished country in Southeast Asia; in which, 35.1% of children under the age of five were stunted and 22.6% were underweight (World Health Organization (WHO), 2009). In Bago Region, Demographic and Health Survey (2016) found that stunting was 9.2% and moderate Anaemia was 39.3%. It was also found that 5.7 per 1000 children suffered from malnutrition and 6 per 1,000 children were low birth weight (Ministry of Health and Sports, 2017). In Bago Region, 30% of under five children from *Waw* township were affected with moderate malnutrition (Bago Regional Health Report, 2016). Those data indicated that under-nutrition among Myanmar children is still a leading cause of childhood morbidity and mortality as a great burden. Accordingly, children nutritional status and its influencing factors are essential to identify periodically to ensure effective child health care.

To deal with those nutritional problems among under five children, many studies were conducted in Myanmar. Correspondingly, a variety of studies on determinants of child nutrition status for developing countries were conducted. Particularly in recent literatures, risk factors for undernutrition among children 0-59 months of age based on the data of Myanmar Demographic Health Survey (MDHS) was conducted using multivariable logistic regression in 35 households. However, there were limited studies on the nutritional status of children aged 3-5 years because many studies focused on under two years children. In this study, the underlying factors that determined the nutritional status of children aged 3-5 years from *Waw* Township were explored by using binary logistic regression analysis.

1.3 Objectives of the Study

The objectives of this study are;

- To analyze the nutritional status indicators (height-for-age, weight-for-height and weight-for-age) of children aged three to five years
- To identify the determinants of nutritional status among children aged three to five years in *Waw* Township

1.4 Method of Study

In this study, quantitative method, cross-sectional survey was used. The survey was conducted in four wards and at four villages based on the respective health centers as a primary survey. A total of 363 respondents were surveyed. In order to identify determinants of nutritional status among children aged (3-5 years), Binary Logistic Regression was employed in this study.

1.5 Scope and Limitations of the Study

In this study, a sample survey was conducted at *Waw* Township, Bago Region in March, 2019. It is located on the Yangon-*Mawlamyaing* Highway which includes Mon State. Accordingly, food products from Thailand are easily available in this Township from illegal imports. Consequently, food preparations are mainly utilized with those products which might be quietly different with the previous times. Moreover, children are taken care by grandparents, aunts and relatives because parents employ in industries of Thailand. In line with the different nurturing styles of children, how the feeding practices determine the child nutritional status is interesting to study in this township. And it was also a native town of the investigator. For those reason, *Waw* Township was selected as a study setting of this study.

Also, anthropometric measures such as weight for height, weight for age and height for age were measured to analyze the child nutritional status. Additionally, the factors affecting on child nutritional status were determined by using questionnaire. Accordingly, the scope of this study covered the child nutritional status and the feeding practices of mothers at *Waw* Township.

During the study period, there were some limitations encountered in this study. Firstly, weight, height and mid upper arm circumstances (MUAC) were measured by respective midwives for each study setting. It might be observer variations as a limitation. And also, though a well-structured questionnaire was employed as a collection tool for collection of primary data, pilot testing could not be carried out to calculate the reliability of questionnaire due to limited time duration. Apart from these issues, this study was carried out properly in line with the literature.

1.6 Organization of the Study

This study is organized with five chapters. Chapter I, consists of introduction, rationale of the study, objectives of the study, scope and limitations of the study, method of study and organization of the study. Next, Chapter II encompasses literature reviews of theoretical background, conceptual framework and related studies. Chapter III is organized with logistic regression, survey design and ethical considerations. In Chapter IV, analysis on survey data is presented. Finally, Chapter V describes findings, discussion and recommendations.

CHAPTER II

THEORECTICAL BACKGROUND AND LITERATURE REVIEW

2.1 Reviews on Theoretical Background

In this part, literatures regarding child nutrition, methods of assessing child nutrition status, malnutrition and under-nutrition, causes of undernutrition, and consequences of undernutrition are described.

2.1.1 Child Nutrition

Adequate nutrition is the balance of intake and utilization of nutrients for controlling diseases, and maintaining well-being, health, and productivity. The nutritional status of children under five is also an important indicator that reflects the situation of the whole population, including food security, livelihoods, public health and social environment. And nutritional status is defined as "the degree of balance between nutrient intake and nutrient requirements. This balance is affected by many factors, including physiologic, psycho-social, developmental, cultural, and economic" (Dieh, 2015).

To determine the nutritional status, an individual's medical, dietary, and social history; anthropometric data, biochemical data, clinical data and drug-nutrient interactions are analyzed (Mahan, & Escott-Stump, 2008). In this study, the anthropometry, including stunting (low height for age), wasting (low weight for height or low mid-upper arm circumference (MUAC)) or edema, and underweight (low weight for age) will be emphasized as the indicators of child nutritional status.

2.1.2 Methods of Assessing Nutritional Status of Children

As the satisfactory results within the ceiling of the available resources, anthropometric and dietary methods were used in this study. In order to identify the nutritional status of children, anthropometric measurements are widely used as a tool. There are two types of anthropometric measurements such as measurements on body size and determining on body composition (Gibson, 2005). In practical, mid upper arm circumference (MUAC), weight for age, weight for height and body mass index is used as anthropometric indicators. One of the main advantages is that anthropometric measurements may be related to past exposure, to present procession to future events (Gibson, 2005).

(a) The anthropometric status of the children

Anthropometric indices can be interpreted using percentiles and z-scores which are used to compare the growth of a child or group of children with that of a reference population (WHO, 2006). These are based on height and weight, body measurement, and are standardized by sex and age. For children under five years of age, weight for height, height for age and weight for age are used as primary anthropometric indices.

Table (2.1) Indicators of Nutritional Status

Indicator	What it measures/What it is used for
Low weight-for-height	**WASTING** (acute malnutrition). Wasted children are too light for their height (very thin). Wasting is the result of recent rapid weight loss or a failure to gain weight. Wasting can be reversed when conditions improve.
Low height-for-age or Low length-for-age	**STUNTING** (chronic malnutrition). Stunted children are too short for their age. Stunting develops over a long period as a result of inadequate dietary intake and/or repeated infections.
Low weight-for- age	**UNDERWEIGHT** (acute or chronic malnutrition or both). Underweight children are too light for their age. Children may become underweight either because of wasting or stunting, or both.
Mid-Upper Arm Circumference (MUAC)	It is an index of body mass. It is usually measured using a MUAC tape that is placed around the middle of the upper arm. It is particularly good for identifying children with a high risk of mortality.

Source: (FAO, 2007)

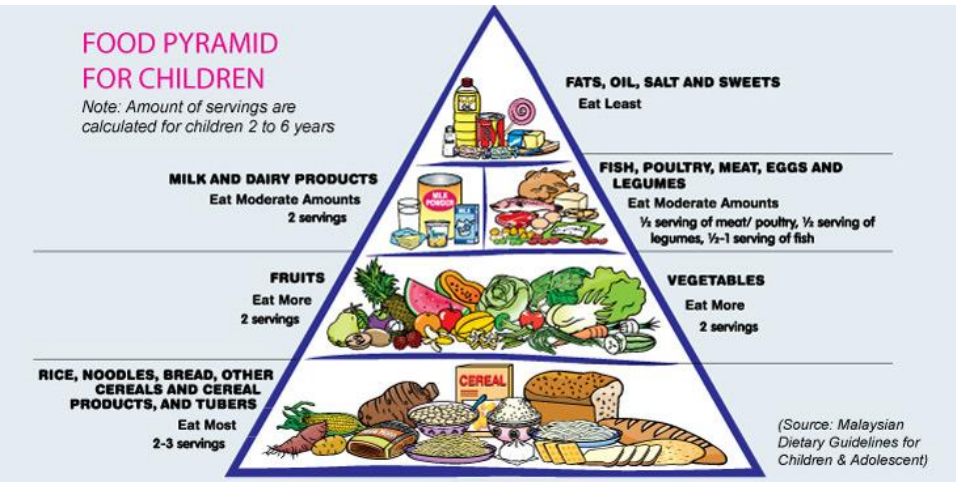
(b) Dietary methods of assessing nutritional status

Dietary assessment is the process of gathering information about a person's eating habits, food and dietary supplement intake and motivation for food selection to identify possible nutrient imbalances (Stephenson, & Schiff, 2016).

(i) 24-hour Dietary Recall

Dietary methods of assessment examine the past and current intakes of nutrients from foods by by individuals or a group to determine their nutritional status by asking what the child had eaten over the past 24 hours and use this data to calculate the dietary diversity score. The number of food groups consumed over a reference period, usually 24 hours is measured by dietary diversity score. Generally, there are six food groups that our body needs to have every day. Those food groups can be represented in the food guide pyramid.

Food guide pyramids (FGPs) are "a graphic representation of patterns of daily food choices that constitute a healthy diet and convey the concepts of variety, proportionality and moderation". FGPs are nutrition education tools that translate dietary standards or guideline recommendations into choices that make up healthy dietary and lifestyle patterns for people with little or no training in nutrition (Lee & Nieman, 2007). In addition, they all encourage eating plenty of plant products (grain products, vegetables, legumes and fruits) daily, while meat, fats, chicken and dairy products should be eaten in smaller amounts and less regularly.



Source: Karim, 2015

Figure (2.1) Food Guide Pyramids

(ii) Food Record

A food record, also called a food diary, gives the responsibility for recording food intake to the client rather than the interviewer. Food records are an effective method of obtaining dietary information when the health care professional is working with highly cooperative individuals who are motivated to keep detailed records of their intake. By keeping detailed food records, clients often become more aware of their personal eating habits and are more likely to assume responsibility for negative eating habits and be receptive to dietary advice. Food records should not be used with individuals who have poor reading skills, are unmotivated and/or lack the time to keep detailed intake records. In this study, probable foods will be listed in records form to be feasible for the respondents. Records are kept for as little as 1 day and as many as 7days (Stephenson, & Schiff, 2016).

2.1.3 Malnutrition

Malnutrition prevails everywhere around the world and both developed and developing countries are suffering from malnourishment (Khattak & Ali, 2010). Malnutrition is a public health problem and is associated with, among other factors, literacy of mother, household wealth index and morbidities (Gichana, 2013). If there was inadequate or non-utilization of nutrients in daily foods properly, it results in a state of imbalance in the body. If this imbalance continues, it may develop into a severe problem which may even be fatal. When there is a lack or an excess intake/faulty utilization of one or more nutrients, it leads to the state of imbalance in the body as malnutrition. There are two types of malnutrition, under-nutrition and over-nutrition.

2.1.4 Under-nutrition

Under-nutrition is a consequence of consuming too few essential nutrients, using or excreting them more rapidly than they can be replaced, or not being able to absorb the nutrients consumed, often due to illness or infection. Under-nutrition is more prevalent under five years of age, mostly effecting the age of 6-24 months, which is weaning and the post weaning period of the child age. Under-nutrition contributes to

more than 50% of all deaths in children under five. There are three categories of under-nutrition, and patients may present with a combination of types:

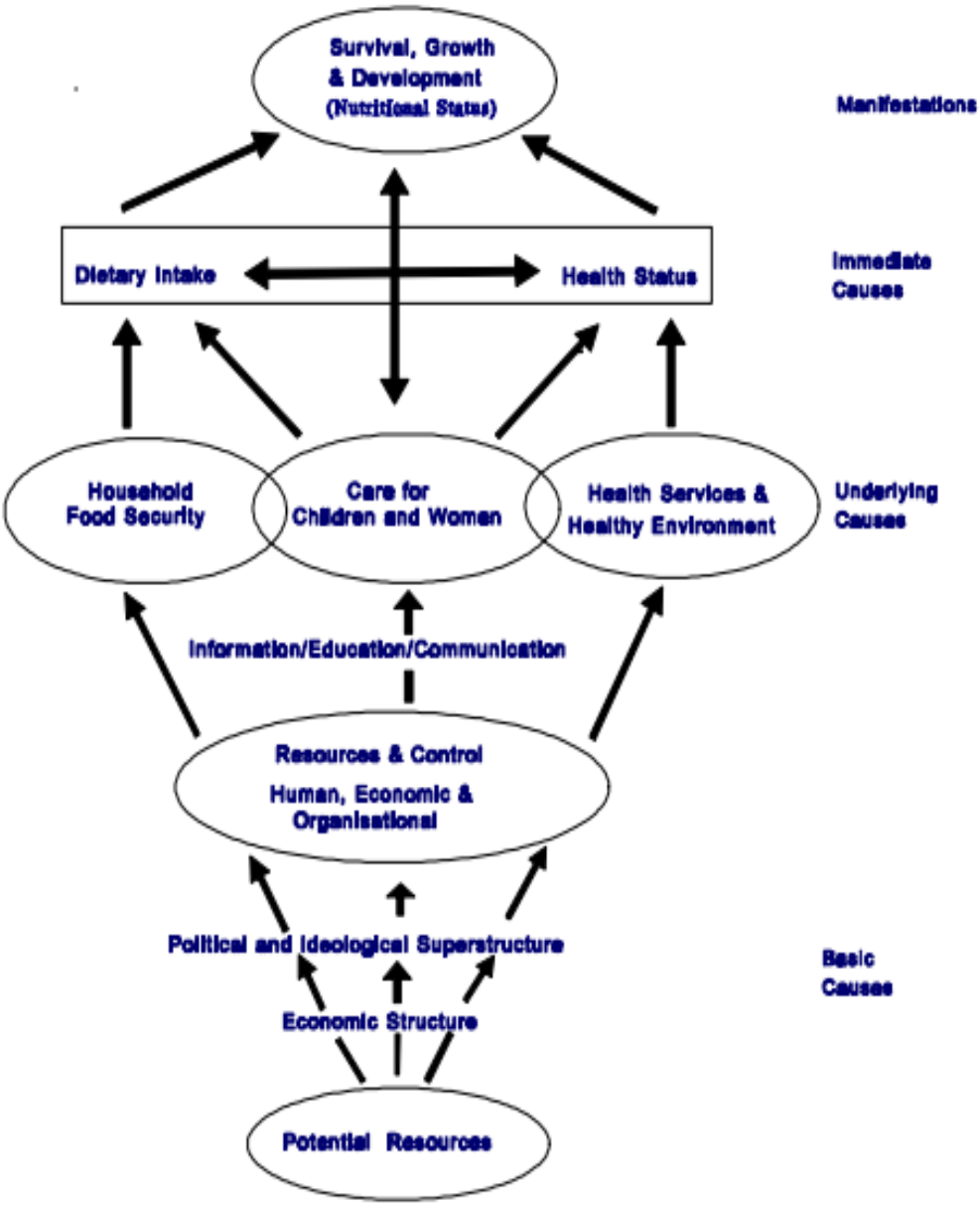
- **Acute malnutrition** is caused when reduced food consumption and/or got illness, resulting in wasting (thinness or low weight for height) or bilateral pitting oedema. Children with severe acute malnutrition (SAM) are at increased risk of death and need treatment urgently.
- **Chronic malnutrition** is caused by long-term or repeated food deprivation or illness that impedes growth (stunting) and development. If the child is too short for his or her age (low height for age), he/she is called a stunted child. Stunting can begin in the womb, and children are at highest risk of stunting from conception through their second birthday. Stunting is largely irreversible after about age 2; hence it must be prevented.
- **Micronutrient deficiencies** occur when someone has inadequate intake or does not absorb micronutrients, often due to illness.

2.1.5 Causes of under-nutrition

The causes of malnutrition are complex, ranging from biological and social to environmental factors. The causes of malnutrition can be classified as immediate, underlying and basic, as illustrated in Figure (3) (UNICEF, 1992).

(a) Immediate causes of malnutrition in children

The immediate causes of malnutrition in children are associated with dietary intake, psycho-social care (stress, trauma) and disease-related factors. Inadequate dietary intake in young children compromises immune function, which may lead to disease or to disease being more severe or prolonged UNICEF (1992). Children with inadequate dietary intakes are more susceptible to disease than children who are well nourished. Therefore, under-nutrition may develop as a result of diseases and dietary inadequacies interacting in a mutually reinforcing manner (Allen & Gillespie, 2001). Therefore, inadequate dietary intake may not be the only cause of malnutrition, since the presence of disease may reduce bioavailability or increase needs or nutrient losses and can thus also be an immediate cause of malnutrition.



Source: UNICEF (1992)

Figure (2.2) Causes of malnutrition

(b) Underlying causes of malnutrition in children

Disease and inadequate dietary intake are the immediate causes of malnutrition in most individuals. Underlying these causes are barriers in the household and family such as:

- **Insufficient access to food**. Families cannot take enough food which contained required energy and nutrients. Other problems may include access to land and agricultural inputs, marketing and distribution of foods, income, and other factors.
- **Inadequate maternal and child care practices**. Families and communities could not use enough time and resources for taking care of the health, dietary, emotional, and cognitive needs of women and children. Feeding sick children inappropriately; not using health care facilities, not providing adequate complementary feeding; inadequate diets for children including food taboos during weaning and feeding practices are regarded as poor caring practices.
- **Poor water/sanitation and inadequate health services**. Health services are unstandardized or non-existent, or inconvenient for service users. As inadequate health services, it is indicated as low immunization coverage; lack of prenatal care; inadequate management of sick and malnourished children; and inadequate water and sanitation facilities.
- **Education**. The education level of women, who are the main caregivers of children, has an influence on the quality of care, because more educated women are more able to process information on nutrition, acquire skills and display positive caring behaviors than less educated women, and this is reflected in the child's nutritional status. In addition, women with no education are more likely to embrace the traditional status quo and less open to changes for better health and family practices, which may influence the way, they feed their children.
- **Information**. Caregivers' nutritional knowledge affects the way they feed their children, and consequently affects the nutritional status of the children. According to UNICEF (1992), poor nutritional knowledge plays a role in most of the multi-sectoral factors, such as inadequate food intake and unhygienic dietary practices involved in the development of malnutrition. Lack of awareness and a lack of nutrition knowledge about feeding amount, frequency, type of food and balanced diet contribute significantly to poor nutritional status of children younger than five years of age, even in families where adults meet their daily requirements (Levitt, Pelletier, & Pell, 2009).

The absence of sanitary latrines, unsafe waste disposal and unhygienic behavior in childcare and food preparation are unsanitary conditions and practices at household

level. It creates a dangerous environment with health risks such as diarrhoeal diseases, which can lead to poor nutritional status in young children (United Nations Environment Programme (UNEP)/UNICEF/ WHO, 2002).

(c) Basic causes of malnutrition in children

The basic causes of malnutrition include resources and the control of human and organizational, economic structure, political and ideological superstructure. In addition, basic causes of malnutrition include culture, religion, tradition and belief that play a role in how children are fed and cared for, which consequently affects the nutritional status of children (UNICEF, 1992).

And cultural and religious structures of societies often give more resources and authorities to men, resulting in women having less access to credit, improved technologies, seed and fertilizers, due to limited women's influence or power within the household and community. It leads to unfair distribution of food within the household (Ajani, 2008). Additionally, religion and cultural norms also constrain women's rights, while reproduction and household responsibilities impinge on their time and mobility, leading to poor care of themselves and their children, resulting in poor nutritional status. The economic growth of a country, especially equitable growth, when social services become affordable and accessible and when adequate investment is made in human resources (including the empowerment of women), is more likely to improve the nutritional status of the community, particularly that of young children (FAO, 2009).

2.1.6 Consequences of Under-nutrition

(a) High Child Mortality, Disease, and Disability

- Newborns who are born small for their gestational age are more likely to die than children born at a healthy weight.
- If the child is severely stunted, there will be four times more likely to die than a healthy child (Black et al. 2008).
- A severely wasted child is nine times more likely to die than a healthy child (Black et al. 2008).

