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DEPARTMENT OF STATISTICS
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FACTORS ASSOCIATED WITH STUNTING AMONG CHILDREN UNDER FIVE YEARS IN MYANMAR

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

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ABSTRACT

This study aims at contribution for the understanding of demographic, socio-economic and health factors of under-five children in Myanmar. The reduction of under-five children indirectly helps to improve child survival and lower the exposure of young children to risk of stunting. A weighted sample of 4069 children aged 0-59 months form the nationally representative data from the Myanmar Demographic and Health Survey (MDHS 2015-16) are utilized in this study. Nutritional status of under five years' children was expressed as indicator of Height-for-age (stunted) according to the criteria of WHO (2009). Descriptive statistics is applied to identify the important factors of child stunting. Furthermore, Binary logistic regression model is used to test the influence of demographic, socio-economic and other factors on the nutritional status of under five children. Among under five children, one-third are stunting. Most of the stunting children was found in aged between 1-3 years. The bivariate analysis shows that stunting is related to maternal age at child birth, place of residence, mother's education, mother's employment status, wealth quintile, child's age, birth order, size of child at birth, ANC visits, BMI, maternal height, received vitamin A1, breastfeeding within first hour. According to the results of binary logistic regression model, wealth quintile, child's age, birth order, small size of child at birth, BMI, mother's height, mother received vitamin A1 have positive effects and are more likely to be stunting of under-five children.

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
CI	Confidence Interval
DHS	Demographic Health Survey
HAZ	Height-for-Age Z-score
IDA	Iron Deficiency Anemia
LBW	Low Birth Weight
LBW	Low Birth Weight
lDD	Iodine Deficiency Disorders
MAC	Mid-arm Circumference
MDHS	Myanmar Demographic Health Survey
MICS	Multiple Indicator cluster Surveys
MS-NPAN	Myanmar Multi-Sectioral National Costed Action Plan for Nutrition
MUAC	Mid-upper arm circumference
NCDS	Non-communicable disease
OR	Odd Ratio
PEM	Protein Energy Malnutrition
SD	Standard Deviation
UNICEF	United Nations International Children's Emergency Fund
VAD	Vitamin A Deficiency
VBD	Vitamin B1 Deficiency
WHO	World Health Organization

CHAPTER I
INTRODUCTION

Malnutrition, embracing both inadequate-nutrition (stunting, wasting, underweight) and over-nutrition (overweight and obesity), is an essential trouble with great effects for survival, healthful development, and the economic productivities of humans and communities (Adelo et al., 2015; Black et al., 2013) Presently the main reason of the world burden of disease in poor income countries is childhood malnutrition. Adequate nutrition diet is important for boom or growth and development of children, and malnutrition displays bad social and economic development. Growth faltering results in adverse consequences including terrible physical and cognitive development, the effect of which may last for the whole lifetime (UNICEF, 2017).

Nutritional inefficiencies are a primary trouble for most poor or developing countries. They can appear in all age sectors, however the result is extra extreme for children age 0-59 months as this age is critical for their development process, and irreversible damage can appear because the consequences of dietary deficiencies. Myanmar has recognized five nutrient deficiency states because of its primary nutrition problems. These consist of Protein Energy Malnutrition (PEM). Iodine Deficiency Disorders (IDD), Iron Deficiency Anemia (IDA) and Vitamin A Deficiency (VAD), Vitamin B1 Deficiency (VBD). WHO said that poor linear growth or stunting has short and long-term consequences problems for nations. Stunting involves increased morbidity and mortality, delay of growth, and financial expense for sick children in the short term while long-term consequences are stunted brains and stunted lives, hindering the improvement of complete communities.

1.1 Rationale of the Study

Stunting, the most usual kind of below nutrition, results from inefficiency to obtain enough nutrition over an extended period. It can be known by evaluating a child length (younger than two years) or height (for children two years or older) and evaluating this dimension with an acceptable general standard rules of World Health Organization (WHO). Children are regarded stunted when they have height-for-age z-score (HAZ) beneath two standard deviations (-2SD) from the WHO Child Growth Standards median for the identical age and sex.

The World Bank forecasts point out that a 1% loss in adult height because of stunting in childhood is related with a 1.4% loss in economic productiveness related for the economic consequences (Shekar. et al., 2006). From Studies, stunted children gain 20% less in their adult lifes in contrast to non-stunted individuals (Grantham-McGregor. et al., 2007). Stunted children have great possibility to left behind than normal children in classroom or learning lessons in future for learning capacity, thus, not absolutely participating to the countries' development (WHO, 2013). A study reveals that children born to stunted mother (height less than 145 cm) are at higher threat of dying than with normal height (Li, Kim, Vollmer & Subramanian, 2010). In 2016, 22.9% or 154.8 million children below five years of age are globally suffering from child stunting, described by a low height-for-age (UNICEF, WHO, World Bank Group, 2017). In this year UNICEF, WHO, World Bank Group organizations reveals that there are 87 million stunted children lived in Asia which is the highest percentage, 59 million in Africa and 6 million in the Latin American and Caribbean regions. These global statistics show that massive numbers of children are affected by stunting worldwide. In Guinea, stunting is a big citizen health issue.

According to recent records from the Myanmar Demographic and Health Surveys (MDHS) (2015-2016) measured children's nutritional fame by evaluating height and weight measurements by using an international reference standard. The survey shows that 29% of children underneath five are stunted or too short in height for their age. Stunting is an indication of persistence below nutrition. Stunting is more frequent in rural areas (32%) than city areas (20%) because it ranges from 20% in Yangon Region to 41% in Chin State. Almost 1 in 5 (19%) children under five are underweight or too skinny for their age. Only 1% of children below five are overweight.

In order to get adequate nutrition, not only child feeding knowledge and practices of care givers but also their socio-economic statuses are important. Therefore, this study aims for identifying factors related to stunting among children aged less than five years in Myanmar.

1.2 Objectives of the Study

The main objective of the study is to investigate the determinants of stunting among children under five years in Myanmar.

The specific objectives are:

(i) To study the demographic, socio-economic and health characteristics of mother with children under five years.

(ii) To find the association between demographic, socio-economic and health characteristics of mothers and stunting of their children under five years and

(iii) To explore the factors associated with stunting among under five years children in Myanmar.

1.3 Method of Study

In this study, secondary data based on Myanmar Demographic Health Survey (2015-16) were applied. Background characteristics was described by using descriptive statistics. For bivariate analysis, the chi-square test was used to assess the relationships between stunting and socio economic and demographic characteristics. Then, binary logistic regression analysis was used to find the determinants factors on stunting.

1.4 Scope and Limitations of the Study

In this study, data from the MDHS (2015-2016), which was conducted using nationally representative samples to estimate core demographic and health indicators of the whole country was used.

Nutritional status is classified by three types: (1) wasting (weight for height/length), (2) underweight (weight for age) and stunting (height for age). Only the stunting (Height for age) was used to identify the nutritional status in this study. The stunting was defined as Z score of height for age was less than -2 standard deviation (-2SD).

1.5 Organization of the Study

This study was organized into five chapters. Chapter I includes introduction, the rationale of the study, objectives of the study, method of study, scope and limitations and organization of the study. Literature review is presented in Chapter II. Chapter III consists of research methodology. Chapter IV is deal with data analysis of significant influencing factors on stunting and Chapter V is conclusion of the study and findings, discussions, suggestions and further study are described.

CHAPTER II
LITERATURE REVIEW

This chapter presents cause, impact and status of nutrition and health. In additional, previous studies related to stunting are also review to construct the analytical framework.

2.1 Nutrition and Health

Nutrition is the provision to organs and cells of the material substances crucial to assist life. With sound nutrition, various frequent health problems can be avoided or protected. Thus, Good nutrition means consuming sufficient food and the proper type of food for the body 'to grow, be wholesome and fight off diseases. Hence; people need essential nutrients or healthy diet to do their daily work, to prevent illness and especially for the women to have safe and healthy births. Therefore, in order to avoid the state of poor nutrition or malnutrition, it needs adequate and good diet. Malnutrition can be described as impairment of physical or mental health as a result of failure to fulfill necessary nutrient requirements. In addition, malnutrition related with two types of growth failure such as: (1) wasting (acute malnutrition) can be defined as low weight-for-height and stunting (chronic malnutrition) mean as low height-for-age. Wasting is speedy weight loss or a failure to gain weight. Normally, wasted children are extreme thin. Wasting can be considered as reversible condition when the conditions improve. (2) Stunted children are short for their age. Stunting resulted from inadequate nutrition or repeated infections or both. Different from the wasting, the development of stunting state is a slow cumulative process at height deficits and it may be irreversible.

Six main classes of nutrients are important for the body needs including protein, carbohydrate, fats vitamins, minerals and water. Consuming these six nutrients on a daily basis is crucial to build and maintain health. The nutrients encompass protein to build the body, vitamins and minerals to protect and repair the body, and small amount of carbohydrate, fat and sugar, which give energy. Clean water is also essential for the body. Nutrition problem is a major health issue of 21^{51} century as every country has a problem of malnutrition. There are many reasons for experiencing malnutrition however; it can result in the negative impact on education, health and economic issue. Some serious health problem can occur due to the lack of the essential vitamins and minerals, Vitamin A, Thiamine (vitamin B 1), Protein, Iron, Calcium and Iodine are the essential micronutrient for the human body. The needs of micronutrient can be differed from one person to another. Moreover, lack of Protein caused Protein Energy Malnutrition (PEM) concerned as a major problem for some regions in the world and Iodine Deficiency Disorders (lDD), Iron Deficiency Anemia (IDA), Vitamin A deficiency (VAD) and Vitamin B 1 deficiency.

2.2 Causes of Malnutrition

There are several causes of malnutrition in the world. Malnutrition resulted from lack of knowledge on the value of nutrition, due to the natural disaster or men-made disaster, weak in technology of agriculture or lack of access to the farm and seeds provision, living in remote area, which is far from the cities to buy the foodstuff easily, and family living with low income. In addition, other impacts of malnutrition caused from the chronic diseases resulted from the rapid increase of communication globally, negative effect of social and culture, change of climate due to the economic boom, growth in the faster rate of population, downsizing of agricultural production. Moreover, malnutrition is caused by the water which is not sanitary that can affect especially on the child in being malnourished with some kinds of parasite, waste or chemical. It becomes a serious factor especially for the young child nowadays. Another issue for malnutrition is caused by the rate of infection when mother does not have sufficient nutrition and health; the toddler is the one to suffer. The newborn will have a low birth weight, jaundice and range of other illnesses, which can remain with the child for years.

The causes of malnutrition can be different from one region to another. Individual live with 'low-income level, lack of access to land and lack of education, community participation, health knowledge and health care are the main causes. The assumption on the food insecurity in late 19th century was based on faster population growth rate and the downsizing of agriculture. Today, soil erosion resulted from natural disaster, over-cultivation and deforestation can have affect a reducing agriculture products. Mother’s nutritional status also directly effect on the child's nutrition during breast-feeding. Health education enhances the health knowledge and the most important issue is to apply it in the consistent behavior. The role of the women these days become very important. They have to spend their time in the work in order to get more income, and then have the children receive less children receive less time to spare with the family. This is one of the reasons for the less time to spare with the family. This is one of the reasons for the less care from working mothers.

Mothers' breast milk is the most suitable for the baby and every country promotes the exclusive breast-feeding these days. In this regard, systematic breast-feeding is as important as prevention measure in health issue. Heath information takes prominent role in the concept of providing supplementary food. Supplementary food has to be provided after the baby is SIX month old. The mother has to understand and accept her obligations to provide immunization, supplementary food and good care. Mother's good care can cover the child from being under-weight even the child infected with some diseases. Furthermore, mother has to realize that postnatal care is as important as prenatal care to support her health especially during breast-feeding. The attitude and practice of their health knowledge is another concern. In spite of having a certain level of health knowledge, if the people do not have the right attitude, it is quite difficult to put it into practice. It can be clearly seen that malnutrition resulted from the collective influential factors.

2.3 Impact of Malnutrition

Malnutrition is a general term for a medical circumstances caused through inadequate eating regimen and nutrition. According to the WHO, Hunger and malnutrition are the single most serious problem in world's public health and malnutrition matters which contributes to child mortality in half of all instances. Moreover, the hazard of infant mortality link to lifelong malnutrition could start since at the stage in embryo and it is generally associated with the mother's stature (related with mother's childhood nutritional status prior to conception, and diarrhea disease, intestinal parasites, and more than a few continual diseases. Multiple research studies have shown that nutritional status of adults is considerably influenced by way of their nutritional experience of early childhood.

