ASSOCIATION OF FACTORS AFFECTING THE NUTRITIONAL STATUS OF 6-59 MONTHS CHILDREN IN PHIDIM MUICIPALITY.

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Asssociation of Factors Affecting the Nutritional Status of 6-59 months Children in Phidim Municipality

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Approval Letter

This *dissertation* entitled "*Assessment of factors affecting the nutritional status of 6-59 months children in Phidim Municipality*" presented by Priyanka Chudal has been accepted as the partial fulfillment of the requirement for the B.Sc. degree in Nutrition and Dietetics

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Abstract

Child malnutrition in the form of stunting, wasting, underweight and clinical malnutrition has significant implications for healthy human development. Despite the various efforts, malnutrition among children is remaining as a major public health problem in Nepal. This study was undertaken with the objectives to assess the feeding practices and nutritional status of under-five year children and to find out the factors associated with it. A community based cross sectional study was conducted on 180 children aged 6-59 months using anthropometric measurement and structured questionnaires for assessing the feeding practices and nutritional status of under-five children of Phidim municipality. Children were selected by simple random sampling method. Collected data were analyzed using SPSS version 20 and WHO Anthro 3.2.2 version. Chi-square test was used to identify the associated factors of malnutrition.

The analysis of this study revealed that, 41.7%, 29.4% and 16.7% of children were stunted, underweight and wasted, respectively. The main associated factors of stunting were found to be age of child in month, colostrum feed to child, frequency of feeding of child in a day, initiation of feeding vegetable, type of vaccines and supplementation to mother, vaccination to child and initiation of water feed. Underweight was found to be associated with age of child, birth order of child, education of mother, initiation of feeding vegetables, types of vaccine and supplementation to mother during pregnancy and vaccination to child. Wasting was found to be associated with age of caretaker, birth order of child, exclusive breastfeeding, vaccination and supplementation of mother during pregnancy, type of vaccine and supplementation to mother, vaccination to child, water treatment at household level and duration of breastfeeding. From the findings of this study, it is concluded that malnutrition is still an important problem among children aged 6-59 months in Phidim Municipality. Therefore, special attention should be given on intervention program on malnutrition.

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List of Abbreviations

Abbreviation	Full form
AED	Academy for Educational Development
ASH	American Society of Hematology
BNF	British Nutrition Foundation
BW	Body weight
CDC	Central Development Committee
CF	Complementary Food
EAR	Estimated Average Requirement
EBF	Exclusive Breastfeeding
FANTA	Food And Nutrition Technical Association
FCS	Food Consumption Score
GIT	Gastro Intetinal Tract
HAZ	Height for age Z score
HDDS	Household Dietary Diversity Score
HDI	Human Development Index
IDA	Iron Deficiency Anemia
IDD	Iodine Deiciency Disorder
IDDS	Individual Dietary Diversity Score
ICMR	Indian Council of Medical Research
IFPRI	International Food Policy Research Institute
LBW	Low Birth Weight
LRNI	Lower Reference Nutrient Intake
MDG	Millennium Development Goal
MoHP	Ministry of Health and Population
MUAC	Ministry of Health and Population
NDHS	Nepal Demographic Health Survey
NEFIN	Nepal Federation of Indegenous Nationalities
NFHS	Nepal Family Health Survey
NGO	Non-Governmental Organisation

NMICS	Nepal Multiple Indicator Cluster Survey
PEM	Protein Energy Malnutrition
PHC	Primary Health Care
RAPA	Rapid Assessment of Physical Activity
RDA	Recommended Daily Allowance
RNI	Reference Nutrient Intake
SAM	Severe Acute Malnutrition
SAARC	South Asian Association For Regional Corporation
SNC	Standing Committee on Nutrition
UMN	United Mission To Nepal
UN	United Nations
UNDP	United Nation Development Plan
UNICEF	United Nations International Child Emergency Fund
USAID	United State Agency For International Development
VAD	Vitamin A Deficiency
VDC	Village Development Committee
WAZ	Weight for Age Z Score
WB	World Bank
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight for Height

PART I

1. Introduction

1.1 General Introduction

Nutritional status is defined as the condition of the body resulting from the intake, absorption and utilization of food (Joshi, 2015). It is determined by a complex interaction between internal/constitutional factors and external environmental factors (Joshi, 2012). The term malnutrition comprises of both over-nutrition as well as under-nutrition. Under-nutrition or poor nutrition is cited as the major factor in more than half of all child deaths in Nepal, a significantly higher proportion than those claimed by other infectious disease. Nutrition, the cornerstone of socioeconomic development of a country, is an essential component of Millennium Development Goals (MDGs) and Primary Health Care (PHC) (WorldBank, 2012).

Nepal is one of the least developed nations which ranks 157th out of 187 countries in terms of its Human Development Index (UNDP, 2012). In Nepal, the nutritional status of mothers and children under five is extremely poor. According to UNICEF, malnutrition plays a role in 60 % of child deaths in Nepal. Although the number of under-five deaths has dropped to 54 per 1,000 live births in 2012 from 162 per 1,000 in 1990, malnutrition rates in Nepal are among the highest in the world. It has been found that 46 % of under-five children in Nepal are anemic, and 144,000 newborns are at risk of iodine deficiency disorders (MoHP, 2011). NDHS 2006 reports that among total children below 5 years of age, 48% are stunted, 13% wasted and 39% are underweight which was found to be considerably reduced in NDHS 2011 report with 41% stunting, 11% wasting and 29% underweight rate (MoHP, 2011).

Malnutrition among children is considered to be one of the most challenging and complex problem globally, affecting the physical, mental and social development particularly that of under privileged and the poor (Berra, 2013). According to Nepal multiple indicator cluster survey 2014, 56.1% of children were exclusively breastfed their child for six months. Over 6 million death (55 % of the 12 million children under 5 years of age) each year in developing countries from infectious diseases can be attributed to malnutrition bringing nutrition to the forefronts of national and international concern (Azim *et al.*, 2005).

Amongst the effective measures for reducing mortality in children less than 5 years of age, promotion of exclusive breastfeeding (EBF) and improved complementary food (CF) at proper age has been ranked first and third respectively by the World Health Organization (Berra, 2013). WHO and United Nations Children's Fund (UNICEF) recommend breast feeding to be started immediately following delivery for the baby to get colostrum (Petit, 2008). The infant should thereafter be exclusively breastfed for the first 4 to 6 months of life on child's demand with no other fluids including water, and breastfeeding should continue together with weaning food up to and beyond second year of life. However, infant feeding and weaning practices have cultural, social and economic roots making malnutrition more than a medical problem. It has been indicated in many studies all over the world that these practices are the subjects strongly influenced by customs, beliefs, superstitions, religion, cultural pattern, mother's education and socioeconomic status of the family (Petit, 2008).

1.2 Background of area of study

Phidim municipality, headquarter of Panchther District which was transformed into municipality from VDC by merging with two other VDCs (Shiva and Chokmagu) in 2014 covers an area of 6608.36 Hectare with 5857 household and total population of 24768 among which 11764 male and 13004 female population. Under five population of this area is 2095 with 1054 boys and 1041 girls. (Phidim Municipality Office).

This area consists of people with various castes, ethnic groups, religion, economic status etc. Limbu, Brahmin and *C*hhetri reside here mainly along with other castes as Tamang, Newar, Magar, Rai, Kami etc. Economic status of people is mostly low in this area and most of the people here follow the occupation of farming and animal husbandry, hotels, small business and also many of them have gone out of home to earn money within country and outside the country. Illiteracy of people, lack of hygiene, nutrition awareness, superstition, lack of health facilities, poor educational facilities etc. have direct effect on the nutritional status of people here. Also alcohol and tobacco consumption rate is high in this area which affects their life style and hence their nutritional status (Phidim Municipality Office).

1.3 Problem statement and justification

Malnutrition is the basic indicator of the nutrition status of children as in early childhood it may interfere with normal physiological development and he/she will not be benefited as normal adult in future. The nutritional status of people of the developing countries is very poor. Malnutrition is the most important risk factor for the burden of disease causing about 300,000 deaths per year directly or indirectly responsible for more than half of all death in children(Muller and Krawinkel, 2005). Malnutrition especially under nutrition in under five children may lead to poor physical (underweight, stunted and wasted), reduced learning ability, reduced resistance and immunity against infection and reduced productivity in future(Bhandari and Chhetri, 2013).

Annually over 10 million under-five children die from preventable and treatable illnesses and almost all these deaths occur in poor countries (Black *et al.*, 2008). More than one-third of all deaths of under-five children is due to malnutrition (WHO, 2016) Currently, 195 million under-five children are affected by malnutrition; 90% of them live in sub- Saharan Africa and South Asia(WHO, 2016). At least 20 million children suffer from severe acute malnutrition (SAM), and another 175 million are undernourished (Black *et al.*, 2008).

Appropriate feeding practices are fundamental to survive, growth, development, health and nutrition to infants and children. Promoting appropriate infant feeding practice is an effective strategy for improving child nutritional status and survival (Katepa-Bwalya *et al.*, 2015).

Phidim, which lies in eastern hill of Nepal is the area where no nutrition interventions were planned when I visited there and also the feeding and care was not seen to be satisfactory which inspired me to choose the area so that the nutritional status of the children and its associated factors can be found out for the nutritional plan to be implemented to improve the nutritional status and practice in the area.

1.4 Objective of the study

1.4.1 General Objective

To assess the nutritional status and associated factors of children between 6-59 months in Phidim Municipality.

1.4.2. Specific Objective

i. To assess the nutritional status of children between 6-59 months of age in the Phidim Municipality.
ii. To find the factor associated with the nutritional status of 6-59 months of age in the area.

1.5 Research Question

i. What is the existing nutritional status of 6-59 months children in Phidim Municipality?
ii. What kind of feeding practices are there?

1.6 Significance

The results and findings of this study may be helpful to:-

- ✓ Give the information of the nutritional status of children and prevalence and degree of malnutrition in the community.
- ✓ Serve as a helpful guide to make the nutritional plan and program to combat the nutritional problem.
- ✓ Provide information to government and organizations who are working in the field of nutrition to intervene proper solution for the current prevailing problem.
- ✓ Identify the individual or group of people who are at the risk of being malnourished.

1.7 Limitations

Following limitations may be encountered during the conduction of the survey.

- ✓ This study is conducted with limited resources so it makes impossible to include clinical, biochemical parameters.
- ✓ The study does not represent seasonal variation, as it is a cross-sectional study.
- ✓ Data collected were based only on reporting process.
- ✓ All the wards couldnot be surveyed because of the problems in the area.

1.8 Conceptual Framework

The literature repeatedly shows that malnutrition is caused by a combination of factors, such as low income, illiteracy, an unhealthy environment, unsatisfactory health services, inadequate food

habits, low agricultural productivity, etc., and that all these factors affect each other differently according to the particular situation (Beghin *et al.*, 1988)

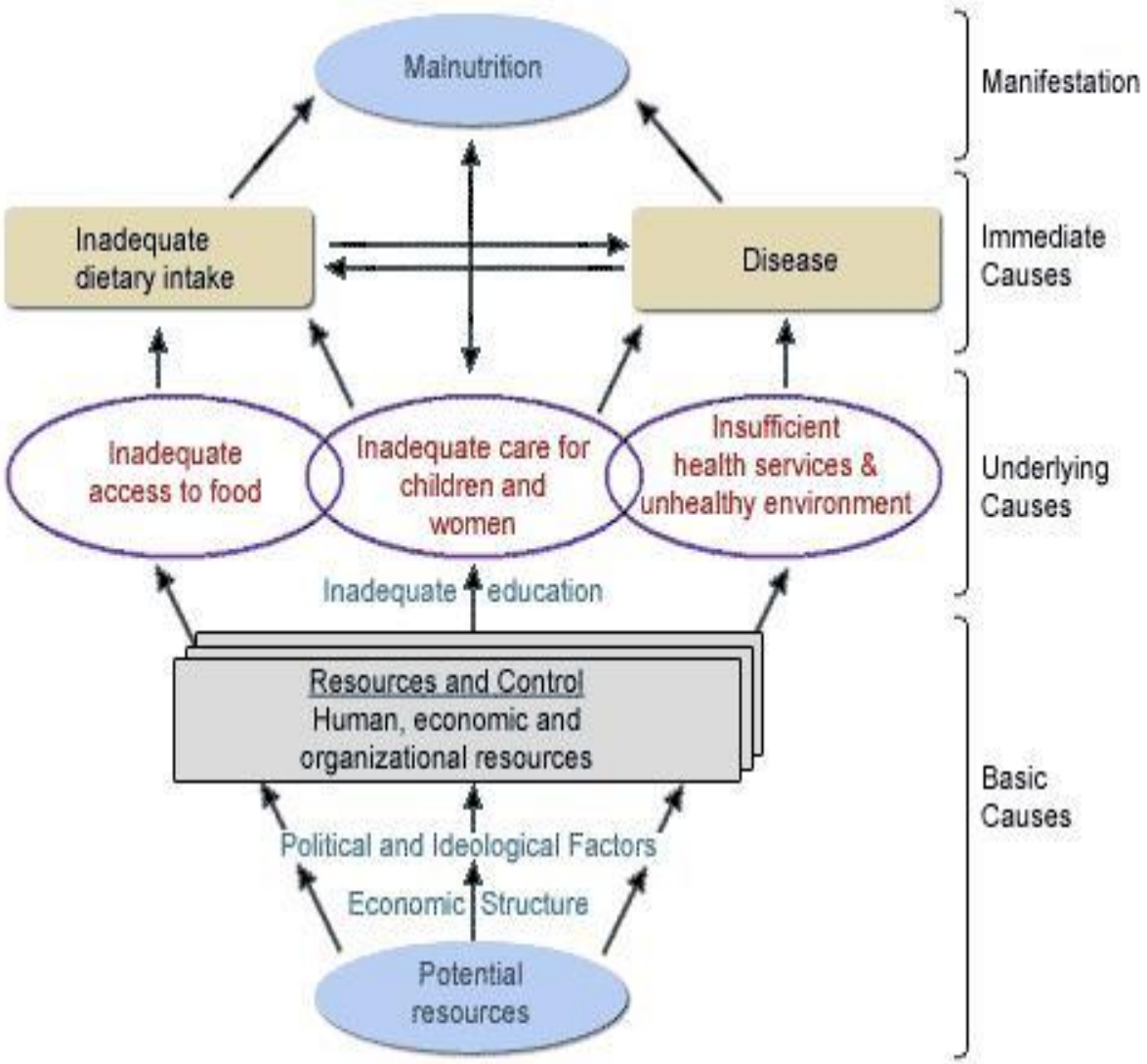

Figure 1.1 A conceptual frameworks for causes of Malnutrition by UNICEF

PART II

2. Literature review

2.1 Nutrition

WHO defined as the intake of food considered in relation to the body's dietary needs. Good nutrition i.e. an adequate well balanced diet with regular physical activity is a cornerstone of good health whereas poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development and reduced productivity (WHO).

Nutrition is the study of food in relation to health and the process by which living organism used food for the maintenance of life, growth, normal functioning of the organs and tissues and productivity of energy or the study of various nutrients their functions food resources and their utilization by human body and their effect on human wellbeing (Gropper *et al.*, 2009).

2.2 Nutrition status

Nutritional status has been defined as the condition of the body resulting from the intake, absorption and utilization of food. It can be measured directly (Burk, 1984). Nutritional status is the condition of health of the individual as influenced by the utilization of nutrient. It can be determine through a careful medical and dietary history, a thorough physical examination, and appropriate laboratory investigation (Robinson, 2000). The nutritional status of the people of developing and under developed countries is very poor. Malnutrition is widely prevalent in developing countries (Muller and Krawinkel, 2005)

Early childhood health and nutrition is a true reflection of countries' level of development. These health indicators are directly linked through existing policies, plans and programs to countries' investment in early childhood and respect for children's rights (Molina, 2012).

2.2.1 Causes of low nutritional status of the 6 to 59 months age group children.

Main causes of the low nutritional status in seemly developed city are market cycle, food habits, agricultural season or seasonality in food availability, religious cycle, low income, spacing in

child birth, food habit, and child birth frequency, food accessibility and economic level (den Hartog and Brouwer, 1990).