- Micronutrient deficiencies—including vitamin A, zinc, and iron—impair the immune system, increasing risk of illness and death.
- Vitamin A deficiency is a main reason for blindness.
- Iron deficiency anaemia in pregnant women increases risk of maternal and perinatal mortality
- Maternal under-nutrition affects foetal growth and the first 2 years of a child's life, contributing to children born small for gestational age, stunting, and also obesity and non-communicable disease in adulthood (Victora, et al. 2008).
- Children who are undernourished at birth, in infancy, and in young childhood and who also gain weight rapidly after age 2 are at increased risk for chronic disease in adulthood, including hypertension, cardiovascular disease, and high blood glucose concentrations and low birth weight.

(b) Weakened Brain Development and Nervous System

- Stunting is associated with impaired cognitive and motor development and poor school achievement and performance.
- Iron deficiency and iron deficiency anaemia impair cognitive development and can reduce children's school performance and adults' physical capacity for work.
- Developmental disorders result in low income-earning capacity in adulthood.
- Folic acid deficiency causes neural tube defects.
- Iodine deficiency causes mental retardation, physical growth retardation, or a combination of both (cretinism).
- Iodine deficiency disorders affect a child's ability to learn, school performance, likelihood of staying in school, and speech and hearing ability.

(c) Socioeconomic Consequences of Under-nutrition

- Increased or persistent poverty
- High costs in treating illnesses relating with malnutrition
- Costs of caring for sick family members, including time away from work or school
- Limited care for family members who are not sick

2.2 Reviews on Related Studies

In the context of research, a literature review is a critical synthesis of previous research (Lie, 1998). It might give a new interpretation of old material or combine new insights with old interpretation. In this section, the reviews on previous researches relating with determinants of nutritional status of children are presented.

Vella, Tomkins, Borghesi, Migliori, Adriko, & Crevatin (1992) conducted a study among a total of 1178 children aged 0-59 months from 30 villages of North-West Uganda to identify the determinants of child nutrition and mortality. The villages were chosen with random sampling with probability proportional to size. Data were analyzed through stepwise multiple regression using SPSS software (8). It was found that parental educational status was positively associated with child nutrition, in contrast, use of unprotected water supplies in the dry season, prolonged breast-feeding, and age negatively affected on nutrition. Follow up survey after 12 months, it was found that mortality was higher among children who had low weight-for-age and weight-for-height, but children who had low height-for-age did not have higher mortality. Based on the results of this study, it was indicated that socio-demographic factors determined the prevalence of childhood nutrition and mortality of those children.

Khattak & Ali, (2010) conducted a study regarding malnutrition and associated risk factors in preschool children aged 2-5 years in District Swabi of Pakistan using correlation analysis. It was conducted among 140 preschool children from urban and rural areas of the district. Data were collected by questionnaire and were analyzed with Epi-Info statistical software (version 6.0). It was found that there were no significant differences between the sex, age for weight and height compared. It was found that all cases were below the third percentile of weight and height and indicated that the children were stunted and under-weight. Furthermore, there was strong association between malnutrition and family size, income of the parents and child number in the family in rural areas. This study indicated that the children in this particular area were at the risk of malnutrition due to large family size and lower income.

Rabbi & Karmaker, (2015) studied the determinants of child malnutrition in Bangladesh, using BDHS-2007 data including 5312 cases through a Multivariate Approach. In conducting factor analysis, it revealed six factors as covariate of malnutrition; where two factors are socio-economical, others are biological and bio-social. Next, linear discriminant analysis was applied to identify the efficiency of obtained factors in malnutrition scenario; which imply that the obtained factors are accurate for approximately 60 percent observations. The study suggested that consciousness should be raised to improve socio-economic and maternal health conditions to improve the scenario of child malnutrition.

Tonkoi, Asito, & Adoka (2016) studied on determinants of malnutrition among children aged 6-59 months in Kenya. Through a cross-sectional descriptive design, data were collected using a semi-structured questionnaire. Among 350 children, 31%, 22% and 8% of the children were stunted, underweight and wasted, respectively. Moreover, the children suffered from overweight 9% and obesity 4% respectively. In fitting the multivariate logistic regression model, it was found that the key determinants for stunted were number of children in the family (adjusted Odds Ratio (aOR): 1.86; 95% CI: 1.01-3.43), mother being a house wife (aOR: 3.63; 95% CI: 1.08-12.24), and being poor (aOR: 3.33; 95% CI: 1.44-7.68). Regarding obesity, the predictors were child age with 12-23 months (Crude Odds Ratio: 2; 95% CI: 0.175-22.8); 24-35 months (odds ratio of 2.22; 95% CI: 0.22-22.3), child gender with males more probable to be obese than females (OR: 3.27; 95% CI: 0.856-12.5). This study indicated that there was double burden of malnutrition in rural settings characterized by high prevalence of under nutrition and low prevalence of over nutrition.

Kang, Aguayo, Campbell, Dzed, Joshi, Wid, et al. (2018) carried out a study of Nutritional status and risk factors for stunting in preschool children through through the 2015 National Nutrition Survey in Bhutan. It surveyed the nutritional status (by *z*-scores of height-for-age [HAZ], weight-for-height [WHZ], and weight-for-age [WAZ]) of 1,506 children. Data were analyzed by multivariable linear/logistic regression analysis to identify child, maternal, and household risk factors for childhood undernutrition and overweight. It was described that prevalence of stunting, wasting, underweight, and overweight was 21.2%, 2.6%, 7.4%, and 2.6%,

respectively. According to multivariate regression analysis, risk of stunting significantly increased by age: 5.3% at <6 months (reference), 16.8% at 6–23 months (OR = 3.06, 95% CI [0.63, 14.8]), and 25.0% at 24–59 months (OR = 5.07, [1.16, 22.2]). It was concluded that although stunting persist in one fifth of the Bhutanese children, other nutrient deficient or non-nutritional factors was constrained in linear growth for a substantial proportion of children.

Sobgui, Fezeu, Diawara, Diarra, Afari-Sefa, Tenkouano, (2018) studied the predictors of poor nutritional status among children aged 6-24 months in agricultural regions of Mail using a cross-sectional study. A total of 1764 mothers were interviewed using a structured interviewer administered a questionnaire. Anthropometric indices were measured using standardized methods in order to identify the factors associated with children suffering from undernutrition (stunting and wasting). Data were analyzed with bivariate and multivariate logistic regression analyses. It was showed that thee were statistically associated with acute malnutrition were male sex ($p < 0.01$), preterm birth ($p < 0.03$), lower child age (0.001), a high number of siblings ($p < 0.03$), and living in a household with more months of inadequate food provisioning ($p < 0.03$). This study suggested that future efforts should be directed at addressing the food insecurity and at improving the yearlong household availability and accessibility of nutritious food.

Mya-K-S, Kyaw-A-T, & Tun-T (2019) studied the feeding practices and nutritional status of children age 6-23 months in Myanmar through a secondary data analysis using the 2015–16 Myanmar Demographic and Health Survey. Data on 1,222 children age 6–23 months were analyzed with multiple logistic regression analysis. It was described that breastfeeding reduced the odds of being stunted. And it was found that short stature mother, working mother, perceived low birth weight and size and male gender were statistically significant predictors of stunted among children. Consumption of iron-rich foods was negatively associated with moderate anemia. This study highlighted further researches to identify the effects of interventions such as iron supplementation, and nutritional education programs feeding practice on linear growth to prevent stunted and anemia among children in Myanmar.

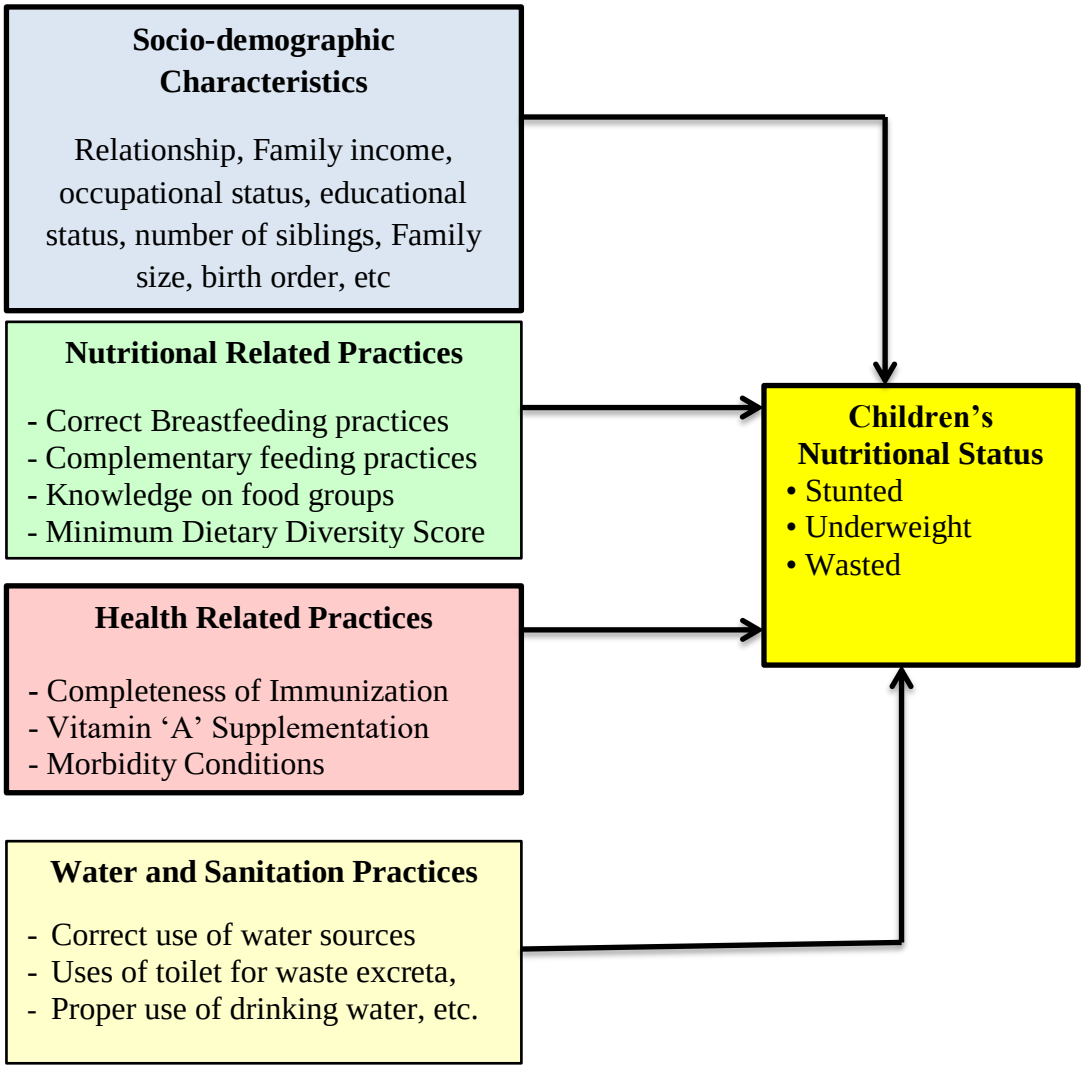
Kang & Kim (2018) conducted a study on risk factors for undernutrition among children 0–59 months of age in Myanmar using the cross-sectional data from the Myanmar Demographic Health Survey 2015–2016. It showed that the prevalence of stunting, wasting, and underweight was 29.0%, 7.3%, and 19.2%, respectively. Through multivariable logistic regression on 35 household, it was revealed that lower wealth quintiles, maternal engagement in nonagricultural occupation, and male child predicted stunting only. Younger child and not receiving vitamin A supplementation in the previous 6 months were risk factors for wasting only. The study pointed out that socio-economic and demographic factors, poor maternal nutritional status, and living in certain geographical locations are affecting children's undernutrition.

Su-Wai-Phyo, Keiwkarnka & Mongkolchati (2014) studied regarding factors related to stunting status of children aged under two years in Magway Township using cross-sectional analytic study. A total of 399 children aged under 2 years children and their mothers were selected by multi-stage sampling. After interviewing the mothers by using face to face method, anthropometric measurements of the children and mothers were performed. Descriptive statistics, Chi-square test and multiple logistic regressions were applied to identify the factors related to the stunting status of the children. It was found that nearly one-fourth of the under two years children (23.8%) were stunted. Through multiple logistic regression, it was showed that the predicted factors of stunted among children are mother's height (<145cm), family income (< 25 percentile, 60$), child age (>10 months), gestational age of the child (< 37 weeks) and early initiation of complementary foods to the children (<6 months). This study highlighted that childhood nutritional status was critical to analyze in order to provide effective intervention for reducing the prevalence of malnutrition.

Based on the review of the previous studies, many studies were focused on under five children and under two children. It indicated that the determinants of the nutritional status of children aged 3-5 years were needed to explore in order to carry out effective provision of nutrition care for those children.

2.3 Conceptual Framework of the Study

The researcher's synthesis of literature usually describes using a conceptual framework to explain the phenomenon of the study by relating with the prior knowledge of the researcher (Regoniel, 2015). In this study, the conceptual framework is adapted and developed by identifying the determinants of nutritional status among under five children (UNICEF, 1992). Based on the complex issues of the under-nutrition among children aged 3-5 years, this study aimed to identify the determinants of nutritional status among children (3-5 years) at *Waw* Township. Accordingly, the conceptual framework of this study was developed by highlighting the main study areas which is shown in Figure (2.3).



Source: Author's Compilation from Literatures (2019)

Figure (2.3) Conceptual Framework of the Study

CHAPTER III

METHODOLOGY

As the investigator aimed to identify the determinants of nutritional status among children (3-5 years) at *Waw* Township, Bago Region, the quantitative approach was suited for this study. For that reason, logistic regression, the use of survey design, study area, sampling frame, sample size determination, data collection methods and ethical considerations were presented in this chapter.

3.1 Logistic Regression

To investigate the relationship between a continuous (interval scale) dependent variable, such as income, blood pressure or examination, multiple linear regression are usually used. The fundamental model underlying multiple regression analysis posits that a continuous outcome variable is, in theory, a linear combination of a set of predictors and error. Thus, for an outcome variable, Y, and a set of p predictor variables, $x_1,..,x_p$, the multiple regression analysis model is of the form:

$$Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_{p-1} X_{p-1} + \beta_p X_p + \varepsilon \qquad (3.1)$$

where:

- Y is the outcome (dependent variable)
- $\beta_0, \beta_1, \beta_2$ *... are* multiple (partial) regression coefficients (i.e., the expected change in Y per unit change in x_k assuming all other x's are held constant)
- b_0 is the intercept and $\beta_1, \beta_2, \beta_3$, etc. are the regression coefficients (estimates) for the variables X_1, X_2, X_3, etc.
- $X_1, X_2 \ldots$ are the predictor variables
- ε is the error of prediction.

However, socio-economic variables are very often categorical, rather the interval scale. For some situations in which the outcome variable is categorical and

dichotomous in nature, logistic regression analysis (LRA) is used by extending the techniques of multiple regression analysis. In order to predict the probability of an event, given a set of predictor variables, LRA is a statistical technique for analyzing them (Sarkar & Midi, 2010). The focus of this document is on situations in which the outcome variable is dichotomous, although extension of the techniques of LRA to outcomes with three or more categories (e.g., improved, same, or worse) is possible (Hosmer & Lemeshow, 2000). The simple logistic regression model could be expressed as follows:

$$Logit(\pi) = \alpha + \beta X \tag{3.2}$$

Where; π is the probability when the outcome variable equals 1, *P*=(Y=1); Logit(π) is the logistic transformation of the probability of success or of an event occurrence; α is the intercept and β is the logit regression coefficient. X is the predictor variable. The logit of the outcome Logit(π) can be easily transformed back to the probability of outcome *P*=(Y=1) since the logit is the natural logarithms of odds or log odds. Since Logit(π) is the ln(odds), it could be rewritten as follows.

$$\ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta X \tag{3.3}$$

Actually, though many distribution functions have been proposed for use in the analysis of a dichotomous variable, logistic regression favors to use as the extremely flexible function and a clinically meaningful interpretation for predicting group membership and differentiating between two groups based on certain factors (Cox & Snell, 1989). The goal of this model is to find the best fitting and most parsimonious in order to describe the relationship between an outcome (dependent or response) variable and a set of independent (predictor or explanatory) variables.

3.2 Binary Logistic Regression Model

For the outcome variable, Y, is categorical (e.g., dichotomous), the logistic regression analysis is modeled, but LRA does not model this outcome variable directly. Logistic regression aims to correctly predict the category of outcome for individual cases using the parsimonious model. In order to predict correctly, all predictor variables that are useful in predicting the response variable are analyzed in fitting a model. In which,

the dependent variable in logistic regression is usually dichotomous, that is the dependent variable can take value1 with a probability of success, P(Y=1) = π, or the value 0 with probability of failure P(Y= 0) =1-π. This type of variable is called a binary variable. The usual form of binary logistic regression model is;

$$Y_i = E(Y_p) + \varepsilon_p \tag{3.4}$$

Since the distribution of the error term ε_p depends on the Bernoulli distribution of the responseY_p. The expected value of each Y_p is

$$\mathrm{E}\ (Y_p) = \pi_p = \frac{\exp(\beta_0+\beta_1 X_1+\cdots+\beta_p X_p)}{1+\exp(\beta_0+\beta_1 X_1+\cdots+\beta_p X_p)} \tag{3.5}$$

where E(Y_p) = conditional mean given the value of X_p

β_0 = the constant of the equation

β_p = the coefficient of the predictor variable p

An alternative to the logistic regression equation is:

$$\log[\pi(X)] = \log[\frac{\pi_p}{1-\pi_p}] = \beta_0 + \beta_1 X_1 + \cdots + \beta_p X_p \tag{3.6}$$

Where; X_1, X_2,…,X_p are predictor variables and β_1, β_2,…,β_p are logit coefficients of these variables.

3.3 Some Measures of Fitting the Model

Depending on the assumptions of the statistical model being satisfied, the validity of inferences is drawn from modern statistical modeling techniques. In order to be valid model, the developed model has to satisfy the assumptions of logistic regression for being valid statistical inferences. It is important to assess the appropriateness of a model by examining its fit, or how well the model describes the observed data. Without such an analysis, the inferences from that model may be misleading or even totally incorrect. Accordingly, it is important to check the underlying assumptions involved in logistic regression and model fits sufficiently well with different aspects because logistic regression model is a powerful statistical tool and it must be used with caution (Hosmer et al. 1991 cited in Sarkar & Midi, 2010). The overall

assessment of fit be examined using a combination of likelihood ratio test, Wald test, the Hosmer-Lemeshow test and pseudo R squared for assessment of the fitted model.

3.3.1 Likelihood Ratio Test

The likelihood ratio test is performed to see where the inclusion of an explanatory variable in a model tells us more about the outcome variable than a model that does not include that variable. The likelihood ratio test is based on likelihood function. The likelihood ratio is;

$$\frac{L(R)}{L(F)} \tag{3.7}$$

where L(F) = the likelihood value for full model, L(R) = the likelihood value for the reduced model. The actual test statistic for likelihood radio test is denoted by χ^2 .

$$\chi^2 = -2\log_e \left[\frac{L(R)}{L(F)}\right] = 2\log_e(L(F) - 2\log_e L(R) \tag{3.8}$$

3.3.2 Wald Test

Wald test is used as a test of significance for the coefficients in the logistic regression. Wald statistics follows a chi-square distribution. Agresti (2007) described that the likelihood-ratio test is more reliable than the Wald test in order to analyze for small sample size. The test statistics is

$$W = S.E(\widehat{\beta}_i) \tag{3.9}$$

3.3.3 The Hosmer-Lemeshow Test

The fit of a logistic model against actual outcomes was assessed by Goodness-of-fit statistics. The inferential goodness-of-fit test for logistic model is the Hosmer-Lemeshow (H-L) test. The H-L statistic, $\hat{C}$, is a person chi-square statistic, calculated from a g x 2 table of observed and estimated frequencies, where g is the number of groups formed from the estimated probabilities. The calculation of $\hat{C}$ is calculated by the following formula:

$$\hat{C} = \sum_{k=1}^{g} \frac{(O_k - n'_k\bar{\pi}_k)}{n'_k\bar{\pi}_k\,(1-\bar{\pi}_k)}^{2} \tag{3.10}$$

where n'_k is the total number of subjects in k^{th} group, C_k denotes the number of covariate patterns in the kth decile,

$$O_k = \sum_{j=1}^{ch} y_i \tag{3.11}$$

is the number of responses among the C_k covariate patterns, and the average estimated probability is

$$\bar{\pi}_k = \sum_{j=1}^{ch} \frac{m_j \pi_j}{n_{k'}} \tag{3.12}$$

3.3.4 Pseudo R^2

The model residuals are squared, summed, and divided by the total variability in the dependent variable, and this R^2 is also equal to the squared correlation between the predicted values and actual values (Efron).The model residuals from a logistic regression are not comparable to those in Ordinary Least Square (OLS). As both of the predicted and actual values are continuous and on the same scale in OLS, their differences are easily interpreted. The formula defining the calculation of R^2 is as follows:

$$R^2 = 1 - \frac{\sum_{i=1}^{N}(y_i - \hat{\pi}_i)^2}{\sum_{i=1}^{N}(y_i - \bar{y})^2} \tag{3.13}$$

$\hat{\pi}$ = model predicted probabilities

3.4 Survey Design

As the investigator intended to identify the determinants of nutritional status among children aged 3-5 years, the cross-sectional primary survey was used in this study.