The nutritional condition of potential mothers or women and children is particularly important because of its dangerous effects of malnutrition that influence future generations. Malnutrition is a complex topic which resulted from poor nutrition can cause exhaustion, weakness, disability, stunted growth for the children and in poor health generally. Malnutrition is the extremely serious public health problem as it can lead to a substantial increase in the risk of mortality and morbidity. Moreover, malnutrition has a direct bearing on poor status of health, education and the economy.

It leads the children require extra severe care from their parents and are less physically and intellectually effective in their adults life. A very excessive degree of malnutrition reduces physical and cognitive growth and additionally hampers the productivity and income of people and results in a terrible effect on the country's economic growth. Malnutrition associated with sickness to loss productivity and deterioration education due to increase absenteeism. The boy compensated for the lack of energy by slowing down its physical and mental activities. Under nutritious person cannot concentrate and does not take initiative and as for the child, he or she loses all desire to play and study.

Malnutrition typically affects all society groups but infants are the foremost vulnerable due to their high nutritional requisites for growth and development. The community of issues includes malnourished pregnant women, who have greater risk of giving birth to a low birth weight babies to growth failure during infancy and babyhood at the risk of morbidity and premature or early death. Undernourished girls have become another malnourished mother, thus contribute to the intergenerational cycle of malnutrition. Underweight or malnourished women may have obstetric complications, which may add the cause to still death or premature death. The most immediate problem with underweight is secondary underlying disorder. Unexplained loss of weight needs health professional diagnosis. Underweight may be a main causative condition. Severely underweight people may have low physical endurance and a poor immune system and its leads open to infection. The symptoms of primary malnutrition can be exacerbated by illness: also easily treatable diseases such as diarrhea may lead to death.

Underweight status and micronutrient deficiencies are supporting to reducing in human immune as the main causes of death if followed by infectious disease. Especially, the underweight women can result in anemia and possible complications during pregnancy. Underweight is also established risk for spontaneous fracture, the damage that would be irreversible. In developing countries, poor antenatal conditions are deaths of the underweight children are concentrated in the lack of neonatal and postnatal care, which attribute to low-birth weight resulted from maternal under-nutrition. Stunted growth is a cause to reduce growth rate in human development and this stunted growth becomes common problem affecting a large percentage of children in developing countries. Most effected children will never gain the appropriate body weight. It also causes premature death of the human due to the un-development of vital organs during childhood.

Malnutrition is resulted from taking inadequate dietary intake, infection or both. It is more about quality than quantity of food. All forms of malnutrition are less visible but no less of death. Malnutrition is usually resulted from the deficiencies of protein, vitamins and micronutrients. Protein energy malnutrition and the deficiencies of Iron, Vitamin A, Iodine and Zinc are the causes of malnutrition. Severe malnutrition leads not only to increase morbidity and mortality but also causes impaired psychological or intellectual development. These outcomes can have severe consequences in adult life, which affect the individuals' economic productivity and reducing economic potential.

On the other hand, another type of malnutrition, obesity resulted from the body taking the dietary more than the body needs without sufficient nutrients or imbalance or nutrients intake can le.id to chronic diseases such as diabetes hypertension and heart disease for life threatening. Today, every country has been set the health strategy to the preventive measure rather than curative measure. In this regard, all the diseases associated with malnutrition are the burden for the government and hindering economic productivity. Besides, it carries to spend more health expenditure and less development in human resource that poses to interrupt the economy substantially. Reduction malnutrition is not only benefits the child's health in the short-term development, it also promotes the future long-term development in economic progress of the nation. Today, reducing malnutrition has the primary role of the Public Health.

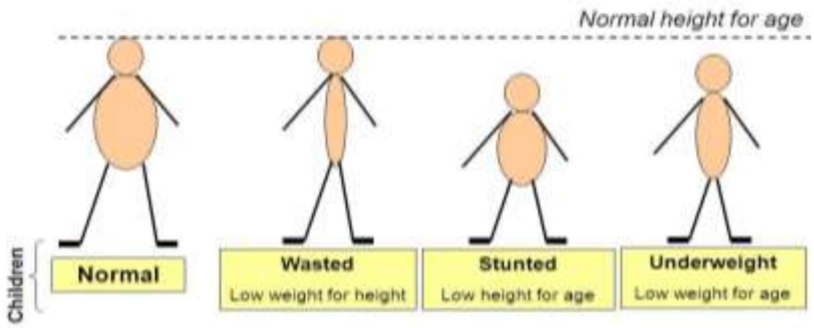
2.4 Nutritional Status of Children Under Age Five

Nutritional status implies that the state of the body in those respects is effected by diet the levels or nutrients in body and the hose level' ability to sustain normal metabolic integrity for adults, it is measured by height and weight; the findings are expressed by the Body Mass Index (BMI). For children, weight and height for age are compared with standard data for adequately nourished children. Children's nutritional status could be a reflection of their overall health. Nutritional status of infant and young children can be assessed by: direct method and indirect method. Direct method includes anthropometry method, clinical examination, biochemical test and biophysical methods. Indirect method includes use of agricultural data, health and vital statistics, socio-economic data and dietary survey.

Among them, Anthropometry is most commonly applied method to interpret the nutritional status of infant and young children. Anthropometry is mostly related with the evaluation of the fluctuations of the physical dimensions and the gross composition of the body at various age levels and degrees of nutrition. Age dependent group were weight for age and height for age. Age independent criteria were mid-arm circumference (MAC) ratio, height ratio and skin fold thickness. In the present study, assessment of nutritional status was done according to weight for height/length, weight for age and height for age. Height for age is the single best indicator of chronic malnutrition.

Table (2.1) Classification of Nutritional Status of Children

Nutrition Status	WHO standard (Z-Score)	Severe	Moderate	Global	Type of malnutrition
Underweight	Weight for age	<-3 SD	<-2 to -3 SD	<-2 SD	Acute or chronic
Stunting	Height for age	<-3 SD	<-2 to -3 SD	<-2 SD	Chronic Under nutrition
Wasting	Weight for height	<-3 SD	<-2 to -3 SD	<-2 SD	Acute under nutrition



Underweight was defined as below the median value and more than 2 standard deviations of the WHO International Growth Reference for the weight for age sector. The global prevalence of underweight was substantially lower than that of stunting. Weight for age was often used to screen for under nutrition because it did not require measurement of height. Weight of age data underestimates substantially the number of malnourished children. The WHO classified the prevalence of underweight: less than 10% as low prevalence, between 10-19% as median, between 20-29% as high, and 30% and above as very high prevalence.

Stunting can be classified as more than 2 standard deviations below the median value of the WHO International Growth Reference and these are related with length or height for age.

Wasting was defined as under the WHO International Growth Reference weight of height median or greater than 2 standard deviations. Recent illness or food storage that induced severe weight loss caused wasting although chronic under nutrition or illness result to this condition. The prevalence of wasting was much lower than of stunting or under-weight. The expected prevalence was 2-3% in developing countries. When wasting rose to about 5%, mortality rates increased continuously.

2.5 Breastfeeding

Breast milk is undoubtedly the best food for a baby's health. It should be exclusive feeding given on demand for the primary six months of a baby's life. For successful breast milk production, in addition for assisting in establishing a bond between baby and mother and it is also crucial for mother to begin suckling the baby within the first hour of birth. On the opposite hand, complementary feeding has been defined because the period during which foods or liquids are provided together with continued breastfeeding. It is the term used to define any nutrient-containing foods or liquids other than breast milk which gives nutrients young children after six months of age during the dietary transitional period." Children are protected from infection for the early years of life by breastfeeding and it also provides an ideal source of nutrients, and is economical and safe.

2.6 Vitamin A Supplements

Vitamin A is necessary for appropriate functions of the Immune system and vision., Current international recommendation is consuming high-dose vitamin A supplementation for every four to six months to all children aged 6-59 months in countries with vitamin A deficiency problems.

2.7 Global Nutritional Status and Nutritional Problems

The biggest public health challenge is stunting which is also the most serious issue in the world. Stunting is mostly can't be found in many countries, however currently impacts 165 million children over the world, nearly 90% of whom are from the area of Africa and Asia, which is also the main source of concern in most developing countries. People in these resource scare countries also face the incidence of stunting, related with multiple determinant variables intermingled with the long-term inefficiency of proper nutrition. From WHO, the predicted prevalence of stunting between children aged 5–18 years of age in Africa was 37% as compared with the highest prevalence rate of 23% in Asia in 2015.

In Ehiopia, stunting among children is one of the ongoing issues. Stunting is broadly accepted to happen mainly in early childhood (generally by 3 years of age) through a cumulative process. As indicated by three DHS surveys in Ethiopia the beginning of stunting is visible by 6–12 months of old and increments to 24 months of age. In newborn children < 6 months of age, stunting rates have significantly diminished, ranging from 22% in 2000 and 23% (2005) reduced to 14% in 2011. Stunting rates for children under 2 years went from 49% in 2000, to 47% in 2005, to 35% in 2011. For youngsters younger than five, rates correspondingly decreased significantly from 54 percent in 2000, to 49 in 2005, and to 41% in 2011.

The DHS 2011 data pointed that stunting rates are over 40% in Afar, Amhara, Tigray, and Benishangul-Gumu, and Tigray has the highest rates 52%. Regional rates of Oromia, Gambela, Harar and Somali, SNNPR, Dire Dawa range from 21 to 32% and Addis Ababa had the lowest rate (13%) at the same time.

2.8 Nutritional Status and Problems in Myanmar

Children's nutritional status is a representation of their overall health. When children have access to get enough food supply, will not expose to illness repeat, and are well cared for and then they reach their growth potential normally and can be considered that they are well nourished. In worldwide, under-nutrition is associated with greater than half of all child deaths case. Undernourished children have more chances likely to die from normal childhood ailments, and those who survive may have recurring sickness and faltering growth. Three-quarters of children who died from malnutrition cases were only mildly to moderate malnourished – showing little evidence of their vulnerability. The goal of The Millennium Development target is to decrease the half of the proportion of hungry individuals between 1990 and 2015. A drop in the prevalence of malnutrition would also help to decrease child mortality.

There is a reference distribution of height and weight for children under five years of age in a well-nourished population. Comparing children with a reference population can evaluate the conditions of under-nourishment in a population. The benchmark population used for this research is based on the WHO growth expectations standards. There are three measures of nutritional status such as weight for-age, height-for-age, and weight-for-height which all can be mentioned in standard deviation units (z-scores) from the median of the reference population.

Weight-for-age is an indicator of both acute and chronic malnutrition. Those weight-for-ages is greater than two standard deviations or below the median of the reference population are graded as moderately or severely underweight while those whose weight-for-age is under the median and more than three standard deviations are considered as significantly underweight.

Height-for-age could be a degree of linear growth. Children whose height-for-age underneath the median of the reference population or more than two standard deviations are considered short for their age and are evaluated as moderately hindered. Height-for-age with more than three standard deviations or below the median are classified as seriously stunted children. Stunting is a reflection of chronic malnutrition which results from failure to attain enough nutrition over a long period and recurrent or chronic sickness.

Weight-for-height can be utilized to get to squandering and overweight status. Children whose weight-for-height is more than two standard deviations below the median of the reference population are grouped as moderately wasted, while those who fall more than three standard deviations below the median are classified as seriously wasted. Wasting is normally the result of a recent nutritional insufficiency. The pointer of wasting may exhibit significant seasonal shifts related with changes in the accessibility of food or disease prevalence.

2.8.1 Status of Nutrition

Myanmar continues to suffer from a high prevalence of maternal and child under nutrition although there is strong macroeconomic growth and poverty reduction than the past decade. While stunting, or chronic under nutrition, has declined from just over 40% in 1990 to 29.2% in 2016, there are still some 1.4 million children under five years of age who are classified as stunted (DHS 2015-16). At the same time, acute under nutrition, or wasting, remains high affecting 7% of preschool children. Micronutrient deficiencies are also a cause for concern, as exemplified by the high burden of anemia amongst 57.8% of children of 6-59 months and 46.5% of women of reproductive age and is likely attributable in part to inadequate dietary intake of iron. Finally, the prevalence of Low Birth Weight (LBW) is 8.1% and is an important indicator of both maternal and child nutrition since it is the direct result of poor nutrition in pregnancy. Adolescent mothers are at higher risk of having LBW babies, and every year more than 50,000 teenage girls give birth in Myanmar. The four manifestations of maternal and child under nutrition (stunting, wasting, micronutrient deficiencies, and low birth weight) each have unique etiologies, and as such, require distinct approaches to ameliorate the problem.

2.8.2 Strategic Approach

The MS-NPAN is based on the underlying assumption that collaboration between key actors and stakeholders is imperative for the long-term and sustainable improvement of nutrition for women, children, and adolescents in Myanmar. By leveraging the collective and complementary inputs of multiple sectors with different strengths and enabling convergence of interventions and services at the community, household and individual level it will be possible to have a significant impact on nutrition outcomes.