2.3 Malnutrition

Malnutrition is not a simple syndrome in fact it is the worldwide and one of the most dangerous problem existing globally which weakens immune systems and worsens illnesses. It is a major factor contributing to children deaths. Malnourished children who survive have diminished learning capacity and lower productivity in adulthood. Malnutrition reduces the quality of life and financially drains families, communities, and countries (WHO et. Al., 1999) and also prevents children from reaching their full physical and mental potential. Malnutrition is one of the biggest health problems that the world currently faces and is associated with more than 41% of the deaths annually in children from 6 to 24 months of age in developing countries which is total approximately 2.3 million. World Health Organization in 2001 reported that 54% of all childhood mortality was attributable direct or indirectly, to malnutrition (Akorede and Abiola, 2013).

Since the diet consumed by a large majority of the low income groups of the population in most of the developing countries are inadequate both in quantity and quality, malnutrition, particularly under nutrition, is widely prevalent among the vulnerable group of the people here (Swaminathan, 1997).

Although rarely listed as the direct cause, malnutrition is estimated to contribute more than one third of all child deaths. Lack of access to highly nutritious food is a common cause of malnutrition. Poor feeding practice as inadequate breastfeeding, offering the wrong food and not ensuring that the child gets enough nutritious food also gives helping hands to raise malnutrition. Infection as persistent diarrhea, pneumonia, measles and malaria also undermines a child nutritional status (WHO, 2004).

Malnutrition has been defined in various ways some believe that it is a result of an imbalance in the intake of nutrient; whereas other say that it is the result of too little or even too much intake of certain nutrient. There are still other who say it is a clinical syndrome with typical symptoms and signs depending on the type of nutrient responsible for the disease. Nevertheless, both over nutrition and under nutrition are considered malnutrition (Swaminathan, 2014).

Malnutrition has been defined as a pathological state resulting from a relative or absolute deficiency or excess of one or more of the essential nutrients in the diet (Jelliffe *et al.*, 1966). Malnutrition is a state in which the physical function of an individual is impaired to the point where he or she can no longer maintain adequate bodily performance processes such as growth, pregnancy, lactation, physical work, and resisting and recovering from disease.(I. Beghin *et al.*, 1988).

Protein energy malnutrition, PEM is the most common easy to diagnose form of malnutrition occurring among infants and young children due to deficiency of protein or calorie or both of them. . Mild PEM manifests itself mainly as poor physical growth, whereas individuals with severe PEM have high case of fatality (WFP, 2011)

Malnutrition as a pathological condition of varying degree of severity and diverse clinical manifestation, resulting from the deficient assimilation of components of the nutrient complex (Gomez *et al.*, 1955). Health and physical consequences of prolonged states of malnutrition among children are delay in physical growth and motor development, lower intellectual quotient (IQ). (Kandala *et al.*, 2011)

According to WHO, malnutrition has three commonly used comprehensive types named stunting, wasting and underweight measures by height for age, weight for height and weight for age indexes respectively (Kandala *et al.*, 2011).

For girls, chronic under nutrition in early life, either before birth or during early childhood can later lead to their babies being born with low birth weight, which can lead again to under nutrition as these babies grow older. Thus a vicious cycle of under nutrition repeats itself, generation after generation. (UNICEF, 2009)

2.3.1 Type of Malnutrition:

a) Under nutrition: It can be discussed as pathological state resulting from the consumption of an inadequate quantity of food over an extended period of time (Jelliffe *et al.*, 1966).

b) Over nutrition: Pathological state resulting from the consumption of an excessive quantity of food, and hence a calorie excess, over and extended period of time can be noted as over nutrition (Jelliffe *et al.*, 1966).

c) Specific deficiency: It is the pathological state resulting from a relative or absolute lack of an individual nutrient (Jelliffe *et al.*, 1966)

d) Imbalance: This pathological state results from a disproportionate consumption of essential nutrient with or without the absolute deficiency of any nutrients as determined by the requirement of a balanced diet (Jelliffe *et al.*, 1966)

Malnutrition can also be classified as acute, chronic and acute and chronic malnutrition (Woodruff *et al.*).

- **Acute malnutrition:** Acute malnutrition relates to the present state of nutrition, for example. weight for height(wasting or thinness)
- **Chronic malnutrition:** chronic malnutrition relates to the past state of nutrient, and the measurable parameters are height for age(stunting or shortness)
- **Acute and chronic malnutrition:** A combination measure, hence it could occur as a result of wasting, stunting or both (underweight)

2.3.2 Most common malnutrition problems

There are a number of types of malnutrition. The most common types of malnutrition problems in the developing countries like Nepal are PEM (protein energy malnutrition),vitamin A deficiency, iron deficiency anemia and iodine deficiency disorders.

a) **Protein-energy malnutrition-**The term PEM was first introduced by Jelliffe in 1959 (Passmore and Eastwood, 1986) and is is defined as a diet with insufficient amounts of all the major macronutrients: proteins, carbohydrates and fats (Jelliffe *et al.*, 1966). Protein energy malnutrition usually is seen during famines in Third-World countries and in eating disorders in Western societies. PEM is also known as starvation and a person becomes thin and weak and is in danger of death (Passmore and Eastwood, 1986).

Classification of PEM

i. **The Wellcome classification**: It is one of the simple method for the diagnosis of clinical malnutrition(Bassat *et al.*).

	Edema	
Weight (% of standard)	Present	Absent
80-60	Kwashiorkor	Undernourished
<60	Marasmic Kwashiorkor	Marasmus

ii. **The Gomez classification**: It was first suggested in the late 1950s as a method of diagnosing mild-moderate forms of malnutrition in the community and for the early identification of marasmus. It is based on weights of healthy American under five aged children and the fifth percentile is taken as the standard. Malnutrition in this classification is graded into three degrees of increasing severity according to the percentage reduction in weight from the standard (Bassat *et al.*).

Gomez classification

First degree malnutrition <80% of the standard
Second degree malnutrition <70% of the standard
Third degree malnutrition <60% of the standard

This classification has been criticized on two counts. Firstly, it does not take height into consideration and secondly, in some of the communities more than half the children fall in the category of third degree malnutrition and health workers doubted whether the growth standards of one community were applicable to another (Bassat *et al.*)

Types of PEM

i) Kwashiorkor: Kwashiorkor, a deficiency disease caused by lack of protein is a life threating and debilitating form of malnutrition mostly seen in regions experiencing famine in low and lower middle income region. Because of its association with edema (fluid retention), kwashiorkor is also known as "edematous malnutrition". People suffering from kwashiorkor typically have an extremely emaciated appearance in all body parts except their ankles, feet, and belly, which swell with fluid (Gomez *et al.*, 1955). The disease is appertaining when the child is

weaned onto traditional diet that maybe low in protein (Swaminathan, 2014). In many rural areas where kwashiorkor is endemic, the food supply become scarce each year before the harvest, at during this hungry season the incidence of kwashiorkor in other nutritional disease increases (Passmore and Eastwood, 1986). This disease can be easily treated with a change in diet and those who are treated early usually have a full recovery. Treatment includes introducing extra calories and protein into the diet. Children who develop kwashiorkor may not grow or develop properly and may remain stunted for the rest of their lives. There can be serious complications when treatment is delayed, including coma, shock and permanent mental and physical disabilities. Kwashiorkor can cause major organ failure and eventually death and can also be life threatening if it's left untreated. Kwashiorkor can be identified with following symptoms: change in skin and hair color (to a rust color) and texture; fatigue; diarrhea; loss of muscle mass; failure to grow or gain weight; edema of ankles, feet and belly; damaged immune system; irritability; flaky rash, shock, moon face, apathy and peevishness, crazy pavement and fatty liver etc (Swaminathan, 2014).

ii) Marasmus: Nutritional marasmus also referred as wasting is considered as a severe form of malnutrition, principally due to consumption of diet markedly deficient in both protein and calories and is usually participated by diarrheal diseases (Swaminathan, 2014). A child suffering from marasmus is less than 60% of normal weight for its age (Shrestha, 1996).Characteristic symptom are growth failure and low body weight wasting, severe of muscles and of subcutaneous fat, and dry and atrophic skin (Swaminathan, 2014). The loss of body fat and muscle tissue leads to a withered appearance and the infant looks like old man or has monkey face (Cameron and Hofaner, 1983). It mainly usually occurs in children that does not ingest enough protein, calories, carbohydrate and other important nutrients which is usually due to poverty and scarcity of food. However marasmus is not always a direct lack of nutrients. It can also be caused by the wrong nutrients or an inability to absorb or process nutrients properly because of infection (Mehta, 2016a). Underweight is the main symptom of marasmus. Children with marasmus have lost a lot of muscle mass and subcutaneous fat along with brittle hair, sunken eyes and dry skin; chronic diarrhea; respiratory infectious; intellectual disability and stunted growth, frequent dehydration, persistent dizziness, ribs and shoulder visible through skin along with frequent infections. Seriously malnourished children have little to no energy or enthusiasm for anything. Short temper and irritability is also seen in marasmic child but this is

usually a more common symptom of kwashiorkor (Roland, 2016). It is estimated that 20 million children under five years of age have severe form of malnutrition like marasmus at some point in their lives and about 500000 to 2 million children die as a result of it (UNICEF, 2015).Improper feeding, Infection as syphilis or tuberculosis, congenital weakness of disease, such as congenital heart disease, very poor sanitary and hygienic condition that spread disease are considered to be additional cause of marasmus (UNICEF, 2015).:

iii) Marasmic – Kwashiorkor: It can be indicated as a mixed form of malnutrition resulting from the deficiency of both calories and protein, primarily in children. The condition is characterized by presence of both wasting and bilateral pitting edema along with dehydration lethargy and growth retardation. It is a very serious condition and classified as forms of severe acute malnutrition (Elsevier, 2009; Farlex, 2012) .

iv) Moderate PEM: It is also known as runche and is the primary state of PEM, a common malnutrition problem in Nepal (UMN, 1995).The restricted food intake of the marasmic child is sometimes the result of maternally imposed restriction. The child is cry baby crying all the time for food (Rajalakshmi, 1987)

v) Mild PEM: Mild PEM manifests itself mainly as poor physical growth in children. Mild and moderate as other form of malnutrition often do not have clear manifestation of malnutrition of malnutrition rather they are shorter and/or thinner than they would be expected for their age and they may have deficts in physiological development and perhaps other signs are not easy to detect. They are diagnosed mainly on the basis of anthropometry especially using measurements of weight and height and sometime other measurements such as arm circumference or skin fold thickness (Mehta, 2016b)

b) Iron deficiency Anemia:

Iron deficiency anemia- a condition in which body lacks healthy blood cells- is the most widespread disorder in developing countries and contributes significantly to reduced work and productivity and economic output as well as to morbidity and mortality. The deficiency disorders are widely prevalent among infants, children, adolescent girls and expectants and nursing mother worldwide (Kaushansky *et al.*, 2012; Yip, 1993).

According to American society of Hematology, iron deficiency is the most common cause of anemia and it may be caused due to several reasons as inadequate iron intake, pregnancy or blood loss due to menstruation, internal bleeding, inability to absorb iron etc. It can occur in both men and women of any age and from any age group however some people may be at greater risk for IDA than other which include – women of childbearing age, pregnant women, women with heavy menstrual periods, people with poor diets, people who donate blood frequently, people with major surgery or physical trauma, GIT disease, inflammatory bowel syndrome, peptic ulcer disease infants and children especially those born prematurely or experiencing a growth spurt, vegetarians who do not replace meat with other iron rich food, children who drink more than 16-24 ounces a day of cow's milk (as it not only contains little iron but can also decrease absorption and irritate the intestinal lining causing chronic blood loss) (Hematology; Stanley and Auerbach, 2016).

The symptoms of IDA can be mild at first and one may not even notice them. Common symptoms of anemia are paleness of lip, tongue, inside the eyelids and hands. The child with severe anemia becomes tired, dizzy, and restless and has a rapid pulse and short breath. Iron deficiency anemia has also been shown conclusively to delay psychomotor development and impair the cognitive performance of infants and pre-school children. There may also be strange craving to eat items that aren't food as dirt, ice or clay along with tingling or crawling feeling in the legs, swelling of tongue or soreness, cold hands and feet, brittle nails and headache (Cafasso and Nall, 2015; Scrimshaw, 1997).

According to WHO, overall rates for iron deficiency anemia in developing countries are 26% for men, 42%for women, 46%for school-age children, and 51% for children four years of age or less. Iron deficiency anemia has long been associated with and tiredness (Scrimshaw, 1997). Anemia is very rare in healthy breast-fed infants. Anemia may be a greater problem in the lower socio-economic families (De Onis and Blossner, 2003)

Anemia burden is high in Nepal with 46% prevalence of anemia among under 5 children an 35% among 15-49 years of women. The distribution of anemia varies geographically by ecological zones and rural/urban residence. Among children 12–59 months who received deworming tablets in the last six months, anemia prevalence was 41% compared to 51% among eligible children who had not received treatment in the last six months (MoHP, 2011)

c) Iodine deficiency disorder:

Iodine deficiency is the leading cause of preventable intellectual impairment and is associated with a spectrum of neurological and developmental pathology. It is a global health issue and WHO estimates over 2 billion people may be iodine deficient up to 50 million of them suffering from serious symptoms of iodine deficiency such as brain damage (Chestnov, 2013)

More than one billion people are at risk (Maberly, 1993). Iodine deficiency disorders are of particular concern among women (Lisile *et al.*, 1997). The main manifestation of iodine deficiency are goiter, impaired mental function and increased rates of fetal wastage, still births, and infant deaths. Severe mental and neurological impairment known as cretinism occurs among infants born to mother who are seriously iodine deficient (Lisile *et al.*, 1997). The extent of iodine deficiency disorder is usually assessed by the prevalence of goiter in affected populations (Swaminathan, 2014). Recently Iodine deficiency has been linked to autism in children (Hamza *et al.*, 2013).

Iodine deficiency symptoms manifest as a result of improper thyroid hormone production i.e. when the thyroid gland does not receive enough iodine, trouble appears. Signs and symptoms of Iodine deficiency may vary according to individuals but they usually include- thyroid enlargement known as goiter; mental imbalance such as depression and anxiety; mental retardation (in extreme case); fetal hypothyroidism leading to brain damage; autism (Eastman and Zimmermann, 2011).

d) Vitamin-A deficiency:

Vitamin-A deficiency, as defined by eye damage, has been identified as a widespread public health problem in the developing countries and is the leading cause of preventable blindness in children and increases the risk of disease and death from severe infections. Each year it is estimated that between 250,000 and 500,000 preschool children go blind from vitamin A deficiency, and that within months of going blind, two-third of these children die. The peak prevalence seems to fall in the age range of two to four year (Scrimshaw, 1997). In pregnant women, VAD causes night blindness and may increase the risk of maternal mortality. VAD is a public health problem in more than half of all countries, especially in Africa and South-East Asia, hitting hardest young children and pregnant women in low income countries. An estimated

250 million preschool children are vitamin A deficient and it is likely that in vitamin A deficient areas a substantial proportion of pregnant women is vitamin A deficient (WHO, 2012).

Xerophthalmia is sometimes used to cover all the clinic disorders of the eyes due to VAD. Xerophthalmia and keratomalacia are progressive disease of the eye due to VAD. The earliest symptoms are night blindness, dryness of conjunctiva and affected cornea (Swaminathan, 2014).

e) Zinc deficiency

Everyone, young and old, requires regular zinc intake to remain alive, which is why it is referred to as an "essential" trace element. Even plants and animals need it to survive. Present in every cell, organ, bone, tissue, and fluid in our bodies zinc is especially prominent in the male prostate gland and semen. The mineral zinc is necessary for proper function of our immune system. Zinc also helps cells divide and grow and assists the body in healing wounds. Deficiency symptoms include frequent infections, hair loss, poor appetite, problems in tasting and smelling and long healing times for wounds. Zinc deficiency can be stopped or prevented by eating nuts, legumes, yeast and whole grains. Zinc is also found in beef, pork and lamb (WFP, 2011).