3.4.1 Study Area

This study was conducted at *Waw* Township, Bago Region. It was located on the Yangon-*Mawlamyaing* Highway. There are 6 wards and 54 village tracts. The majority of the people in the Township live in rural areas with only 13.1% living in urban areas. In this study, 4 wards and 4 villages were selected as study settings by

assuming equal allocation of the stratum. The map of *Waw* Township is shown in Appendix (3).

3.4.2 Sampling Procedure

In this study, stratified two stage random sampling was employed in this study. In *Waw* Township, there are 6 wards and 54 village tracts which were stratified as stratum I and stratum II. In the first stage, 4 wards and 4 villages were selected by simple random sampling. The respondents from the selected wards and villages were obtained by simple random sampling in the second stage. Hence, 188 respondents from 4 wards and 175 respondents from 4 villages were selected in accordance with sample size determination by Chadha (2006). The number of samples from the respective wards and villages are shown in following Table (3.1) and Table (3.2).

Table (3.1) List of Selected Wards from Stratum I

No.	Name of Wards	No. of children aged 3-5 years	No. of Selected Children Aged 3-5 years
1.	Kan Taw	121	23
2.	Chan Mya Thar Si	51	33
3.	Aye Chan Thar Yar	167	40
4.	Waw Ah Shey Bet Kan	466	92
	Total	805	188

Source: General Administration Department (2017)

According to the list, there were 805 children aged 3-5 years in Stratum I. From the list, the required sample of 188 respondents was selected by simple random sampling.

Table (3.2) List of Selected Villages from Stratum II

No.	Name of Villages	No. of children aged 3-5 years	No. of Selected Children Aged 3-5 years
1.	Kyar La Har	58	45
2.	Inn Taing su	76	65
3.	Pyon Su	49	35
4.	Oo Moe Su	46	30
	Total	229	175

Source: General Administration Department, 2017

Also, there were 229 children aged 3-5 years in Stratum II. From this list, 175 respondents were selected by simple random sampling.

Sample Size Determination

In this survey, the required sample size was calculated using the following formula.

$$n = Z^2 p (1-p)/d^2 \quad (3.13)$$

$$= (1.96)^2 (0.3) (0.7)/ (0.048)^2$$

$$= 350.15$$

where,

n = the desired sample size

z = the confidence level at 95% confidence level

p = proportion of target population estimated to have characteristics being measured (30% prevalence of malnutrition)

= 0.3.

q = (1-p) = population lacking the features being measured = (1-0.3) = 0.7

d = margin of error = degree required for precision = 0.048

To be representative sample, the minimum sample size was 351 of mothers who have 3-5 year olds children. In which, 363 respondents were selected using stratified two-stage random sampling to cover the non-responses.

3.4.3 Data Collection

In this study, the questionnaire was adapted and developed based on the Standardized Guidelines from MoHS (Myanmar), and Macias & Glasauer's Guidelines for assessing nutrition related Knowledge, Attitudes and Practices: KAP manual (2014). It was pretested among five mothers of children aged 3-5 years at *Mingaladon* Township. This pretested structured questionnaire was used as a data collection tool. Additionally, weighting machine, height board, and tape measure for Mid-Upper Arm Circumference (MUAC) were used as data collection tools for anthropometric measurement. The accuracy of the data collection tools was assured by standard procedure.

After developing the data collection tools, the data were collected by face to face interview using structured questionnaire and measuring the children's height, weight and MUAC.

3.5 Ethical Considerations

Prior to conduct this study, the approval from Academic Committee of University of Economics (Yangon) was obtained. And also, permission from local authorities of *Waw* Township was secured before conducting this study. After that, the respondents were informed the objectives, preceding procedures of the study using statement form which was shown in Appendix (I). After that, the signed informed consent was obtained. Then, the respondents were informed the objectives, procedures, benefits and future implications of the study.

In this study, the respondents were assured about the right to refuse to participate, right to withdraw from this study before data analysis. The anonymity and confidentiality were maintained throughout the study by using code numbers of questionnaire. Also, the respondents were clarified that they will not be kept in harmful condition as invasive procedure will not be included in this study. As based on the ethical principle of beneficence, the right to protection from discomfort and harm were assured from this study. Also, the respondents had the right to ask any questions if they want to know something about this study. As a token of thanks for

participation in this study, some gifts were provided to compensate for the respondents' travel cost and their time.

Based on the above mentioned survey design, the detailed analysis will be presented in the next chapter.

CHAPTER IV

ANALYSIS ON SURVEY DATA

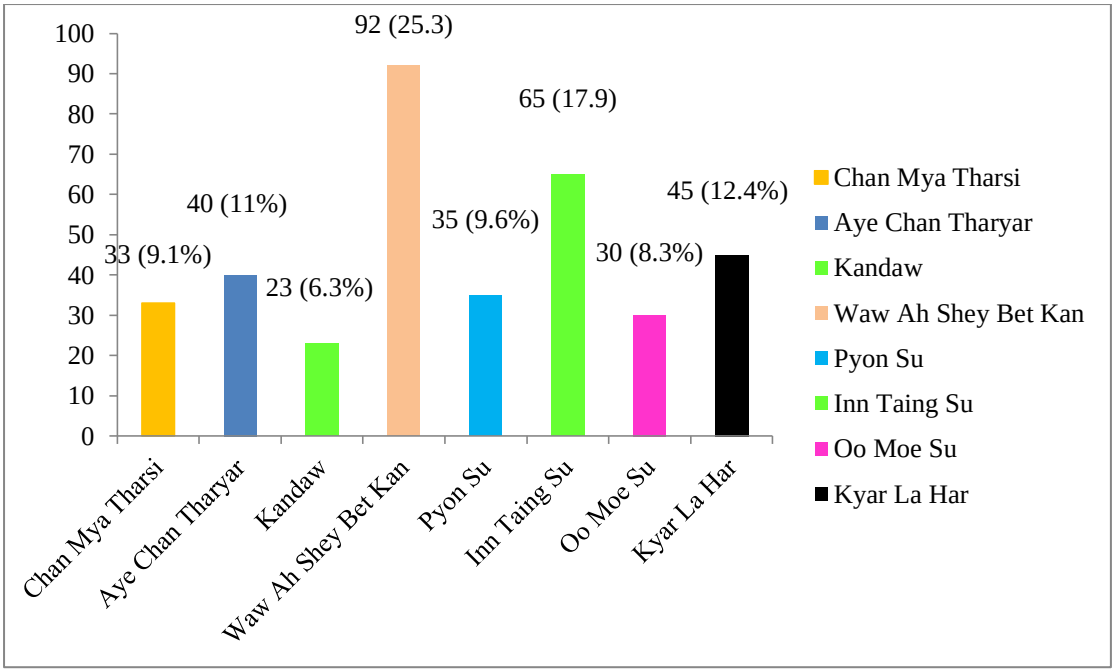
In the study, the nutritional indices (weight-for-height (WHZ), height-for-age (HAZ), weight-for-age (WAZ), and MUAC-for-age were analyzed using WHO Anthro (version 3.2.2). Socio-demographic characteristics, and minimum dietary diversity score (DDS) were calculated by descriptive statistics. After that, Binary Logistic Regression modeling was done which was applied to determine the determinants of nutritional status among children aged 3-5 years at *Waw* Township, Bago Region. In order to fitting the model, socio-demographic characteristics of respondents, nutritional status among children aged 3-5 years, variables descriptions, and determinants of nutritional status among children aged 3-5 years using Binary Logistic Regression are presented in this chapter.

4.1 Socio-demographic Characteristics of Respondents

Socio-demographic characteristics of respondents such as location of respondents, respondents' relationship with children, educational status of respondents, occupational status of respondents, monthly family income, number of family members, gender of children, and number of siblings of children are presented.

4.1.1 Locations of Respondents

In this study, the respondents are selected four wards of urban areas and four villages from rural areas by assuming equal allocation of the respondents. It is shown in Figure (4.1).



Source: Survey Data, 2019

Figure (4.1) Location of the Respondents

This study found that most of the respondents 92 (25.3%) are from *Waw Ah Shey Bet Kan* Ward and the least respondents 23 (6.3%) are from *Kandaw* Ward.

4.1.2 Respondents' Relationship with Children Aged 3-5 years

In this study, relationships with the children aged 3-5 years are assessed in this study. It is presented in Table (4.1).

Table (4.1) Respondent's Relationship with Children Aged 3-5 years

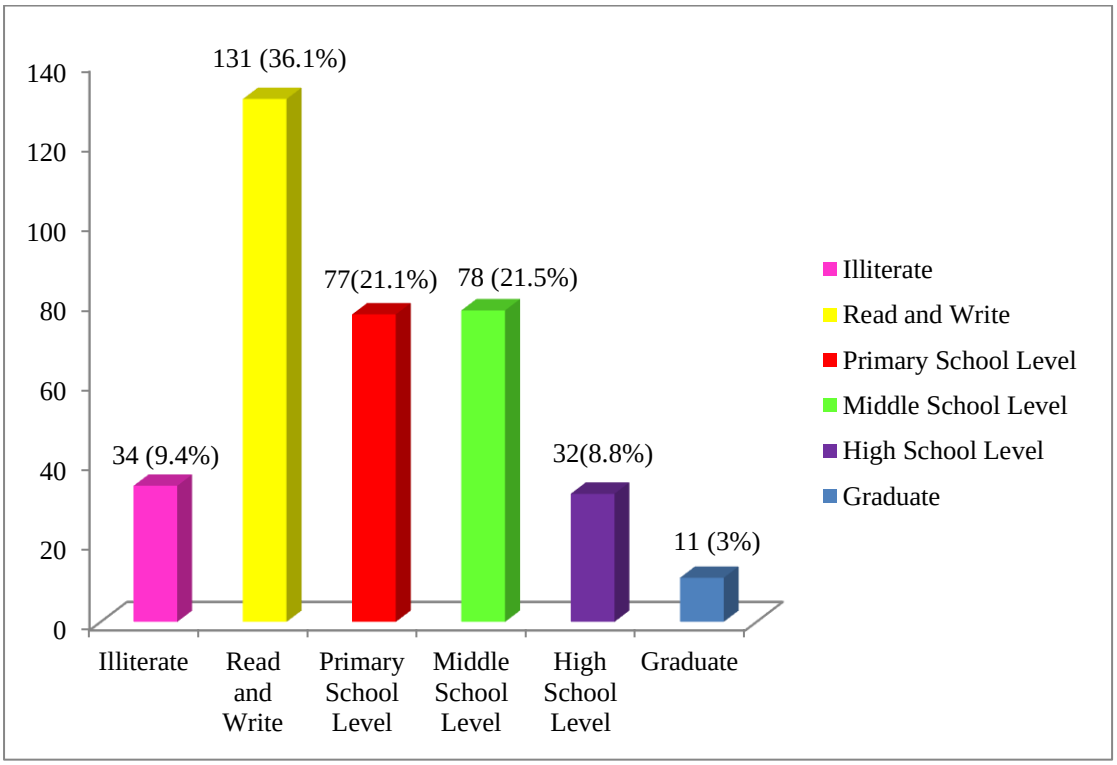
No.	Type of Relationship	Number of Respondents	Percent (%)
1.	Mothers	335	92.2
2.	Grand Parent	14	3.9
3.	Others	14	3.9
	Total	363	100

Source: Survey Data, 2019

It is found that 335 (92.2%) of the respondents are related with children aged 3-5 years as mothers. The rest of children in this study are taken care by grandparents and other relatives.

4.1.3 Educational Status of Respondents

The educational status of respondents is categorized into 6 categories such as illiterate, read and write, primary school level, middle school level, high school level and graduate. These are presented in Figure (4.2).



Source: Survey Data, 2019

Figure (4.2) Educational Status of Respondents

It is revealed that most of the respondents 131 (36.1%) are able to read and write while the least 11(3%) of respondents are graduate.

4.1.4 Occupational Status of Respondents

The occupational status of the respondents is assessed as dependent, in-house business and out-houses business. It is described in Table (4.2).

Table (4.2) Occupational Status of Respondents

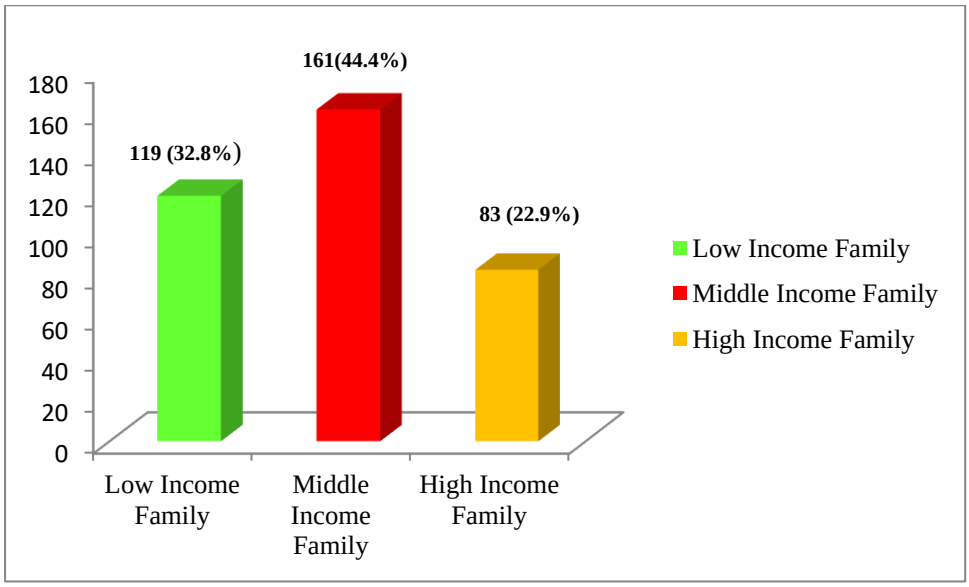
No.	Type of Occupation	Number of Respondents	Percent (%)
1.	Dependent	120	33.1
2.	In-house Business	153	42.1
3.	Out-house Business	90	24.8
	Total	363	100

Source: Survey Data, 2019

According to the survey results, 153 (42.1%) of respondents earn money by doing in-house business, while 90 (24.8%) of respondents earn money by doing out-house business.

4.1.5 Monthly Family Income of Respondents

In this study, the average family income is 281708 Kyats and range from 80,000 Kyats to 700,000 Kyats. It is categorized into three groups such as ≤ 200,000 Kyats as low income family, 200001-300000 Kyats as middle income family and >300,000 Kyats as high income family. It is shown in Figure (4.3).



Source: Survey Data, 2019

Figure (4.3) Monthly Family Income of Respondents

Survey results reveal that 161 (44.4%) of respondents are from middle income family, on the other hand, 83 (22.9%) of respondents are from high income family.

4.1.6 Number of Family Members

In this study, the average family members are 5.1 members with the standard deviation (SD) of 1.7 members. It is categorized into two groups ≤5 family members and >5family members.

Table (4.3) Number of Family Members

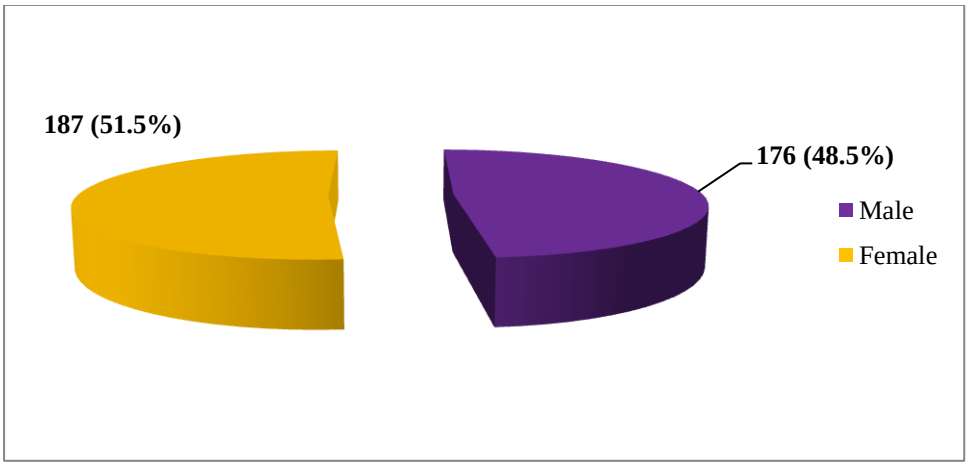
No.	Family members	Number of Respondents	Percent (%)
1.	≤5 family members	243	66.9
2.	>5family members	120	33.1
	Total	363	100

Source: Survey Data, 2019

Table (4.3) shows that 243 (66.9%) of respondents have less than five family members, while the rest 120 (33.1%) have more than five family members.

4.1.7 Gender of Children Aged 3-5 years

As a socio-demographic characteristic, gender of children aged 3-5 years is identified. It is described in Figure (4.4).



Source: Survey Data, 2019

Figure (4.4) Gender of Children Aged 3-5 years

According to the survey finding, 187 (51.5%) of children are female and 176 (48.5%) are male.

4.1.8 Numbers of Siblings among Child Respondents

The numbers of sibling are assessed by assuming that the numbers of family members might affect the nutritional status of those children. It is ranged from 1 to 9 siblings.

4.2 Nutritional Status of Children Aged 3-5 years

In this study, child nutritional status is presented as height-for-age (stunted), weight-for-age (underweight) and weight-for-height (wasted). The prevalence of nutritional status among children aged 3-5 years was categorized by z-score classification by WHO (2009) to determine the nutritional status of children aged 3-5 years. Those nutritional statuses are used to categorize as follows.