This Myanmar Multi-Sectoral National Costed Action Plan for Nutrition (MS-NPAN) describes the nature of the problem, the key factors which lead to poor nutrition, priority interventions and the rationale for the proposed multi-sectoral approach. This plan provides the basis for initial implementation which will commence with a series of program preparation steps during an inception period from 1st October 2018-30th September 2019 during which time State/Region plans for priority geographical areas will be adapted to the specific conditions and requirement of those areas. In year two, the MS-NPAN will be scaled-up in all parts of the country according to State/Region plans. The MS-NPAN will prioritize certain interventions in each State/Region based on (1) the most important factors causing poor nutrition and (2) the interventions which are most amenable to effective operationalization and scale-up to achieve high coverage, and as a result will lead to the greatest impact.

2.8.3 Children's Nutrition Situation in Myanmar

Despite strong macroeconomic growth in Myanmar, the prevalence of under nutrition among women and children remains high. Nutritional status is available from several Multiple Indicator Cluster Surveys (MICS) and Demographic Health Survey

(DHS) conducted between 1997 and 2016 using different indicators. The current condition of nutrition in Myanmar is reflected by the prevalence of stunting, wasting, low birth weight, underweight, and micronutrient deficiencies.

Stunting, or low height-for-age, is an anthropometric measurement of linear growth that points out chronic under nutrition in children and is caused by long-term dietary deficiency and recurrent infectious diseases. Stunting is related with deficits in cognitive development, poor performance in school and reduced productivity in their adult lives. The most recent estimates from 2015-16 show a national prevalence of stunting of 29.2%, having declined from 40.8% in 2015.

Acute malnutrition, or wasting, is an indicator of recent or current under nutrition and is often the result of a short-term inadequacy of food and a high burden of morbidity, such as diarrhea or respiratory infection. It is assessed by measurements of weight-for-height, mid-upper arm circumference (MUAC), or the presence of edema. According to the MDHS (2015-2016), 7.0% of children under five years of age are classified with acute malnutrition, which is a reduction of about a third from levels observed in 2000 of 10.7%. There is a high prevalence of underweight among women, as measured by a low BMI (15.5% with BMI<16). Maternal underweight is associated with low birth weight in newborns, which is a reflection of poor nutrition prior to and through pregnancy, resulting in diminished fetal growth.

Low birth weight is highly profoundly related with perinatal, neonatal, and postnatal morbidity and mortality. Expending birth weight contributes to a much better overall child growth and increased adult height. Worldwide evidence has demonstrated that birth weight can be quickly improved, indeed in populations of short adult women (UNSCN 2011). Agreeing to the MDHS (2015-2016), the prevalence of low birth weight (Less than 2,500 grams) was 8.1% representing an improvement from 15% in 2000. Finally, it should be noted that while the focus of the MS-NPAN will be to reduce under nutrition, the burden of over nutrition is growing in Myanmar, albeit from a low base. Overweight among children (weight-for-height>2SD) was 103% in 2015-16, while among of reproductive age, overweight (19.2%) and obesity (5.5%) are considerably more common. However, experience from other countries has demonstrated the importance of optimal nutrition and adoption of healthy nutrition practices early in life as an avenue to reduce to risk of later life over nutrition and NCDs. The MS-NPAN will therefore focus on what WHO has termed double duty action for nutrition, which can address both under nutrition and over nutrition through common interventions, while attention will be paid to these emerging issue of overweight / obesity, nutrition in emergencies and urbanization.

2.9 Reviews on Related Studies

In this section, the reviews on previous researches relating with determinants of nutritional status of children are presented.

Chhetri and Gharti (2005) examined factors associated with malnutrition among children aged 6 – 36 months in the rural area of Sunsari district, Terai, Eastern Nepal. Multivariate analysis showed that children in households of low socio economic status are risk of being underweight compared to those from higher levels of socio economic status. Socio-economic factors were found to be the key factors of child malnutrition. Mother’s condition like age at marriage and education had significant relationship with child malnutrition. Sanitation and prolonged exclusive breast-feeding also had strong relationship with malnutrition. Size of baby at birth also was one of the important factors influencing child malnutrition.

Borgen (2009) studied commonness of under nutrition and recognize reasons of under nourishment among kids below 5 years of age in the Far West Terai of Nepal. The multiple regression models showed that significantly incorporated the variation were included: family units where the mother was working over 8 hours per day had higher levels of stunting than any households where the mother was working under 8 hours/day, households headed by the dad, the granddad or the grandma, had relatively z-score lower stunting than household headed by the mother.

Teshome et al (2009) found that the determinants of stunting in food surplus areas of West Gojam Zone in Ethiopia. Both bivariate analysis and the model of logistic regression were used to identify the determinants of under-five stunting. The main contributing variables for under-five stunting were found to be gender of the child, child’s age, and diarrhea episode, deprivation of colostrum, duration of breastfeeding, pre-lacteal feeds, and kinds of food, complementary feeding introduced age and method of feeding.

The risk factors for stunting were investigated by Paudel et al (2013) among infants of age between 6 to 59 months in Nepal. Community-based case control design in the mid-west, Surkhet Nepal was studied from August to September 2010.Data was obtained by observing the mothers of those children and then measured the length/height of 118 children as cases and for controls 236 children. Logistic regression was analyzed for the purpose of identifying the best model of factors which are leading to stunting. Socio-economic stunting risk factors includes non-earning mothers, families with food deficit and care taker of the children other than mother were established as significant factors for stunting. Environmental risk factors such as kitchen unless sound ventilation and children exposed to pesticide were determinant factors of stunting. Inappropriate exclusive breast feeding, complementary feeding less than four times a day and dietary diversity below WHO standard were factors of stunted children and Diarrhea was found significantly associated with stunting.

Haque (2013) assessed the nutritional status and factors that are related to malnutrition among under five children in Sri Lanka. In multivariate analysis using multiple linear regressions model demonstrated that child age, birth weight, area of residence, socio-economic conditions, mother's BMI, education, occupation, practices of hygiene and sanitation, household head education were found to be significant predictor of stunting.

Mzumara et al (2014) identified socio-economic variables that were related with hindering among children aged 0 to 59 months in Zambia. The analysis includes easy and multiple logistic regressions in order to find ties between stunting and independent variables. Stunting has been found that it was correlated with sex and race of a child, age and education of the mother, residence, wealth and duration of breastfeeding.

Bwalya et al (2015) determined factors associated with obesity among children aged 6–23 months in Zambia. The binary logistic regression Adjusted Odds Ratios (AORs), confidence intervals and corresponding p-values for the association between stunting by immediate, fundamental, basic and other factors of children who 6–23 months of age. The main factors associated with children being stunted are: mothers who are receiving iron tablets at the time of pregnancy, children and mothers individual dietary diversity scores (IDDS) in the immediate causes of stunting. These factors can't make a contribution to this model such as Vitamin A post-partum, Mothers receipt of anti-malaria tablets and de-worming drugs. At the time of survey, mothers were confirmed breastfeeding, mothers having attended antenatal clinics during the previous pregnancy and place of delivery were also the fundamental causes of child stunting. In addition, maternal education, the age of mother, income index and mothers earning more or less as partner were also underlying factors. Further on, the model reveals that, age in months, sex and size at birth are some of the other determinant factors of stunted growth.

Rugema and Joselyne (2017) identified the determinants of stunting among children two-years of age and younger in Rutsiro District, Rwanda. Chi-square test and multiple logistic regressions were used to determine association between study variables and stunting. Findings indicated that children were at increased risk of stunting if they lived in households with severe hunger, lower wealth category, used water from an unprotected source, used untreated drinking water, had unimproved toilette, practiced unsafe stool disposal, child did not receiving minimum dietary diversity and child not receiving micronutrients powder.

Sarma et al (2017) studied the determinants of stunting in children between 1 – 5 years of age in Bangladesh. To know the correlation of stunting and potential demographic and socioeconomic factors, several binary logistic regressions are used to analyses. It has been found that the prevalence of stunting has to be about 41% among children under 5 years of age and higher for rural area than in urban. Children who are living in slightly food-insecure households had higher possibilities of becoming stunted compared than to those in food-secure households. There is also a finding that children delivered at institutions especially facilitated by public or private sectors were have the possibility of stunting less than for children at home. Like this, the index of income, the exposure of mother to the mass media, age of child, pound size of new borns, and parents' education levels were significantly related with stunting.

Akombi et al (2017) examined factors related to children under 60months age in Nigeria. To identify possible risk related with stunting or severe stunting, the logistic regression analyses which are adjusted for cluster and survey weights were accustomed. Gender of child (male), geopolitical zone (North East, North West, North Central), mother's perceived birth size (small and average), household wealth index (poor and poorest households), duration of breastfeeding (more than 12 months), and children who were reported to having had diarrhea within the 2 weeks before the survey are consistent risk factors for stunting among children aged under 5 years according to the multivariate analysis.

Birhanu et al (2017) examined prevalence and factors associated stunting for children under 5 years in Lasta Woreda, North East Ethiopia based on cross sectional study that was conducted from March-April, 2015.With the purpose of identifying the association and significant predictors, binary logistic regression model was used. In this study, these stunting factors are found that such as being male, increasing age, large family size, poor wealth status, and literate mother, leftover food, living in rural area and less frequency of feeding.

Wicaksono and Harsanti (2020) identified the risk factors of childhood of nutrition in Indonesia by applying 2013 Indonesia Basic Health Research Survey dataset. This study covers a huge number of 76,165 children aged less than 5 years. This research used logistic regression to calculate adjusted odds ratios. It has been found that the chances of stunting increased significantly among the under-five boys, or living in slum area, and large number of household member. The odds of stunting reduced especially for children whose have educated parents or live in urban area, in a province with higher (GDP) per capita, and higher ratio of professional health worker per 1,000 population aged 0-4 years.

Wali et al (2020) studied that factors associated with stunting among children under 5 years in five South Asian Countries (2014–2018) based on Demographic Health Surveys. South Asia continues to be the global hub for child undernutrition with 35% of children still stunted in 2017. This paper aimed to identify factors associated with stunting among children aged 0–23 months, 24–59 months, and 0–59 months in South Asia. A weighted sample of 564,518 children aged 0–59 months from the most recent Demographic and Health Surveys (2014–2018) was combined of five countries in South Asia. Multiple logistic regression analyses that adjusted for clustering and sampling weights were used to examine associated factors. The common factors associated with stunting in three age groups were mothers with no schooling and maternal short stature.

Based on the review of the previous studies, many studies were focused on under five children. It indicated that the determinants of the nutritional status of children under five years were needed to explore in order to carry out effective factors of stunting for those children.

2.10 Analytical Framework of the Study

In this study, the analytical 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 under five years, this study aimed to determine the effects of socio-economic and demographic characteristics on nutritional status among children under five years. Accordingly, the analytical framework of this study was developed by the main study areas which is shown in Figure (2.1).