Zinc deficiency, a significant problem for most countries in the world, the World Health Organization (WHO) reports that the global prevalence of zinc deficiency is 31%.Ranked as the fifth leading risk factor in causing disease worldwide, underdeveloped nations regularly suffer from high mortality rates because of the connection that zinc deficiency has with childhood diarrhea and pneumonia. Zinc deficiency is such a serious global problem that 176,000 diarrhea deaths, 406,000 pneumonia deaths and 207,000 malaria deaths are caused by it; primarily in Africa, the Eastern Mediterranean and South-East Asia (WHO, 2012).

2.4 Nutritional Situation

2.4.1 Incidence of Under-nutrition

Under nutrition is defined as the outcome of insufficient food intake and repeated infectious diseases. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition) (UNICEF, 2006).

Malnutrition is associated with more than half of all child deaths worldwide. Undernourished children are more likely to die from common childhood ailments and, for those who survive, have recurring sicknesses and faltering growth. Three quarters of the children who die from causes related to malnutrition are only mildly or moderately malnourished—showing no outward sign of their vulnerability (UNICEF, 2006).

Malnutrition remains a serious obstacle to child survival, growth and development in Nepal. Prevalence of malnutrition among under five children is high with 48.6% in the country. Protein-energy malnutrition (PEM) and micronutrient deficiency are most common types of malnutrition. As of the Nepal Demographic and Health Survey 2006, 49% of children below 5 years of age are stunted and 20% are severely stunted (MoHP, 2006). The survey also showed that 13% the children are wasted and 3% are severely wasted and 39% of the children below 5 years are under weight and 11% are severely underweight. Similarly NDHS 2011 shows that 41%of children under 5 years of age are stunted, and 16% are severely stunted. The survey also shows that 11% of children are wasted and 3% are severely wasted and 29% of children below 5 year of age are underweight and 8% are severely underweight (MoHP, 2011).

Eighteen percent of women of reproductive age are thin or undernourished (BMI < 18.5 kg/m^2). The proportions of mild thinness (17.0-18.4 kg/m^2) and moderate and severe thinness (<17 kg/m^2) are 12 percent and 7 percent, respectively in Nepal (MoHP, 2011).

2.4.2 Nutritional Status in Nepal

Decreasing trend of malnutrition is shown by various surveys conducted in past few years however the prevalence is much higher than in developed countries. The Nepal Demographic Health Survey 2011 has provided the data on prevalence of malnutrition under 5 years of child and the percentage of prevalence of malnutrition below 5 years of age is illustrated in given diagram(MoHP, 2011)

Table: 2.1 Nutritional Status of Children under five years of age

	NDHS 2001	**NDHS 2006**	**NDHS 2011**
Stunting	57%	49%	41%
Wasting	11%	13%	11%

Underweight	43%	39%	29%

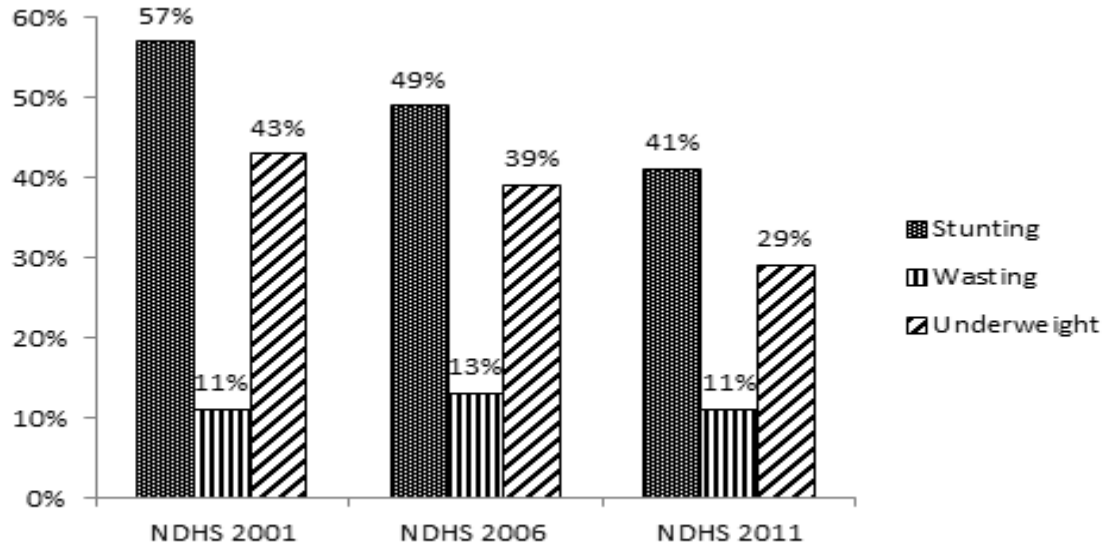

Fig: 2.1 Nutritional status of children of Nepal under five years of age

2.5 Infant and young child feeding practices

2.5.1 The global strategy for infant and young child feeding

In 2003, the World Health Organization and UNICEF adopted the Global strategy for infant and young child feeding. The strategy was developed to revitalize world attention to the impact that feeding practices have on the nutritional status, growth and development, health and survival of infants and young children(WHO/UNICEF, 2003).

2.5.2 Recommended infant and young child feeding practices

WHO and UNICEF global recommendations for optimal infant feeding as set out in the global strategy are:

- exclusive breastfeeding for 6 months
- nutritionally adequate and safe complementary feeding starting from the age of 6 months with continued breastfeeding up to 2 years or beyond (WHO/UNICEF, 2003).

2.5.2.1 Exclusive Breastfeeding

Exclusive breastfeeding as defined by WHO and UNICEF is practice whereby an infant receives only breast milk from the mother or a wet nurse or expressed breast milk. The WHO and UNICEF, both recommend that mother should breastfed their child exclusively for the first six months and continue breastfeeding up to two years or longer rather than stop exclusive breastfeeding practice as from 4-6 months (Motee and Jeewon, 2014).

Breastfeeding an infant exclusively for the first six months of life carries numerous benefits such as lowered risk of gastrointestinal infection, pneumonia, otitis media and urinary tract infection in the infant while mother return to her pre-pregnancy weight very rapidly and have a reduced risk of developing type 2 diabetes (Motee and Jeewon, 2014).

Expressed breast milk

Breastfeeding is beneficial to both infant and mother. However, owing to certain circumstances, mother are unable to breastfed, so they wish to express their milk it is the only opportunity for the infants to have the human milk(Motee and Jeewon, 2014).

2.5.2.2 Complementary feeding

Complementary feeding is the term used or giving other food and drinks in addition to breastfeeding after completion of the six months exclusive breastfeeding period. According to WHO, this process covers the period from 6-12 months of age and this is critical period of growth during which infant are at high risk of nutrition deficiencies and illness as only breast milk is no longer sufficient to meet the nutritional requirements of infant. Breast milk is relatively deficient in iron, and the infant's store of iron is sufficient only until about six months of age. From six to twelve months, the normal infant may be expected to gain between 2-3 kg and the infant, while continuing to receive breast milk, will now need foods to provide extra energy, protein, iron, vitamin c and other nutrient for growth (WHO).

Timing of the first introduction of solid food during infancy may have potential effects on life-long health. It can be seen that very often solid foods are either given too early o too late. According to UNICEF, the frequency and amounts of food that is given may be insufficient hence; hindering the normal growth of the child or their consistency or energy density may be

incorrect in relation to the child's need. So, WHO stated that it is advisable or mothers to adopt an appropriate complementary practice at appropriate age for better growth of child (WHO).

At six months age, complementary feeding should be introduced gradually while the infant continues to be breastfed intensively and to receive most of his or her energy and other nutrients from the breast milk and not from complementary food. From six to twelve months, it is highly desirable that breastfeeding should continue and that the child should get as much milk as possible from the mother while other food, first semi-solid and then solid, should be introduced to the diet of the infant for normal growth and health (WHO). .

2.5.3 Determinants of infant feeding practice

Three levels of factors that influence breastfeeding practices- individual, group and society- can be considered (Australian Health Minister, 2009; Hector *et al.*, 2005)

2.5.3.1 Individual level factor

These factors are directly related to the mother, infant and mother infant dyad and includes: mother's intention to breastfeed, her knowledge, skills and parenting experience, the birth experience, health and risk status to mother and infants, and the nature of early interaction between mother and infant, each of which can directly influence the initiation and duration of breastfeeding and are frequently correlated with social and demographic variables (Australian Health Minister, 2009; Hector *et al.*, 2005) .

2.5.3.2 Group level factors

They are the attributes of the environment in which mother and child find themselves, the attributes that enable the mother to breastfeed. They include hospital and health facilities environment, home and per environment, work environment, community environment and public policy environment which modifies how each of these environment influence mother's feeding decisions (Australian Health Minister, 2009; Hector *et al.*, 2005).

2.5.3.3 Societal level factors

They influence the acceptability and expectation about breastfeeding, complementary feeding and provide the background or the context in which mother's feeding practice occur. This

includes cultural norms regarding breastfeeding, child feeding and parenting; the role of women in society, including how working outside the home is valued; the extent to which men's social role includes support for breastfeeding mothers; the extent to which exposing breast for feeding is complicated by cultural norms regarding sexuality; existing food beliefs and taboos related to gender, infant, mothers, pregnancy and lactation; at different stage the economic importance of product such as breast milk substitutes and complementary foods in the food system (Australian Health Minister, 2009; Hector *et al.*, 2005).

2.6 Breastfeeding and Weaning Process in Nepal

2.6.1 Breastfeeding

WHO/UNICEF defined breastfeeding as child receiving breast milk direct from the breast. Expressed and exclusively breastfeeding means the infant has received only breast milk directly or expressed and no other liquids or solids with the exception of drops or syrups consisting of vitamins, mineral supplements or medicines. Similarly predominant source of nourishment has been breast milk however, the infant may also receive water and water-based drinks, fruit juice, oral rehydration salts solution, drop and syrup forms of vitamins, minerals and medicines. Exclusive breastfeeding and predominant breastfeeding together constitute full breastfeeding. Bottle feeding means the child has received liquid or semi-solid food from a bottle with a nipple teat (WHO *et al.*, 2007).

Breastfeeding is universally endorsed by the world's leading health and scientific organization as the best way of feeding infants and according to Lancent 2000 breastfeeding if universal, is the most effective preventive intervention to prevent malnutrition. Breastfeeding had been a universal practice in the past. Breastfeeding in the first years of life protects children from infection, provides an ideal source of nutrients, and is economical and safe. However, many mothers stop breastfeeding too soon and there are often pressures to switch to infant formula, which can contribute to growth faltering and micronutrient malnutrition and is unsafe if clean water is not readily available (Chapagain, 2012).

WHO/UNICEF provide the following feeding recommendations (NMISC, 2010)

- ✓ Exclusive breastfeeding for first six months of life

- ✓ Continued breastfeeding for two years or more
- ✓ Safe, appropriate and adequate complementary foods beginning at six months of age
- ✓ It is also recommended that breastfeeding be initiated within one hour of birth.
- ✓ Frequency of complementary feeding: 2-3 times per day for 6–8-month-olds; 3-4 times per day for 9-11 month ad 12-24 moths ol with additional nutritious snacks offered 1-2 times per day as desired.

Breast-feeding is nearly universal among the Nepalese mothers, but its duration and frequency are not always optional. In most communities, a mother begins feeding their infants almost immediately, but in some parts of the country feeding doesn‘t begin for a two days or after the colostrum has been discarded. Such practice means some new infants are deprived of the immunological qualities of colostrum. Breast feeding is usually continued together with the provision of cereal weaning until child is 2-3 years of old or until the mother is pregnant again. In certain communities, children receive only breast milk until they begin to eat adult‘s food. Mother will generally feed their infants on demand but workloads interfere with the frequency of feeding (Chapagain, 2012).

According to Nepal Demographic Health Survey 2011, 70 percent of children under age 6 months are exclusively breastfed, and 66 percent of children 6-8 months (breastfed and non-breastfed) are introduced to complementary foods at an appropriate time. Ninety- three percent of all children are still breastfeeding at age 1, and the same proportion are still breastfeeding at age 2. Four of five Nepalese children ages 0-23 months are breastfed appropriately for their age. This includes exclusive breastfeeding for children age 0-5 months and continued breastfeeding along with complementary foods for children age 6-23 months. Four-fifths of children under 6 months are predominantly breastfed. This percentage includes children who are exclusively breastfed and those who receive breast milk and only plain water or nonmilk liquids such as juice. Finally, 6 percent of children under age 2 are bottle fed (MoHP, 2011).

Reasons for breast milk feeding are:-

- ✓ Any milk other than breast milk has no anti-infective properties to protect the infant in the early months.
- ✓ Bottle feeds are often too difficult. The mother makes the expensive milk lost as long as

possible and often is unable to follow written instructions on the can or container (Cameron and Hofaner, 1983)

2.6.2 Weaning pattern

Weaning pattern is the process of providing other nutritive food to the child besides mother‘s milk. Such foods helps the child to grow in healthy way and to keep the children away from the malnutrition; growing child cannot only depends on the mother‘s milk, so other foods should be given to the child on the requirement quantity. Similarly, most of the mother‘s start to work in the field after one month of their child birth and they have less time to feed their infants. If the baby is hungry when the mother is absent, the baby may be fed with ―Jaulo‖, milk etc. This provides the temporary relief, although it is inappropriate for infants less than four months old (Vaidya, 1987)

Both early and late supplementation is harmful for child health. Weaning that began too early involves the risk of infection, weaning that too late leaves the infants with an inadequate intake of nutrients and, thus is harmful to the growth and development of child (Abate and Yohannes, 1987). Among many facilities in Nepal, the fifth or sixth months of the life are marked by the rice feeding ceremony i.e. ―*Pasni* in which the baby is offered rice or ― *Kheer* according to the economic condition of the family for the first time. After this ceremony the baby can take supplementary foods. But the mother will continue to give breast milk beyond and the first year. This late introduced serious under nutrition at this age (NFHS, 1996).

2.6.3 Weaning Practice

The children are considered to be the nutritionally most vulnerable member of any community. The period of childhood especially the second year of life is notoriously fraught with risk. The young child is―transitional as regard diet immunity to infection and psychologically dependence. This is a period of rapid growth with high nutrients needs, particularly of proteins for swiftly increasing muscle tissue. It is a time when several meals a day required and when foods should be easily mistakable and digestible (Jelliffe *et al.*, 1966)

The American Academy of Pediatrics, the World Health Organization, the National Health Service Choices UK and the National Health & Medical Research Council in Australia

recommend waiting until 6 months to introduce baby food.

If the baby is to maintain the expected rate of growth, remain healthy and well nourished, supplementary feeding has to be restored to a round 6^{th} month .Weaning can be defined as the process of gradually introducing a infant to what will be its adult diet and gradually decreasing breast milk (Srilakshmi, 2014)

During the weaning period good food source of energy, protein calcium and iron are particularly important. On the basis of body weight, children required twice as much as protein calcium and iron as do adults (Vaidya, 1987)

Common traditional weaning foods include:

1. Porridge (*lito*), made from roasted rice flour (occasionally maize or millet), *ghee* (clarified butter) and sugar
2. *Jaulo*, made from rice and turmeric or rice and salt
3. *Dhindo*, made from maize flour (or millet or wheat)
4. *Maar*, made in lowland areas by cooking rice, cracked maize and soybeans together

5. *Khichari*, a mix of rice, pulses and vegetables.

Some of these traditional foods are high in energy and nutrients and should be encouraged. These include *maar* and *khichari*. Others are poor weaning foods with little protein or nutrients, such as *jaulo*, so adding pulses, green leafy vegetables or fruit to these foods is encouraged (Nidhi, 2006)

In an under developed country like Nepal the average family food, *Dal Bhat* in small quantities and in diluted form is given to the infants child, especially in the hills among low income group families, is *Dhindo*. Roasted soybean or corn, flattened rice (*chiura*) and puffed rice are also given as snacks food (Vaidya, 1987).