Table (4.4) Z-score Classification to determine the nutritional status of children (WHO, 2009)

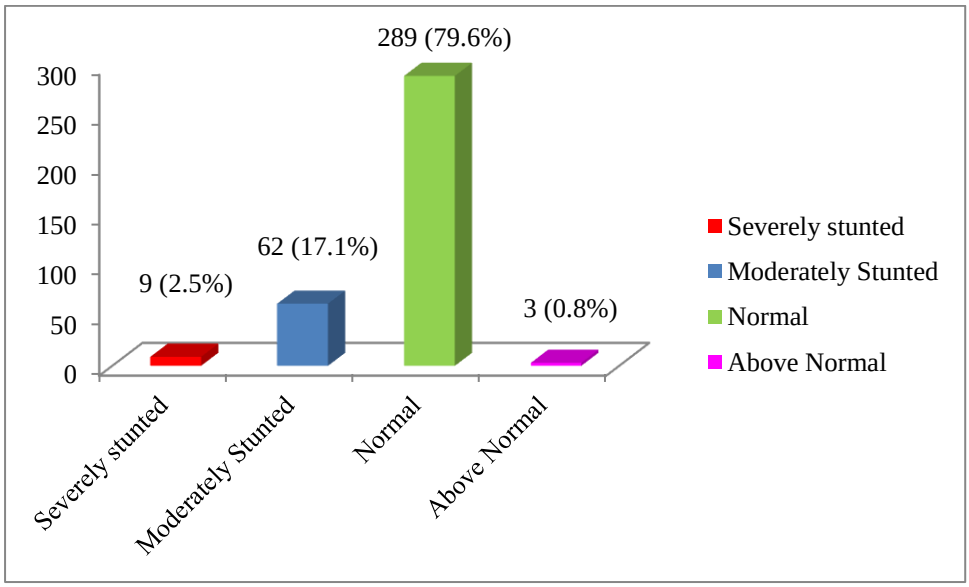
Z-score Classification	Stunted (Height-for-age) (HAZ)	Underweight (Weight-for-age) (WAZ)	Wasted (Weight-for-height) (WHZ)
<-3SD	Severely stunted	Severely underweight	Severely wasted
-3SD to < -2SD	Stunted	Underweight	Wasted
-2SD to < -1SD	Mild stunted	Mild underweight	Mild wasted
-1SD to +1SD	Normal height	Normal WAZ	Normal WHZ
>+1SD to ≤+2SD	Normal height	Possible Growth Problem	Possible Risk of Overweight
+2SD to ≤+3SD	Normal height	Possible Growth Problem	Overweight
>+3SD	Above normal	Possible Growth Problem	Obese

Source: WHO, 2009

Based on the above mentioned criteria, child nutritional statuses among children aged 3-5 years in *Waw* Township are categorized.

4.2.1 Stunted among Children Aged 3-5 years

Stunted among children aged 3-5 years is assessed using height-for-age (z-score). The prevalence of stunted among children aged 3-5 years is shown in Figure (4.5).



Source: Survey Data, 2019

Figure (4.5) Stunted among Children Aged 3-5 years

This study found that 289 (79.6%) of children are normal height while 9 (2.5%) of children are severely stunted and 3 (0.8%) are above normal respectively. It is categorized into having stunted and not having stunted as dichotomous variable. It is found that 191 (52.5%) are not stunted while 172(47.4%) are stunted. It is shown in Table (4.5).

Table (4.5) Stunted of Children Aged 3-5 years

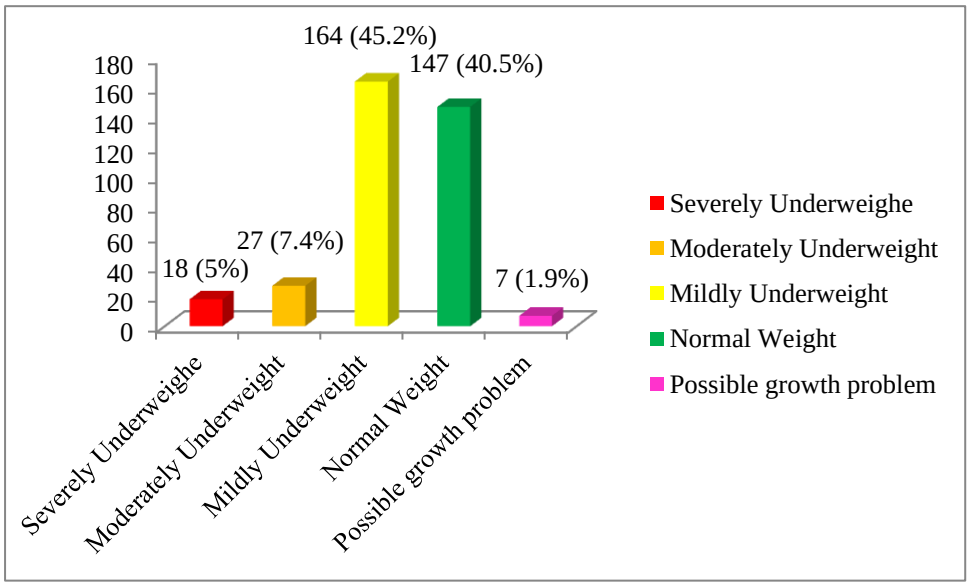
No.	Stunted	Number of Children	Percent (%)
1.	No Stunted	292	80.4
2.	Stunted	71	19.6
	Total	363	100

Source: Survey Data, 2019

According to the result of this study, it is found that 292 (80.4%) of children aged 3-5 years are not being stunted, whereas, 71 (19.6%) of children aged 3-5 years are stunted.

4.2.2 Underweight among Children Aged 3-5 years

In this study, underweight is classified by z-score of weight-for-age. The prevalence of underweight among children aged 3-5 years is described in Figure (4.6).



Source: Survey Data, 2019

Figure (4.6) Underweight among Children Aged 3-5 years

It was found that 164 (45.2%) of the children aged 3-5 years are mildly underweight, while 7(1.9%) are possible growth problem and 18 (5%) of children are severely underweight respectively. It can be assumed that double burden of malnutrition are occurred among children aged 3-5 years of *Waw* Township. Also its prevalence is grouped into underweight or not being underweight which are shown in Table (4.6).

Table (4.6) Underweight of Children Aged 3-5 years

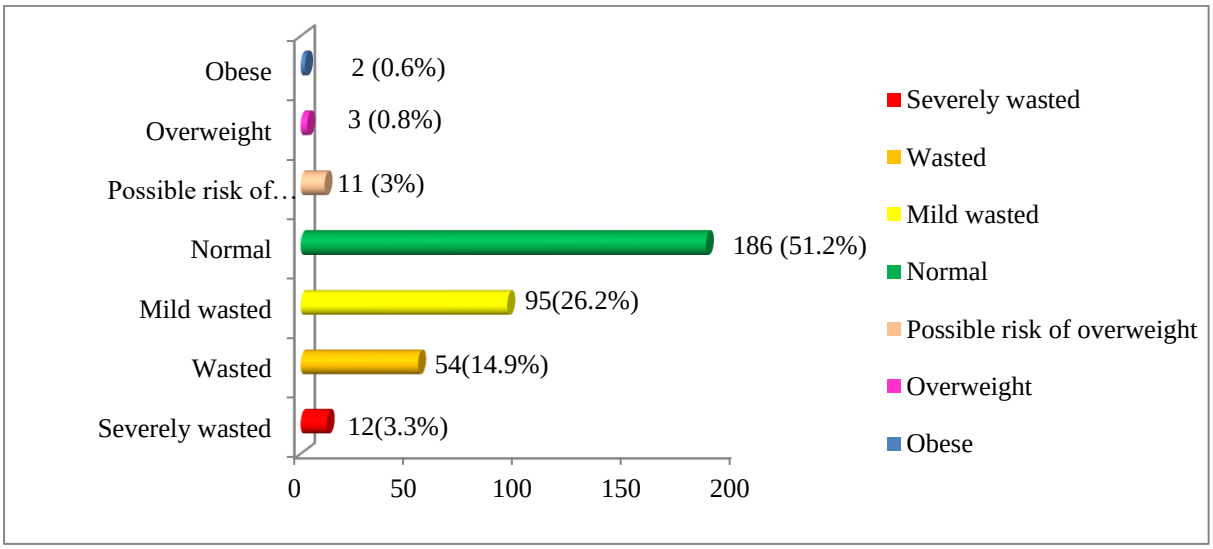
No.	Underweight	Number of Children	Percent (%)
1.	No Underweight	154	42.4
2.	Underweight	209	57.6
	Total	363	100

Source: Survey Data, 2019

Based on this survey result, 209 (57.6%) of children aged 3-5 years are underweight, while 154 (42.4%) of children aged 3-5 years are not being underweight.

4.2.3 Wasted among Children Aged 3-5 years

Wasted is denoted as low z-score of weight-for-height among the children respondents of this study.



Source: Survey Data, 2019

Figure (4.7) Wasted among Children Aged 3-5 years

Figure (4.7) shows that 186 (51.2%) of children aged 3-5 years are of normal weight; however, 2(0.6%) are obese. On the other hand, 12 (3.3%) of those children are severely wasted. Accordingly, it can be assumed that double burden of malnutrition are occurred among the children of this study. And also, it is described in two groups as wasted and not being wasted as shown in Table (4.7).

Table (4.7) Wasted of Children Aged 3-5 years

No.	Wasted	Number of Children	Percent (%)
1.	No Wasted	202	55.6
2.	Wasted	161	44.4
	Total	363	100

Source: Survey Data, 2019

The survey results reveal that 161(44.4%) children aged 3-5 years are being wasted while the remaining children are not. According to the findings of nutritional statuses among children aged 3-5 years, double burden of malnutrition are suffered among

those children. It indicates for further researches in order to identify the morbidity and mortality patterns relating with malnutrition of those children.

4.3 Variables Description

The use of dependent and independent variables are presented in this section.

4.3.1 Dependent Variables – Nutritional Status of Children Aged 3-5 Years

Three dependent variables are applied for nutritional status of children aged 3-5 years. These are;

(a) Weight-for-age which is classified as having underweight/overweight or not
(b) Weight-for-height which is classified as having wasted/obese or not
(c) Height-for-age which is classified as having stunted or not

4.3.2 Independent Variables

The independent variables (explanatory variables) are identified to determine the determinants of nutritional status among children 3-5 years at *Waw* Township. As explanatory variables, socio-demographic characteristics, water and sanitation, feeding practices, availability of nutritional knowledge, caregiver's knowledge on food groups, breastfeeding, complementary feeding, completeness of immunization, taking vitamin A supplementation, history of illness and minimum dietary diversity scores are applied. Based on the well suited model, the fitted explanatory variables are discussed in this section.

4.4 Determinants of Nutritional Status among Children Aged 3-5 years

In this section, nutritional statuses such as stunted, wasted and underweight are dependent variables which are discussed in relation with the explanatory variables.

4.4.1 Determinants for Stunted among Children Aged 3-5 years

In this section, Binary Logistic Regression Model (LRA) is developed to determine stunted among children aged 3-5 years.

4.4.1.1 Variables in the Model

Stunted is dependent variable and it is given "1" when the children had stunted (mild to severely stunted) and "0" when those children were not being stunted. The variables of this model are as follows.

Y = 1, if the children were being in any degree of stunted
= 0, if the children were not being stunted

X_1 = respondents' educational status
= 1, if the respondent's educational level is illiterate
= 2, if the respondent's educational level is able to read and write
= 3, if the respondent's educational level is primary school passed
= 4, if the respondent's educational level is middle school passed
= 5, if the respondent's educational level is high school passed
= 6, if the respondent's educational level is graduate

X_2 = respondents' occupational status
= 1, if the respondent is dependent
= 2, if the respondent employs in-house business
= 3, if the respondents employs out-house business

X_3 = Monthly family income
= 1, if the family's average income was ≤200,000 kyats
= 2, if the family's average income was 200,001-300,000 kyats
= 3, if the family's average income was >300,000 kyats

X_4 = Family size
= 1, if the family size is ≤ 5 family members
= 2, if the family size is >5 family members

X_5 = Uses of toilet for waste excreta

=2, if the respondents used toilet for waste excreta

=1, if the respondents did not use for waste excreta

X_6 = Sources of water

= 1, Not proper use of water sources

= 2, Proper use of water sources

X_7 = Proper practice of drinking water

= 1, Score “0”

= 2, Score “1”

= 3, Score “2”

= 4, Score “3”

X_8 = Proper practice of hand-washing

= 1, if the respondent did not wash hands properly

=2, if the respondent washed hands properly

X_9 = Uses of hand-washing accessories

= 1, if the respondents did not use hand-washing facilities properly

= 2, if the respondents used hand-washing facilities properly

X_{10} = Breastfeeding practices

= 1, if the respondents practice incorrectly

= 2, if the respondents practice correctly

X_{11} = Knowledge on complementary feeding

= 1, if respondents have incorrect knowledge

= 2, if respondents have correct knowledge

X_{12} = Practices on complementary feeding

= 1, if the respondents introduced complementary feeding less than six months of child age

= 2, if the respondents introduced complementary feeding at six months of child age

= 3, if the respondents introduced complementary feeding greater than six months of child age

X_{13} = Minimum Dietary Diversity Score

= 1, if the respondents fed the children less than 3 food groups with 24 hours

= 2, if the respondents fed the children 4-5 food groups with 24 hours

= 3, if the respondents fed the children more than 5 food groups with 24 hours

X_{14} = Completeness of immunization

= 1, if the children took immunization incompletely

= 2, if the children took immunization completely

X_{15} = Taking Vitamin 'A' Supplementation

= 1, if the children took vitamin 'A' supplementation

= 2, if the children did not take vitamin 'A' supplementation

X_{16} = History of illness

= 1, if the children were not ill last two weeks

= 2, if the children were ill last two weeks

4.4.1.2 Model Fitting for Stunted among Children Aged 3-5 years

The results of overall model evaluation for Binary Logistic Regression Model are shown in Table (4.8).

Table (4.8) Model Fitting Information for Stunted among Children Aged 3-5 years at *Waw* Township

Model Fitting Criteria	χ^2 value	df	p-value
Omnibus Tests of Model Coefficient	48.634	26	**0.005**
Hosmer and Lemeshow (H-L) Tests	11.389	8	0.181
-2 Log Likelihood	310.178		
Cox & Snell R-square	0.125		
Negelkerke R-square	0.200		
Overall Correct Prediction	81.3%		

Source: Survey Data, 2019

According to the Omnibus test, the model coefficients give a Chi-square of 48.634 on 26 df, significant beyond 0.005. It has been concluded that the LRA model for stunted

among children aged 3-5 years is significant. Also, it evidences for no lacking of fit the model based on the H-L statistics (χ^2=11.389, df=8, p=0.181). Since -2 Log Likelihood statistics is 310.178, it can be said that the existence of a relationship between the independent variables and dependent variables are supported. The model fitting information includes two different ways of estimating R^2 (Cox & Snell R^2 and Negelkerke R^2). This Pseudo- R^2 like 12.5% (Cox & Snell R^2) and 20% (Negelkerke R^2) indicates that the variation in the occurrence of stunted can be explained by the variation in independent variables. Also, it is evidenced that 81.3% of stunted are correctly predicted by this model.

4.4.1.3 Parameter Estimates for the Binary Logistic Regression Model of Stunted among Children Aged 3-5 years

The parameter estimates for LRA model of stunted among children aged 3-5 years at *Waw* Township are analyzed which is shown in table (4.9).

Table (4.9) Parameter Estimates for the Binary Logistic Regression Model of Stunted among Children Aged (3-5 years)

Variables	B	SE	Wald	df	p-value	Exp (B)	ME	95% CI	
								Lower	Upper
Constant*	3.474	1.919	3.277	1	**.070**	32.27			
Respondents' educational status			3.759	5	.585				
Illiterate (ref:)									
Read and Write*	-.964	.540	3.188	1	**.074**	.381	-0.1639	.132	1.099
Primary*	-1.049	.577	3.304	1	**.069**	.350	-0.1728	.113	1.086
Middle	-.987	.640	2.380	1	.123	.373	-0.1680	.106	1.306
High	-.885	.778	1.294	1	.255	.413	-0.1532	.090	1.895
University/Graduate	-20.29	11307.3	.000	1	.999	.000		.000	.
Respondents' occupational status			1.210	2	.546				
Dependent (ref:)									
In-house Business	-.012	.357	.001	1	.972	.988	-0.0004	.490	1.990
Out-house Business	.423	.431	.963	1	.326	1.527	-0.0621	.656	3.553
Monthly family income*			4.790	2	**.091**				
≤200,000 kyats (ref:)									
200,001-300,000 kyats	-.216	.363	.353	1	.552	.806	-0.0333	.396	1.642
≥300,001 kyats**	-1.057	.497	4.518	1	**.034**	.347	-0.1302	.131	.921

Variables	B	SE	Wald	df	p-value	Exp (B)	ME	95% CI	
								Lower	Upper
Family Size									
≤ 3 family members (ref:)									
> 3 family members	-.346	.335	1.068	1	.301	.708	-0.0461	.367	1.364
Use of toilet for waste excreta									
Not use (ref:)									
Use	.448	.475	.888	1	.346	1.565	0.0617	.617	3.972
Water sources									
Don't use of water from proper sources (ref:)									
Use of water from proper sources	-.443	.489	.822	1	.365	.642	-0.0624	.246	1.674
Proper practices of drinking water*			7.323	3	**.062**				
Score '0' (ref:)									
Score '1'**	-2.891	1.159	6.224	1	**.013**	.056	-0.5445	.006	.538
Score '2'**	-2.681	1.162	5.323	1	**.021**	.069	-0.5171	.007	.668
Score '3'*	-2.151	1.259	2.919	1	**.088**	.116	-0.4337	.010	1.372
Proper practices of hand washing									
Don't proper hand washing (ref:)									
Do Proper Hand washing	-.073	.358	.041	1	.839	.930	-0.0095	.461	1.874
Uses of hand washing accessories									
Don't use the right facilities (ref:)									
Use the right facilities	-.299	.407	.541	1	.462	.741	-0.0424	.334	1.646
Breastfeeding practices									
Incorrect breastfeeding practices (ref:)									
Correct breastfeeding practices	-.459	.383	1.434	1	.231	.632	-0.0611	.298	1.339
Knowledge on complementary feeding									
Incorrect Knowledge (ref:)									
Correct Knowledge	-.714	.436	2.682	1	.102	.490	-0.1113	.208	1.151
Practices on Complementary feeding			.302	2	.860				
Less than six months (ref:)									
At six months	-.111	.398	.077	1	.781	.895	-0.0622	.410	1.953
Above six months	-.427	.784	.296	1	.586	.653	-0.0075	.140	3.034

Variables	B	SE	Wald	df	p-value	Exp (B)	ME	95% CI	
								Lower	Upper
Minimum Dietary Diversity Score			3.137	2	.208				
Lowest Dietary Diversity (ref:)									
Medium Dietary Diversity	-.209	.385	.294	1	.588	.812	-0.0227	.382	1.726
High Dietary Diversity	.589	.502	1.375	1	.241	1.801	0.1089	.674	4.818
Completeness of immunization									
Uncompleted Immunization (ref:)									
Completed Immunization**	1.044	.426	6.013	1	**.014**	2.839	0.12878	1.233	6.538
Taking Vitamin 'A' Supplementation*									
Did not take (ref:)									
Take	-.919	.576	2.546	1	.111	.399	-0.1421	.129	1.233
History of illness									
Did not get sick (ref:)									
Got sick	-.194	.405	.229	1	.632	.824	-0.0242	.372	1.823

Source: Survey Data, 2019

*** denotes significant at 1% level, ** denotes significant at 5%,

* denotes significant at 10% level

In this Binary Logistic Regression modeling of the occurrence of the stunted among children age 3-5 years, 16 explanatory variables are determined. Apart from explanatory variables of educational status and monthly family income of respondents, proper practices of drinking water, and completeness of immunization to children, most of the explanatory variables are not statistically significant. Based on those results, the explanatory variables are presented relating with the statistically significant finding of this model.

As the educational status of the respondents, although the overall effect is not statistically significant (Wald=3.759, df=5, p=0.585). the 'b' coefficients for the educational level of 'read and write' and 'primary school level' are statistically significant and negative at 10% level, indicating the decreasing influence of the occurrence of stunted is associated. It is found that respondents with the educational level of read and write are (0.074) times less likely to have stunted children compared with the reference category of respondents who are illiterate (B=-0.964, OR=0.381). And the magnitude of the effect could be anywhere from a 0.132 decrease to 1.099

fold decrease. The marginal effect is -0.1639, it indicates that the percentage of stunted among children aged 3-5 years at *Waw* Township is 16.39% less for children whose mothers' educational status is able to read and write than illiterate mothers.

Additionally, respondents with educational level of primary school level of education are (0.069) times less likely to have stunted children in compared to the respondents' educational status of illiterate (reference category). The 90% confidence interval suggests that the magnitude of the effect can be anywhere from a 0.113 fold to a 1.086 fold decrease. Also, the marginal effect is -0.1728, it means that the percentage of being stunted among children is 17.28% less for mothers' who have educational status of primary school level than illiterate mothers.