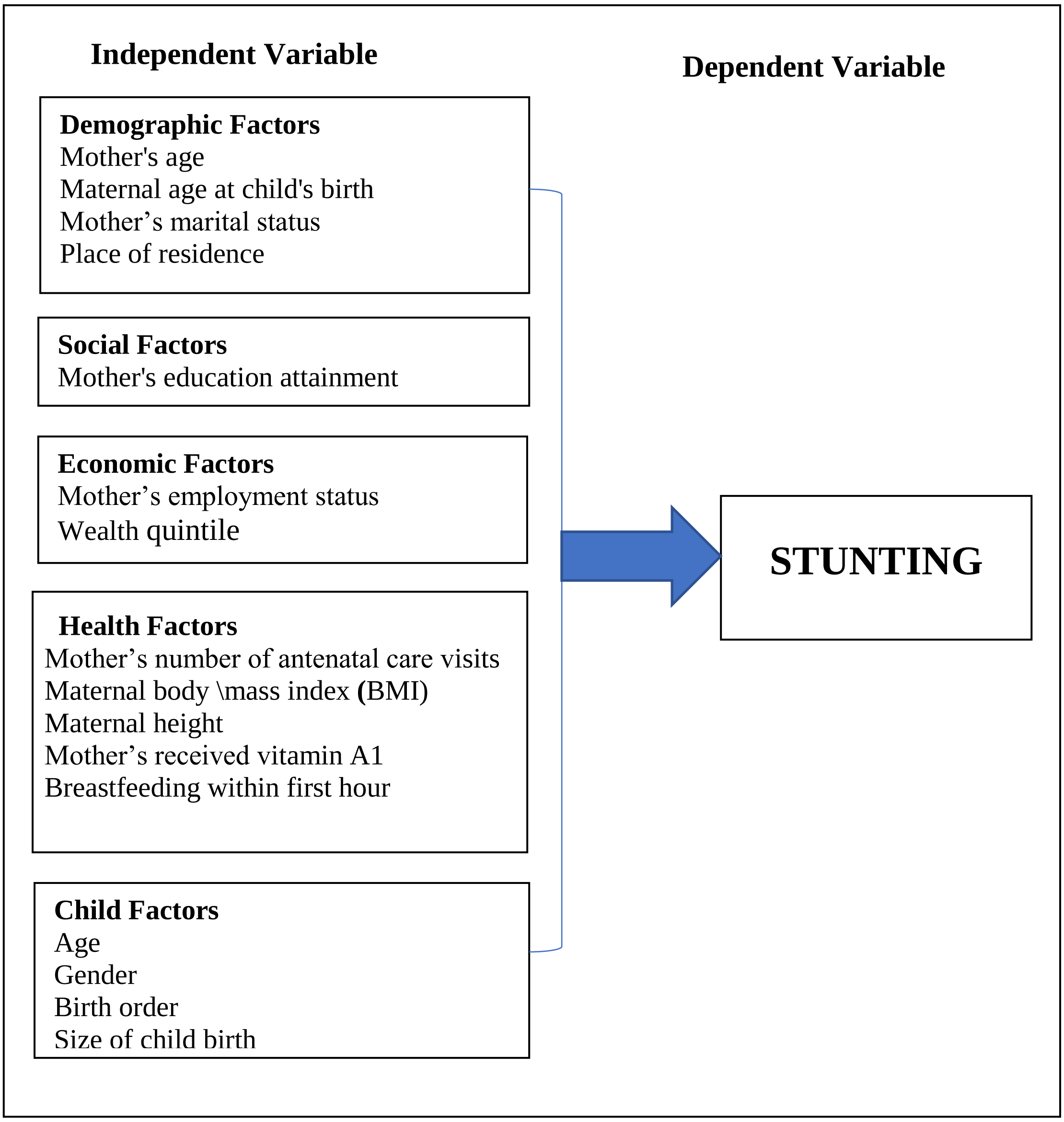


Figure (2.1) Analytical Framework of the Study

CHAPTER III
RESEARCH METHODOLOGY

This chapter provides the data source, method used in data analysis and description of variables in this study.

3.1 Data Source

In this study, the secondary data from the 2015-16 Myanmar Demographic and Health Survey (MDHS) were used. The MDHS collected data very detailed information from a nationally representative sample of women aged 15-49 years, using a two-stage clustered design, which is used to identify eligible households. Data collection is carried out in two stages. In first stage, the household questionnaire collects basic socio-demographic information on each household member (i.e. age, sex, education), and information regarding the household's physical characteristics (i.e. wealth index). In second stage, each household's 'roster' is used to identify and administer additional surveys with eligible women (13-49 years old), men (13-59 years old), and children (0-59 months old). The MDHS data set includes a sample of 4550 under five children and the weighting sample of 4069 children were used to analyze stunting in this study.

3.2 Chi-Square Test of Independence

The Chi-Square test of independence is used to determine if there is a significant relationship between two nominal (categorical) variables. The frequency of each category for one nominal variable is compared across the categories of the second nominal variable. The data can be displayed in a contingency table where each row represents a category for one variable and each column represents a category for the other variable. The chi-square test of independence can be used to examine this relationship. The null hypothesis for this test is that there is no relationship between two variables. The alternative hypothesis is that there is a relationship between the two variables.

The following formula is applied to calculate the value of the Chi-Square test of Independence:

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(O_{ij} - E_{ij})^2}{E_{ij}} \qquad (3.1)$$

O_{ij} = observed frequencies

E_{ij} = expected frequencies = $\frac{\sum_{k=1}^{c} O_{ij} \sum_{k=1}^{r} O_{kj}}{N}$

$\sum_{k=1}^{c} O_{ij}$ = sum of the observed frequencies for i^{th} column

$\sum_{k=1}^{r} O_{kj}$ = sum of the observed frequencies for k^{th} row

N = total number of observations

The critical value for the chi-square statistic is determined by the level of significance (typically .05) and the degrees of freedom. The degrees of freedom for the chi-square are calculated using the following formula: df = (r-1)(c-1) where r is the number of rows and c is the number of columns. If the observed chi-square test statistic is greater than the critical value, the null hypothesis can be rejected.

3.3 Some Concepts Related to Logistic Regression

Logistic regression sometimes called the logistic model or logic model, analyzes the relationship between multiple independent variables and a categorical dependent variable, and estimates the probability of occurrence of an event by fitting data to a logistic curve. Binary logistic regression is typically used when the dependent variable is dichotomous and the independent variables are either continuous or categorical.

Odds of an event are the ratio of the probability that an event will occur to the probability that it will not occur. If the probability of an event occurring is *p*, the probability of the event not occurring is (*1-p*). Then the corresponding odds is a value given by

$$\text{odds of \{Event\}} = \frac{p}{1-p}$$

Since logistic regression calculates the probability of an event occurring over the probability of an event not occurring, the impact of independent variables is usually explained in terms of odds. With logistic regression the mean of the response variable p in terms of an explanatory variable x is modeled relating p and x through the equation $p=\alpha+\beta x$. Unfortunately, this is not a good model because extreme values of x will give values of $\alpha+\beta x$ that does not fall between 0 and 1. The logistic regression solution to this problem is to transform the odds using the natural logarithm (Peng, Lee & Ingersoll, 2002). With logistic regression we model the natural log odds as a linear function of the explanatory variable:

$$\text{logit (y)} = \ln \text{(odds)} = \ln \left(\frac{p}{1-p}\right) = \alpha + \beta x \qquad (3.2)$$

where p is the probability of interested outcome and x is the explanatory variable. The parameters of the logistic regression are α and β. This is the simple logistic model.

Taking the antilog of equation (3.2) on both sides, one can derive an equation for the prediction of the probability of the occurrence of interested outcome as

$$p = P\,(Y = \textit{interested outcome} / X = x, \textit{a specific value})$$

$$= \frac{e^{\alpha + \beta\chi}}{1+e^{\alpha + \beta\chi}} = \frac{1}{1+e^{-(\alpha + \beta\chi)}}$$

Extending the logic of the simple logistic regression to multiple predictors, one may construct a complex logistic regression as

$$\text{logit (y)} = \ln \left(\frac{p}{1-p}\right) = a + \beta_1 X_1 + \ldots + \beta_k X_k$$

Therefore,

$$p = P\,(Y = \textit{interested outcome} / X_1 = x_1, \ldots, X_k = x_k)$$

$$= \frac{e^{\alpha + \beta_1\chi_1 + \ldots + \beta_k\chi_k}}{1+e^{\alpha + \beta_1\chi_1 + \ldots + \beta_k\chi_k}} = \frac{1}{1+e^{-(\alpha + \beta_1\chi_1 + \ldots + \beta_k\chi_k)}}$$

When a logistic regression is calculated, the regression coefficient (b_1) is the estimated increase in the logged odds of the outcome per unit increase in the value of the independent variable. In other words, the exponential function of the regression coefficient (e^{b_1}) is the OR associated with a one unit increase in the independent variable. The OR can also be used to determine whether a particular exposure is a risk factor for a particular outcome, and to compare the magnitude of various risk factors for that outcome. OR=1 indicates exposure does not affect odds of outcome. OR>1 indicates exposure associated with higher odds of outcome. OR<1 indicates exposure associated with lower odds of outcome.

3.4 Evaluation of Logistic Regression Model

After estimating the coefficients, there are various evaluation parameters or test need to be conducted for assessing the appropriateness, usefulness and adequacy of the developed logistic regression model. These evaluation parameters are the statistical test of each predictor variable and goodness-of-fit statistics.

3.4.1 The Likelihood Ratio Test

Overall fit of a model shows how strong a relationship between all of the independent variables, taken together, and dependent variables. It can be assessed by comparing the fit of the two models with and without the independent variables. A logistic regression model with the k independent variables (the given model) is said to provide a better fit to the data if it demonstrates an improvement over the model with no independent variables (the null model). The overall fit of the model with k coefficients can be examined via a likelihood ratio test which tests the null hypothesis

$$H_0 : \beta_1 = \beta_2 = ... = \beta_k = 0.$$

To do this, the deviance with just the intercept (-2 log likelihood of the null model) is compared to the deviance when the k independent variables have been added (-2 log likelihood of the given model). Likelihood of the null model is the likelihood of obtaining the observation if the independent variables had no effect on the outcome. Likelihood of the given model is the likelihood of obtaining the observations with all independent variables incorporated in the model.

The difference of these two yields a goodness of fit index G= χ^2 statistic with k degrees of freedom (Bewick, Cheek, & Ball, 2005). This is a measure of how well all of the independent variables affect the outcome or dependent variable.

G= χ^2 = (-2 log likelihood of null model) - (-2 log likelihood of given model) An equivalent formula sometimes presented in the literature is

$$= -2\log \frac{likelihood\ of\ the\ null\ \mathrm{mod}\ el}{likelihood\ of\ the\ given\ \mathrm{mod}\ el}$$

where the ratio of the maximum likelihood is calculated before taking the natural logarithm and multiplying by -2. The term 'likelihood ratio test' is used to describe this test. If the p-value for the overall model fit statistic is less than the conventional 0.05, then reject H_0 with the conclusion.

3.4.2 Chi-Square Goodness of Fit Tests

With logistic regression, instead of R^2 as the statistics for overall fit of the linear regression model, deviance between observed values from the expected values is used. In linear regression, residuals can be defined as $y_i - \hat{y}_i$ where y_i is the observed dependent variable for the ith subject, and $\hat{y}_i$ the corresponding prediction from the model. The same concept applies to logistic regression, where y_i is equal to either 1 or 0, and the corresponding prediction from the model is as

$$\hat{y}_i = \frac{e^{\alpha + \beta_1\chi_1 + \ldots + \beta_k\chi_k}}{1+e^{\alpha + \beta_1\chi_1 + \ldots + \beta_k\chi_k}} \quad (3.3)$$

A standardized residual can be defined as

$$r_i = \frac{y_i - \hat{y}_i}{\sqrt{\hat{y}_i(1-\hat{y}_i)}}$$

One can then form a χ^2 statistic as $\chi^2 = \sum_{i=1}^{n} r_i^2$

This statistic follows a χ^2 distribution with n−(k+1) degrees of freedom, so that p-values can be calculated.

3.4.3 Hosmer-Lemeshow Test

The Hosmer–Lemeshow test is to examine whether the observed proportions of events are similar to the predicted probabilities of occurrence in subgroups of the model population. The Hosmer-Lemeshow test is performed by dividing the predicted probabilities into deciles (10 groups based on percentile ranks) and then computing a Pearson Chi-square that compares the predicted to the observed frequencies in a 2-by-10 table. The value of the test statistic is

$$H = \sum_{g=1}^{10} \frac{(O_g - E_g)^2}{E_g} \quad (3.4)$$

Where Og and Eg denote the observed events, and expected events for the gth risk decile group. The test statistic asymptotically follows a χ2 distribution with 8 (number of groups -2) degrees of freedom. Small values (with large p-value closer to 1) indicate a good fit to the data, therefore, good overall model fit. Large values (with $p < 0.05$) indicate a poor fit to the data.

3.4.4 Cox and Snell R-Square

The ratio of the likelihoods reflects the improvement of the full model over the intercept model (the smaller the ratio, the greater the improvement). L(M) is the conditional probability of the dependent variable given the independent variables. If there are N observations in the dataset, then L(M) is the product of N such probabilities. Thus, taking the nth root of the product L(M) provides an estimate of the likelihood of each Y value. Cox & Snell‟s presents the R-squared as a transformation of the –2ln[L(MIntercept)/L(MFull)] statistic that is used to determine the convergence of a logistic regression. Note that Cox & Snell‟s pseudo R-squared has a maximum value that is not 1: if the full model predicts the outcome perfectly and has a likelihood of 1, Cox & Snell‟s is then 1-L(MIntercept) 2/N, which is less than one. The Cox and Snell R square is

$$R^2 = 1 - [\frac{L(M_{Intercept})}{L(M_{Full})}]^{2/N} \tag{3.5}$$

3.5 Statistical Significance of Individual Regression Coefficients

If the overall model works well, the next question is how important each of the independent variables is. The logistic regression coefficient for the ith independent variable shows the change in the predicted log odds of having an outcome for one unit change in the ith independent variable, all other things being equal. That is, if the ith independent variable is changed 1 unit while all of the other predictors are held constant, log odds of outcome is expected to change b_i units.