As mentioned earlier, after pasni the child can take supplementary food and the infants are fed with *Litto. Litto* is a traditional blend rice porridge made with green vegetables is also given to infants, but it is specially given to convalescing young children. *Sattu* an infant food particularly made from roasted maize is used especially in the Terai (Vaidya, 1987)

Another traditional food which has been shown by scientists to be very nutritious, is a porridge made from the finely ground floor of roasted cereal grains and pulses. In Nepal this is known as super-flour porridge or sarbottam pitho ko lito (Nidhi, 2006)

2.7 Current Breast Feeding status in Nepal

According to NDHS (2011), 88% of children less than 2 months of age are exclusively breastfed but the percentage is dropping sharply with subsequent increasing age. Overall 70% of under six months aged children are breastfed exclusively, remarkable improvement than 2006, when it was 53%. Although bottle feeding is not common in Nepal, but the percentage has been slightly rise in the practice from 2006 (4%) to 2011 (6%) among 0-6 months infants(MoHP, 2011).

2.8 Infant Feeding Practice in Nepal

2.8.1 Breastfeeding practice

Breastfeeding is the most favored method of feeding newborn infants and children in Nepal. It is almost universal during the newborn period. Only about 35% of infants initiated breastfeeding within one hour of birth (MoHP, 2006). According to NDHS 2011 less than half of children (45%) are breastfed within one hour of birth. Majority i.e 85% are breastfed within one day of birth. The percentage of those who initiated breastfeeding within one hour ranged from 55% in the far western region to 34% in central region. Initiation of breastfeeding within one hour of birth was highest in western mountain, far western hll and far western terai sub region (54%) each. Compared to children delivered at home (36%), child born in health facility were more likely to start breastfeeding within one hour of birth. Education status of mother had direct proportion whereas wealth quintle had indirect proportion to initiation of breastfeeding within one hour of birth (MoHP, 2011)

2.8.2 Pre lacteal feeds

NDHS (2006) reported that more than 35% of mothers gave pre lacteals feed to their newborns, ranging from 4.3% in mid-western hills to 75.7% in Central Terai (MoHP, 2006). This percent decreased to 28% in NDHS 2011. Similarly, 37% of the new born in terai, 17% in mountain and 18% in hill were given pre lacteals. According to regional area, 41% infants in Central region being maximum and 8% in Far western region were given prelacteals (MoHP, 2011).

2.8.3 Duration and frequency of breast feeding

It is common practice to continue to breast-feed children for a longer period of time. In many cases, this may be the only food that the children receive, to the determinant of their nutritional status. It may also interfere with timely and appropriate complementary feeding. The mean duration of breastfeeding was noted as 30 months and it was reported that male children were breastfed for longer period of time than females. The median duration of breast feeding was 34 months and it was higher for children living in Western Mountain, Western Hill, Mid-western Hill and far Eastern Terai sub regions. Education status of mother was found to be indirectly related with breastfeeding practice i.e. children of mothers with some secondary and higher level of education were breastfed for a shorter period of time than mother with or no or primary education (MoHP, 2006, 2011).

2.8.4 Breast- feeding status at different age group

Only slightly more than half (53%) of the infants under six months old were exclusively breast-fed contrary to the promotion of exclusive breast-feeding for six months by the government nutrition program. Mother of children less than six months old with a higher level of education were less likely to exclusively breast feed: only one in three mothers with secondary level or higher education did so. For mothers with no or primary education, two out of three exclusively breast-fed their babies for six months. In addition, mothers in the lowest wealth quintal were more likely to exclusively breast feed than mothers in the highest wealth quintal (67% and 38% respectively) (MoHP, 2011).

2.8.5 Types of complementary food used

Almost three children out of five (58.4%) were reported consuming solid food by 6-7 months of age. About a quarter on infants had started on solid food by 4-5 months old. The introduction of liquids was reported to be much earlier. By 6-9 months of age, children are more likely to receive foods made from grains (71%) than other types of solid or semi-solid foods. Only about 20% of children in the six-to- nine month age group received vitamin A rich food and vegetables. Only about one in ten children consumed meat, fish or eggs around 6-9 months old. Babies are given milk other than breast milk most commonly around 12-15 months old (MoHP, 2006, 2011).

2.8.6 Complementary feeding of infants and young children

IYCF practices guidelines promoted by the World Health organization (WHO) and the United Nations Children's Fund (UNICEF) recommend feeding an average healthy child in the following ways (USAID *et al.*, 2010; WHO):

- Exclusive breast feeding till the age of 6 months unless any complication
- Continued breast-feeding, solid/semi-solid foods 2-3 times for infants 6-9 months old
- 3-4 times for infants 9-24 months old, with an additional snack being offered 1-2 times per day

The minimum IYCF practices for children 6-23 months are defined as continued breastfeeding, feeding at least the minimum number of times per day, and feeding from minimum number of food groups per day (USAID *et al.*, 2010).

The criteria for non-breast-fed children include feeding substitutes of breast milk (infant formula, powered o fresh animal milk, cheese, yoghurt and other milk products) .

According to NDHS 2006, 57% of children are fed according to recommended IYCF practices. Nearly all children 6-23 months old are breast-fed or given milk products, about 60% are given the recommended number of foods (food from three or more groups for breast-fed children), and more than 80% are fed at least as often as recommended. These findings indicate that male children, children with mothers with some secondary or higher education and children in the highest wealth quintal were more likely than other children to be fed according to recommendations. Feeding practices in the western Hills and the Western development region were better than the rest (MoHP, 2006, 2011).

2.9 Dietary Diversity

Dietary diversity is related to nutrient adequacy and to diet variety/balance, which are two of the main components of diet quality. Dietary diversity, is considered an outcome measure of food security mainly at the level of individual or household food access, but also can provide information about food availability in the community and reflect seasonal changes in dietary patterns, an aspect of the sustainability of the food supply (Kennedy, 2009)

Dietary diversity (DD) relates to nutrient adequacy (coverage of basic needs in terms of macro and micro nutrients) and to diet variety/balance, which are two of the main components of diet quality. DD is thought to reflect the adequate intake of essential nutrients either at the household level (HDD), in which case it can be measured by a HDD score. (HDDS) or by a Food Consumption Score (FCS), or at the individual level (IDD), in which case it can be measured by an IDD score (IDDS) (Bilinsky and Swindale, 2006). Studies of dietary diversity and energy intake at the individual level show mostly a positive, significant relationship (Kennedy, 2009)

A more diversified diet is an important outcome in and of itself. Some points regarding importance of diversified diet are given below (Bilinsky and Swindale, 2006).

- A more diversified diet is associated with a number of improved outcomes in areas such as birth weight, child anthropometric status, and improved hemoglobin concentrations.
- A more diversified diet is highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high quality protein), and household income.
- Even in very poor households, increased food expenditure resulting from additional income is associated with increased quantity and quality of the diet.
- Questions on dietary diversity can be asked at the household or individual level, making it possible to examine food security at the household and intra- household levels.

2.10 Nutrient requirement

Each nutrient has a particular series of functions in the body and some nutrients are needed in larger quantities than others. For example, protein is needed in gram (g) quantities. Vitamin C is needed in milligram (mg) quantities (1/1000 gram) and vitamin B_{12} is needed in microgram (µg) quantities (1/1000000 gram). Individual requirements of each nutrient are related to a person's age, gender, level of physical activity and state of health. Also, some people absorb or utilise nutrients less efficiently than others and so will have higher than average nutritional requirements, e.g. among older people, vitamin B_{12} absorption can be relatively poor. people need many different nutrients if they are to maintain health and reduce the risk of diet-related diseases. The amount of each nutrient needed is called the nutritional requirement. These are

different for each nutrient and also vary between individuals and life stages, e.g. women of childbearing age need more iron than men (BNF, 2016).

Estimated Average Requirement (EAR): This is an estimate of the average requirement for energy or a nutrient - approximately 50% of a group of people will require less, and 50% will require more. For a group of people receiving adequate amounts, the range of intakes will vary around the EAR (BNF, 2016).

Reference Nutrient Intake (RNI): The RNI is the amount of a nutrient that is enough to ensure that the needs of nearly all the group (97.5%) are being met. By definition, many within the group will need less (BNF, 2016).

Lower Reference Nutrient Intake (LRNI): The amount of a nutrient that is enough for only the small number of people who have low requirements (2.5%). The majority need more (BNF, 2016).

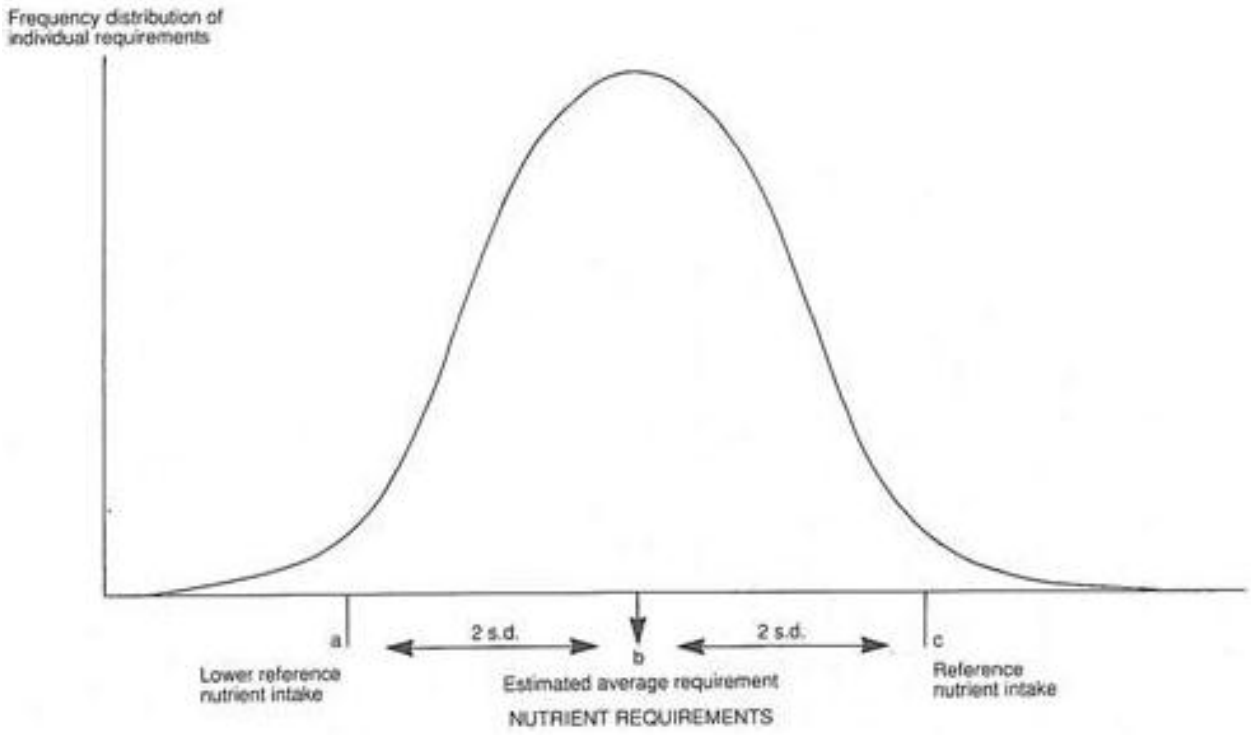

Figure 2.2 : Dietary reference value- definitions

Table 2.2. : ICMR Recommended Dietary allowances for infants-2010 (Srilakshmi, 2014)

Nutrients	Age (in months)	
	0 to 6	6 to 12
Calories (Kcal)	92	80
Protein (g)	1.16	1.69
Fat (g)	..	19
Calcium (mg)	500	500
Iron (mg)	46 ug/kg	5
Vitamin A (µg)		
Retinol (µg)	350	350
β- carotene (µg)	2800	2800
Thiamine (mg)	0.2	0.3
Riboflavin (mg)	0.3	0.4
Niacin equivalent (µg/kg)	710	650
Pyridoxine (mg)	0.1	0.4
Ascorbic acid (mg)	25	25
Dietary Folate (µg)	25	25
Vitamin B12 (µg)	0.2	0.2
Magnesium (mg)	30	45
Zinc (mg)	…	...

Table 2.3 :ICMR Recommended dietary allowance for preschool children-2010 (Srilakshmi, 2014)

Nutrients	Age (in years)	
	1 to 3	4 to 6
Calories (Kcal)	1060	1350
Protein (g)	16.7	20.1
Fat (g)	27	25
Calcium (mg)	600	600
Iron (mg)	9	13
Vitamin A (µg)		
Retinol (µg)	400	400
β- carotene (µg)	3200	3200
Thiamine (mg)	0.5	0.7
Riboflavin (mg)	0.6	0.8
Niacin Equivalent (mg)	8	11
Pyridoxine (mg)	0.9	0.9
Ascorbic acid (mg)	40	40
Folic acid (µg)	80	100
Vitamin B12 (µg)	0.2-1	0.2-1
Magnesium (mg)	50	70
Zinc (mg)	5	7

2.10 Assessment of Nutritional Status

Assessment of nutritional status of community is one of the first steps in the formulation of any public health strategy to identify and combat malnutrition. The principle aim of nutritional assessment is to determine the type, magnitude and distribution if malnutrition in different areas to identify risk groups and to determine the contributory factors. In addition fractural evidence of the exact magnitude of malnutrition is essential to sensitize administrators and politicians to obtain allocation of materials and human resources and to plan appropriately (Srilakshmi, 2002)

The nutritional assessment may require encompassing nations, communities, vulnerable

segments of communities or individuals. It may be done as a part of an exercise to document current status as compared with post status or as specific attempt to evaluate the, impact of an intervention program (Ramchandran *et al.*, 1987)

The assessment of nutritional status can be done using the following information(WHO, 1966)

- ✓ Direct method: - Deals with the individual and measures objective criteria. e.g. Anthropometric, Clinical examination, Biochemical and Bio- physical parameters.
- ✓ Indirect method:- Use community indices that reflect the community nutritional status or need. e.g. Dietary intake, morbidity and mortality rates, as specific mortality and vital statistics.
- ✓ Ecological factors:-e.g. Socio-economic status, housing and environmental hygiene, health and education services, conditioning infection.

Direct method of nutritional survey: They are summarized as ABCD (Rashed, 2009)

- ✓ Anthropometric method
- ✓ Biochemical and laboratory method
- ✓ Clinical examination
- ✓ Dietary evaluation method

Indirect method of nutritional survey (Rashed, 2009)

- ✓ Ecological variables including agricultural crop production, food balance sheet, health and educational services.
- ✓ Socio economic factors eg. Family size, occupation per capita income, population density, education customs and social habits.
- ✓ Vital health statistics particularly infant ,under 5, mortality and morbidity related to PEM, school age child stunting and wasting, anemia, goiter, diarrhea, measles and parasitic infestation.

2.11 Indicator in Nutritional Status

A variety of indicators, which can be used for the purpose of assessing nutritional status, are currently available. Of the many possible indicators of nutritional status only few are suitable for

the evaluation of field program. The only indicator of nutritional status that are applicable in a large scale and for which a suitable experience if available are those based on anthropometric indicators are best applicable in the evaluation of nutritional status (Keller, 1982)

A report by WHO in 1976 listed the lowering nutritional status indicators based on body dimensions, birth weight, weight for height, height for age , weight for age, arm circumference. The measurement of weight and height is relatively simple and reliable and their changes and distribution over ages are well documented for healthy well-nourished reference populations. The simplest of these indicator is weight –for age (Keller, 1982; RAPA, 1988). It is widely used for both the assessment of child population and the monitoring of individual development.

Weight is the measure of total body mass but gives no indication of its structure, a tall thin child may have same mass as a short, well-proportioned one, a fact that introduces a considerable error in to the classification of malnutrition by weight for age particularly in the categories of mild and moderate malnutrition. Therefore, a refinement that has long been used by anthropologist was introduced into the nutritional anthropometry of children (Scoane and Lathan, 1971). By relating the weight to the attained height a distinction was made between chronic and acute malnutrition (Scoane and Lathan, 1971) or between; stunting (low-height-for-age), and _wasting‘ (low-weight-for –height), (Waterlow and Rutishause, 1974)The three indicators weight-for-age , height-for-age, and weight-for-height have since found wide acceptance and application and probably more is known today about these indicators in different population and different health situations than any of other indicators that have been prepared in the past (Keller, 1982).