And the overall Wald test for monthly family income is statistically significant at 10% level (Wald=4.790, df=2, p=0.091). In preceding the individual regression coefficients, the coefficient of family which earned more than 300,000 Kyats is -1.057, indicating negative and statistically significant at 5% level. Its odds ratio suggests that children aged 3-5 years from the family which earned of more than 300,000 Kyats monthly is 0.347 times less likely to have stunted children than the respondents who got the monthly family income of less than and equal to 200,000 Kyats. The value of marginal effect is -0.1302; it meant that the percentage of being stunted among children aged 3-5 years is 13.02% less for the respondents who earned more than 300,000 Kyats monthly than those respondents who earned less than 200,000 Kyats monthly. Based on this finding, it can be assumed that the children from the better earned family seem to have less stunted children than those children from the less earned family.

Next, proper drinking practices of the respondents is statistically significant at 10% level in account for the overall Wald test (Wald = 7.323, df=3, p=0.062). As the individual regression coefficients, this study evidences that the respondents who got the higher score on proper drinking practices is negatively associated with the possibility of stunted among children aged 3-5 years at *Waw* Township as indicated by 0.056 times less likely to have stunted children among the respondents who got those score of '1' (B=-2.891, OR=0.056) compared to the respondents who got those score of '0'. And the value of its marginal effect is -0.5445; it shows that the

percentage of being stunted among those children is 54.45% less than the children whose mothers got those score of ‘0’.

Moreover, the odds ratio for the respondents who got the score of ‘2’ on proper drinking practices indicates 0.069 times less likely to have stunted children than reference category of those respondents who got those score of ‘0’(B=-2.681, OR=0.069). And the value of its marginal effect (ME=-0.5171) shows that the percentage of the occurrence of stunted among children aged 3-5 years is 51.71% less likely for this variable, holding the other independent variables constant at the reference point. And, the coefficient of the respondents who got the score on proper drinking practices is -2.151 and the odds ratio is 0.116. It indicates 0.116 times less likely to have stunted children among the respondents who got those score of ‘3’ when the influences of other selected predictors are held constant. The marginal effect (ME=-0.4337) shows that the percentage of the occurrence of stunted among children aged 3-5 years is 43.37% less than the reference category of the respondents who got the score of ‘0 on proper drinking practices. According to the revealed findings, it can be suggested that the more proper practices on drinking water among respondents, the less occurrence of stunted among children aged 3-5 years at *Waw* Township.

Additionally, the coefficient of completeness of immunization is 1.044 and its odds ratio is 2.839. It indicates that the completeness of immunization is positively related with the occurrence of stunted among children aged 3-5 years which is statistically significant at 5% level. Based on the result of odds ratio (OR=2.839), those children who were competed immunization are about 2.839 times more likely to be stunted than the children who did not complete the immunization (reference category). The magnitude of effect can be anywhere from a 1.233 fold increase to a 6.538 fold increase at 95% confidence interval. The marginal effect is 0.1288; it means that the percentage of the occurrence of stunted is 12.88% higher for children who got the complete immunization schedule. As this finding is different from theoretical literature; it should be recommended for further studies.

4.4.2 Determinants for Underweight among Children Aged 3-5 years

In this section, determinants for underweight among children aged 3-5 years are analyzed using Binary Logistic Regression Model.

4.4.2.1 Variables in the Model

Underweight is dependent variable and it is given "1" when the children had underweight (mild to severely underweight) and "0" when those children were not being underweight. The variables of this model are as follows.

Y = 1, if the children were being in any degree of underweight
= 0, if the children were not being underweight

X1 = respondents' educational status
= 1, if the respondent's educational level is illiterate
= 2, if the respondent's educational level is able to read and write
= 3, if the respondent's educational level is primary school passed
= 4, if the respondent's educational level is middle school passed
= 5, if the respondent's educational level is high school passed
= 6, if the respondent's educational level is graduate

X2 = respondents' occupational status
= 1, if the respondent is dependent
= 2, if the respondent employs in-house business
= 3, if the respondents employs out-house business

X3 = Monthly family income
= 1, if the family's average income was ≤200,000 kyats
= 2, if the family's average income was 200,001-300,000 kyats
= 3, if the family's average income was >300,000 kyats

X4 = Family size
= 1, if the family size is ≤ 5 family members
= 2, if the family size is >5 family members

X5 = Uses of toilet for waste excreta

=2, if the respondents used toilet for waste excreta

=1, if the respondents did not use for waste excreta

X6 = Sources of water

= 1, Not proper use of water sources

= 2, Proper use of water sources

X7 = Proper practice of drinking water

= 1, Score “0”

= 2, Score “1”

= 3, Score “2”

= 4, Score “3”

X8 = Proper practice of hand-washing

= 1, if the respondent did not wash hands properly

=2, if the respondent washed hands properly

X9 = Uses of hand-washing accessories

= 1, if the respondents did not use hand-washing facilities properly

= 2, if the respondents used hand-washing facilities properly

X10 = Breastfeeding practices

= 1, if the respondents practice incorrectly

= 2, if the respondents practice correctly

X11 = Knowledge on complementary feeding

= 1, if respondents have incorrect knowledge

= 2, if respondents have correct knowledge

X12 = Practices on complementary feeding

= 1, if the respondents introduced complementary feeding less than six months of child age

= 2, if the respondents introduced complementary feeding at six months of child age

= 3, if the respondents introduced complementary feeding greater than six months of child age

X13 = Minimum Dietary Diversity Score

= 1, if the respondents fed the children less than 3 food groups with 24 hours

= 2, if the respondents fed the children 4-5 food groups with 24 hours

= 3, if the respondents fed the children more than 5 food groups with 24 hours

X14 = Completeness of immunization

= 1, if the children took immunization incompletely

= 2, if the children took immunization completely

X15 = Taking Vitamin 'A' Supplementation

= 1, if the children took vitamin 'A' supplementation

= 2, if the children did not take vitamin 'A' supplementation

X 16 = History of illness

= 1, if the children were not ill last two weeks

4.4.2.2 Model Fitting for Underweight among Children Aged 3-5 years

The result of overall model evaluation for Binary Logistic Regression Model are shown in Table (4.10).

Table (4.10) Model Fitting Information for Underweight among Children Aged (3-5 years) at *Waw* Township

Model Fitting Criteria	χ^2 value	df	p-value
Omnibus Tests of Model Coefficient	58.070	26	**0.000**
Hosmer and Lemeshow (H-L) Tests	5.750	8	0.675
-2 Log Likelihood	436.789		
Cox & Snell R-square	0.148		
Negelkerke R-square	0.199		
Overall Correct Prediction	67.5%		

Source: Survey Data, 2019

As shown in above table, the Omnibus tests of model coefficients are statistically significant (χ^2 = 58.070, df = 26, p=0.000 which can be concluded that the model for determinants of having underweight among children aged 3-5 years with above mentioned explanatory variables is significant. Also, it is found that the deviance

statistics -2 Log Likelihood statistics is 436.789 which is insignificant by expressing the H-L statistics (χ^2=5.750, df=8, p=0.675). Due to those statistically insignificant finding of the H-L statistics, it can be said that the model is well suitable for modeling.

Additionally, the Pseudo- R^2 like 14.8% (Cox & Snell R^2) and 19.9% (Negelkerke R^2) indicates that the variation in the occurrence of stunted among children aged 3-5 years can be explained by the variation in independent variables. In which, 67.5% of underweight among children aged (3-5 years) in *Waw* Township can be correctly estimated by this model.

4.4.2.3 Parameter Estimates for the Binary Logistic Regression Model of Underweight among Children Aged 3-5 years

The parameter estimates for underweight among children aged 3-5 years are modeled with LRA. Those parameter estimates for determinants of being underweight among children aged 3-5 years at *Waw* Township in Binary Logistic Regression Model are shown in table (4.11).

Table (4.11) Parameter Estimates for the Binary Logistic Regression Model of Underweight among Children Aged (3-5 years)

Variables	B	SE	Wald	df	p-value	Exp (B)	ME	95% CI	
								Lower	Upper
Constant*	2.061	1.728	1.423	1	.233	7.857			
Respondents' educational status			8.775	5	.118				
Illiterate (ref:)									
Read and Write	-.750	.497	2.278	1	.131	.472	-0.1614	.178	1.251
Primary	-.232	.533	.191	1	.662	.793	-0.0383	.279	2.251
Middle	-.275	.565	.237	1	.627	.760	-0.0611	.251	2.297
High	.709	.733	.936	1	.333	2.031	0.1266	.483	8.537
University/Graduate	-.170	.922	.034	1	.854	.844	-0.0407	.139	5.139
Respondents' occupational status			1.746	2	.418				
Dependent (ref:)									
In-house Business	-.306	.284	1.157	1	.282	.737	-0.0577	.422	1.286
Out-house Business	-.409	.351	1.362	1	.243	.664	-0.0849	.334	1.321

Variables	B	SE	Wald	df	p-value	Exp (B)	ME	95% CI	
								Lower	Upper
Monthly family income* **			18.756	2	**.000**				
≤200,000 kyats (ref:)									
200,001-300,000 kyats* **	1.235	.308	16.080	1	**.000**	3.437	0.2720	1.880	6.285
≥300,001 kyats* **	1.353	.376	12.948	1	**.000**	3.868	0.3058	1.851	8.083
Family Size									
≤ 3 family members (ref:)									
> 3 family members	.064	.265	.058	1	.810	1.07	0.0168	.634	1.791
Use of toilet for waste excreta									
Not use (ref:)									
Use	-.537	.376	2.042	1	.153	.585	-0.0877	.280	1.22
Water sources									
Don't use of water from proper sources (ref:)									
Use of water from proper sources*	.632	.383	2.722	1	**.099**	1.881	0.1278	.888	3.982
Proper practices of drinking water			3.441	3	.329				
Score '0' (ref:)									
Score '1'	-1.051	1.224	.738	1	.390	.349	-0.1856	.032	3.848
Score '2'	-1.571	1.238	1.609	1	.205	.208	-0.2976	.018	2.353
Score '3'	-.978	1.330	.540	1	.462	.376	-0.1696	.028	5.101
Proper practices of hand washing									
Don't proper hand washing (ref:)									
Do Proper Hand washing	.309	.309	.997	1	.318	1.362	0.0684	.743	2.496
Uses of hand washing accessories									
Don't use the right facilities (ref:)									
Use the right facilities	-.053	.322	.027	1	.871	.949	0.5789	.505	1.784
Breastfeeding practices									
Incorrect breastfeeding practices (ref:)									
Correct breastfeeding practices	.038	.287	.018	1	.893	1.039	0.0039	.592	1.824
Knowledge on complementary feeding									
Incorrect Knowledge (ref:)									
Correct Knowledge	-.008	.349	.001	1	.982	.992	-0.0089	.501	1.966

Variables	B	SE	Wald	df	p-value	Exp (B)	ME	95% CI	
								Lower	Upper
Practices on Complementary feeding			.020	2	.990				
Less than six months (ref:)									
At six months	.031	.307	.010	1	.919	1.032	0.5819	.565	1.884
Above six months	.082	.651	.016	1	.900	1.085	0.6591	.303	3.886
Minimum Dietary Diversity Score			2.010	2	.366				
Lowest Dietary Diversity (ref:)									
Medium Dietary Diversity	.406	.306	1.762	1	.184	1.501	0.6209	.824	2.735
High Dietary Diversity	.093	.429	.047	1	.828	1.097	0.5806	.474	2.542
Completeness of immunization									
Uncompleted Immunization (ref:)									
Completed Immunization* **	-1.022	.337	9.191	1	**.002**	.360	-0.197	.186	.697
Taking Vitamin 'A' Supplementation									
Did not take (ref:)									
Take*	.884	.519	2.900	1	**.089**	2.421	0.1860	.875	6.700
History of illness									
Did not get sick (ref:)									
Got sick	.351	.322	1.185	1	.276	1.420	0.0803	.755	2.670

Source: Survey Data, 2019

*** denotes significant at 1% level, * denotes significant at 10%

Through LRA modeling, it is indicated that the independent variables such as monthly family income and completeness of immunization are statistically significant at 1% level. And the independent variables of water sources and taking vitamin 'A' supplementation are statistically significant at 10% level. Concerning with those findings, it describes in this section.

Conducting Logistic Regression Analysis, the overall effect of monthly family income is statistically significant (Wald=118.756, df=2, p=0.000). The 'b' coefficients for all monthly family income level are significant and positive, indicating that the increased occurrence of underweight among children aged 3-5 years is associated. Particularly, the coefficient of monthly family income of 200,001-

300,000 Kyats is 1.235 and odds ratio is 3.437. It indicates that the children from the family which earned 200,001-300,000 Kyats monthly are 3.437 times more likely to have underweight children than those from the monthly family income of less than 200,000 Kyats. And the magnitude of the effect can be anywhere from a 1.880 fold to 6.285 fold increase at 99% confidence interval. The value of marginal effect (ME=0.2720) indicates that the percentage of being underweight among children aged (3-5 years) is 27.2% more than those children from the monthly family income of less than 200,000 Kyats, holding other independent variables constant at reference point.

According to the individual regression analysis, the results shows that family who got the income more than 300,000 Kyats is 1.353 times more likely to have underweight children compared with those children from family who got the monthly income less than 200,000 Kyats (B= 1.353, OR = 3.863). The marginal effect (ME=0.3058) indicates that the percentage of having underweight among children aged 3-5 years from family which earned more than 300,000 Kyats is 30.58% higher than those children from the monthly family income of less than 200,000 MMK, holding other independent variables constant at reference point.

Unexpectedly, the findings reveal that use of water from proper sources is positively associated with having underweight among children aged 3-5 years which is statistically significant at 10% level, indicating use of water from proper sources appears to be 1.881times more likely to have underweight children compared to children from family do not use water from proper sources (B=0.632, OR=1.881). The value of marginal effect (ME=0.1278) indicates that the percentage of having underweight among children aged (3-5 years) is 12.78% more than those children from family did not use water from proper sources, holding other independent variables constant at reference point. Due to different evidence from theoretical literatures, further studies should be suggested.

Moreover, the coefficient of completeness of immunization is negatively related with underweight among children aged (3-5 years) which is statistically significant at 1% level. The odds ratio for completeness of immunization (OR=0.360) shows that the occurrence of underweight is about 0.36 times less likely to occur among children got completed immunization in compared to children who did not get immunization completely. The 95% confidence level suggests that the magnitude of the effects can

be anywhere from a 0.186 fold to a 0.697 fold decrease. The marginal effect (ME=-0.1970) shows that the percentage of having underweight among children aged 3-5 years is 19.7% less than those children who did not get immunization completely, holding other independent variables constant at reference point.

Furthermore, the coefficient of taking vitamin 'A' supplementation is 0.884 and the odds ratio is 2.421; it reveals that children who took vitamin 'A' supplementation is positively associated with the occurrence of underweight among children aged 3-5 years which is statistically significant at 10% level. And those children who took vitamin 'A' supplementation are 2.421 times more likely to be underweight than the children who did not take vitamin 'A'. The marginal effect (ME=-0.1860) shows that the percentage of the occurrence of underweight among children aged 3-5 years is 18.6% higher than those children who did not take vitamin 'A', holding other independent variables constant at reference point.

To sum up, the developed logistic regression model for determinants of underweight shows that the occurrence of underweight among children aged 3-5 years decreases by taking immunization completely, while children who are from the family of monthly higher income, from the family which use water from proper source and child who took vitamin 'A' increases the chance of being underweight among those children in *Waw* Township. It points out to conduct further studies for identifying the individualized determinants on nutritional statuses among children aged 3-5 years.

4.4.3 Determinants for Wasted among Children Aged 3-5 years

In this section, Binary Logistic Regression Model is applied to determine the determinants of wasted among children aged 3-5 years at *Waw* Township.

4.4.3.1 Variables in the Model

Wasted is dependent variable and it was given "1" when the children had wasted (mild to severely wasted) and "0" when those children were not being wasted. The variables of this model are as follows.

Y = 1, if the children were being in any degree of wasted

= 0, if the children were not being wasted

X1 = respondents' educational status

= 1, if the respondent's educational level is illiterate

= 2, if the respondent's educational level is able to read and write

= 3, if the respondent's educational level is primary school passed

= 4, if the respondent's educational level is middle school passed

= 5, if the respondent's educational level is high school passed

= 6, if the respondent's educational level is graduate

X2 = respondents' occupational status

= 1, if the respondent is dependent

= 2, if the respondent employs in-house business

= 3, if the respondents employs out-house business

X3 = Monthly family income

= 1, if the family's average income was ≤200,000 kyats

= 2, if the family's average income was 200,001-300,000 kyats

= 3, if the family's average income was >300,000 kyats

X4 = Family size

= 1, if the family size is ≤5 family members

= 2, if the family size is >5 family members

X5 = Uses of toilet for waste excreta

=2, if the respondents used toilet for waste excreta

=1, if the respondents did not use for waste excreta

X6 = Sources of water

= 1, Not proper use of water sources

= 2, Proper use of water sources

X7 = Proper practice of drinking water

= 1, Score "0"

= 2, Score "1"

= 3, Score "2"

= 4, Score "3"

X8 = Proper practice of hand-washing

= 1, if the respondent did not wash hands properly

=2, if the respondent washed hands properly

X9 = Uses of hand-washing accessories

= 1, if the respondents did not use hand-washing facilities properly

= 2, if the respondents used hand-washing facilities properly

X10 = Breastfeeding practices

= 1, if the respondents practice incorrectly

= 2, if the respondents practice correctly

X11 = Knowledge on complementary feeding

= 1, if respondents have incorrect knowledge

= 2, if respondents have correct knowledge

X12 = Practices on complementary feeding

= 1, if the respondents introduced complementary feeding less than six months of child age

= 2, if the respondents introduced complementary feeding at six months of child age

= 3, if the respondents introduced complementary feeding greater than six months of child age

X13 = Minimum Dietary Diversity Score

= 1, if the respondents fed the children less than 3 food groups with 24 hours

= 2, if the respondents fed the children 4-5 food groups with 24 hours

= 3, if the respondents fed the children more than 5 food groups with 24 hours

X14 = Completeness of immunization

= 1, if the children took immunization incompletely

= 2, if the children took immunization completely

X15 = Taking Vitamin ‘A’ Supplementation

= 1, if the children took vitamin ‘A’ supplementation

= 2, if the children did not take vitamin ‘A’ supplementation

X 16 = History of illness

= 1, if the children were not ill last two weeks

4.4.3.2 Model Fitting for Wasted among Children Aged 3-5 years

The result of overall model evaluation for Binary Logistic Regression Model are shown in Table (4.12).

Table (4.12) Model Fitting Information for Wasted among Children Aged 3-5 years at *Waw* Township

Model Fitting Criteria	χ^2 value	df	p-value
Omnibus Tests of Model Coefficient	144.975	26	**0.000**
Hosmer and Lemeshow (H-L) Tests	8.994	8	0.343
-2 Log Likelihood	353.609		
Cox & Snell R-square	0.329		
Negelkerke R-square	0.441		
Overall Correct Prediction	74.7%		

Source: Survey Data, 2019

In fitting the model with Binary Logistics Regression, it reveals that the Omnibus tests of model coefficients is statistically significant at 1% level ($\chi 2$= 144.975, df=26, p=0.000). It has been concluded that the model for determinants of being wasting among children aged 3-5 years with above mentioned explanatory variables is efficient. Also, there are no evidence of lack of fit based on the H-L statistics (χ^2=8.994, df=8, p=0.343). Since -2 Log Likelihood statistics is 353.609 with statistically insignificant, it can be said that the model is well fit to proceed.

Additionally, the Pseudo- R^2 like 32.9% (Cox & Snell R^2) and 44.1% (Negelkerke R^2) indicates that the variation in the occurrence of stunted could be explained by the variation in independent variables. In which, 74.7% of the occurrence of underweight among children aged 3-5 years in *Waw* Township can be correctly classified by this model.

4.4.3.3 Parameter Estimates for the Binary Logistic Regression Model of Wasted among Children Aged 3-5 years

The estimates obtained in logistic regression model for wasted among children aged 3-5 years at *Waw* Township are presented in table (4.13).