3.5.1 Wald Statistic

The Wald statistic is the ratio of the square of the regression coefficient to the square of the standard error of the coefficient. The Wald statistic is asymptotically distributed as a Chi-square distribution. Wald test is used as a test of significance for the coefficients in the logistic regression.

$$W_j = \frac{\beta_j^2}{SE_{\beta_j^2}} \qquad (3.6)$$

Each Wald statistic is compared with a Chi-square with 1 degree of freedom. Wald statistics are easy to calculate but their reliability is questionable.

3.5.2 Odds Ratios with 95% Confidence Interval (CI)

Odds ratio with 95% confidence interval (CI) can be used to assess the contribution of individual predictors (Katz, 1999). It is important to note however, that unlike the p value, the 95% CI does not report a measure's statistical significance. It is used as a proxy for the presence of statistical significance if it does not overlap the null value (e.g. OR=1). The 95% CI is used to estimate the precision of the OR. A large CI indicates a low level of precision of the OR, whereas a small CI indicates a higher precision of the OR. An approximate confidence interval for the population log odds ratio is

95% CI for the ln (OR) = ln (OR) ± 1.96 × {SE ln (OR)} (3.7)

Where ln(OR) is the sample log odds ratio, and SE ln(OR) is the standard error of the log odds ratio. Taking the antilog, we get the 95%confidenceinterval for the odds ratio:

95% CI for OR = exp In (OR) ± 1.96 × {SE In (OR)}. (3.8)

3.6 Definition and Description of Variables

The followings are the definition and description of variables.

Stunting: The stunting was defined as Z score of height for age was less than -2Standard Deviation (-2SD).

Mother's age: It refers the completed age of mother.

Maternal age at child birth: It refers the completed age of mother at child birth.

Mother's marital status: It is classified as currently married and formerly married. Currently married includes never in union, married and living with partner. Formerly married includes divorced, widowed and no longer living together separated.

Place of residence: Place of respondent permanently stays.

Mother's educational attainment: The mother's education was completed level of education.

Mother's employment status: Mothers who were employed in the 7 days before the survey.

Wealth quintile: Households are given scores based on the number and kinds of consumer goods they own, ranging from a television to a bicycle or car, plus housing characteristics such as source of drinking water, toilet facilities, and flooring materials. These scores are derived using principal component analysis. National wealth quintiles are compiled by assigning the household score to each usual household member, ranking each person in the household population by their score, and then dividing the distribution into five equal categories, each with 20% of the population.

Mother's number of antenatal visits: It means that the number of visit to the antenatal care.

Maternal body mass index: The body mass index (BMI) is the metric currently in use for defining anthropometric height/weight characteristics in adults and for classifying (categorizing) them into groups.

Maternal height: It refers the height of mother.

Mother's received vitamins A1: The child recently received vitamins A1.

Breastfeeding within first hour: It means that the child was breastfed within one hour when he/she was born.

Child's age: It means that completed age of child.

Sex of child: It denotes to the features of child by male and female.

Birth order: It represents the number of child born.

Size of child birth: It represents the weight of child birth.

The description of variables was considered in Table (3.1).

Table (3.1) Description of Variables

Dependent Variable	**Code**
Stunting	1 = Stunting 2 = Not stunting
Independent Variable	**Code**
Mother's age (years)	1 = 15-19 2 = 20-24 3 = 25-29 4 = 30-34 5 = 35-39 6 = 40-44 7 = 45-49(ref)
Maternal age at child birth	1 = less than 20 years 2 = 20-29 3 = 30-39 4 = 40 and above years(ref)
Mother’s marital status	1 = Currently married 2 = Formerly married (ref)
Place of residence	1 = Urban 2 = Rural(ref)
Mother's educational attainment	1= Primary 2 = Secondary 3 = Higher 4 = No Education (ref)
Mother’s employment status	1 = Working 2 = Not Working (ref)
Wealth quintile	1 = Poorest 2 = Poorer 3 = Middle 4 = Richer 5 = Richest (ref)

Table (3.1) Description of Variables (Continued)

Dependent Variable	Code
Mother's number of antenatal visits	1 = 1-4 Times 2 = 5-8 Times 3 = At least 9 Times 4 = None (ref)
Body Mass Index (BMI)	1 = Thin (BMI<=18.5kg/m^2) 2 = Normal (BMI=19-25/m^2) 3 = Overweight/Obese (ref) (BMI = 25 and above kg/m^2)
Maternal height	1 = less than145cm 2 = 145-149 3 = 150-154 4 = 155-159 5 = above 160cm (ref)
Mother's received vitamins A1	1 = Yes 2 = No (ref)
Breastfeeding within first hour	1 = Yes 2 = No (ref)
Age of child	1 = 0-11 months 2 = 12-23 3 = 24-35 4 = 36-47 5 = 48-59 (ref)
Sex of child	1 = Male 2 = Female(ref)
Child birth order	1 = First child 2 = Otherwise (ref)
Size of child at birth	1 = Small (birth weight<2.5kg) 2 = Average (birth weight>=2.5 <4kg) 3 = Large (birth weight $\geq 4.0kg$) (ref)

CHAPTER IV

ANALYSIS OF THE FACTORS INFLUENCING ON STUNTING

This chapter consists of descriptive statistics for demographic, socio-economic and relative health factors, association between those factors and stunting, and the results of binary logistic regression model for stunting.

4.1 Descriptive Statistics

In order to analyze the influencing factors on stunting, descriptive statistics of demographic, socio-economic and relative health factors are described in this section.

4.1.1 Distribution of Stunting

The distribution of stunting among children under five years of age is shown in Table (4.1).

Table (4.1) Distribution of Stunting

Description	Number of Children	Percent
Stunting	1,121	27.6
Not stunting	2,948	72.4

Source: MDHS (2017)

Among the under five children 4069, it was found that the number of stunting children was 1121 (27.6%) and that for not stunting children was 2948 (72.4%). More than one-fourth of the under five years children were stunting.

4.1.2 Distribution of Mother's Age

The distribution of mother's age is shown in Table (4.2).

Table (4.2) Distribution of Mother's Age

Age Group	Number of Mothers	Percent
15-19	93	2.3
20-24	682	16.8
25-29	1,100	27.0
30-34	1,018	25.0
35-39	752	18.5
40-44	331	8.1
45-49	92	2.3
Total	**4,069**	**100.0**

Source: MDHS (2017)

According to the Table (4.2), most of the mother's age was between 25-35 years. More than half of the mothers were 25 to 35 years old. The percentage of mothers 35-49 years old was 28.9%.

4.1.3 Distribution of Maternal Age of Child Birth

Table (4.3) presents the distribution of maternal age of child birth.

Table (4.3) Distribution of Maternal Age of Child Birth

Maternal Age at Birth	Number	Percent
less than 20	1173	28.8
20-29	2525	62.1
30-39	362	8.9
40 and above	9	0.2
Total	4069	100.0

Source: MDHS (2017)

According to the Table (4.3), it has been found that most of the maternal women were aged between 20-29. More than 90% of the mother's maternal age at birth was younger than 29 years old.

4.1.4 Distribution of Mother Marital Status

Table (4.4) shows the distribution of mother marital status.

Table (4.4) Distribution of Mother Marital Status

Marital Status	Number	Percent
Currently married	3894	95.7
Formerly married	175	4.3
Total	4069	100.0

Source: MDHS (2017)

According to the Table (4.4), more than 95% of mothers were currently married and 4% of mothers were formerly married.

4.1.5 Distribution of Place of Residence

The distribution of place of residence is shown in Table (4.5).

Table (4.5) Distribution of Place of Residence

Type of place of residence	Number of Mothers	Percent
Urban	913	22.4
Rural	3,156	77.6
Total	4,069	100.0

Source: MDHS (2017)

According to the Table (4.5), 22.4% are of mothers lived in urban and 77.6% are lived in rural areas. It can be seen that the number of mothers who lived in rural was greater than that for urban.

4.1.6 Distribution of Mother's Education

The distribution of mother's educational level is presented in Table (4.6).

Table (4.6) Distribution of Mother's Education

Mother's Education	Number	Percent
No Education	727	17.9
Primary	1,868	45.9
Secondary	1,162	28.6
Higher	312	7.7
Total	4,069	100.0

Source: MDHS (2017)

According to the Table (4.6), the percentage of no educated mothers was 17.9% and that for educated mothers was 82.1%. Among the educated mothers, the percentage of the mothers who complete primary educational level was 45.9%. Most of the mothers have primary educational level. It has been found that, the percentage of higher educated mothers was lowest in this study.

4.1.7 Distribution of Mother's Employment Status

The distribution of mother's employment status is shown in Table (4.7).

Table (4.7) Distribution of Employment Status

Mother Employment status	Number	Percent
Yes	2,267	55.7
No	1,802	44.3
Total	4,069	100.0

Source: MDHS (2017)

Table (4.7) shows that, the percentage for working mothers was 55.7% and that for non-working mothers was 44.3%. Mother's currently working has the higher percentage than that of mother's does not working.

4.1.8 Distribution of Wealth Quintile

The distribution of wealth quintile is shown in Table (4.8).

Table (4.8) Distribution of Wealth Quintile

Wealth Quintile	Number of Mothers	Percent
Poorest	1,202	29.5
Poorer	899	22.1
Middle	687	16.9
Richer	695	17.1
Richest	586	14.4
Total	4,069	100.0

Source: MDHS (2017)

According to Table (4.8), wealth quintile exhibits the children nutritional status that 29.5% of poorest households, 22.1 % of poorer households, 16.9 % of middle households, 17.1 % of richer households and 14.4 % of richest households. The highest percent of poorest households by 29.5%. Most of the mothers was the poorest and the richest mothers were lowest percentage

4.1.9 Distribution of Antenatal Care Visits

The distribution of mother's antenatal care visits is shown in Table (4.9).

Table (4.9) Distribution of Antenatal Care Visits

Antenatal Care Visits	Number of Mothers	Percent
1-4 times	1,365	33.6
5-8 times	1,216	29.9
9 and above	432	10.6
None	1,056	25.9
Total	4,069	100.0

Source: MDHS (2017)

As shown in Table (4.9), nearly 74% of the mothers took antenatal care, about 30% of the mothers visited at least 5 times to take antenatal care and 34% of the mothers visited 1-4 times to take antenatal care. Most of the mothers visited 1-4 times to take antenatal café.

4.1.10 Distribution of Mother's Body Mass Index (BMI)

The distribution of mother's body mass index is shown in Table (4.10).

Table (4.10) Distribution of Mother's Body Mass Index

Body Mass Index	Number of Mothers	Percent
Thin	461	11.3
Normal	2,613	64.2
Overweight/Obese	995	24.5
Total	4,069	100.0

Source: MDHS (2017)

Table (4.10) shows that 64.2% of the mothers have normal body mass index. Most of the mothers have normal body mass index. Nearly 11% and 25% have thin and overweight body mass index.

4.1.11 Distribution of Maternal Height

Distribution of maternal height was described in Table (4.11).

Table (4.11) Distribution of Maternal Height

Maternal Height	Number	Percent
Less than 145cm	237	5.8
145-149	899	22.1
150-154	1511	37.1
155-159	1037	25.5
160 cm and above	385	9.5
Total	4069	100

Source: MDHS (2017)

Table (4.11) shows that 5.8% of mothers have less than 145cm of height and 37.1% of mothers have 150-154 cm of height. 25.5% of mothers have 155-159cm and also 9.5% of mothers have 160 and above of height.

4.1.12 Distribution of Received Vitamin A

The distribution of mother's received vitamin A is shown in Table (4.12).

Table (4.12) Distribution of Mother's Received Vitamin A

Received Vitamin A	Number	Percent
Yes	2,049	50.3
No	2,020	49.7
Total	4,069	100.0

Source: MDHS (2017)

Table (4.12) shows that 49.7% of mothers who received Vitamin A 50.3% was not received Vitamin A. Mothers who received Vitamin A was slightly higher than the not received Vitamin A.

4.1.13 Distribution of Breastfeeding within First Hour

The distribution of breastfeeding within first hour shown in Table (4.13).

Table (4.13) Distribution of Breastfeeding within First Hour

Breastfeeding within first hour	Number of Children	Percent
Yes	2,385	58.6
No	1,684	41.4
Total	4,069	100.0

Source: MDHS (2017)

Table (4.13) shows that 58.6% of children who breastfeeding within first hour 41.4% was not breastfeeding within first hour.

4.1.14 Distribution of Child's Age

The distribution of child's age in months is shown in Table (4.14).