An essential component of these indicators and their use is the reference population. It provide the indicator value of the population that are considered normal i.e, healthy and without significant deficiencies, and against which measured indicator value are compared while the indicator weight-for-height is apparently independent of age during childhood (Waterlow and Rutishause, 1974). In the case of dependent indicators weight-for-age and height-for age, it has been argued the major difference in growth potential between ethnic groups would require local references population. It has however, been shown that with few exception growth of different ethnic groups under favorable conditions is almost identical (Bondal, 1996) .

2.12 Anthropometric Measurement

Anthropometric assessment is the physical measurement of the human body and is commonly used to estimate the nutritional status. Anthropometric measures have been extensively used for identification and classification of children suffering from PEM. Different anthropometric measurements are combined as ratios or indices such as weight for age, weight for height and height for age (Pietsch, 2000).

Nutritional anthropometry is concerned with the measurement of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition (D. B. Jelliffe, 1996).

The field of anthropometry encompasses a variety of human body measurements. Weight, stature (standing height), recumbent length, skinfold thicknesses, circumferences (head, waist, limb, etc.), limb lengths, and breadths (shoulder, wrist, etc.) are examples of anthropometric measures (CDC, 2007)

Three indices are commonly used in assessing the nutritional status of children:

1. Weight-for-age
2. Length-for-age or Height-for-age
3. Weight-for-length or Weight-for-height

There are many other anthropometric measures including mid - upper arm circumference (MUAC), sitting height to standing height ratio and many skinfold measures (Cogill, 2003)

Nutritional anthropometry appears to be of greatest value in the assessment of growth failure and under nutrition, principally from lack of protein and calorie. In particular the often numerous less advanced stages of PEM in early childhood can probably be best detected characteristics of this age group as shown especially by a low body weight and by depletion of protein stores as indicated by a subnormal muscles mass (WHO, 1966).

Growth is influenced by biological determinants, including sex, intrauterine environment birth order, birth weight in single and multiple pregnancies, parental size and genetic constitution and by environmental factors including climate seasons and socio-economics level. In the final analysis the environment seems to produce its effects by the presence (or absence) of infective

parasitic and psychological illness (WHO, 1966).

Advantages of anthropometry

- ✓ Simple, non-invasive
- ✓ Some equipment‘s are inexpensive, portable
- ✓ Relatively unskilled personnel can perform measurements
- ✓ Methods are reproducible
- ✓ Measures with long term nutritional history
- ✓ Quickly identifies mild to moderate malnutrition
- ✓ Measure many variable of nutritional significance like height, weight, skin fold thickness, head circumference waist-hip ratio and BMI,

Limitation of Anthropometry

- ✓ Relative insensitive to short term nutritional status
- ✓ Cannot identifies specific nutrient deficiencies
- ✓ Measurements like skin-fold are difficult to carry out in obese people
- ✓ There may be ethnic differences in fat deposition

The most common indicators to detect the problem of malnutrition are discussed below:

i) Weight for height

It is an indicator of leanness or thinness of the body and therefore of the present state of nutrition. An age effect of the relationship between weight and height becomes apparent only at the extremes of the range in children who are very tall or very short for their age. Thus, standards of expected weight at a given height, constructed from presumable well-nourished populations, are essentially age independent. Weight-for-height is an index of current nutritional status (Scoane and Lathan, 1971).

Weight is the anthropometric measurement most in use. Its potential value, especially for children, is appreciated not only by health personnel, by often by less educated parents, for whom it is useful as a source of health education. In developing regions, the prevalence of protein-calorie malnutrition appears to be best indicated by weight deficiency in all age-groups and by growth failure in children. Weighing is the key anthropometric measurement. Weight estimations can be made on isolated occasions, as in many surveys, or repeated at intervals under

special conditions, as at child-welfare clinics, schools, parental clinics, or in longitudinal studies. These serial measurements give a better index of actual growth or growth failure (Jelliffe *et al.*, 1966)

The height of an individual is made up of the sum of four components; Legs, pelvis, spine and skull. While, for detailed studies of body proportions, all of these measurements are required, in field nutritional anthropometry usually only the total height (or length) is measured (Jelliffe *et al.*, 1966)

The prevalence of acute malnutrition (or wasting) is determined using the weight-for-height index, as an indicator of current nutritional status. The weight-for-height index of a child from the studied population can be expressed either as a percentage of the median or as a Z-score (Keller, 1982)

The expression of the weight-for-height index as a Z-score (WHZ) compares the observed weight (OW) of the surveyed child to the median weight (MW) of the reference population, for a child of the same height. The Z-score represents the number of standard deviations (SD) separating the observed weight from the median weight of the reference population (WHO, 1966)

WHZ = (OW - MW) / SD.

WHO recommends the use of Z-scores as it is considered more reliable in terms of statistical theory. Definitions of acute malnutrition according to weight-for-height index (W/H), expressed as a Z-score or as a percentage of the median are shown in Table 2.1 below.

Table 2.4 Definition of acute malnutrition according to weight-for-height index (W/H), expressed as a Z-score (WHO, 1966)

Type of Malnutrition	**Z-score criteria**
Moderate Acute Malnutrition (MAM)	W/H <-2 z-score and ≥-3 z-score and absence of bilateral edema
Severe Acute Malnutrition (SAM)	W/H <-3 z-score and/or bilateral edema
Overweight	W/H >+2 Z-score

ii) Height for age

The height-for-age index indicates if a child of a given age is stunted. This index reflects the nutritional history of a child rather than his/her current nutritional status. This is mainly used to identify chronic malnutrition. The same principle is used as for weight-for-height, except that a child's chronic nutritional status is estimated by comparing his/her height-for-age with NCHS reference or WHO standards height-for-age curves, as opposed to weight-for-height curves (Scoane and Lathan, 1971).

For older children and adults, a vertical measuring rod or scale fixed to the wall can be employed with feet parallel and with heels, buttocks, shoulders and back of head touching the upright. For infants and pre-school children, recumbent length has to be employed as the measurement of standing height is either impossible or very inaccurate with an uncooperative child (Gopaldas and Seshadri, 1988).

A given deficit in height may represent a short period of growth failure at any early age or a larger period of growth failure at a later age. Ht/age gives a picture of past history (Gopaldas and Seshadri, 1988)

Table2.5 Definition of chronic malnutrition according to height-for-age index (H/A), expressed as a Z-score (WHO, 1966)

Definition	**Index**
Normal/ Not stunted	>-2 z-score
Moderate stunting	-3 z-score ≤H/A < -2 z-score
Severe stunting	< -3 z-score

iii) **Weight for Age**

Weight-for-age is a composite index, which reflects both wasting and stunting, or any combination of both. In practice about 80% of the variation in W/A is related to stunting and about 20% to wasting. It is not a good indication of recent nutritional stress. It is used because it is an easy measurement to take in practice, and can be used to follow individual children longitudinally in the community (Keller, 1982)

In developing countries the prevalence of Protein Energy Malnutrition appears to be best

indicated by weight deficiency in all age-group and by growth failure in children. Weighing is the key anthropometric measurement. Weighing machines based on two different principles are available: Beam balance scale and spring balance scale. The latter should not be used as it easily become stretched and inaccurate from frequent use (WHO, 1966).

Various methods have been used suggested or used to express the classification of malnutrition. The Gomez system labels young children between 90% and 75% of standard as first degree malnutrition, between 75% and 61% as second degree and 60% below as third degree (Gomez *et al.*, 1955). This classification has been used widely and proved extremely useful.

Table 2.6 Definition of malnutrition according to weight-for-age index (W/A), expressed as a Z-score (WHO, 1966)

Definition	**Index**
Normal	>-2 z-score
Underweight	-3 z-score ≤H/A < -2 z-score
Severe underweight	< -3 z-score

iv).MUAC index

The mid-upper arm circumference does not need to be related to any other anthropometric measurement. It is a reliable indicator of the muscular status of the child and is mainly used to identify children with a risk of mortality. The MUAC is taken for every child, but is an indicator of malnutrition only for children equal or taller than 65 cm (Keller, 1982) Measurements of the mid upper arm circumference appears to be most useful, easy and fast in practice. This region is easily accessible, even with a young child sitting in front of the examiner on his mother's lap. Also, in kwashiorkor the upper arm is not usually clinically edematous, while it has been shown that the mid upper arm is markedly wasted in his condition (Jelliffe *et al.*, 1966).Both MUAC cut-offs recommended by WHO and used at national level are as in the Table 2.5 below (WHO, 1966)

Table2.7 WHO and national MUAC cut-off points for children 6-59 months (WHO, 1966)

National cut-offs	WHO recommended cut-offs	Classification
	> 135 mm	Normal
	125-135 mm	At risk of malnutrition
110-124 mm	115-124 mm	Moderate malnutrition
<110 mm	<115 mm	Severe malnutrition

2.13. Edema

Bilateral pitting edema is a sign of Kwashiorkor, one of the major clinical forms of severe acute malnutrition. When associated with Marasmus (severe wasting), it is called Marasmic-Kwashiorkor. Children with bilateral edema are automatically categorized as being severely malnourished, regardless of their weight-for-height index, and referred immediately to the nearest center (Smith, 2013).Usually first appears over the ankles and feet, it may extend to other areas of the extremities. It may involve the genitals, face and hands. It is commonly seen in kwashiorkor (Jelliffe *et al.*, 1966).

2.14 Other studies conducted regarding infant and child feeding practice and nutritional status of child

In a similar study conducted by Mary Katepa-Bwalya et. al in two districts of Zambia between January and march in 2006, 30% respondents practiced exclusive breastfeeding up to six months whereas 54% respondents knew the recommended duration of Exclusive Breast feeding and 8.9% mother gave pre lacteals feed to children. 50.5% considered colostrum to be good and complementary food were introduced early before six months of age and was not of adequate quality and quantity. Most of the children nutritional status was normal with 4.2% severely stunted, 1.7% severely wasted and 0.5% severely underweight(Katepa-Bwalya *et al.*, 2015).

Also in a study conducted in Kordofan State, Sudan almost half of the mother (52.2%) stopped breastfeeding when the child was 24 months old. The age of termination of breastfeeding was significantly influenced by education of mother. It was observed that only 6.8% of the mothers in the present study practiced exclusive breastfeeding. Majority of mothers (91.6%) introduced complementary food before six months of age while only 8.4% started giving food at six months of age and over. Significant association was found between education

and age of introduction of complementary food(Gutabi and Mohammad, 2014).

In the study conducted in Anganwari (AW) area of urban Allahabad, 36.4% children were found to be underweight, 51.6% stunted and 10.6% wasted. Proportion of underweight and stunting were found among children aged 13.24 months whereas wasting was most prevalent among children aged 37-48 months. Initiation of breast feeding after six hours, deprivation from colostrum and improper complementary feeding were found significant risk factor for underweight. Wasting was not found significantly associated with any infant feeding practice studied. It was concluded that delayed initiation of breast feeding, deprivation from colostrum and improper weaning are significant risk factor for under nutrition among under-fives (Kumar *et al.*, 2006).

In a study conducted by Manjeswori Ulka, et.al in 2011 in Bhaktapur concluded that 91% mothers gave colostrum to their babies and 57% initiated breastfeeding within one hour of delivery. Prevalence of exclusive breastfeeding at 1,3 and six months were 74%, 24% and 9% and partial feeding was initiated in 15%, 38%, 79% respectively. The main reason according to mother for introducing other foods before six months of age was insufficient breast milk (Ulka *et al.*, 2012).

In a nutritional survey by Gaurav K et.al. in hill community of Nepal, 17% of under five children were moderately and 10.4% were severely underweight. 22.9% and 17.5% were found to be moderately and severely stunted respectively. Less than 10% were found to be moderately and severely wasted. Older age group of children, education level of mother, not exclusively breast feeding had significant effect on stunting. More than 50% children were affected with stunting, wasting and underweight at same time (Gaurak *et al.*, 2014).

Similarly, a nutritional study by Tulsi Ram Bhandari and Muniraj Chhetri in Kapilvastu district, Nepal reported that for HFA scale, 11.8% were below -1SD, 30.8% below -2SD and 25% below -3SD. For WFA scale, 23.5% were below -1SD, 31.5% below -2SD and 11.5% below -3SD and that for WFH scale, 25% children were below -1SD, 16% below -2SD and 6% below -3SD. Better socio-economic status, mothers age 20-35 years, birth order up to second, gap more than two years between two pregnancies, recommended EBF practice, early recommended supplementary food, complete immunization and timely care seeking had positive

effect on children health, which were also statistically significant. In Kapilvastu, more than 60% children had any kind of malnutrition. Out of them, one-fourth children were in critical condition and they need immediate intervention (Bhandari and Chhetri, 2013).

PART III

3. Methodology

3.1 Research Design

A community based cross-sectional and descriptive study was conducted in the survey area, Phidim Municipality. An area nutrition survey of under five children of *Phidim* Municipality consists 4 parts

- Household survey with the help of questionnaire
- Anthropometric measurements of 6-59 month age children: Height, weight and MUAC
- Edema check for protein energy malnutrition(PEM)

3.2 Research Instruments

Equipment used for performing the survey:

1. Child weighing machine (1 piece)- To measure the weight of the children
2. Height measuring machine (Stadiometer, 1 piece)- To measure the height of children
3. Mid Upper Arm Circumference(MUAC tape: 1 piece)- To measure the MUAC
4. Questionnaire- A well designed and pretested set of questionnaire to collect household data and information.

3.3 Study Area

The study was conducted at *Phidim* Municipality of *Panchthar* District, *Mechi* zone, Nepal. *Phidim* municipality is located in the eastern hilly region of Nepal. This municipality is divided into 11 wards with 24768 total populations and 2095 under five year children (Source: *Phidim* Municipality office)

3.4 Target Population

Care takers of child of 6-59 months and the child themselves were regarded as target populations of the study.

Inclusion Criteria: Children aged 6-59 months and their caretakers who live in Phidim municipality were included in study.

Exclusion Criteria: The study participants who were seriously ill or who were not available at household during the time of survey were not selected in the study.

3.5 Sample Size

The sample size was calculated by taking the prevalence of stunting as 41% (NDHS, 2011) in Nepal (as there is no current data for prevalence of malnutrition in *Phidim* Municipality), with confidence level 95% and 7% margin of error by using the formula

Calculation of sample size for infinite population:-

Sample size (n_0) = $Z^2 \times p\ (1-p)/d^2$

Where z= confidence level at 95% (standard value of 1.96)

P= estimated prevalence of malnutrition (41%)

d= margin of error (7%)

Now

$N_0=1.96^2\times0.41\times (1-0.41)/ (0.07)^2$

$= 189.65$

≈ 190

Calculation of sample size for finite population:-

From Phidim municipality we found that the total no. of children of 6-59 months are 2095.Thus we apply finite population sample formula to obtain new sample size to conduct survey in this particular village.

Therefore,

New SS = $n_0 / [1+ \{(n_0-1) / POP\}]$

Where,

New SS = New sample size for finite population

n_o = Sample size in infinite population

POP= Total number of population (in this case total number of population is number of 6-59 months age children in this village)

New sample size obtain as

$= n_0 / [1+ \{(n_0-1) / POP\}]$

$= 190 / [1+ \{(190-1) / 2095\}]$

$= 174.27$

i.e., 174

Thus calculated sample size is adjusted for non-response. Considering non-response rate as 10%, the adjusted sample size is calculated to be 180.

3.6 Sampling technique

Convenient sampling method was used to select the wards of *Phidim* Municipality and simple random sampling method was used to select the children from household. Out of 11 wards in the municipality, 7 wards were selected. The basic criterion for the selection of household sample was that the household with at least one child 6-59 months of age was included in the sample. In household with more than one children of age between 6-59 months, only one child was chosen by lottery method.

3.7 Pre- Testing

The study was pre-tested among the under five year children from a selected area under sampling procedure. The pre- testing was conducted to establish accuracy of questionnaire and to check for consistency in the interpretation of questions and to identify ambiguous items. After review of instruments all suggested change were made before being administered in the actual study.