Table (4.13) Parameter Estimates for the Binary Logistic Regression Model for Wasted among Children Aged 3-5 years

Variables	B	SE	Wald	df	p-value	Exp (B)	ME	95% CI	
								Lower	Upper
Constant*	1.785	1.643	1.180	1	.277	5.959			
Respondents' educational status			8.205	5	.145				
Illiterate (ref:)									
Read and Write	-.462	.529	.762	1	.383	.630	-0.0716	.224	1.776
Primary	.247	.571	.187	1	.666	1.280	0.0437	.418	3.918
Middle	-.230	.593	.151	1	.698	.794	-0.0371	.248	2.540
High	.770	.714	1.163	1	.281	2.159	0.1336	.533	8.745
University/Graduate	1.133	.952	1.416	1	.234	3.104	0.1974	.481	20.06
Respondents' occupational status			3.187	2	.203				
Dependent (ref:)									
In-house Business	-.519	.332	2.446	1	.118	.595	-0.0844	.311	1.140
Out-house Business	-.558	.382	2.140	1	.144	.572	-0.0913	.271	1.209
Monthly family income			1.696	2	.428				
≤200,000 kyats (ref:)									
200,001-300,000 kyats	-.366	.357	1.050	1	.305	.694	-0.0583	.344	1.396
≥300,001 kyats	.029	.418	.005	1	.945	1.029	0.0168	.454	2.335
Family Size									
≤ 3 family members (ref:)									
> 3 family members	.269	.308	.763	1	.383	1.31	0.4764	.716	2.393
Use of toilet for waste excreta									
Not use (ref:)									
Use	-.117	.421	.077	1	.781	.890	-0.0154	.390	2.030
Water sources									
Don't use of water from proper sources (ref:)									
Use of water from proper sources	.598	.411	2.116	1	.146	1.818	0.1277	.812	4.069
Proper practices of drinking water			7.979	3	.046				
Score '0' (ref:)									
Score '1'	-.792	.979	.655	1	.418	.453	-0.1856	.067	3.083
Score '2'	-1.397	1.001	1.948	1	.163	.247	-0.2976	.035	1.759
Score '3'	.238	1.115	.046	1	.831	1.269	-0.1696	.143	11.28

Variables	B	SE	Wald	df	p-value	Exp (B)	ME	95% CI	
								Lower	Upper
Proper practices of hand washing									
Don't proper hand washing (ref:)									
Do Proper Hand washing	-.394	.368	1.148	1	.284	.674	0.0684	.328	1.387
Uses of hand washing accessories									
Don't use the right facilities (ref:)									
Use the right facilities*	.671	.349	3.691	1	**.055**	1.956	0.5499	.987	3.879
Breastfeeding practices									
Incorrect practices (ref:)									
Correct practices*	.541	.315	2.951	1	**.086**	1.718	0.0039	.927	3.184
Knowledge on complement: feeding									
Incorrect Knowledge (ref:)									
Correct Knowledge	.207	.378	.301	1	.583	1.230	0.4516	.587	2.579
Practices on Complement: feeding			.222	2	.895				
Less than six months (ref:)									
At six months	-.128	.343	.140	1	.708	.880	-0.4713	.450	1.722
Above six months	.082	.667	.015	1	.902	1.09	0.3835	.294	4.016
Minimum Dietary Diversity Score			.513	2	.774				
Lowest Dietary Diversity (ref:)									
Medium Dietary Diversity	.057	.353	.026	1	.873	1.058	0.4821	.529	2.115
High Dietary Diversity	-.260	.496	.275	1	.600	.771	-0.3685	.292	2.037
Completeness of immunization									
Uncompleted Immunization (ref:)									
Completed Immunization	-.472	.402	1.383	1	.240	.623	-0.0793	.284	1.370
Taking Vitamin 'A' Supplementation									
Did not take (ref:)									
Take* **	-1.924	.563	11.691	1	**.001**	.146	-0.3614	.048	.440
History of illness									
Did not get sick (ref:)									
Got sick **	-.858	.380	5.095	1	**.024**	.424	-0.1286	.201	.893

Source: Survey Data, 2019

*** denotes significant at 1% level, ** denotes significant at 5%,

* denotes significant at 10%

Due to the results of Binary Logistic Regression on wasted among children aged 3-5 years, taking vitamin 'A' supplementation is statistically significant at 1% confidence level. And history of illness is statistically significant at the 5% level while correct breastfeeding practices and correct use of hand washing accessories are statistically significant at 10% level. By highlighting the statistically significant findings, the results of Binary Logistics Regression for determinant of wasted among children aged 3-5 years will be presented in this section.

Also, the coefficient of taking vitamin 'A' supplementation by children aged 3-5 years in *W*aw Township is statistically significant and negative direction at 1% level (B=-1.924, OR=0.146). It is indicated that the children who took vitamin 'A' are 0.146 times less likely to be wasted compared to those children who did not take vitamin 'A' supplementation. And the magnitude of the effect can be anywhere from a 0.048 fold decrease to a 0.440 fold decrease. The marginal effect (ME=-0.3614) shows that the percentage of the occurrence of wasted among children aged 3-5 years is 36.14% less than those children who did not take vitamin 'A', holding other independent variables constant at reference point.

In addition, the result of this study evidences that the coefficient of getting sick in 2 weeks ago is negatively related with having wasted on children aged 3-5years at *Waw* Township compared to children who did not get sick in 2 weeks ago (B=-0.858, OR=0.424). It is statistically significant at 5% level and there is 0.424 times less likely to be wasting among children who got sick two weeks ago than children who did not get sick. And the magnitude of the effect can be anywhere from a 0.201 fold decrease to a 0.893 fold decrease at 95% confidence interval. The marginal effect (ME=-0.1286) indicates that the percentage of the occurrence of wasted among children aged 3-5 years is 12.86% less than those children who did not get sick in two weeks ago, holding other independent variables constant at reference point. As this result is a different finding from theoretical literature, the additional studies should be recommended.

Additionally, the coefficient of correct breastfeeding practices indicates that children who got the correct breastfeeding practices is positively associated with the

occurrence of wasted among children which is statistically significant at 10% level. And it indicates that children who got correct breastfeeding practices appears to be 1.718 times more likely to be wasted compared to children who did not get correct breastfeeding practices (B=0.541, OR=1.718). The value of marginal effect (ME=0.0039) indicates that the percentage of the occurrence of wasted among children aged 3-5 years was 0.39% more than those children who did not got correct breast feeding, holding other independent variables constant at reference point. According to this unpredicted finding, further studies will be needed in this area.

Also, the coefficient of use of hand washing facilities is positively associated with the occurrence of wasted which is statistically significant at 10% level. It evidences that uses of hand washing facilities appears to be about 2 times more likely to have wasted children compared to children from family did not use hand washing facilities (B=0.671, OR=1.956). The value of marginal effect (ME=0.5499) indicates that the percentage of the occurrence of wasted among children aged 3-5 years is 54.99% more than those children from family did not use hand washing facilities, holding other independent variables constant at reference point. As it is quite different from theoretical literature, the additional studies will be suggested.

In conclusion to this chapter, some factor like completeness of immunization determines unexpectedly on the occurrence of stunted among children aged 3-5 years. Also, variables such as monthly family income, use of water from proper sources and taking vitamin 'A' supplementation gives the unpredicted findings on the determinants of the occurrence of underweight among those children. Some variables such as use of hand washing facilities, correct breast feeding practices and history of illness in children previous two weeks are surprisingly influenced on the occurrence of under-nutrition among children aged 3-5 years. Those findings indicates to conduct further studies to inference the typical determinants of each nutritional indicators of stunted, underweight and wasted among the children aged 3-5 years.

CHAPTER V

CONCLUSION

This study was conducted at *Waw* Township using cross-sectional primary survey. Stratified two stage random sampling was done by assuming equal allocation of respondents from both rural and urban areas. The summary of this study is presented in this chapter by dividing into three ports such as findings, conclusion and recommendations.

5.1 Findings

This study aimed to analyze the determinants of children aged 3-5 years at *Waw* Township using primary survey method. Through stratified two stage random sampling, four wards such as *Chan Mya Tharsi* ward, *Aye Chan Tharyar* ward, *Kandaw* ward and *Waw Ah Shey Bet Kan* ward and four villages such as *Pyon Su* village, *Inn Taing Su* village, *Oo Moe Su* village and *Kyar La Har* village were selected in first stage. Among them, 363 respondents with children aged 3-5 years were selected randomly in second stage.

Next, anthropometric measurements of the children such as weight, height and mid-upper arm circumstances were measured by the respective midwives of each study setting. After that, data were collected by self-administered questionnaire. To identify the determinants of nutritional status of those children aged 3-5 years, the collected data were analyzed by Binary Logistic Regression.

In this study, nutritional status of children aged 3-5 years were expressed as three indicators of stunted (Height-for-age), underweight (Weight-for-age) and wasted (Weight-for-height) according to the criteria of WHO (2009). As a nutritional indicator of stunted among children aged 3-5 years, it is found that 289 (79.6%) of

those children are normal while the rest of those children are 62(17.1%), 9(2.5%) and 3(0.8%) are moderately stunted, severely stunted and above normal respectively.

In addition, the prevalence of underweight among children of this study evidences as 164 (45.2%) of those children are mildly underweight, 27(7.4%) are moderately underweight and 18 (5%) are severely underweight. On the other hand, 147 (40.5%) of those children are normal while 7 (1.9%) have possible growth problem. As another nutritional indicator of wasted among children aged 3-5 years, 2 (0.6%) of children from this study are obese while 12 (3.3%) of those children are severely wasted although 186 (51.2%) of children are normal. According the revealed findings of the nutritional status among children aged 3-5 years in *Waw* Township, it is evidenced that the children from this study suffered from double burden of malnutrition. It should be recommended to strengthen the public health services of nutritional intervention by collaboration and coordination with community, policy makers and health care professionals.

Due to the three nutritional indicators, the individualized model for determinants of stunted, underweight and wasted among children aged 3-5 years in *Waw* Township are developed in this study. It was evidenced that educational status and monthly family income apart from other socio-demographic characteristics of respondents was associated with the nutritional status of children aged 3-5 years at *Waw* Township.

Through LRA modeling, it was found that the variables of educational status of respondents, monthly family income, proper practices of drinking water and completeness of immunization are statistically significant among the 16 explanatory variables of the occurrence of stunted among children aged 3-5 years in *Waw* Township. Whereas, the more family income, the less occurrence of stunting among those children will be. If respondents performed the proper practices of drinking water, it is less likely have stunted children in those respondents than children from the respondents who did not perform the proper practices of drinking water. However, chance of stunting will be increased by completeness of immunization due to the positive coefficients of these variables (B=1.044, OR=2.839). As these unpredicted findings from theoretical literatures, the additional studies should be suggested.

Moreover, the logistic regression on the occurrence of underweight among children 3-5 years is determined by the 16 explanatory variables. It is found that monthly family income, water sources, completeness of immunization and taking vitamin 'A' supplementation are statistically significant in determining the occurrence of underweight among children aged 3-5 years apart from other explanatory variables. According to the evidenced findings, the occurrence of underweight will reduce 0.36 times than those children who did not get immunization completely (B=-1.022, OR=0.36, ME=0.197, p=0.002) if the children aged 3-5 years got immunization completely.

Additionally, LRA modeling for wasted among children aged 3-5 years found that use of hand washing facilities, correct breastfeeding practices, taking vitamin 'A' supplementation and having illness in the previous two weeks are statistically significant among 16 the explanatory variables of this model. It is revealed that the children who took vitamin 'A' supplementation is 0.146 times less likely to be wasted compared to those children who did not take vitamin 'A' supplementation. However, the unpredictable findings can be seen in the individual regression analysis of some explanatory variables such as use of hand washing facilities, correct breastfeeding practices and history of having illness in the previous two weeks. These findings highlight the additional studies to analyze the effects of those variables on the occurrence of wasted in children 3-5 years at *Waw* Township.

Based on the findings of this study, the prevalence of under nutrition such as stunted, underweight and wasting are quite high in relation to the country's prevalence. And, it can be said that some determinants found in this study were quite different form expected predictors of the literatures. These findings highlight on public health interventions in order to combat the nutritional problems among children aged 3-5 years at *Waw* Township. Also, additional studies will be suggested in order to analyze the key determinants on those nutritional statuses.

5.2 Discussions

Nowadays, unhealthy eating patterns and food insecurity challenge the good nutritional status among children. Along with the lifestyle changes, the determinants of nutritional status among children might be changed day after day. Thus, this study aimed to study the determinants of nutritional status among children the occurrence of wasted among the children aged 3-5 years using cross-sectional primary survey. Stratified two stage random sampling was applied to select the required samples. And Binary Logistic Regression Model was applied to identify its key determinants of nutritional status among children aged 3-5 years at *Waw* Township.

In this study setting, the double burden of malnutrition such as under nutrition and over nutrition are affected among children aged 3-5 years. Accordingly, feeding practices and its influencing factors will be necessary to study the actual impacts on nutritional status among children. Particularly, this study describes that the predictors of stunted among children aged 3-5 years such as educational status, monthly family income, proper drinking practices, and completeness of immunization are statistically significant among 16 predictors of this model. And, the explanatory variables of underweight among children aged 3-5 years such as monthly family income, sources of water, completeness of immunization and taking vitamin 'A' supplementation are statistically significant than the remaining explanatory variables.

Furthermore, Logistic Regression Model for the occurrence of wasted among children aged 3-5 years in *Waw* Township is determined by 16 predictors. Among them, use of hand washing facilities, breastfeeding practices, taking vitamin 'A' supplementation, and history of illness in previous two weeks are statistically significant. Addressing the determinants of nutritional status among children can reduce the potential negative impacts on child growth and development.

By highlighting the results of this study, it was imperative to take collective actions between community members, health care personnel and policy makers for proper nutritional interventions among children. More importantly, community awareness on

childhood malnutrition should be strengthened in order to gain good nutritional status among children which would help in country's development. Also, future researches should be conducted in this area to reduce the burden of nutrition related problems.

5.3 Recommendations

Based on the findings of the study, the following considerations would be recommended.

(1) To reduce the risk of malnutrition in this area, health education program such as risk of malnutrition, nutrition education, water and sanitation practices should be provided periodically that would encourage the community awareness for home based nurturing practices in order to facilitate the good nutritional among children.

(2) Provision of public health care strategies should be strengthened effectively and efficiently to meet the health care needs of the targeted population.

(3) An effective coordination mechanism should be developed in order to sustain the collective actions for reduction of double burden of malnutrition.

(4) Further nutritional researches using mixed method approach should be recommended to uncover the context of malnutrition.

REFERENCES

Agresti, A. (2007). *An Introduction to Categorical Data Analysis* (2nd ed.). Canada: John Wiley and Sons, Inc.

Ajani, O. (2008). *Gender Dimensions of Agriculture, Poverty, Nutrition and Food Security in Nigeria*. NSSP Background Paper 4. Washington, DC: IFPRI. Retrieved from https://www.africaportal.org/documents/5162/NSSP_Background_Paper_5.pdf

Allen, L. H., & Gillespie, S. R. (2001).*What works? A review of the efficacy and effectiveness of nutrition interventions*. Manila; United Nations Administrative Committee on Coordination Sub-Committee on Nutrition (ACC/SCN). Retrieved from https://www.adb.org/sites/default/files/publication/27916/what-works-nutrition-interventions.pdf

Bago Health and Sports Department. (2016). *Regional Health Report*.Bago: Author.

Black, R. E., Allen, L. H., & Bhutta, Z. A., et al. (2008). Maternal and child under-nutrition: global and regional exposures and health consequences. *The Lancet*, *371*(9608), 243-260. Retrieved from https://doi.org/10.1016/S0140-6736(07) 61690-0

Chadha, V. K. (2006). Sample size determination in health studies. *NTI Bulletin, 42*(3&4), 55-62. Retrieved from https://pdfs.semanticscholar.org/54ce/51e7d0292aefbc78a8a7f2c81413831b9c7e.pdf

Cox, D. R. & Snell, E.J. (1989). *Analysis of Binary Data*, (2nd ed.). London: Chapman and Hall/CRC. Retrieved from https://www.scirp.org/(S(vtj3fa45qm1ean45vvffcz55))/reference/ReferencesPapers.aspx?ReferenceID=2052223

Dieh, H. A., (2015). *Nutritional Assessment*. Retrieved from https://www.slideshare.net/hanialzo3bi/nutritional-assessment-48772870

Food and Agriculture Organization (FAO). (2003). *The state of food insecurity in the world*.Italy: Author. Retrieved from http://www.fao.org/3/j0083e/j0083e00.htm

FAO. (2007). *Nutritional Status Assessment and Analysis Nutritional Status Indicators Learner Notes*. Retrieved from https://oerafrica.org/FTPFolder/Agriculture/ Nutrition/pdf/lessons/lesson0281.pdf

FAO. (2009). *The State of Food Insecurity in the World: Economic Crises – Impacts and Lessons Learned.* Retrieved from www.fao.org

General Administration Department. (2017). *ပဲခူးခရိုင်၊ ဝေါ်မြို့နယ်၏ ဒေသဆိုင်ရာအချက်အလက်*. Retrieved from gad.gov.mm/my/content/ ပဲခူးခရိုင်၊ ဝေါ်မြို့နယ်၏ ဒေသဆိုင်ရာအချက်အလက်

Gibson, R. S. (2005). *Principles of Nutritional Assessment*. (2nd ed.). Newyork: Oxford. Retrieved from https://books.google.com.mm/books?id=lBlu7UKI3aQC& printsec=frontcover#v=onepage&q&f=false

Gichana, M. B. (2013). *Nutritional knowledge of mothers and nutritional status of their children 6-59 months under malezi bora programme in Kawangware Sub-location, Dagoretti, Nairobi county*. Retrieved from http://erepository.uonbi.ac.ke/bitstream/handle/11295/56292/Gichana_Nutritional%20knowledge.pdf?sequence=3

Hosmer, D. W., & Lemeshow, S. (2000). *Applied Logistic Regression* (2nd ed.). Canada: John Wiley & Son Inc.

Kang, Y., & Kim, J., (2018). Risk factors for undernutrition among children 0–59 months of age in Myanmar. *Maternal and Child Nutrition*, e12821. Retrieved from https://doi.org/10.1111/mcn.12821

Kang, Y., Aguayo, V. M., Campbell, R. K., Dzed, L., Joshi, V., Wid, J. L., et al. (2018). Nutritional status and risk factors for stunting in preschool children in Bhutan. *Maternal Child Nutr*ition, 14(4): e12653. Retrieved from https://doi.org/ 10.1111/mcn.12653

Karim, N. A. (2015). *Good Nutrition for Growth*. Retrieved from https://mypositiveparenting.org/2015/04/26/good-nutrition-for-growth/

Khattak, M. M. A. K., & Ali, S., (2010). Malnutrition and Associated Risk Factors in Pre-School Children (2-5 Years) in District Swabi (NWFP)-Pakistan. *Journal of Medical Sciences, 10*(2): 34-39. Retrieved from https://scialert.net/fulltextmobile/?doi=jms.2010.34.39

Lee, R. D., & Nieman, D. C. (2007). *Nutrition Assessment* (4th ed.). Retrieved from https://www.worldcat.org/title/nutritional-assessment/oclc/62885416

Leviitt, E. J, Pelletier, D. L., & Pell, A. N. (2009). *Revisiting the UNICEF malnutrition framework to foster agriculture and health sector collaboration to reduce malnutrition: A comparison of stakeholder priorities for action in Afghanistan.Food Policy, 34*(2). Retrieved from https://www.researchgate.net/publication/222059571_Revisiting_the_UNICEF_malnutrition_framework_to_foster_agriculture_and_health_sector_collaboration_to_reduce_malnutrition_A_comparison_of_stakeholder_priorities_for_action_in_Afghanistan

Lie, K. (1998). *Writing the literature review*. Retrieved from http://www.mantex.co.uk

Mahan, L. K., & Escott-Stump, S. (2008). *Krause's Food & Nutrition Therapy* (12th ed.). Retrieved from https://vdocuments.mx/download/krauses-12edition

Mya-K-S, Kyaw-A-T, & Tun-T., (2019). Feeding practices and nutritional status of children age 6-23 months in Myanmar: A secondary analysis of the 2015-16

Demographic and Health Survey. *PLoS ONE, 14*(1): e0209044. Retrieved from https://doi.org/10.1371/journal.pone.0209044

Ministry of Health and Sports. (2017). *Myanmar Demographic and Health Survey 2015-16: Key Indicators Report.* Naypyitaw: Author.