Table (4.9) Distribution of Child's Age

Child's Age in Months	Number of Children	Percent
0-11	779	19.1
12-23	858	21.1
24-35	777	19.1
36-47	849	20.9
48-59	806	19.8
Total	4,069	100.0

Source: MDHS (2017)

According to Table (4.14), child's age in months exhibits the children nutritional status that 19.1% of 0-11 months, 21.1 % of 12-23 months, 19.1 % of 24-35, 20.9% of 36-47 months and 19.8% of 48-59.

4.1.15 Distribution of Gender

The distribution of gender of child is shown in Table (4.15).

Table (4.15) Distribution of Gender

Gender of Child	Number of Children	Percent
Male	1,954	48.0
Female	2,115	52.0
Total	4,069	100.0

Source: MDHS (2017)

Table (4.15) shows that 52.0% was male children and 48.0 % was female children. The under-five nutrition status of male children has the higher percentage than that of female child.

4.1.16 Distribution of Birth Order

The distribution of birth order is shown in Table (4.16).

Table (4.16) Distribution of Birth Order

First Child	Number of Children	Percent
Yes	2,637	64.8
No	1,432	35.2
Total	4,069	100.0

Source: MDHS (2017)

Table (4.16) shows that 35% was not first child and 65% were first child respectively.

4.1.17 Distribution of Size of Child Birth

The distribution of size of child birth is shown in Table (4.17).

Table (4.17) Distribution of Size of Child Birth

Size	Number of Children	Percent
Small	654	16.1
Average	2,436	59.9
Large	979	24.0
Total	4,069	100.0

Source: MDHS (2017)

The results of Table (4.17) present that, nearly 60% of the children has average size at birth. Nearly 16% and 24% of the children have small size and large size at birth respectively. The average size at birth is the highest and small size at birth is the lowest in the sample.

4.2 Bivariate Analysis of Under-Five Stunting

In the bivariate analysis of under-five stunting expressed by 16 factors together with chi-square value, degree of freedom and p-value is shown in Table (4.18).

Table (4.18) Bivariate Analysis of Children Under-Five Stunting and Mother's Characteristics

Variable	Not Stunting (%)	Stunting (%)	Chi-square Value	p-value
Mother's Age				
15-19	75(2.5)	18(1.6)	6.209	0.400
20-24	491(16.7)	192(17.1)		
25-29	806(27.3)	294(26.2)		
30-34	745(25.3)	273(24.4)		
35-39	537(18.2)	215(19.2)		
40-44	229(7.8)	102(9.1)		
45-49	65(2.2)	27(2.4)		
Maternal Age at Child Birth				
Less than 20	778(26.4)	395(35.2)	32.230***	0.000
20-29	1883(63.9)	642(57.3)		
30-39	280(9.5)	82(7.3)		
40 and above	7(0.2)	2(0.2)		
Mother Marital Status				
Currently married	2829(96.0)	1065(95.0)	1.814	0.178
Formerly married	119(4.0)	56(5.0)		
Place of Residence				
Urban	744(25.2)	169(15.1)	48.188***	0.000
Rural	2204(74.8)	952(84.9)		

Table (4.18) Bivariate Analysis of Children Under-Five Stunting and Mother's Characteristics (Continued)

Variable	Not Stunting (%)	Stunting (%)	Chi-square Value	p-value
Mother's Education				
No Education	482(16.4)	245(21.9)	70.463***	0.000
Primary	1289(43.7)	579(51.7)		
Secondary	912(30.9)	250(22.3)		
Higher	265(9.0)	47(4.2)		
Employment Status				
Working	1607(54.5)	659(58.8)	6.016*	0.014
Not Working	1341(45.5)	462(41.2)		
Wealth Quintile				
Poorest	775(26.3)	427(38.1)	120.967***	0.000
Poorer	613(20.8)	286(25.5)		
Middle	502(17.0)	185(16.5)		
Richer	551(18.7)	144(12.8)		
Richest	507(17.2)	79(7.0)		
Antenatal care visits (times)				
1-4	948(32.2)	417(37.2)	68.093***	0.000
5-8	954(32.3)	262(23.4)		
9 And Above	351(11.9)	81(7.2)		
None	695(23.6)	361(32.2)		
Body mass index				
Normal	1877(63.7)	736(65.7)	20.987***	0.000
Thin	304(10.3)	157(14.0)		
Overweight/Obese	767(26.0)	228(20.3)		

Table (4.18) Bivariate Analysis of Children Under-Five Stunting and Mother's Characteristics (Continued)

Variable	Not Stunting (%)	Stunting (%)	Chi-square Value	p-value
Maternal height				
Less than 145cm	125(4.2)	112(10.0)	145.239***	0.000
145-149	534(19.8)	315(28.1)		
150-154	1073(36.4)	438(39.1)		
155-159	830(28.2)	207(18.5)		
160 cm and above	336(11.4)	49(4.4)		
Received vitamin A1				
Yes	1445(49.0)	604(53.9)	7.687***	0.006
No	1503(51.0)	517(46.1)		
Breastfeeding within first hour				
Yes	1759(59.7)	626(55.8)	4.897**	0.027
No	1189(40.3)	495(44.2)		

Note: *** significance at 1%, ** significance at 5%, * significance at 10% level

The results from the bivariate data analysis, maternal age at child birth, place of residence, mother's educational attainment, wealth quintile, antenatal care visits, BMI, maternal' height and received vitamin A1 are significant at 1% level and employment status and Breastfeeding within first hour are statistically significant at 5% level. This means that under five stunting is significantly associated with mother's characteristic except marital status.

Table (4.19) Bivariate Analysis of Under-Five Stunting and Children's Characteristics

Variable	Not Stunting(%)	Stunting(%)	Chi-square Value	p-value
Child's age in Years				
Under 1 Year	538(18.2)	241(21.5)	104.194***	0.000
1-2	581(19.7)	277(24.7)		
2-3	496(16.8)	281(25.1)		
3-4	660(22.4)	189(16.9)		
4-5	673(22.8)	133(11.9)		
Gender of child				
Male	1530(51.9)	585(52.2)	0.027	0.870
Female	1418(48.1)	536(47.8)		
Birth order				
First Child	1841(62.4)	796(71.0)	26.086***	0.000
Not First Child	1107(37.6)	325(29.0)		
Size of child at birth				
Small	405(13.7)	249(22.2)	44.847***	0.000
Average	1799(61.0)	637(56.8)		
Large	744(25.2)	235(21.0)		

Note: *** significance at 1%, ** significance at 5%, * significance at 10% level

According to Table (4.19) have shown that all independent variables are significant at 1 % level except gender of child. This means that under five stunting is significantly associated with child's age, birth order, and size of child at birth.

4.3 Binary Logistic Regression Analysis

This section presents the evaluation and parameter estimates of binary logistic model.

4.3.1 Model Evaluation

Table (4.20) presents model fitting information for binary logistic model for child stunting.

Table (4.20) Model Fitting Information for Binary Logistic Model

Model Fitting Criteria	Chi-square value	df	p-value
Omnibus Test of Model Coefficient	422.30	38	0.000
Hosmer and Lemeshow (H-L) Tests	7.01	9	0.428
-2 Log Likelihood	2184.02		
Cox & Snell R Square	0.0882		

According to the results of the Tale (4.20), the value of the Omnibus tests of model coefficient was found that the model for stunting is significant (Chi-square=422.30, df =38, p=0.000). There is no evidence of lack of fit based on the H-L statistic, so apparently any lack of fit (Chi-square=7.01, df=9, p=0.428). The existence of a relationship between the independent variables and the dependent variable is supported according to the -2 log likelihood value (2184.02). According to the results of Cox & Snell R^2 8.82% of variation in stunting can be predicted from the linear combination of the independent variables.

4.3.2 Parameter Estimation of Child Stunting

The following Table (4.21) shows the results of the binary logistic regression analysis. The findings indicate that there is significant relationship between demographic, socio-economic characteristics.

Table (4.21) Binary Logistic Regression Analysis of the Relationship between Child Stunting and Selected Variables

Variable	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Mother's age							
15-20	-0.05	0.23	-0.22	0.827	0.95	-0.501	0.401
20-25	0.20	0.17	1.24	0.216	1.23	-0.120	0.530
25-30	0.15	0.15	0.95	0.340	1.16	-0.156	0.451
30-35	0.12	0.15	0.79	0.431	1.13	-0.178	0.418
35-40	0.12	0.15	0.78	0.438	1.13	-0.181	0.419
40-45	0.12	0.16	0.73	0.465	1.12	-0.199	0.435
45-49 (ref)							
Mother's age at child birth							
less than 20	0.15	0.6	0.25	0.804	1.16	-1.030	1.328
20-29	0.03	0.6	0.04	0.966	1.03	-1.147	1.199
30-39	0.08	0.6	0.13	0.895	1.08	-1.098	1.256
40 and above (ref)							
Mother's marital status							
Formerly Marriage	-0.02	0.11	-0.2	0.845	0.98	-0.228	0.187
Currently Marriage (ref)							
Place of residence							
Urban	-0.05	0.07	-0.78	0.435	0.94	-0.185	0.080
Rural (ref)							
Mother's educational							
Primary	0.05	0.06	0.75	0.452	1.05	-0.074	0.167
Secondary	-0.03	0.08	-0.37	0.710	0.97	-0.176	0.120
Higher	0.00	0.12	0.03	0.978	1.00	-0.235	0.242
No Education (ref)							
Employment Status							
Working	0.05	0.05	1.18	0.238	1.06	-0.036	0.144
Not Working (ref)							

Table (4.21) Binary Logistic Regression Analysis of the Relationship between Child Stunting and Selected Variables (Continued)

Variable	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Wealth quintile							
Poorest	0.38***	0.1	3.79	0.000	1.46	0.183	0.573
Poorer	0.35***	0.1	3.56	0.000	1.42	0.158	0.544
Middle	0.25**	0.1	2.49	0.013	1.28	0.053	0.444
Richer	0.15	0.09	1.61	0.108	1.16	-0.033	0.337
Richest (ref)							
Number of antenatal care visits							
1-4 times	0.02	0.06	0.34	0.731	1.02	-0.099	0.141
5-8 times	-0.104	0.069	-1.52	0.129	0.90	-0.239	0.030
9 times and Above	-0.125	0.095	-1.32	0.188	0.88	-0.312	0.061
None (ref)							
Maternal body mass index (BMI)							
Thin	0.24***	0.08	2.96	0.003	1.27	0.080	0.396
Normal	0.09*	0.06	1.7	0.088	1.1	-0.014	0.204
Overweight/Obese (ref)							
Maternal height							
Less than 145cm	0.93***	0.12	7.7	0.000	2.52	0.690	1.161
145-149	0.64***	0.1	6.64	0.000	1.89	0.450	0.828
150-154	0.8***	0.09	5.27	0.000	1.62	0.303	0.665
155-159	0.22**	0.1	2.33	0.020	1.25	0.036	0.414
160 cm and above (ref)							
Received Vitamin A1							
Yes	0.09*	0.05	1.94	0.052	1.09	-0.001	0.182
No(ref)							
Breastfeeding within first hour							
Yes	0.03	0.05	0.55	0.579	1.03	-0.068	0.122
No(ref)							

Table (4.21) Binary Logistic Regression Analysis of the Relationship between Child Stunting and Selected Variables (Continued)

Variable	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Child's age in months							
0-11 months	0.45***	0.08	5.5	0.000	1.56	0.288	0.606
12-23 months	0.51***	0.08	6.68	0.000	1.67	0.363	0.664
24-35 months	0.64***	0.08	8.43	0.000	1.90	0.491	0.789
36-47 months	0.2**	0.08	2.59	0.010	1.22	0.048	0.348
48-59 months (ref)							
Sex of child							
Male	0.04	0.04	0.86	0.392	1.04	-0.049	0.124
Female (ref)							
Birth order							
First Child	0.14**	0.06	2.22	0.026	1.15	0.164	0.263
No First Child (ref)							
Size of child at birth							
Small	0.38***	0.07	5.47	0.000	1.47	0.246	0.520
Average	0.09	0.05	1.62	0.105	1.09	-0.018	0.196
Large (ref)							
Constant	-2.28	0.61	-3.73	0.000	0.10	-3.474	-1.082

Source: MDHS (2017)

Note: *** significance at 1%, ** significance at 5%, * significance at 10% level

In this Binary Logistic Regression modeling of the occurrence of the stunting among children age 0-59 months, 16 explaining variables are determined wealth quintile, child’s age, birth order, small size of child, mother’s height, body mass index and received vitamin A1 are statistically significant.