3.8 Validity and Reliability

To ascertain the degree to which the data collection instruments would measure what they purposed to measure, the instruments were validated by group of students of Bsc. Nutrtion and Dietetics from Central Campus of Technology. The aspects tested in the questionnaire were also drawn from the available literature in nutrition about the preschool children. The questionnaire was also pre-tested prior to data collection to ascertain content and face validity. Before data collection, detailed study was based on the objectives of the study and on data collection techniques. Questionnaire was checked daily for completeness, consistency and clarity.

3.9 Data Collection Technique

Data on household and food consumption was obtained from respondents and collected on structured form of questionnaire after obtaining informed consent. Similarly, data on anthropometric measurement of child was obtained by following method.

Height: Height was measured using stadiometer where the subject stood (without shoes) on a horizontal platform with his heels together and head positioned looking forward with hip and head touching the wall. Height was recorded to the nearest 0.1cm (Adhikari and Krantz, 2013).The length of each child aged 6 - 24 months was measured lying flat and centrally on measuring boards placed on a hard flat surface on the ground. The length was read to the nearest 0.1 cm (head and feet against the base of the board and foot piece respectively) (Tamiru *et al.*, 2015).

Weight: Weight was measured using digital weight scale where subject stood on the center of the weight scale platform with minimal clothing. Readings were taken at nearest 100gm (Adhikari and Krantz, 2013).In case of children age below two years and those who were unable to stand alone, their weight was obtained from the difference between weights of mother as she/he held the child and the weight of the mother alone (Tamiru *et al.*, 2015)

Mid Upper Arm Circumference (MUAC): MUAC was measured using MUAC tape by placing a tape around the child's left arm between the elbow and the shoulder. Tape consists of three colors where in the green strip denotes a child of adequate nutrition status, yellow strip denotes a child at risk of developing malnutrition and a child in red strip indicates with severe malnutrition (Adhikari and Krantz, 2013)

3.10 Data Analysis

Quantitative data was cleared, coded and entered in statistical software. Similarly, qualitative data were transcribed and coded by assigning labels to various categories. The verified test parameters were used to establish the relationship between the variables and nutritional status of children. SPSS 20 and WHO Anthro 3.2.2 software version was used to assess individual nutritional status and chi- square test was used to find associated factors for malnutrition.

3.11 Logical and Ethical Consideration

Permission to conduct research was obtained from Central Campus of Technology, Department of Nutrition and Dietetics and from the *Phidim* Municipality office. Verbal consent from parents/care taker was obtained prior to study. Respondents were assured that the data collected were for the purpose of the study and would be treated with the uttermost confidentiality.

Part IV

4. Results and Discussion

A study was conducted to find the nutritional status and feeding practices of children in *Phidim* municipality. The result of survey are presented below

4.1 General Characteristics of Study Population

Family Details

The total study population was 180, out of which, 57.2% (n=103) have had small family size whereas 33.2% (n=60) have had medium family size and 9.4% (n=17) have had large family size. Family size was classified as members below or equal to 4 to be small family, 5-7 members to be medium sized family and that over 7 to be large sized family. Also, 76.1% (n=137) were living in nuclear family and 23.9% (n=43) were living in joint family.

Education of parents

The study shows that 0.6% (n=1) of the children fathers were illiterate, 17.2% (n=31) received primary education, 68.9% (n=124) received secondary education, 11.1% (n=20) receive bachelor and above level education while 2.2% (n=4) received non formal education. Similarly, 5% (n=9) of the children mothers were illiterate, 18.9% (n=34) received primary level education, 70.6% (n=127) received secondary level education, 5% (n=9) received bachelor level education and 0.6% (n=1) received non formal education as shown in Table 4.1.

Occupation

As majority, 32.8% (n=59) population were involved in business followed by 30% (n=54) were in abroad, 20.6% (n=37) in agriculture and 16.7% (n=30) in service as shown in Table 4.1.

Income

As regard to estimated annual income as shown in table 4.1, yearly income less than 1 lakh was considered to be low income, 1-3 lakhs to be medium income and over 3 lakhs to be high

income and out of the total sample population, 23.3% (n=42) families have had low income, 41.1% (n=74) have had medium income and 35.6% (n=64) have had high income. Most of the family (86.7%) reported to have their income sufficient for food (n=156) and 13.3% (n=24) reported it was not sufficient.

Type of house

Out of total population, 74.4% (n=134) have had their own house and 25.6% (n=46) have had rented house.

Table 4.1 General Characteristics of Study Population (n=180)

Variables		Frequency (N=180)	Percent
Family size	Small	103	57.2
	Medium	60	33.3
	Large	17	9.4
Family Type	Nuclear family	137	76.1
	Joint family	43	23.9
Education of Father	Illiterate	1	0.6
	Primary	31	17.2
	Secondary	124	68.9
	Bachelor and above	20	11.1
	Non- Formal	4	2.2
Occupation of family	Service	30	16.7
	Agriculture	37	20.6
	Business	59	32.8
	Abroad	54	30
Family Income	Low	42	23.3
	Medium	74	41.1
	High	64	35.6
Income sufficient for food	Yes	156	86.7
	No	24	13.3
Type of home	Own	134	74.4
	Rented	46	25.6

4.2 Maternal characteristics

Age of caretaker

Mother of the child were interviewed as the caretakers and it was found that majority of the caretakers (n=122) were of age group 20-29 years followed by 29.4% (n=53) of 30-39 years,

1.7% (n=3) belonging to over 40 age group and 1.1% (n=2) below or equal to 19 years age group as shown in table 4.2. Mean age of the mothers who participated in the survey were found to be 27.31 years (±4.59) with minimum age to be 18 years and maximum age to be 40 years.

Age of mother during pregnancy

The mean age of mothers during pregnancy was found to be 23.46 (±4.76) with minimum age to be 15 years and maximum age to be 37 years. Study shows that maximum women became pregnant at 20-29 years with 69.4% (n=125) followed by age group less than 19 years with 19.4% (n=35) and least with 30-39 years age group with 11.1% (n=20).

Supplementation and vaccination of mother during pregnancy

Most of the mothers i.e. 97.2% (n=175) among the surveyed population had been either given supplementation or vaccinated or both during their pregnancy period where as 2.8% (n=5) were not. 2.8% (n=5) mothers had been supplemented with iron tablets only where as 51.7% (n=93) mothers were supplemented with iron tablets, calcium and vitamins and immunized with TT vaccine and 42.8% (n=77) were immunized with iron tablets and TT vaccine only.

Education of mother

Most of the family mothers were found to have some secondary level education, 70.6% (n=127) followed by primary education, 18.9% (n=34). Mothers with bachelor and higher level education were found to be 5% (n=9) which was similar to that of illiterate population, 5% (n=9) whereas 0.6% (n=1) mother was found to have non-formal education.

Table 4.2: Maternal Characteristics (n=180)

Variable		Frequency (N=180)	Percent
Age of caretaker (years)	<19	2	1.1
	20-29	122	67.8
	30-39	53	29.4
	>40	3	1.7
Age of mother during pregnancy (years)	<19	35	19.4
	20-29	125	69.4
	30-39	20	11.1
Immunization of mother during pregnancy	Yes	175	97.2
	No	5	2.8
	Iron Tablet only	5	2.8
	Iron, calcium, vitamin and TT vaccine	93	51.7
	Iron tablet and TT vaccine	77	42.8
	None	5	2.8
Vaccination to child	Yes	179	99.4
	No	1	0.6
Education of mother	Illiterate	9	5
	Primary	34	18.9
	Secondary	127	70.6
	Bachelor and above	9	5
	Non formal	1	0.6

4.3 Child characteristics

Majority of the children were females (n=52.2%) whereas 47.8% (n=86) children were male and had mean age of 36.51 months (±13.16). Majority of the children were of 24-35 months (32.22%; n=58) followed by 36-47 months (27.78%; n=50), 48-59 months (22.78%; n=41), 12-23 months (12.78%; n=23) and 6-11 months (4.44%; n=8). Also regarding the birth order of the child, 37.2% (n=67) children were first child, 33.3% (n=60) were second child, 23.3% (n=42) were third child and 6.1% (n=11) were fourth or above child of the family. Almost all 99.4% (n=179) children were vaccinated whereas 0.6% (n=1) child was not vaccinated. Children were given all the vaccines according to their age. Nationally, 80.7% children

received all the vaccines that should be given till 2 years of age whereas 2.9% didn't receive any. Similarly, 90.4% children received vaccines in Eastern terai (MoHP, 2011). Compared to both the data, vaccination among the children in the study area is seen to be better i.e 99.4% children received vaccines whereas 0.6% did not.

Table 4.3 Child characteristics

Variables	Frequency (N=180)	Percent
Sex of child		
Male	86	47.8
Female	94	52.2
Age group (months)		
(6-11)	8	4.44
(12-23)	23	12.78
(24-35)	58	32.22
(36-47)	50	27.78
(48-59)	41	22.78
Birth order		
1st child	67	37.2
2nd child	60	33.3
3rd child	42	23.3
4th or more	11	6.1
Vaccination to child		
Yes	179	99.4
No	1	0.6

4.4 Hygiene and sanitation

Most of the families (93.9%) of the study population performed water treatment at home and 6.1% (n=11) didn't do so. Out of various types of water treatment, 71.67% (n=129) used water after boiling, 5% (n=9) after filtering and 17.22% (n=31) after both filter and boil.

100% caretakers reported to wash their hands before feeding the child but only 32.2% (n=58) of them washed their hands before preparing food and 67.8% (122) of them did not. Similarly, 100% children were made to wash their hands before having food and after toilet and 100% have had toilet at their home.

Table 4.4 Hygiene and sanitation practices

Variable		Frequency (N=180)	Percent
Water treatment	Yes	169	93.9
	No	11	6.1
Type of water treatment	Filter	9	5
	Boil	129	71.67
	Filter and boil	31	17.22
Toilet avaibality at home	None	11	6.1
	Yes	180	100
Hand wash by caretaker before preparing food	Yes	58	32.2
	No	122	67.8
Hand wash by caretaker before feeding food to child	Yes	180	100
Hand wash by child before eating food	Yes	180	100

4.5 Infant and child feeding practices

4.5.1 Breastfeeding practice

Data of breastfeeding practices showed that all the children (180) were breastfed which is slightly higher than that of national data (98.2%) and in eastern hill (98.7%) (MoHP, 2011). Similarly, as shown in table 4.5, 46.7% (n=84) infants were fed with different types of pre-lacteals as honey, ghee, molasses etc. where as 53.3% (n=96) were not given any of them. Similarly, majority of the infants were fed with colostrum (99.4%; n=179) and 0.6% (n=1) infant was not fed colostrum. Pre-lacteal feeding practice in the study area was found to be

higher than that in the national data and in eastern hill i.e. 28.1% and 17.5% respectively (MoHP, 2011). Also, the colostrum feeding practice in Phidim municipality was found to be better than that of Bhaktapur, Nepal where 91% infants were given colostrum (Ulka *et al.*, 2012) and Anganwari state of Urban Allhabad where 45.2% were given colostrum whereas rest 54.8% were deprived of it (Kumar *et al.*, 2006). Similarly a study conducted in *Nigeria* reported that only 61.7% infants were given colostrum (Lawan *et al.*, 2014) which is much lower than that of the study in Phidim municipality. In a study conducted in Nepal, none of the child were given pre-lacteals and 35.4% were fed colostrum (Pandey *et al.*, June 2010).

Out of the total study population, 40% (n=72) infants were exclusively breastfed as recommended by WHO i.e. 6 months. 34.4% (n=62) infants were exclusively breastfed for 1 month or less, 19.4% (n=35) for 2-3 months and 6.1% (n=11) for 4-5 months. Extended breastfeeding was done for different duration and 3.3% (n=6) were breastfed for 1 year, 29.4% (n=53) for 2 years and 67.2 % (n=121) for 3 or more years. 38.9% (n=70) of the caretakers of the study population had correct knowledge about the minimum breastfeeding duration (2 years) where as 3.3% (n=6) caretakers reported 1 year to be duration for minimum breastfeeding and 57.8% (n=104) as 4 years. 96.7% (n=174) caretakers believed that child fed with breast milk was the best feed to children and child fed with breast milk were healthier than those fed with other milk and formulas whereas, 3.3% (n=6) caretakers believed child fed with other formula milk were healthier and so was best for child. 53.1% infants below six months were reported to be exclusively breastfed in a study conducted in Nepal (Pandey *et al.*, June 2010) whereas 23.5% were reported to be exclusively breastfed in a study conducted in Anganwari area of Urban Allhabad (Kumar *et al.*, 2006)

As per breastfeeding of child in current situation, 48.9% (n=88) child were breastfed once in an hour, 9.4% (n=17) were fed once in two hour, 12.2% (n=22) were fed once in three hour, 27.2% (n=49) once in four hour and 2.2% (n=4) children were not breastfed at current situation.

Majority of infants (40%) were given water only after six months whereas 8.3% (n=15) were given water within an hour, 13.9% (n=25) within a day, 19.4% (n=35) within a month and 18.3% (n=33) between 2-5 months as shown in Table 4.5.

Table 4.5: Breastfeeding practices

Variables		Frequency (N=180)	Percent
Breastfeeding to child	Done	180	100
Pre-lacteals feed	Yes	84	46.7
	No	96	53.3
Colostrum Feed	Yes	179	99.4
	No	1	0.6
Exclusive breastfeeding	Till 1 month	62	34.4
	2-3 months	35	19.4
	4-5 months	11	6.1
	6 months or above	72	40
Duration of breastfeeding	1 year	6	3.3
	2 years	53	29.4
	3 or more years	121	67.2
Knowledge of minimum	1 year	6	3.3
breastfeeding among caretakers	2 year	70	38.9
	4 year	104	57.8
Child fed with breast milk is	Right	174	96.7
healthier than fed with other milk	Wrong	6	3.3
Breastfeeding of child in a day	Once in a hour	88	48.9
	Once in two hour	17	9.4
	Once in three hour	22	12.2
	Once in four hour	49	27.2
	Don’t	4	2.2
Initiation of water feed	Within an hour	15	8.3
	Within a day	25	13.9
	within a month	35	19.4
	2-5 months	33	18.3
	after 6 months	72	40

4.5.2 Complementary feed

Majority of infants (80.6%; n=145) were given complementary food during sixth month followed by 15.6% (n=28) infants before six months and 3.9% (n=7) after six months. Different types of complementary feed as Cereals, pulses, meat, fish, egg, fruits, and vegetables were given to infant at different time period. 12.2% (n=22) infants were given cereals before six months, 82.8% (n=149) at sixth month of birth and 5% (n=9) after six months. Similarly, 13.9% (n=25) infants were given pulses before six months, 81.7% (n=147) during sixth months and 4.4% (n=8) after sixth months. Out of 180 children, 1.1% (n=2) were given meat group before six months, 55.6% (n=100) at six month, 36.7% (n=66) after six months and 6.7% (n=12) children do not consume this food group. Majority of children (n=145) started consuming fruits and vegetables during sixth month of life, followed by before six months (9.4%; n=17), after six months (7.8%; n=14) and then 2.2% (n=4) who don not consume fruit and vegetable. On face to face interview, most of the caretakers responded saying that first solid feed was given to the child at the age of 6 months after the ritual called "*Pasni*- rice feeding ceremony" of the child.

The study revealed that 100% of the caretakers believed that complementary food was important for infant above 6 months while 90.6% (n=163) caretakers believed complementary food was not important for infant before six month and 9.4% (n=17) believed it was important. In a study conductd in Kanti Children hospital, it was found that 87% mother knew when to start complementary food and had the knowledge that complementary food was important for chld above six months (Chapagain, 2013)

Table 4.6 Complementary food

Variable		Frequency (N=180)	Percent
Initiation of complementary Feed	before 6 months	28	15.6
	6 month	145	80.6
	After 6 months	7	3.9
Initiation of Cereals feed	before 6 months	22	12.2
	6 months	149	82.8
	after 6 months	9	5
Initiation of pulses feed	Before 6 months	25	13.9
	6 months	147	81.7
	after 6 months	8	4.4
Initiation of meat/fish feed	before 6 months	2	1.1
	6 months	100	55.6
	after 6 months	66	36.7
	Do not consume	12	6.7
Initiation of vegetables feed	Before 6 months	17	9.4
	6 months	145	80.6
	after 6 months	14	7.8
	Do not consume	4	2.2
Is complementary food required for infant before six months	Yes	17	9.4
	No	163	90.6
Is complementary food required for infant after six months	Yes	180	100

Sarbottam pitho, Jaulo, Rice and *dal*, Rice and milk, Boiled fruits, Milk and biscuits, *Lito*, commercially available formula food etc. were some of the most commonly reported complementary food given in the study area.