Rabbi, A. M. F., & Karmaker, S. C. (2015). Determinants of child malnutrition in Bangladesh: A Multivariate approach. *Asian Journal of Medical Sciences, 6*(2), 85-89. Retrieved from http://dx.doi.org/10.3126/ajms.v6i2.10404

Regoniel, P. A. (2015). Conceptual Framework: A step by step guide on how to make one. In SimplyEducate,Me. Retrieved from https://simplyeducate.me/2015/01/05/conceptual-framework-guide/

Sarkar, S. K., & Midi, H. (2010). Importance of Assessing the Model Adequacy of Binary Logistic Regression. *Journal of Applied Sciences, 10*(6)*:* 479-486. Retrieved from https://scialert.net/abstract/?doi=jas.2010.479.486

Sobgui, C. M., Fezeu, L. K., Diawara, F., Diarra, H., Afari-Sefa, V., Tenkouano, A., (2018). Predictors of poor nutritional status among children aged 6–24 months in agricultural regions of Mali: a cross-sectional study. *BMC Nutrition, 4*(18). Retrieved from https://doi.org/10.1186/s40795-018-0225-z

Stephenson, T. J., & Schiff, W. J. (2016). *Human nutrition science for healthy living*. New York: McGrawHill.

Su-Wai-Phyo, Keiwkarnka, B., & Mongkolchati, A. (2014). Factors related to stunting status of children aged under two years in Magway township, Myanmar. *Journal of Public Health and Development, 12*(3), 3-16. Retrieved from https://www.tci-thaijo.org/index.php/AIHD-MU/article/view/18386

Tonkoi, E. O. O., Asito, S. A., & Adoka, S. (2016). Determinants of malnutrition among children aged 6-59 months in Trans-Mara East Sub-country, Narok Country, Kenya. *Int J Pub Health Safe, 1*(3), 116. Reterieved from https://www.omicsonline.org/open-access/determinants-of-malnutrition-among-children-aged-659-months-in-transmara-east-subcounty-narok-county-kenya. php?aid=84166

United Nations Children's Fund (UNICEF). (1992). *A UNICEF policy review: Strategy for improved nutrition of children and women in developing countries*. USA, New York. Retrieved from http://ceecis.org/iodine/01_global/01_pl/01_01_other_1992_unicef. pdf

United Nations Environment Programm (UNEP), UNICEF, World Health Organization (WHO). (2002). *Children in the new millennium environmental impact on health*. Retrieved from https://apps.whoint/iris/bitstream/handle/10665/42506/a75954.pdf; sequence=1

UNICEF. (2009). *UNICEF Data: Monitoring the situation of children and women, Malnutrition*. Retrieved from https://data.unicef.org/topic/nutrition/malnutrition/

UNICEF. (2018). *UNICEF Data: Monitoring the situation of children and women, Malnutrition*. Retrieved from https://data.unicef.org/topic/nutrition/malnutrition/

Vella, V., Tomkins, A., Borghesi, A., Migliori, G. B., Adriko, B. C., & Crevatin, E., (1992). Determinants of child nutrition and mortality in north-west Uganda. *Bulletin of the World Organization, 70*(5):637-643. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2393364/

Victora, C. G., Adair, L., & Caroline F. D. M., et al. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *The Lancet, 371*(9609). https://doi.org/10.1016/S0140-6736(07)61692-4Get rights and content

World Health Organization (WHO). (1997). *Indicators for assessing infant and young child feeding practices Part 3: Country Profiles*. Malta: Author. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/44368/9789241599757_eng.pdf;sequence=1

WHO. (2006). *Reliability of anthropometric measurements in the WHO Multicentre Growth Reference Study*. Retrieved from https://www.who.int/childgrowth/standards/Reliability_anthro.pdf

WHO. (2009). *Supplementary foods for the management of moderate acute malnutrition in infants and children 6-59 months of age: Technical note*. Retrieved from https://www.who.int/nutrition/publications/moderate_malnutrition/9789241504423/en/

WHO, UNICEF, & World Bank Group, (2018*). Levels and trends in child malnutrition*. Washington DC: Authors.

Appendix – I

သုတေသနပန်ကြားလွှာ

ဤသုတေသနမေးခွန်းလွှာသည် စီးပွားရေးတက္ကသိုလ် (ရန်ကုန်) မှဖွင့်လှစ်သော အသုံးချ စာရင်းအင်းပညာ (မဟာဘွဲ့) အတွက်လိုအပ်သော သုတေသန စာတမ်းအတွက် ကောက်ယူခြင်းဖြစ်ပါသည်။ ဤသုတေသနသည် ကလေးငယ်များ (အသက် ၃-၅နှစ်) ကလေးငယ်များ၏ အာဟာရဖွံ့ဖြိုးမှု အပေါ် လွှမ်းမိုးသောအချက်များကို လေ့လာမည်ဖြစ်ပါသည်။ (မိမိတို့အိမ်တွင် ကလေးငယ်များ (အသက် ၃-၅နှစ်) တစ်ဦးထက် ပိုရှိပါက အငယ်ဆုံး ကလေး၏ ကိုယ်အတိုင်းအတာများသာ ခန္ဓာကိုယ် အတိုင်းအတာများကိုသာ တိုင်းတာမည်ဖြစ်ပါသည်။

သုတေသနတွင်ပါဝင်သူ တို့ ၏ အကျိုးစီးပွား နှင့် ကျန်းမာရေးစောက်ရှောက်မှု လုပ်ငန်းများတွင် မည်သို့မျှ ထိခိုက်၊ နစ်နာမှု မရှိပါ။ ပညာရေးဆိုင်ရာ လိုအပ်ချက် အတွက် အသုံးပြုရန်သာ ကောက်ခံခြင်းဖြစ်ပါသည်။ အကယ်၍ စာတမ်းဖတ်ကြားမှု၊ စာတမ်းတင်သွင်းမှုများ ပြုလုပ်ပါကလဲ လူကြီးမင်းတို့၏ ဂုဏ်သိက္ခာ ကိုလေးစားသောအားဖြင့် အမည်ပှက်များ၊ ကုတ်ဒ် နံပါတ်များကိုသာ အသုံးပြုမည် ဖြစ်ပါသည်။ မရှင်းလင်းသည့် အချက်များကို မေးမြန်းရန် ရှိပါက ဖုန်း ၀၉-၆၉၆၇၅၇၆၃၅ သို့ ဆက်သွယ် မေးမြန်းနိုင်ပါသည်။ ပါဝင်ကူညီမှု အတွက် အထူးကျေးဇူးတင်ရှိမါသည်။

သုတေသီ
မစုစုငြိမ်း
MAS-Batch

Roll No. 22

Appendix-II

သုတေသနမေးခွန်းလွှာ

ရက်စွဲ - ..... အမှတ်စဉ် ☐

မြို့အမည် -.....

ရပ်ကွက်/ကျေးရွာအမည် -..... အိမ်အမှတ်.....

အပိုင်း (က) လူမှုစီးပွားရေးဆိုင်ရာအချက်အလက်များ

၁။ တော်စပ်ပုံ

(က) မိခင် ☐

(ခ) ဖခင်

(ဂ) အဖိုး/အဖွား

(ဃ) ဦးလေး/အဒေါ်

(င) မောင်နှစ်မ

(စ) အခြား (တော်စပ်ပုံရေးပေးပါရန်).....

၂။ ပညာအရည်အချင်း

(က) စာမတက် ☐

(ခ) ရေးတက်/ဖတ်တက်

(ဂ) မူလတန်းအောင်

(ဃ) အလယ်တန်းအောင်

(င) အထက်တန်းအောင်

(စ) တက္ကသိုလ်ကျောင်းသူ/ဘွဲ့ရ

(ဆ) အခြား (အသေးစိတ်ဖော်ပြပါရန်).....

၃။ အလုပ်အကိုင် ☐

(က) မှီခို

(ခ) အိမ်တွင်းစီးပွားရေးလုပ်

(ဂ) အိမ်ပြင်ပစီးပွားရေးလုပ်

၄။ တစ်လဝင်ငွေပျမ်းမျှ (ကျပ်) .....

၅။ မိသားစုဝင်အရေအတွက်

.....

အပိုင်း (ခ) ကလေး နှင့် သက်ဆိုင်သော မေးခွန်း အချက်အလက်များ

(မှတ်ချက်။ ။ ၃-၅ နှစ် ကလေးတစ်ဦးထက်ပိုမိုရှိပါကအငယ်ဆုံးကလေးအတိုင်းအတာရွေးရန်)

၁။ မွေးနေ့ (ရက်/လ/နှစ်).....

၂။ ပြည့်ပြီးအသက်.....နှစ်.....လ ☐

၃။ လိင်

(က) ကျား ☐

(ခ) မ

၄။ မောင်နှစ်မအရေအတွက်.....

၅။ ခန္ဓာကိုယ် တိုင်းထွာခြင်း အချက်အလက်များ

စဉ်	ကလေး၏ မွေးဖွားမှု အမှတ်စဉ်	မွေးနေ့	ပြည့်ပြီးအသက်	ကိုလ်အလေးချိန် (အနီးစပ်ဆုံး ၀.၁ ကီလို ဂရမ်)	အရပ် (အနီးစပ်ဆုံး ၀.၁စင်တီမီတာ)	လက်မောင်းပတ်အတိုင်းအတာ	ခြေထောက်ရောင်ရမ်းမှု ၁။ရှိ ၂။မရှိ	မှတ်ချက်

အပိုင်း (၀) ရေနှင့် သန့်ရှင်းရေး

၁။ သောက်သုံးရေ အဓိကရရှိသောနေရာမှာအဘယ်နည်း။

(က) မြစ်ရေ

(ခ) ဘုံဘိုင်ရေ/ပိုင်းလိုင်းရေ

(ဂ) အဖုံးမအုပ်ထားသောရေတွင်း

(ဃ) အဖုံးအုပ်ထားသောရေတွင်း

(င) လက်ရေတွင်း/ရေကန်

(စ) အခြား (ပြည့်စုံစွာရေးသားရန်) .....

၂။ သောက်သုံးရေ ကို ပြုပြင်မှု ပြုလုပ်ပါသလား။

(က) ပြုလုပ်ပါသည်။

(ခ) မပြုလုပ်ပါ။

၃။ သောက်သုံးရန်ရေကို မသုံးစွဲမီ မည်သို့ပြုလုပ်သနည်း။

(က) သောက်ရေသန့်သာသုံးသည်။

(ခ) ကြွေထည်၊မြေထည် အိုးများဖြင့် စစ်ခြင်း

(ဂ) အဂတ်ဖြင့်စစ်၍

(ဃ) ဆေးခတ်ခြင်း (ဥပမာ-ကလိုရင်း)

(င) ရေပူရေအေး စစ်စက်

(စ) ကြိုချက်၍

(ဆ) မည်သို့မှမပြုလုပ်ပါ။

၄။ အညစ်အကြေး စွန့်ရန် အိမ်သာအသုံးပြုပါသလား။

(က) သုံးစွဲပါသည်။

(ခ) မသုံးစွဲပါ။

၅။ အိမ်သာအနီးလက်ဆေးရန်ပစ္စည်းများထားရှိပါသလား။

(က) ရှိပါသည်။

(ခ) မရှိပါ။

၆။ မည်သည့်အချိန်တွင်လက်ဆေးလေ့ရှိပါသနည်း။ (တစ်မျိုးမကဖြေဆိုနိုင်ပါသည်။)

(က) အိမ်သာတက်ပြီး

(ခ) အစားအစာများ မချက်ပြုတ်ခင်

(ဂ) အစာမစားခင်

(ဃ) နို့မတိုက်ခင်

(င) ကလေးအား အိမ်သာပို့ပြီး

(စ) အိမ်မွေးတိရစ္ဆာန် များအား ကိုင်တွယ်ပြီးချိန်

(ဆ) အစာစားပြီး

(ဇ) မည်သည့်အခါမှ မဆေးပါ

(ဈ) အခြား (အသေးစိတ်ဖော်ပြပါရန်) .....

၇။ လက်ဆေးသည့်အခါ မည်သည့်ပစ္စည်းကို အသုံးပြုပါသနည်း။

(က) ရေတစ်မျိုးထဲဖြင့်

(ခ) ဆပ်ပြာဖြင့်

(ဂ) ဆပ်ပြာရှိသည့်အခါ

(ဃ) ဖွဲပြာ တစ်မျိုးမျိုးဖြင့်

(စ) အခြား (အသေးစိတ်ဖော်ပြပါရန်)

.....

အပိုင်း (ဃ) အစာအာဟာရ ဗဟုသုတ ဆိုင်ရာ မေးခွန်းများ

၁။ သင်သည် အာဟာရနှင့် ပက်သတ်ပြီး ဗဟုသုတ ရဖူးပါသလား။

(က) ရဖူးပါသည်။

(ခ) မရဖူးပါ။

၂။ အဓိက အစာအုပ်စုကြီး မည်မျှရှိသနည်း။

(က) တစ်အုပ်စု

(ခ) နှစ်အုပ်စု

(ဂ) သုံးအုပ်စု

(ဃ) လေးအုပ်စု

(င) လေးအုပ်စု နှင့်အထက်

၃။ အောက်ပါတို့အနက် အင်အားကိုဖြစ်စေသော အစာအုပ်စု တစ်အုပ်စုကိုရွေးပါ။

(က) ထမင်း၊ဂျို၊ ပြောင်း၊ဆီ။

(ခ) ဥ၊နို့၊ အသား၊ငါး၊ပဲ။

(ဂ) ဟင်းသီးဟင်းရွက်များ။

၄။ အောက်ပါတို့အနက် ခန္ဓာကိုယ်ကြီးထွားစေသော အစာအုပ်စု တစ်အုပ်စုကိုရွေးပါ။

(က) ဆန်၊ဂျို၊ ပြောင်း၊ ဆီ။

(ခ) ဥ၊နို့၊ အသား၊ငါး၊ပဲ။

(ဂ) ဟင်းသီးဟင်းရွက်များ။

၅။ အောက်ပါတို့အနက် ခုခံအားကောင်းစေသော အစာအုပ်စု တစ်အုပ်စုကိုရွေးပါ။

(က) ဆန်၊ဂျို၊ ပြောင်း၊ ဆီ။

(ခ) ဥ၊နို့၊ အသား၊ငါး၊ပဲ။

(ဂ) ဟင်းသီးဟင်းရွက်များ။

၆။ မိခင်နို့ တစ်မျိုးထဲကို အသက်အရွယ်မည်မျှ အထိ တိုက်သင့်ပါသနည်း။

(က) အသက် (၄)လအထိ

(ခ) အသက် (၆)လအထိ
(ဂ) အသက် (၁)နှစ် အထိ
(ဃ) အသက် (၂)နှစ် အထိ

၇။ ကလေးအသက် မည်သည့်အရွယ်တွင် ဖြည့်စွက်စာ စတင်ကျွေးသင့်ပါသနည်း။
(က) အသက် (၆)လ အောက်
(ခ) အသက် (၆)လ အထက်

အပိုင်း (c) ကလေးငယ်များအား အစားအစာ ကျွေးမွေးပုံစံဆိုင်ရာမေးခွန်းများ

၁။ သင်အမြဲနို့တိုက်ပါသလား။
(က) တိုက်ပါသည်။
(ခ) မတိုက်ပါ။
(ဂ) မသိပါ။

၂။ သင်အမြဲနို့တိုက်လျှင်၊ မွေးပြီးဘယ်အချိန်တွင် စတင်တိုက်ပါသနည်း။
(က) တစ်နာရီအတွင်း
(ခ) ၂၄ နာရီမပြည့်ခင်
(ဂ) ၂ ရက်မပြည့်ခင်
(ဃ) ၂ ရက်ကျော်မှ
(c) မသိပါ။

၃။ သင်အမြဲနို့တိုက်ခဲ့လျှင်၊ တစ်နေ့ကိုဘယ်နှစ်ကြိမ်တိုက်ပါသနည်း။
(က) ၃ ကြိမ်ထက်လျော့၍
(ခ) ၃-၅ ကြိမ်
(ဂ) ၆ ကြိမ်
(ဃ) ကလေးဆာသည့်အခါတိုင်း

၄။ မိခင်နို့အပြင် အခြားအစားအစာကိုကလေးဘယ်အရွယ်တွင် စတင်ကျွေးပါသနည်း။
(အဖြေကိုလဖြင့် ဖော်ပြပါရန်) .....လ

၅။ မနေ့ကနေပြီး ယခုစာရင်းကောက်သော အချိန်အထိ ကလေးက အောက်ပါ အစာအုပ်စု တွေထဲက ဘာတွေစားခဲ့သေးလဲ။

	အုပ်စု	**အစားအစာ စာရင်း**	**စားပါသည် (အကြိမ်ရေ)**	**မစားပါ**
၁။	အုပ်စု- ၁။ အစေ့အဆန်များ၊ အမြစ်များ နှင့် သစ်ဥသစ်ဥများ	- ဆန်ပြုတ်၊ ပေါင်မုန့်၊ ထမင်း၊ ခေါက်ဆွဲ (သို့) အစေ့အဆန်နှင့်ပြုလုပ်ထားသောအစားအစာများ - အာလူးဖြူ၊ ဂဉ္ဇာဖြူများ၊ ပလောပီနံဥ၊ပလောပီနံမုန့် (သို့) အမြစ်များ (သို့) ဥ နှင့် အမြစ်များမှ ပြုလုပ်ထားသောအစားအစာများ		
၂။	အုပ်စု- ၂။ ပဲတောင့်ရှည်နှင့် အခွံမာသီးများ	- ပဲတောင့်ရှည်၊ ပဲသီး၊ ပဲနီကလေး အခွံမာသီးများ(သို့)အစေ့ဖြင့် ပြုလုပ်ထားသော အစားအစာများ		
၃။	အုပ်စု- ၃။ နို့ထွက် ပစ္စည်းများ	- စည်သွပ်ဘူး၊ နို့မှုန့်၊ လတ်ဆတ်သော (တိရိစ္ဆာန်မှရသည့်) နို့များ (သို့) ကလေးများအတွက် ဖော်စပ်ထားသော နို့မှုန့်များ		
၄။	အုပ်စု- ၄။ အသားပါသောအစားအ	- အသဲ၊ကျောက်ကပ်၊ နှလုံး (သို့) အခြားသောအသားများ		