The coefficient of wealth quintile was statistically significant at 1% level and it has positive effect on stunting. It was found that poorest, poorer, middle and richer mothers have 46%, 42%, 28% AND 16% more likely to stunt compared with the richest mothers. The 95% of confident interval for poorest mothers suggested the magnitude of the effect could be anywhere from a 0.183 increase to 0.573 and that for poorer mothers was 0.158 to 0. 544. The 95% of confident interval for middle wealth index suggested the magnitude of the effect could be anywhere from a 0.053 increase to 0.444 and that for richer mothers was -0.033 to 0.337.

The coefficient for child age was statistically significant at 1% level and it was positively effect on stunting and the children have 56% more likely to have stunting in age 0-11 months compared with the children age 48 to 59 months. The children age 12-23 months have 67% more likely to stunt compared with the children aged 48-59 months. The 95% of confident interval for under 1 year suggested the magnitude of the effect could be anywhere from a 0.288 increase to 0.606. The 95% of confident interval for under 1-2 years suggested the magnitude of the effect could be anywhere from a 0.363 increase to 0.664. It has been found that, children age 24-35 months and those age 36-47 months have 90% and 22% more likely to stunt compared with the children age 48-59 months. The 95% of confident interval for under 2-3 years and 3-4 years suggested the magnitude of the effect could be anywhere from a 0.491 increase to 0.789 and 0.048 To 0.348.

The coefficient for birth order was statistically significant at 5% level and it was positive effect on stunting. It was found that the first child have 15% more likely to stunt compared with not the first child. The 95% of confident interval suggested the magnitude of the effect could be anywhere from a 0.164 increase to 0.263.

The coefficient for size of child at birth was statistically significant at 1% level and it was positive effect on stunting. If the size of child at birth were small, the children were 47% more likely to chance stunting compared with the large size of child at birth. The 95% of confident interval for small size of child at birth suggested the magnitude of the effect could be anywhere from a 0.246 increase to 0.520.

The coefficients for thin and normal body mass index were statistically significant at 1% level and 10% level. It was found that when body mass index of mother were thin, the mother has 27% more likely to have stunting and for normal body mass index mother has 10% more likely to chance stunting compared with overweight/obese body mass index. The 95% of confident interval for thin body mass index suggested the magnitude of the effect could be anywhere from a 0.080 increase to 0.396 and for normal body mass index was -0.014 to 0.204.

The coefficient for mother height is positively related to stunting. The coefficient of height (155-159) cm was statistically significant at 5% level. The rest coefficients were statistically significant at 1% level. It was found that if mother's height is less than 145cm, children have nearly 3 times more likely to stunt compared with mother’s height 160cm and above. The 95% of confident interval for less than 145cm suggested the magnitude of the effect could be anywhere from a 0.690 increase to 1.161. If mother’s height was 145-149cm, children have nearly two times more likely to stunt compared with mother’s height 160cm and above. The 95% of confident interval for 145-149cm suggested the magnitude of the effect could be anywhere from a 0.450 increase to 0.828. The children whose mother’s height was 150-154cm have 62% more likely to stunt compared with mother’s height 160cm and above. The 95% of confident interval for 150-154cm suggested the magnitude of the effect could be anywhere from a 0.303 increase to 0.665. When mother’s height was 155-159cm, the children have 25% more likely to stunt compared with mother’s height 160cm and above. The 95% of confident interval for 155-159cm suggested the magnitude of the effect could be anywhere from a 0.036 increase to 0.414.

The coefficient for children received Vitamin A1 was statistically significant as 10% level and positively effect on stunting. It was found that the children whose received Vitamin A1 have 9% more likely to stunt compared with the children whose did not received Vitamin A1. The 95% of confident interval suggested the magnitude of the effect could be anywhere from a -0.001 increase to 0.182.

CHAPTER V
CONCLUSION

5.1 Findings

This study examined the predictors of under-five child stunting on nutritional status. Stunting reflects a country's level of socio-economic development and quality of life. It utilized the nationally representative data from the Myanmar Demographic and Health Survey (MDHS 2015-16). In this study, nutritional status of under five years children was expressed as indicator of Height-for-age (stunted) according to the criteria of WHO (2009). Among under five children, one-third are stunting.

Concerning with the descriptive statistics of stunting children, most of the mothers is aged 20-29 and they got married age 20-29. The numbers of currently married women were more than that of formerly married women. The percentage of mothers who lived in rural area was more than in urban area. Educated mothers are more than non-educated. More than half of the mothers are working women. The largest percentage of wealth quintile was found in poorest quintile. Most of mother has height between 150 and 154 cm. Most of the mothers took antenatal care visit between 1 to 4 times and body mass index was Normal. The number of received vitamin A1 is more than that of not received vitamin A. Among under five children, the percentage of male children was higher than that female children. The number of first child is more than that of not first child. In size of child birth, the most children were average size.

According to bivariate analysis of Under-Five Stunting, all independent variables are associated with stunting except mother's age, marital status and sex of child.

According to the results of binary logistic regression model of the under-five stunting children, wealth quintile, mother's height, mother's body mass index (BMI), received Vitamin A, child's age, birth order and small size of child at birth have positive effects and more chance to be stunting.

5.2 Discussions

In this study, there were 4069 under five children. Among them 1121 (28%) were stunting children and 2948 (72%) were not stunting children. According to the result of binary logistic regression, under five children belonging to poorest household were at higher odds of being stunted when compared to those from wealthy households. This finding is similar to previous research conducted in Blagladesh (Hong et al., 2006), India (Chalasani and Rutstein , 2014) and Indonesia (Ramli et al., 2009). Mother height was associated with stunting among all children aged under five years. Short maternal height (<145cm) has largest odds to be stunting. A research conducted in 35 LMICs found the association of shorter maternal height with stunting among children aged 12-59 months (Li, Z., et al., 2010). Wali et al., 2020 also found that mother's height less than 145cm was significant factor on stunting. Maternal height provides a useful marker for assessing intergenerational linkages in child's health before or immediately after birth with lasting influence over a few years. In this study, child age was significant effect on stunting. This result is consistent with previous result conducted in West Gojam Zone (Teshome et al., 2009) and Sri Lanka (Haque, 2005). Small size of child at birth was significant effect on stunting. This finding was also found in Sri Lanka (Haque, 2005).

5.3 Suggestions and Further Study

This study aims to investigate the determinants of under-five stunting in Myanmar. In fact, mother's age at child birth, place of residence, mother's educational status and breastfeeding within first hour are also essential and important determining factors for under-five stunting in Myanmar. Too young less than 20 years and over 40 year of mother's at child birth can affect the infant nutrition status through mother's BMI or mother's educational status. Being low knowledge about the nutritional facts also cause the under-five stunting. Colostrum (breast milk) produced immediately after birth to contain the good antibodies, to fight against infections from mother and should receive within first hour after birth. Therefore, breastfeeding within first hour is also an important for preventing the under-five stunting. Place of residence, urban or rural areas affect the under-five stunting because infants from rural areas does not receive good or average immunization coverage to fight against the infections. But, these determining factors are not significant in this study because of many confounding factors. So, further research for under-five stunting should be studied to evaluate these issues from wider perspective. Moreover, research for determinants on stunting under two years should be studied.

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APPENDIX

Respondent Age * Stunting Cross tabulation

			Stunting		Total
			Normal	Stunted	
Mother's Age	15-19	Count	75	18	93
		Expected Count	67.4	25.6	93.0
		% within Respondent Age	80.6%	19.4%	100.0%
		% within Stunting	2.5%	1.6%	2.3%
		% of Total	1.8%	.4%	2.3%
	20-24	Count	491	192	683
		Expected Count	494.8	188.2	683.0
		% within Respondent Age	71.9%	28.1%	100.0%
		% within Stunting	16.7%	17.1%	16.8%
		% of Total	12.1%	4.7%	16.8%
	25-29	Count	806	294	1100
		Expected Count	797.0	303.0	1100.0
		% within Respondent Age	73.3%	26.7%	100.0%
		% within Stunting	27.3%	26.2%	27.0%
		% of Total	19.8%	7.2%	27.0%
	30-34	Count	745	273	1018
		Expected Count	737.5	280.5	1018.0
		% within Respondent Age	73.2%	26.8%	100.0%
		% within Stunting	25.3%	24.4%	25.0%
		% of Total	18.3%	6.7%	25.0%
	35-39	Count	537	215	752
		Expected Count	544.8	207.2	752.0
		% within Respondent Age	71.4%	28.6%	100.0%
		% within Stunting	18.2%	19.2%	18.5%
		% of Total	13.2%	5.3%	18.5%
	40-44	Count	229	102	331
		Expected Count	239.8	91.2	331.0
		% within Respondent Age	69.2%	30.8%	100.0%
		% within Stunting	7.8%	9.1%	8.1%
		% of Total	5.6%	2.5%	8.1%
	45-49	Count	65	27	92
		Expected Count	66.7	25.3	92.0
		% within Respondent Age	70.7%	29.3%	100.0%
		% within Stunting	2.2%	2.4%	2.3%
		% of Total	1.6%	.7%	2.3%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Respondent Age	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.209[a]	6	.400
Likelihood Ratio	6.402	6	.380
Linear-by-Linear Association	2.360	1	.124
N of Valid Cases	4069		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 25.35.

Maternal Age At Birth * Stunting Crosstabulation

			Stunting		
			Normal	Stunted	Total
Maternal Age At Birth	less than 20	Count	778	395	1173
		Expected Count	849.8	323.2	1173.0
		% within Maternal Age At Birth	66.3%	33.7%	100.0%
		% within Stunting	26.4%	35.2%	28.8%
		% of Total	19.1%	9.7%	28.8%
	20-29	Count	1883	642	2525
		Expected Count	1829.4	695.6	2525.0
		% within Maternal Age At Birth	74.6%	25.4%	100.0%
		% within Stunting	63.9%	57.3%	62.1%
		% of Total	46.3%	15.8%	62.1%
	30-39	Count	280	82	362
		Expected Count	262.3	99.7	362.0
		% within Maternal Age At Birth	77.3%	22.7%	100.0%
		% within Stunting	9.5%	7.3%	8.9%
		% of Total	6.9%	2.0%	8.9%
	40+	Count	7	2	9
		Expected Count	6.5	2.5	9.0
		% within Maternal Age At Birth	77.8%	22.2%	100.0%
		% within Stunting	.2%	.2%	.2%
		% of Total	.2%	.0%	.2%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Maternal Age At Birth	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.230[a]	3	.000
Likelihood Ratio	31.622	3	.000
Linear-by-Linear Association	28.982	1	.000
N of Valid Cases	4069		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 2.48.

Marital status * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Marital status	Currently Marriage	Count	2829	1065	3894
		Expected Count	2821.2	1072.8	3894.0
		% within Marital status	72.7%	27.3%	100.0%
		% within Stunting	96.0%	95.0%	95.7%
		% of Total	69.5%	26.2%	95.7%
	Formerly Marriage	Count	119	56	175
		Expected Count	126.8	48.2	175.0
		% within Marital status	68.0%	32.0%	100.0%
		% within Stunting	4.0%	5.0%	4.3%
		% of Total	2.9%	1.4%	4.3%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Marital status	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.814[a]	1	.178		
Continuity Correction[b]	1.589	1	.207		
Likelihood Ratio	1.762	1	.184		
Fisher's Exact Test				.194	.105
Linear-by-Linear Association	1.814	1	.178		
N of Valid Cases	4069				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 48.21.

b. Computed only for a 2x2 table

Place Of Residence * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Place Of Residence	Rural	Count	2204	952	3156
		Expected Count	2286.5	869.5	3156.0
		% within Place Of Residence	69.8%	30.2%	100.0%
		% within Stunting	74.8%	84.9%	77.6%
		% of Total	54.2%	23.4%	77.6%
	Urban	Count	744	169	913
		Expected Count	661.5	251.5	913.0
		% within Place Of Residence	81.5%	18.5%	100.0%
		% within Stunting	25.2%	15.1%	22.4%
		% of Total	18.3%	4.2%	22.4%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Place Of Residence	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	48.188[a]	1	.000		
Continuity Correction[b]	47.606	1	.000		
Likelihood Ratio	51.155	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	48.176	1	.000		
N of Valid Cases	4069				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 251.53.

b. Computed only for a 2x2 table

Respondent Education * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Mother's Education	Primary	Count	1289	579	1868
		Expected Count	1353.4	514.6	1868.0
		% within Respondent Education	69.0%	31.0%	100.0%
		% within Stunting	43.7%	51.7%	45.9%
		% of Total	31.7%	14.2%	45.9%
	Secondary	Count	912	250	1162
		Expected Count	841.9	320.1	1162.0
		% within Respondent Education	78.5%	21.5%	100.0%
		% within Stunting	30.9%	22.3%	28.6%
		% of Total	22.4%	6.1%	28.6%
	Higher	Count	265	47	312
		Expected Count	226.0	86.0	312.0
		% within Respondent Education	84.9%	15.1%	100.0%
		% within Stunting	9.0%	4.2%	7.7%
		% of Total	6.5%	1.2%	7.7%
	No Education	Count	482	245	727
		Expected Count	526.7	200.3	727.0
		% within Respondent Education	66.3%	33.7%	100.0%
		% within Stunting	16.4%	21.9%	17.9%
		% of Total	11.8%	6.0%	17.9%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Respondent Education	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	70.463[a]	3	.000
Likelihood Ratio	73.902	3	.000
Linear-by-Linear Association	.190	1	.663
N of Valid Cases	4069		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 85.96.