4.5.3 Frequency of feeding a child

Most of the children (63.9%; n=115) were fed four times in a day followed by 31.1% (n=56) children fed six times a day, 3.9% (n=7) fed three times a day and 1.1% (n=2) fed two times a day while, 98.3% (n=177) children were given breakfast regularly an 1.7% (n=3) were not.

Table 4.7 Feeding pattern of child

		Frequency (N=180)	Percent
Feeding of child in a day	2 times	2	1.1
	3 times	7	3.9
	4 times	115	63.9
	6 times or more	56	31.1
Breakfast regularity	Yes	177	98.3
	No	3	1.7

4.5.4 Food consumption pattern of feeding of child

Consumption of cereal and pulses among the study population was found good where 98.9% (n=178) child were fed cereal and pulses on daily basis and 1.1% (n=2) children were reported to be fed cereal and pulses on each alternative day or thrice or more times in a day.

Similarly, 7.2% (n=13) children were reported to not consume vegetables, 87.8% (n=158) to consume on daily basis and 5% (n=9) occasionally i.e. three times or more in a week according to their preference. In comparison to consumption of vegetables, more children (25%; n=45) were reported to not consume green leafy vegetables and 63.3% (n=114) to consume daily, 1.1% (n=2) to eat them once a week, 2.8% (n=5) twice a week and 7.8% (n=14) thrice a week. Variation in consumption may be due to their preference, available at home etc.

Among the study population, 8.9% (n=16) children did not consume milk or milk products, 87.2% (n=157) consumed them daily, 2.2% (n=4) consumed them twice a week and 1.7% (n=3) thrice a week as shown in Table 4.8.

Variation was seen in consumption of egg, meat and fish in the children of study area. Majority of children (42.2%; n=76) were reported to eat meat once a week, followed by twice a week (36.7%; n=66), thrice or more times in a week (12.8%; n=23) and 0.6% (n=1) to consume once a month. 6.7% (n=12) children did not consume meat at all. Similarly, 11.7% (n=21)children did not eat egg at all, 24.4% (n=44) consumed it daily, 25% (n=45) consumed once a week, 27.8% (n=50) twice a week, and 10.6% (n=19) three times or more in a week and 0.6% (n=1) once a month. Consumption of fish was seen low in comparison to meat and egg. 21.7% (n=39) child never consumed fish, 12.8% (n=23) consumed once a week, 2.8% (n=5) two times in a week, 1.7% (n=3) three times in a week and 61.1% (n=110) once a month as shown in Table 4.10.

Consumption of processed foods as were seen high in the study area where 87.8% (n=158) child were having junk food on daily basis. 1.1% (n=2) children did not consume junk food at all, 3.3% (n=6) consumed it once a week, 2.2% (n=4) twice a week, 4.4% (n=8) three or more times in a week and 1.1% (n=2) once a month as shown in Table 4.11.

The dominant food group that the children were fed on the daily basis was cereals and pulses while meat and egg were fed in comparatively low frequency which is similar to the study conducted in Kemba Woreda (Gatahun EA and DM, 2015). Similarly, in a study conducted in Pacific Island, consumption of cereal is high followed by that of vegetables and junk food. (Savila Fa'asisila *et al.*, 2015). This is similar to the result obtained in our study but the frequency of consumption of milk and meat in the study (Savila Fa'asisila *et al.*, 2015) is in contrast to our result. Consumption of junk food among the target population on daily basis is very high (87.8%) which is similar to the study in Brazil which showed the high consumption of different processed food among under two year aged children (Cavassim *et al.*, 2016).

Table 4.8 Consumption pattern of food

	Frequency (n=180)					
Food group	**Daily**	**Once a week**	**Twice a week**	**Thrice or more times a week**	**Once a month**	**Never**
Cereals	178	.	.	2	.	.
Pulses	178	.	.	2	.	.
Vegetable	158	.	.	9	.	13
Green leafy vegetable	114	2	5	14	.	45
Milk	157	.	4	3	.	16
Meat	2	76	66	23	1	12
Egg	44	45	50	19	1	21
Fish	.	23	5	3	110	39
Processed food	158	6	4	8	2	2

4.6 Diversity of food

Food was classified into seven groups (grains, roots and tubers; legumes and nuts, vit. A rich fruits and vegetables, other fruits and vegetables, dairy product, egg and flesh foods) (Crum *et al.*, 2013) and scoring was done where children having score less than 4 were 6.7% (n=12) and those having more or equal to 4 were 93.3% (n=168) as shown in table 4.9. This concluded the diversity of food in the study area was satisfactory.

Only 28.6% children receive diversified diet in Nepal with highest to be in Hill region (35.5%) followed by that in mountain (28.1%) and in Terai (23.5%). Also less than 20% children received diversified diet in central region (19.8%) and in Mid western Region (19.9%) whereas 36.7% children received diversified diet in Eastern region of Nepal, 37% in western and 28.6% in Far western region (Crum *et al.*, 2013). Comparing with these datas, we can come to the point that children in this area obtain or consume diversified diet.

Table 4.9 Frequency of diversity of food

Variable		Frequency (N=180)	Percent
Diversity of food	Less than 4	12	6.7
	More than or equal to 4	168	93.3

4.7 Nutrition Status

4.7.1 Overall prevalence of malnutrition

In Phidim municipality, prevalence of wasting was 16.7% which is higher than the national data where 10.9% children in Nepal were wasted, eastern hill where 10.2% under five children are wasted(MoHP, 2011). Similarly severe wasting in Nepal according to NDHS, 2011 is 2.6% and in Eastern Hill is 1.8% whereas in the study it was found to be 5.6% which is higher when compared to both. This may be due to inappropriate infant and child feeding practice, inappropriate timing of initiation of complementary feed etc. Prevalence of wasting according to MUAC in the study area was found to be 13.9%.

Prevalence of stunting in the study area was found to be 41.7% which was slightly higher when compared to national data i.e. 40.5% (MoHP, 2011) but low when compared to that of Eastern Hill i.e. 45.5%. Severe wasting in the study area was found to be low i.e. 13.9% in comparison to both National data (16.2%) and eastern hill (17.2%)(MoHP, 2011).

Prevalence of underweight was found to be slightly higher in the study area i.e., 29.4% when compared to national data (28.8%) and that of eastern hill (28.6%). Similar was the prevalence of severe underweight i.e. 11.7% in the study area whereas 7.7% as total in Nepal and 5.8% in eastern hill(MoHP, 2011).

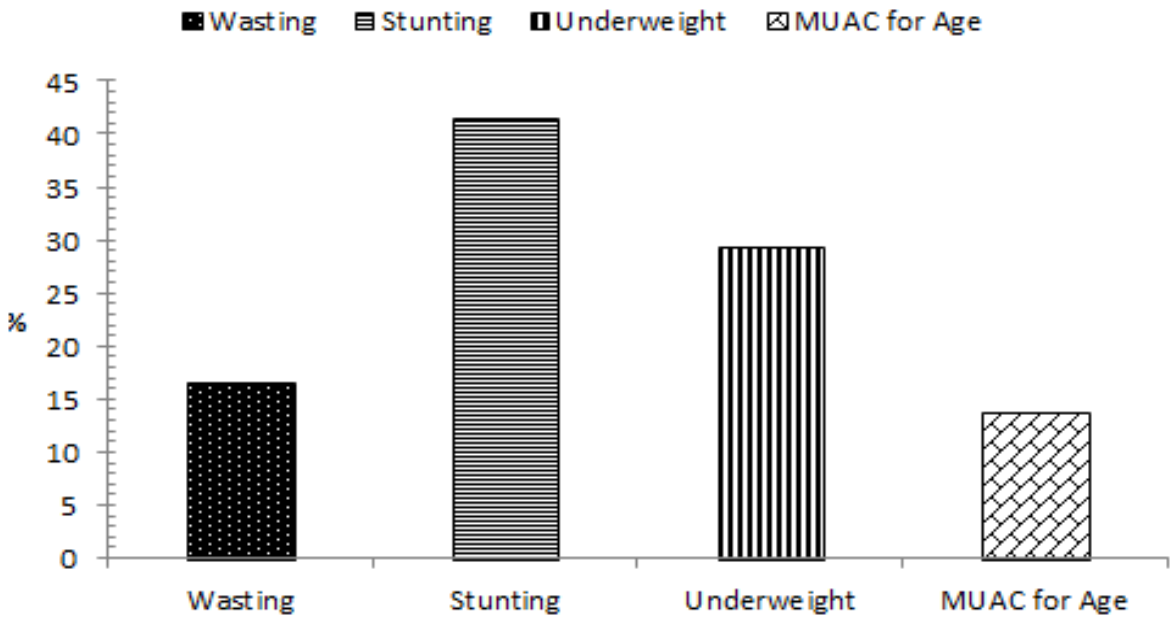

Fig 4.1: Prevalence of malnutrition in Phidim Municipality

4.7.2 Nutrition status according to severity and gender

Out of total wasted population, 5.6% (n=10) were severely wasted among which 5.2% (n=4) were male and 5.8% (n=6) were female and 11.1% (n=20) were moderately wasted among which 16.9% (n=13) were male and 6.8% (n=7) were female. Similarly, 13.9% (n=25) of the population was severely stunted and 27.8% (n=52) were moderately malnourished. 11.7% (n=10) of male population and 15.5% (n=15) of female population were severely stunted and 33.8% (n=26) male and 23.3% (n=26) female were moderately stunted. 11.7 % (n=21) of the total population was severely underweight among which 9.3% (n=8) of both male and 13.94% (n=13) female was severely underweight. Similarly, 17.7% (n=32) of total population was moderately malnourished among which 13.9% (n=12) was male and 21.27% (n=20) was female as shown in Table 4.11.

Prevalence of wasting of both male and female of the study population when compared with that of NDHS,2011 was found to be greater i.e. male and female prevalence according to NDHS, 2011 be 12% and 9.7% respectively whereas that of the study population be 22.1% and 12.6%. Similarly, severe wasting rate was also found to be higher in the study population

i.e, 3.4% and 1.8% in male and female respectively according to NDHS, 2011 and 5.2% and 5.8% in male and female respectively according to the study(MoHP, 2011).

Prevalence of stunting in male in the study i.e. 45.5% was found to be higher in male population when compared to NDHS, 2011 i.e. 41.4% and that in female was found to be low i.e. 39.5% according to NDHS, 2011 and 38.8% according to the study. Prevalence of severe stunting was found to be low in case of both male and female children when compared to NDHS, 2011 i.e. 11.7% and 15.5% severe stunting rate of male and female according to study and 16.7% and 15.7% of male and female according to NDHS respectively(MoHP, 2011).

Prevalence of underweight in male population in the study area i.e. 23.2% was found to be low when compared with NDHS, 2011 i.e. 29.6%. However prevalence in female was found to be high i.e. 35.21% according to the study and 28% according to NDHS, 2011. Prevalence of severe underweight was high in both male and female when compared to NDHS, 2011 i.e. 9.3% in male and 13.94% in female according to study and 8.2% in male and 7.2% in female population according to NDHS, 2011(MoHP, 2011).

Wasting prevalence in the study area (16.7%) was found to be slightly higher than that of national prevalence (10.9%) where as stunting and underweight prevalence was found to be quite similar (41.7% and 29.4%). It shows that the stunting being chronic form of malnutrition, did not show much changes but the wasting rate is increased in the area which gives idea that the child care in the area is decreased.

Table 4.10: Distribution of Malnutrition according to severity and gender (n=180)

	Severely malnourished(%)	Moderately Malnourished(%)	Normal(%)
Weight for height (Wasting)			
MALE	5.2	16.9	77.9
FEMALE	5.8	6.8	87.4
Total	5.6	11.1	83.3
Height for age (Stunting)			
MALE	11.7	33.8	54.5
FEMALE	15.5	23.3	61.2
Total	13.9	27.8	58.3
Weight for age (Underweight)			
MALE	9.3	13.9	76.8
FEMALE	13.94	21.27	21.27
Total	11.7	57.6	70.6

4.7.3 Nutrition status according to age group

Malnutrition among children in different age group is illustrated in table 4.12 which indicates that population with highest wasting rate falls in age group 12-23 months which is similar to that of NDHS, 2011 and lowest age group among 6-11 months. Similarly, 48-59 months children are most stunted and 24-35 months children are found to be least stunted. Underweight among under five children is seen highest among 48-59 months children and lowest among 24-35 months.

When compared with NDHS report , result was found to be quite different where wasting is higher in age group 6-11 months followed by 12-23 months which is the first age group in our study (MoHP, 2011). This might be because of the reason that child of age 6-11 months were started their complementary feed and proper care was given to child but this was reduced in the later period. Similary, stunting and underweight in Nepal was found to be highest among the age group 12-23 months where as in our study, it was found hightst in the age group 48-59 months (MoHP, 2011). As it is the represents the chronic malnutrition, the resut depicts that the care during childhood period was not so good.

Table 4.11 Distribution of Malnutrition according to age group

Age group(months)	WHZ%	HAZ%	WAZ%
(6-11)	0	37.5	25
(12-23)	26.1	39.1	30.4
(24-35)	19	24.1	15.5
(36-47)	12	42	34
(48-59)	17.1	68.3	43.9

4.7.4 Nutrition status according to MUAC measurement

The survey shows that 2.8% (5) population were found to be severely wasted according to their MUAC measurement, 11.1% (20) were child were found to be moderately wasted and 86.1% (i.e. 155) were found to be normal.

In a study, done in Kavre and Dolakha, it was found that 11.1% childen was suffering from GAM accoding to their MUAC and 2.5% of them were severly wasted and 8.6% were moderately wasted (Chataut and Khanal, 2106). Prevalance in these study area and Phidm Municipality is found to be similar however in Phidim Municipality, wasting due to MUAC is found to be slightly lower than the wasting due to WFH.

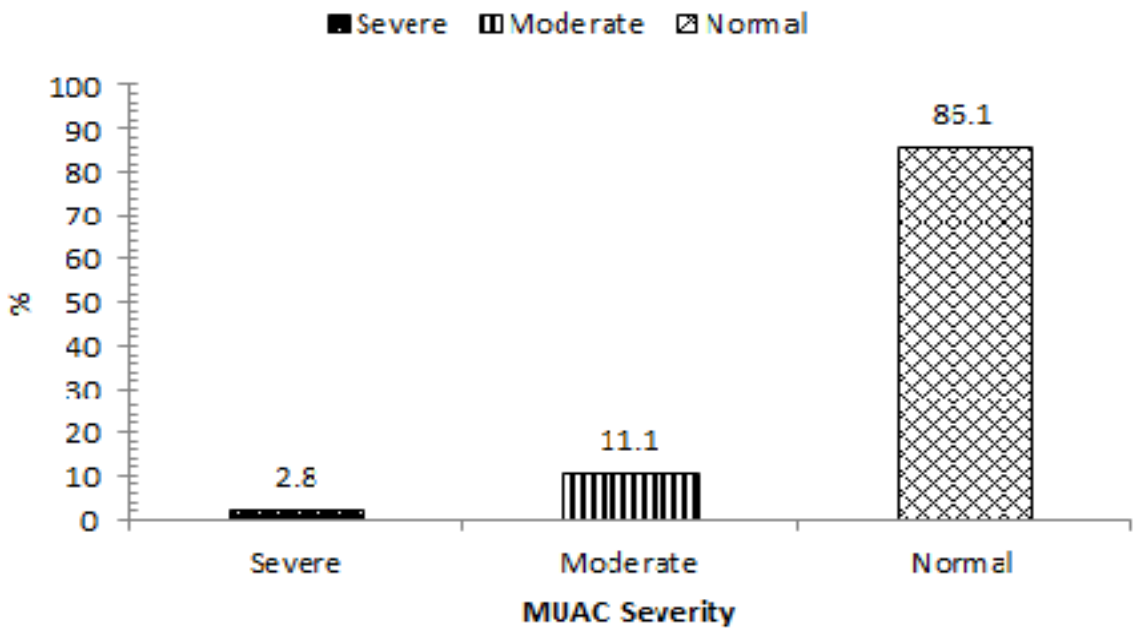

Fig 4.6: Distribution of MUAC wasting according to Severity

4.7.5 Nutrition status comparison with WHO standard

Distribution of wasting, stunting, underweight and wasting based on MUAC among under-five children of Phidim Municipality comparing with general population based on WHO standard are shown in Figure 4.3, 4.4, 4.5 and 4.6 respectively.