	အုပ်စု	အစားအစာ စာရင်း	စားပါသည် (အကြိမ်ရေ)	မစားပါ
	စာများ	- အမဲသား၊ သိုးသား၊ ဂက်သား၊ ဆိတ်သား၊ ကြက်သား (သို့) ဘဲသားကဲ့သို့သောအသားများ - ငါးအစိမ်း၊ ငါးခြောက်၊ အခွံမာ ရေသတ္တဂါ (သို့) ပင်လယ်စာများ - သားလောင်းပိုးကောင်များ၊ ခရုများ (သို့) အင်းဆက်ပိုးများ။		
၅။	အုပ်စု- ၅။ ဥအမျိုးမျိုး	- ဥ အမျိုးမျိုး		
၆။	အုပ်စု- ၆။ ဗိုက်တာမင် A ပါဝင်သော အသီးများ နှင့် ဟင်းသီးဟင်းရွက်များ	- ရွှေဖရုံသီး၊ မုန်လာဥဂါ၊ သစ္စားမွှေး (သို့) အာလူးချိုများကဲ့သို့ အတွင်းပိုင်းတွင် အဂါ (သို့) လိမ္မော်ရောင်ရှိသောအရာများ။ - အစိမ်းရင့်ရောင် ဟင်းရွက်များ။ - သရက်သီးမှည့်များလတ်ဆတ်သော(သို့)ခြောက်သွေ့သော (အစိမ်းရောင် မဟုတ်သော)၊ သဘော်သီးမှည့် လတ်ဆတ်သော (သို့) ခြောက်သွေ့သော၊ ဖရဲသီးမွှေးများ		
၇။	အုပ်စု- ၇။ အခြားသောအသီးနှင့် ဟင်းသီး ဟင်းရွက်များ	- အခြားသောအသီးနှင့် ဟင်းသီးဟင်းရွက်များ		
၈။	အုပ်စု- ၈။ အစားအသောက် စံသတ်မှတ်ချက်တွင် ထည့်သွင်းမရေတွက်သော အခြားအရာများ	- ဆီ၊ အဆီ(သို့)ထောပတ် (သို့) ၄င်း တို့နှင့် ပြုလုပ်ထားသောအစားအစာများ။ - ချောကလက်၊ မုန့်အချို၊ သကြားလုံများ၊ အစာသွပ်မုန့်များ၊ ကိတ် (သို့) ဘီစကွတ် ကဲ့သို့ သကြားနှင့် ပြုလုပ်ထားသောမုန့်များ။ - ဟင်းခတ် အမွှေးအကြိုင် အဖြစ် သုံးသောဂရုတ်သီး၊ ဟင်းခတ်မှုတ်၊ ဆေးဘက်ဂင် အပင် များ၊ ငါးအသားမှုန့်များ။		

အပိုင်း (စ) ကလေးငယ်များကျန်းမာရေးအခြေအနေ နှင့် ပြုစုကုသမှု ဆိုင်ရာမေးခွန်းများ

၁။ ကလေးအား ကာကွယ်ဆေး ထိုးခဲ့ဖူး ပါသလား။

(က) ထိုးခဲ့ဖူးပါသည်။

(ခ) မထိုးခဲ့ဖူးပါ။

☐

၂။ ထိုးခဲ့ဖူးပါက မည်သည့်ကာကွယ်ဆေးများ ထိုးခဲ့ပါသနည်း။

ကာကွယ်ဆေးအမည်	ပထမ အကြိမ်	ဒုတိယ အကြိမ်	တတိယ အကြိမ်	ကာကွယ်ဆေးထိုး/တိုက် သည့်အသက်	မှတ်ချက်
ဘီစီဂျီ					
အသည်းရောင်၊အသားဝါ (ဘီ) ကာကွယ်ဆေး					

ကာကွယ်ဆေးအမည်	ပထမ အကြိမ်	ဒုတိယ အကြိမ်	တတိယ အကြိမ်	ကာကွယ်ဆေးထိုး/တိုက် သည့်အသက်	မှတ်ချက်
ဆုံဆို့၊ ကြက်ညှာ၊ မေးခိုင်၊ အသည်းရောင်၊အသားဝါ (ဘီ)၊ ဦးနှောက် အမြှေး ရောင် (ငါးမျိုးစပ် ကာကွယ်ဆေး)					
ဝမ်းပျက်ဝမ်းလျှောရောဂါ ကာကွယ်ဆေး) (ရိုတာ)					
ပြင်းထန်အဆုတ်ရောင် (ပီစီဗီ)					
ပိုလီယကာကွယ်ဆေး (အစက်ချ)					
ပိုလီယိုကာကွယ်ဆေး (ထိုးဆေး)					
ဝက်သက်၊ဂျိုင့်သိုး					
ဂျပန်ဦးနှောက်ရောင်					
ဗီတာမင် (အေ)					

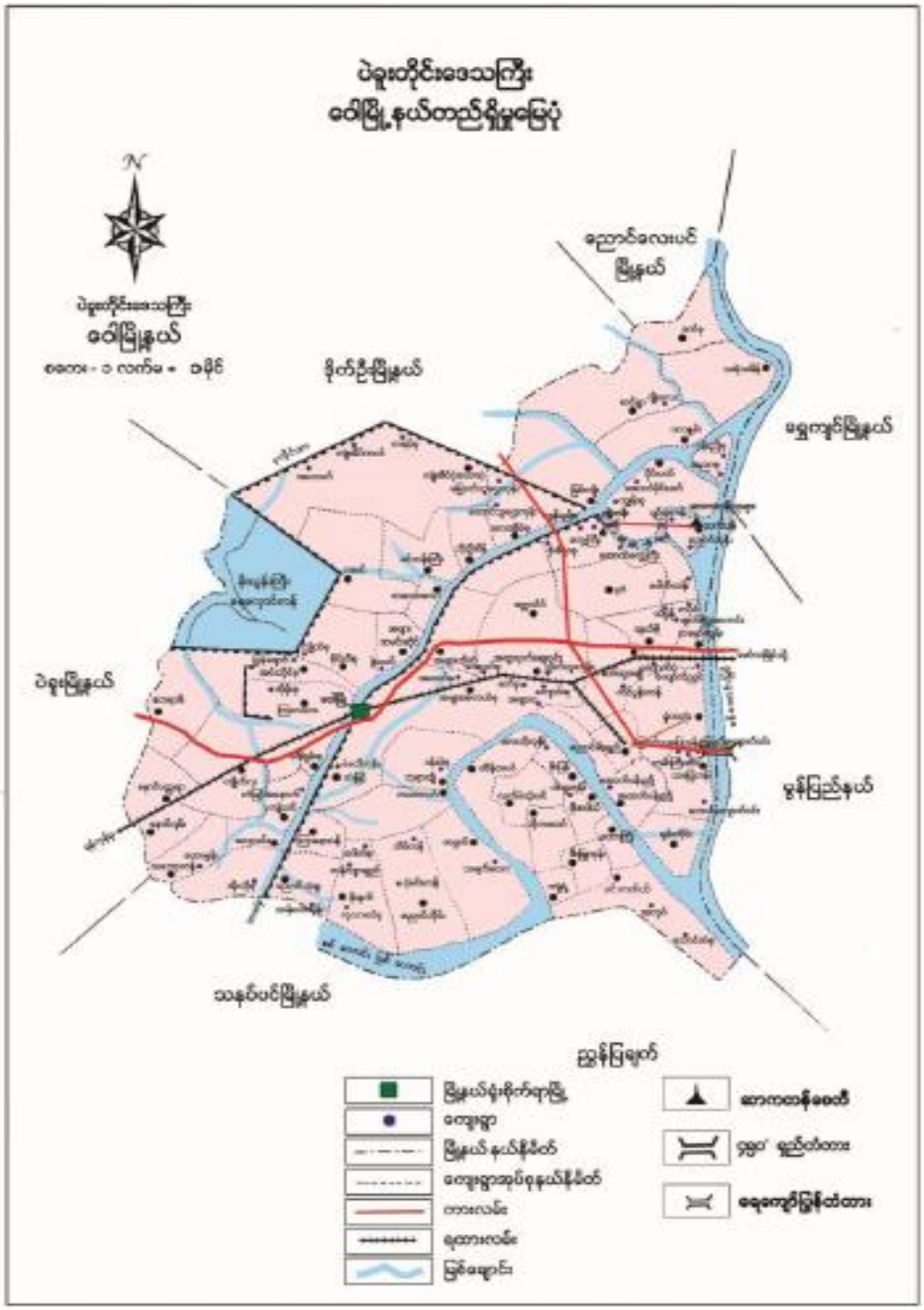
၄။ ပြီးခဲ့သော နှစ်ပတ် အတွင်းနေမကောင်းခြင်း(သို့)ထိခိုက်ဒဏ်ရာရခြင်းရှိပါသလား။

(က) ရှိပါသည်။

(ခ) မရှိပါ။

******** ပါဝင်ကူညီမှု အတွက် အထူးကျေးဇူးတင်ရှိမါသည်။ ********

Appendix-III



Source: General Administration Department (2017)

Figure (1) Map of *Waw* Township

Appendix-IV

Table (A-1) Classification of Stunted among Children Aged 3-5 years by Step '0'

	Observed		Predicted		
			Having Stunted among Children (3-5 years)		Percentage Correct
			No Stunted	Stunted	
Step 0	Having Stunted among Children aged 3-5 years	No Stunted	292	0	100.0
		Stunted	71	0	.0
	Overall Percentage				80.4
a. Constant is included in the model.					
b. The cut value is .500					

Table (A-2) Variables in Equation of the Logistic Regression Model for Stunted among Children Aged 3-5 years

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.414	.132	114.203	1	.000	.243

Table (A-3) Omnibus Tests of Model Coefficients for Stunted among Children Aged 3-5 years

		Chi-square	df	Sig.
Step 1	Step	42.380	25	.016
	Block	42.380	25	.016
	Model	42.380	25	.016

Table (A-4) Model Summary of Stunted among Children Aged 3-5 years

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	316.432[a]	.110	.176
a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.			

Table (A-5) Hosmer and Lemeshow Test for LRA of Stunted among Children Aged 3-5 years

Step	Chi-square	df	Sig.
1	14.313	8	.074

Table (A-6) Classification of Stunted among Children Aged 3-5 years by Step '1'

	Observed		Predicted		
			Having Stunted among Children (3-5 years)		Percentage Correct
			No Stunted	Stunted	
Step 1	Having Stunted among Children (3-5 years)	No Stunted	286	6	97.9
		Stunted	61	10	14.1
	Overall Percentage				81.5
a. The cut value is .500					

Table (A-7) Parameter Estimates of the Logistic Regression Model for Stunted among Children Aged 3-5 years

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1	Constant	.121	1.890	.004	1	.949	1.129		
	Education			6.169	5	.290			
	Education(1)	-1.173	.524	5.015	1	.025	.309	.111	.864
	Education(2)	-1.269	.566	5.026	1	.025	.281	.093	.853
	Education(3)	-1.284	.625	4.218	1	.040	.277	.081	.943
	Education(4)	-.970	.766	1.602	1	.206	.379	.084	1.702
	Education(5)	-20.424	11373.155	.000	1	.999	.000	.000	.
	Occupation			1.380	2	.502			
	Occupation(1)	.058	.353	.027	1	.870	1.059	.531	2.115
	Occupation(2)	.472	.423	1.247	1	.264	1.603	.700	3.669
	Monthly Family Income			5.330	2	.070			
	M-Family Income (1)	-.252	.357	.498	1	.480	.777	.386	1.565
	M-Family Income (2)	-1.111	.492	5.112	1	.024	.329	.126	.862
	Family Size	-.266	.327	.662	1	.416	.766	.403	1.455
	Use of Toilet	.466	.462	1.018	1	.313	1.594	.644	3.944
	Source of Water	-.423	.475	.795	1	.373	.655	.258	1.661
	Proper Practice of Drinking water	.072	.262	.076	1	.782	1.075	.644	1.795

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Proper hand washing	-.190	.352	.290	1	.590	.827	.415	1.650
Right use of facilities	-.121	.389	.097	1	.755	.886	.413	1.900
Correct Breastfeeding Practices	-.467	.379	1.513	1	.219	.627	.298	1.319
Complementary Feeding Knowledge	-.725	.432	2.821	1	.093	.484	.208	1.129
Practices complementary food			.302	2	.860			
Practices complementary food(1)	-.107	.397	.073	1	.787	.899	.413	1.956
Practices complementary food(2)	-.438	.802	.298	1	.585	.646	.134	3.109
Knowledge food groups	.448	.388	1.334	1	.248	1.565	.732	3.346
D D Scores			2.100	2	.350			
D D Score(1)	-.197	.376	.274	1	.601	.821	.393	1.715
D D Score(2)	.454	.494	.842	1	.359	1.574	.597	4.147
Completeness of Immunization	.726	.401	3.288	1	.070	2.068	.943	4.534
Vitamin A Supplementation	-1.100	.520	4.462	1	.035	.333	.120	.924
History of Illness	.025	.389	.004	1	.948	1.026	.478	2.199

Table (A-8) Classification of Underweight among Children Aged 3-5 years by Step '0'

	Observed		Predicted		
			Having Underweight among Children Aged (3-5 years)		
			No Underweight	Underweight	Percentage Correct
Step 0	Having Underweight among Children Aged (3-5 years)	No Underweight	0	154	.0
		Underweight	0	209	100.0
	Overall Percentage				57.6
a. Constant is included in the model.					
b. The cut value is .500					

Table (A-9) Variables in Equation of the Logistic Regression Model for Underweight among Children Aged 3-5 years

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.305	.106	8.269	1	.004	1.357

Table (A-10) Omnibus Tests of Model Coefficients for Underweight among Children Aged 3-5 years

		Chi-square	df	Sig.
Step 1	Step	57.734	25	.000
	Block	57.734	25	.000
	Model	57.734	25	.000

Table (A-11) Model Summary of Underweight among Children Aged 3-5 years

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	437.125[a]	.147	.198
a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.			

Table (A-12) Hosmer and Lemeshow Test for LRA of Underweight among Children Aged 3-5 years

Step	Chi-square	df	Sig.
1	6.047	8	.642

Table (A-13) Classification of Underweight among Children Aged 3-5 years by Step '1'

	Observed	Predicted

			Having Underweight among Children Aged (3-5 years)		Percentage Correct
			No Underweight	Underweight	
Step 1	Having Underweight among Children Aged (3-5 years)	No Underweight	84	70	54.5
		Underweight	49	160	76.6
	Overall Percentage				67.2
a. The cut value is .500					

Table (A-14) Parameter Estimates of the Logistic Regression Model for Underweight among Children Aged 3-5 years

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1	**Constant**	**2.987**	**1.608**	**3.452**	**1**	**.063**	**19.817**		
	Education			8.463	5	.133			
	Education(1)	-.732	.500	2.145	1	.143	.481	.181	1.281
	Education(2)	-.208	.535	.151	1	.697	.812	.285	2.318
	Education(3)	-.215	.569	.142	1	.706	.807	.264	2.463
	Education(4)	.654	.731	.801	1	.371	1.924	.459	8.057
	Education(5)	-.132	.910	.021	1	.885	.876	.147	5.219
	Occupation			1.563	2	.458			
	Occupation(1)	-.268	.284	.893	1	.345	.765	.438	1.334
	Occupation(2)	-.403	.350	1.324	1	.250	.668	.336	1.328
	Monthly Family Income			19.840	2	.000			
	Monthly Family Income (1)	1.252	.306	16.767	1	.000	3.498	1.921	6.369
	Monthly Family Income (2)	1.393	.374	13.839	1	.000	4.027	1.933	8.390
	Family Size	.078	.262	.088	1	.766	1.081	.647	1.808
	Use of Toilet	-.566	.377	2.249	1	.134	.568	.271	1.190
	Source of water	.850	.376	5.105	1	.024	2.339	1.119	4.890
	Proper Practice of Drinking Water	-.198	.220	.812	1	.367	.820	.533	1.262

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
	Proper hand washing	.245	.305	.643	1	.423	1.277	.703	2.321
	Right use of facilities	-.119	.318	.140	1	.708	.888	.476	1.655
	Correct Breastfeeding Practices	.062	.287	.047	1	.829	1.064	.606	1.867
	Complementary Feeding K	-.072	.350	.042	1	.837	.930	.468	1.849
	Practices complementary food			.098	2	.952			
	Practices complementary food(1)	.088	.308	.082	1	.774	1.092	.598	1.997
	Practices complementary food (2)	.142	.651	.047	1	.828	1.152	.322	4.124
	Knowledge food groups	-.449	.299	2.259	1	.133	.638	.356	1.146
	DDScore			2.219	2	.330			
	DDScore (1)	.440	.304	2.095	1	.148	1.553	.856	2.817
	DDScore (2)	.166	.428	.150	1	.698	1.180	.511	2.729
	Completeness of Immunization	-1.045	.332	9.929	1	.002	.352	.184	.674
	Vitamin A Supplementation	.482	.456	1.120	1	.290	1.620	.663	3.958
	History of Illness	.375	.321	1.363	1	.243	1.455	.775	2.729

Table (A-15) Classification of Wasted among Children Aged 3-5 years by Step '0'

	Observed	Predicted

			Having wasted		Percentage Correct
			No Wasted	Wasted	
Step 0	Having wasted	No Wasted	202	0	100.0
		Wasted	161	0	.0
	Overall Percentage				55.6
a. Constant is included in the model.					
b. The cut value is .500					

Table (A-16) Variables in Equation of the Logistic Regression Model for Wasted among Children Aged 3-5 years

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.227	.106	4.611	1	.032	.797

Table (A-17) Omnibus Tests of Model Coefficients for Wasted among Children Aged 3-5 years

		Chi-square	df	Sig.
Step 1	Step	138.817	25	.000
	Block	138.817	25	.000
	Model	138.817	25	.000

Table (A-18) Model Summary of Wasted among Children Aged 3-5 years

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	359.767[a]	.318	.426

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table (A-19) Hosmer and Lemeshow Test for LRA of Wasted among Children Aged 3-5 years

Step	Chi-square	df	Sig.
1	6.247	8	.620

Table (A-20) Classification of Wasted among Children Aged 3-5 years by Step '1'

	Observed	Predicted

			Having wasted		Percentage Correct
			No Wasted	Wasted	
Step 1	Having wasted	No Wasted	183	19	90.6
		Wasted	72	89	55.3
	Overall Percentage				74.9
a. The cut value is .500					

Table (A-21) Parameter Estimates of the Logistic Regression Model for Wasted among Children Aged 3-5 years

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1	**Constant**	**2.852**	**1.669**	**2.920**	**1**	**.087**	**17.314**		
	Education			7.640	5	.177			
	Education(1)	-.396	.518	.583	1	.445	.673	.244	1.859
	Education(2)	.321	.569	.318	1	.573	1.379	.452	4.207
	Education(3)	-.109	.589	.034	1	.853	.897	.283	2.842
	Education(4)	.684	.707	.934	1	.334	1.981	.495	7.927
	Education(5)	1.179	.918	1.651	1	.199	3.251	.538	19.633
	Occupation			2.795	2	.247			
	Occupation(1)	-.474	.327	2.100	1	.147	.623	.328	1.182
	Occupation(2)	-.523	.379	1.912	1	.167	.593	.282	1.244
	Monthly Family Income			1.729	2	.421			
	Monthly Family Income (1)	-.339	.357	.904	1	.342	.712	.354	1.433
	Monthly Family Income (2)	.079	.411	.037	1	.847	1.082	.483	2.424
	Family Size	.283	.302	.877	1	.349	1.327	.734	2.398
	Use of Toilet	-.144	.411	.122	1	.727	.866	.387	1.939
	Source of water	.946	.399	5.616	1	.018	2.576	1.178	5.634
	Proper Practice of Drinking Water	.040	.235	.029	1	.865	1.041	.656	1.651
	Proper hand washing	-.538	.361	2.220	1	.136	.584	.288	1.185
	Right use of facilities	.580	.343	2.864	1	.091	1.787	.912	3.498

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
	Correct Breastfeeding Practices	.565	.314	3.242	1	.072	1.759	.951	3.253
	Complementary Feeding K	.127	.375	.114	1	.735	1.135	.544	2.369
	Practices complementary food			.233	2	.890			
	Practices complementary food(1)	-.032	.339	.009	1	.925	.968	.498	1.883
	Practices complementary food (2)	.262	.652	.161	1	.689	1.299	.362	4.666
	Knowledge food groups	-.394	.281	1.968	1	.161	.675	.389	1.169
	DDScore			.397	2	.820			
	DDScore (1)	.097	.355	.074	1	.786	1.102	.549	2.211
	DDScore (2)	-.172	.492	.122	1	.727	.842	.321	2.209
	Completeness of Immunization	-.524	.395	1.758	1	.185	.592	.273	1.285
	Vitamin A Supplementation	-2.560	.551	21.615	1	.000	.077	.026	.227
	History of Illness	-.738	.369	4.003	1	.045	.478	.232	.985