Wealth quintile * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Wealth quintile	Poorest	Count	775	427	1202
		Expected Count	870.9	331.1	1202.0
		% within Wealth Index	64.5%	35.5%	100.0%
		% within Stunting	26.3%	38.1%	29.5%
		% of Total	19.0%	10.5%	29.5%
	Poorer	Count	613	286	899
		Expected Count	651.3	247.7	899.0
		% within Wealth Index	68.2%	31.8%	100.0%
		% within Stunting	20.8%	25.5%	22.1%
		% of Total	15.1%	7.0%	22.1%
	Middle	Count	502	185	687
		Expected Count	497.7	189.3	687.0
		% within Wealth Index	73.1%	26.9%	100.0%
		% within Stunting	17.0%	16.5%	16.9%
		% of Total	12.3%	4.5%	16.9%
	Richer	Count	551	144	695
		Expected Count	503.5	191.5	695.0
		% within Wealth Index	79.3%	20.7%	100.0%
		% within Stunting	18.7%	12.8%	17.1%
		% of Total	13.5%	3.5%	17.1%
	Richest	Count	507	79	586
		Expected Count	424.6	161.4	586.0
		% within Wealth Index	86.5%	13.5%	100.0%
		% within Stunting	17.2%	7.0%	14.4%
		% of Total	12.5%	1.9%	14.4%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Wealth Index	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	120.967[a]	4	.000
Likelihood Ratio	128.689	4	.000
Linear-by-Linear Association	118.974	1	.000
N of Valid Cases	4069		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 161.44.

BMI * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
BMI	Normal	Count	1877	736	2613
		Expected Count	1893.1	719.9	2613.0
		% within BMI	71.8%	28.2%	100.0%
		% within Stunting	63.7%	65.7%	64.2%
		% of Total	46.1%	18.1%	64.2%
	Thin	Count	304	157	461
		Expected Count	334.0	127.0	461.0
		% within BMI	65.9%	34.1%	100.0%
		% within Stunting	10.3%	14.0%	11.3%
		% of Total	7.5%	3.9%	11.3%
	Overweight	Count	767	228	995
		Expected Count	720.9	274.1	995.0
		% within BMI	77.1%	22.9%	100.0%
		% within Stunting	26.0%	20.3%	24.5%
		% of Total	18.8%	5.6%	24.5%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within BMI	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.987[a]	2	.000
Likelihood Ratio	20.984	2	.000
Linear-by-Linear Association	6.546	1	.011
N of Valid Cases	4069		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 127.00.

Maternal Height * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Maternal Height	>=160 cm	Count	336	49	385
		Expected Count	278.9	106.1	385.0
		% within Maternal Height	87.3%	12.7%	100.0%
		% within Stunting	11.4%	4.4%	9.5%
		% of Total	8.3%	1.2%	9.5%
	155-159	Count	830	207	1037
		Expected Count	751.3	285.7	1037.0
		% within Maternal Height	80.0%	20.0%	100.0%
		% within Stunting	28.2%	18.5%	25.5%
		% of Total	20.4%	5.1%	25.5%
	150-154	Count	1073	438	1511
		Expected Count	1094.7	416.3	1511.0
		% within Maternal Height	71.0%	29.0%	100.0%
		% within Stunting	36.4%	39.1%	37.1%
		% of Total	26.4%	10.8%	37.1%
	145-149	Count	584	315	899
		Expected Count	651.3	247.7	899.0
		% within Maternal Height	65.0%	35.0%	100.0%
		% within Stunting	19.8%	28.1%	22.1%
		% of Total	14.4%	7.7%	22.1%
	<145cm	Count	125	112	237
		Expected Count	171.7	65.3	237.0
		% within Maternal Height	52.7%	47.3%	100.0%
		% within Stunting	4.2%	10.0%	5.8%
		% of Total	3.1%	2.8%	5.8%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Maternal Height	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	145.239[a]	4	.000
Likelihood Ratio	148.471	4	.000
Linear-by-Linear Association	143.031	1	.000
N of Valid Cases	4069		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 65.29.

Respondent Current Working * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Respondent Current Working	Not Working	Count	1341	462	1803
		Expected Count	1306.3	496.7	1803.0
		% within Respondent Current Working	74.4%	25.6%	100.0%
		% within Stunting	45.5%	41.2%	44.3%
		% of Total	33.0%	11.4%	44.3%
	Working	Count	1607	659	2266
		Expected Count	1641.7	624.3	2266.0
		% within Respondent Current Working	70.9%	29.1%	100.0%
		% within Stunting	54.5%	58.8%	55.7%
		% of Total	39.5%	16.2%	55.7%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Respondent Current Working	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.016[a]	1	.014		
Continuity Correction[b]	5.844	1	.016		
Likelihood Ratio	6.037	1	.014		
Fisher's Exact Test				.015	.008
Linear-by-Linear Association	6.014	1	.014		
N of Valid Cases	4069				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 496.72.

b. Computed only for a 2x2 table

Child's age in months * Stunting Crosstabulation

			Stunting		
			Normal	Stunted	Total
Child's age in months	0-11	Count	538	241	779
		Expected Count	564.4	214.6	779.0
		% within Child's age in months	69.1%	30.9%	100.0%
		% within Stunting	18.2%	21.5%	19.1%
		% of Total	13.2%	5.9%	19.1%
	12-23	Count	581	277	858
		Expected Count	621.6	236.4	858.0
		% within Child's age in months	67.7%	32.3%	100.0%
		% within Stunting	19.7%	24.7%	21.1%
		% of Total	14.3%	6.8%	21.1%
	24-35	Count	496	281	777
		Expected Count	562.9	214.1	777.0
		% within Child's age in months	63.8%	36.2%	100.0%
		% within Stunting	16.8%	25.1%	19.1%
		% of Total	12.2%	6.9%	19.1%
	36-47	Count	660	189	849
		Expected Count	615.1	233.9	849.0
		% within Child's age in months	77.7%	22.3%	100.0%
		% within Stunting	22.4%	16.9%	20.9%
		% of Total	16.2%	4.6%	20.9%
	48-59	Count	673	133	806
		Expected Count	583.9	222.1	806.0
		% within Child's age in months	83.5%	16.5%	100.0%
		% within Stunting	22.8%	11.9%	19.8%
		% of Total	16.5%	3.3%	19.8%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Child's age in months	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	104.194[a]	4	.000
Likelihood Ratio	108.163	4	.000
Linear-by-Linear Association	62.315	1	.000
N of Valid Cases	4069		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 214.06.

Sex of Child * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Sex of Child	Female	Count	1418	536	1954
		Expected Count	1415.7	538.3	1954.0
		% within Sex of Child	72.6%	27.4%	100.0%
		% within Stunting	48.1%	47.8%	48.0%
		% of Total	34.8%	13.2%	48.0%
	Male	Count	1530	585	2115
		Expected Count	1532.3	582.7	2115.0
		% within Sex of Child	72.3%	27.7%	100.0%
		% within Stunting	51.9%	52.2%	52.0%
		% of Total	37.6%	14.4%	52.0%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Sex of Child	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.027[a]	1	.870		
Continuity Correction[b]	.016	1	.898		
Likelihood Ratio	.027	1	.870		
Fisher's Exact Test				.888	.449
Linear-by-Linear Association	.027	1	.870		
N of Valid Cases	4069				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 538.32.

b. Computed only for a 2x2 table

No of Antinal Visits During Pregrancy * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
No of Antinal Visits During Pregrancy	1-4	Count	949	417	1366
		Expected Count	989.8	376.2	1366.0
		% within No of Antinal Visits During Pregrancy	69.5%	30.5%	100.0%
		% within Stunting	32.2%	37.2%	33.6%
		% of Total	23.3%	10.2%	33.6%
	5-8	Count	954	262	1216
		Expected Count	881.1	334.9	1216.0
		% within No of Antinal Visits During Pregrancy	78.5%	21.5%	100.0%
		% within Stunting	32.3%	23.4%	29.9%
		% of Total	23.4%	6.4%	29.9%
	9 And Above	Count	351	81	432
		Expected Count	313.0	119.0	432.0
		% within No of Antinal Visits During Pregrancy	81.3%	18.8%	100.0%
		% within Stunting	11.9%	7.2%	10.6%
		% of Total	8.6%	2.0%	10.6%
	None	Count	695	361	1056
		Expected Count	765.1	290.9	1056.0
		% within No of Antinal Visits During Pregrancy	65.8%	34.2%	100.0%
		% within Stunting	23.6%	32.2%	25.9%
		% of Total	17.1%	8.9%	25.9%
Total		Count	2949	1121	4070
		Expected Count	2949.0	1121.0	4070.0
		% within No of Antinal Visits During Pregrancy	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	68.093[a]	3	.000
Likelihood Ratio	69.462	3	.000
Linear-by-Linear Association	3.340	1	.068
N of Valid Cases	4070		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 118.99.

Size of child at birth * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Size of child at birth	Small	Count	405	249	654
		Expected Count	473.8	180.2	654.0
		% within Size of child at birth	61.9%	38.1%	100.0%
		% within Stunting	13.7%	22.2%	16.1%
		% of Total	10.0%	6.1%	16.1%
	Average	Count	1799	637	2436
		Expected Count	1764.9	671.1	2436.0
		% within Size of child at birth	73.9%	26.1%	100.0%
		% within Stunting	61.0%	56.8%	59.9%
		% of Total	44.2%	15.7%	59.9%
	Large	Count	744	235	979
		Expected Count	709.3	269.7	979.0
		% within Size of child at birth	76.0%	24.0%	100.0%
		% within Stunting	25.2%	21.0%	24.1%
		% of Total	18.3%	5.8%	24.1%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Size of child at birth	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	44.847[a]	2	.000
Likelihood Ratio	42.748	2	.000
Linear-by-Linear Association	33.412	1	.000
N of Valid Cases	4069		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 180.18.

Received Vitamin A1 * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Received Vitamin A1	No	Count	1503	517	2020
		Expected Count	1463.5	556.5	2020.0
		% within Received Vitamin A1	74.4%	25.6%	100.0%
		% within Stunting	51.0%	46.1%	49.6%
		% of Total	36.9%	12.7%	49.6%
	Yes	Count	1445	604	2049
		Expected Count	1484.5	564.5	2049.0
		% within Received Vitamin A1	70.5%	29.5%	100.0%
		% within Stunting	49.0%	53.9%	50.4%
		% of Total	35.5%	14.8%	50.4%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Received Vitamin A1	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.687[a]	1	.006		
Continuity Correction[b]	7.493	1	.006		
Likelihood Ratio	7.693	1	.006		
Fisher's Exact Test				.006	.003
Linear-by-Linear Association	7.685	1	.006		
N of Valid Cases	4069				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 556.51.

b. Computed only for a 2x2 table

Breastfeeding within first hour * Stunting Crosstabulation

			Stunting		Total
			Normal	Stunted	
Breastfeeding within first hour	No	Count	1189	495	1684
		Expected Count	1220.1	463.9	1684.0
		% within Breastfeeding within first hour	70.6%	29.4%	100.0%
		% within Stunting	40.3%	44.2%	41.4%
		% of Total	29.2%	12.2%	41.4%
	Yes	Count	1759	626	2385
		Expected Count	1727.9	657.1	2385.0
		% within Breastfeeding within first hour	73.8%	26.2%	100.0%
		% within Stunting	59.7%	55.8%	58.6%
		% of Total	43.2%	15.4%	58.6%
Total		Count	2948	1121	4069
		Expected Count	2948.0	1121.0	4069.0
		% within Breastfeeding within first hour	72.5%	27.5%	100.0%
		% within Stunting	100.0%	100.0%	100.0%
		% of Total	72.5%	27.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.897[a]	1	.027		
Continuity Correction[b]	4.741	1	.029		
Likelihood Ratio	4.880	1	.027		
Fisher's Exact Test				.027	.015
Linear-by-Linear Association	4.896	1	.027		
N of Valid Cases	4069				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 463.94.

b. Computed only for a 2x2 table