The median weight for height z-score of survey children was found to be -0.81 which is less than 0.81 with the reference to WHO standard. This cause curve to slightly skew to the left side of WHO standard` curve showing the prevalence of wasting among study population.

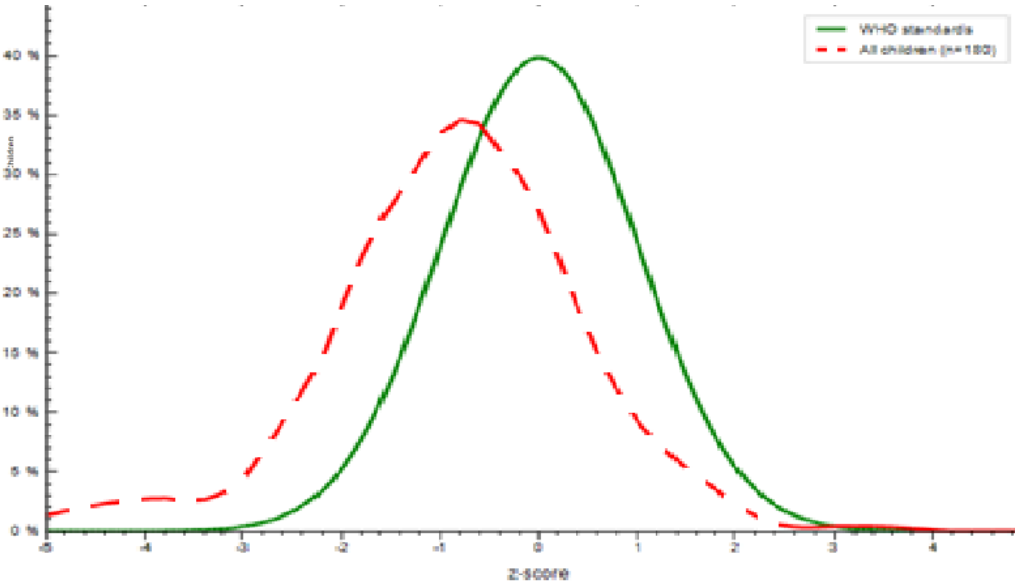

Fig.4.3 Distribution of weight-for-height Z-score curve comparing with WHO standards 2006

The median height-for-age z-score of survey children was found to be -1.63 which is less than 1.63 with the reference to WHO standard. This cause curve to slightly skew to the left side of WHO standard curve showing the prevalence of stunting among study population.

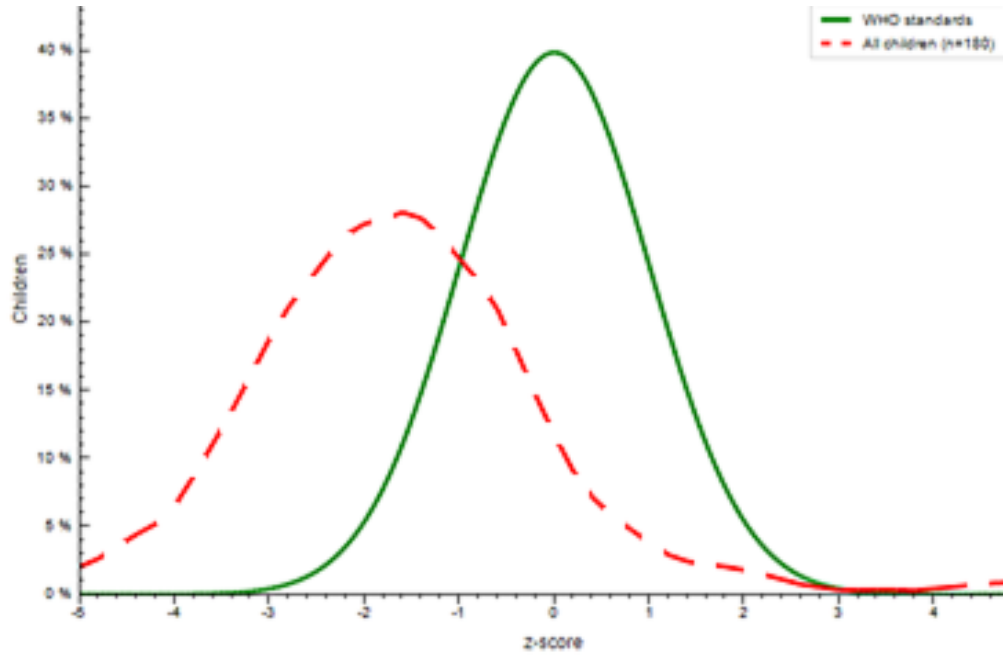

Fig 4.4 Distribution of height-for-age Z-score curve comparing with WHO standards 2006

The median weight for age z-score of survey children was found to be -1.45 which is less than 1.45 with the reference to WHO standard. This cause curve to slightly skew to the left side of WHO standard curve showing the prevalence of underweight among study population.

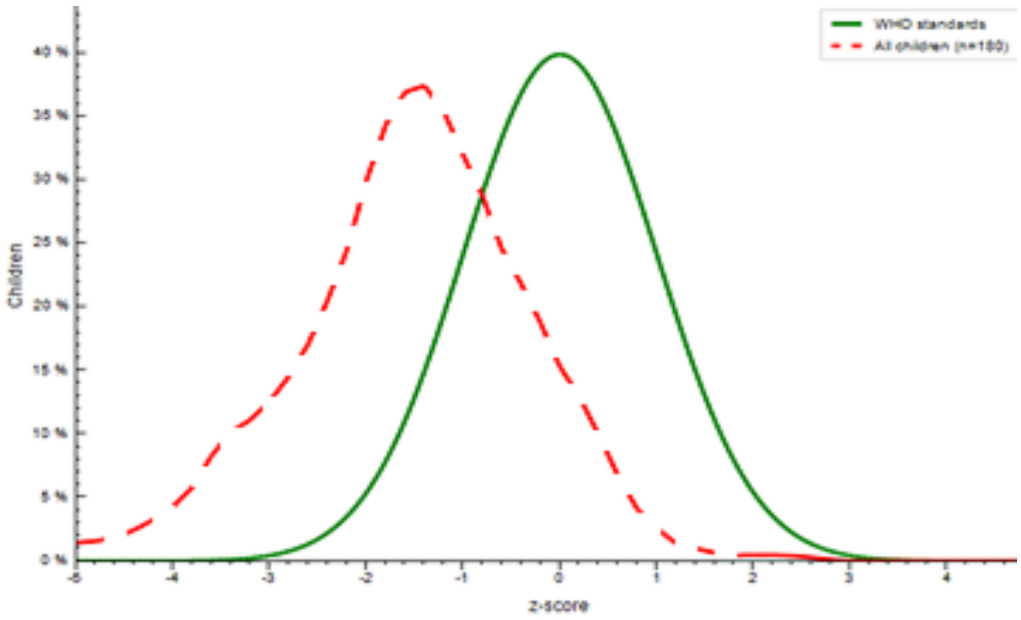

Fig 4.5 Distribution of weight-for-age Z-score curve comparing with WHO standards 2006

The median MUAC for age z-score of survey children was found to be -1.46 which is less than 1.46 with the reference to WHO standard. This cause curve to slightly skew to the left side of WHO standard curve showing the prevalence of undernourished among study population.

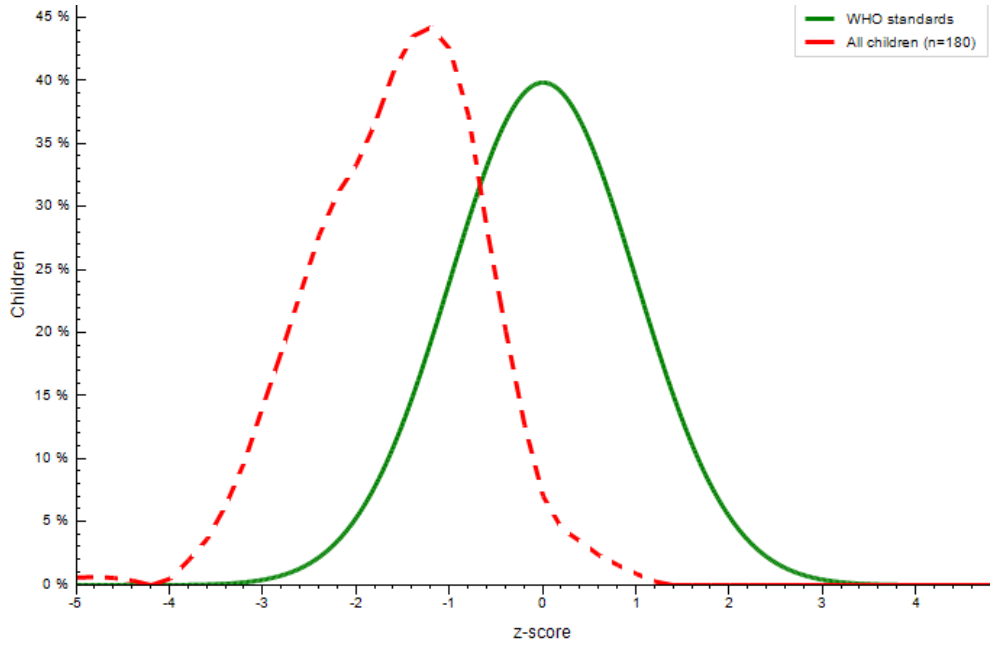

Fig 4.6 Distribution of MUAC-for-age Z-score curve comparing with WHO standards 2006

4.8 Factors associated with under nutrition of children

Anthropometric results are most widely used for the assessment of under nutrition and it was assessed by wasting, stunting and underweight. In this survey Chi - square test was used for finding out factors those are responsible for nutritional situation.

4.8.1 Factors associated with wasting

Table 4.13 showed that there was significant association of wasting with age of care taker, birth order of child, duration of exclusive breastfeeding to child, duration of breastfeeding, vaccination and supplementation to the mothers, type of supplementation and vaccination to mothers, vacciation to child and water treatment.

Age of caretaker of child classified as less than 19 years, 20-29 years, 30-39 years and above 40 years was found to be significantly associated with wasting (P=0.007). Children with caretakers less than 19 years of age are more prone to wasting. Association of wasting and age of care taker i.e. child with caretaker below 19 years of age are more prone to wasting is similar to study conducted in São Leopoldo, Souther Brazil (Vitolo *et al.*, 2008). Similar result is also shown in a study conducted by Lima M et. Al. in Recife, Brazil which stated that the

undernourished child was 2.5 times more likely to have an adolescent mother compared to the child who remains well nourished (Lima *et al.*, 1990). As the age increases, knowledge due to experience also increases which might be the probable reason for the wasting rate to be decreasing with increase in the age of care takers.

The result shows that wasting is significantly associated with birth order (P=0.019). This finding was similar to the findings obtained from the study conducted in Kapilvastu district, Nepal which states that wasting is high in children in birth order 4 followed by 1 (Bhandari and Chhetri, 2013). During our study, we found that child were left with their elder siblings and parents went out for work due to which proper care to child was not provided. Also the concept that they are now on earth and will learn to grow by themselves was found due to which proper care was not provided to the child and hence wasting was seen more in forth or more ordered child followed by first child where parents had no experience and knowledge about child care.

Duration of exclusive breastfeeding classified as less than 6 months and 6 months was found to be significantly associated with wasting (p= 0.036). Children who were exclusively breastfed for less than 6 months were found to be more wasted compared to those who were exclusively breastfed 6 months or above. Similar result is found in study conducted by Abhishek kumor and V.K Singh in 2015 in Empoured States Group (Kumor and Singh, 2015) and also in a study conducted at Morogoro municipality, Tanzaia in 2013 (Safari *et al.*, 2013). Duration of exclusive breastfeeding have a significant relation with wasting was said in a study conducted in South-west region of Bangladesh in 2013 (Mohidul *et al.*, 2013) and the study also showed similar result to the study. According to a study conducted in public Hospitals, Oromia region, West Ethopia, exclusively breast fed child were less prone to acute malnutrition which is similar to the study (Ayana *et al.*, 2015). Till 6 months of age, chid should be given only mothers milk as it provides all the nutrients required for the child, is safe and promotes the child health. If other food is proivded to chd, there is increased risk of illness to the child which leads to wasting.

Duration of breastfeeding to the child i.e. continuing the breast feeding was found to be a significant variable to wasting (p=0.014) where, children who were breastfed for only one year

were found to be more wasted. The result was supported by a study conducted in Nairobi, Kenya children who had discontinued breastfeeding were likely to be wasted (Munchina and Waithaka, 2010). A study conducted by in Kapilvastu district, Nepal also supported the result saying that WFH scale related duration of breastfeeding as significant variables and the children who were breastfed for less than a year to be more prone to be wasting compared to those who were breastfed for two years or more (Bhandari and Chhetri, 2013). Duration of minimum breastfeeding according to WHO and UNICEF is 2 years and if the child is given breastmilk only for one year, then there is high chance his nutrient requirement is not met and also breastfeeding for longer period of time shows the case where breast milk is given more and other food is given in low amount due to which his nutrient requirement is not met and hence he cannot have appropriate growth.

Immunization and supplementing the nutrients to the pregnant women is found to be significant variable for wasting (p=0.002) where mother who are not given any or some of the supplements and immunization are found to be more prone to wasting (60%) compared to those who were given. Supplementation to the pregnant women is due increased requirement during pregnancy and if the requirement is not met, child growth since before birth is affected.

Type of vaccine and supplements given to pregnant women was also found to be associated with wasting making it a significant variable (p=0.000) where children of mother who were not given no any supplements and vaccines and those who were given only iron tablets were found to be more wasted (60%)compared to others.

Vaccination to child was also found to be a significant variable to wasting (p=0.000) where children who had not been given any vaccine was found to be more prone to wasting. According to a study conducted in Guto Gide District, Oromia Regional State, Ethopia, lack of complete vaccine or any vaccine is associated with wasting of child i.e. 1.73 times more likely to be wasted (Adeba *et al.*, 2014). Vaccination prevents the child from various diseased condition which directly or indirectly prevents child from malnutrition.

Also, treatment of water at household level is found to be significantly associated with wasting (p=0.000) where, 45.5% children were wasted whose household didn't use any water treatment methods. Similar result was found in a study conducted at Hibadu Abote District,

North Shewa, Oromia Regional State which reported that treatment of water at household level is significantly associated with malnutrition as measured by wasting. Children of the household which did not treat household by any means were 2.4 times more likely wasted as compared to children who were from those families who treat drinking water (Mengistu *et al.*, 2013). Water have direct role in preventing the illness and hence malnutrition among all the population.

Table 4.12 Factors associated with wasting

		Wasting		χ^2	p-value
		Wasted	Normal		
Age of caretaker (years)	<19	2 (100%)	Nil	17.705	0.007*
	20-29	20 (16.4%)	102 (83.6%)		
	30-39	8 (15.1%)	45 (84.9%)		
	>40	Nil	3 (100%)		
Birthorder of child	1st child	14 (20.9%)	53 (79.1%)	15.151	0.019*
	2nd child	9 (15%)	51 (85%)		
	3rd child	4 (9.5%)	38 (90.5%)		
	4th or more	3 (27.3%)	8 (72.7%)		
Exclusive breastfeedibg	Below 6 months	35 (32.4%)	73 (67.6%)	6.625	0.036*
	6 months	18 (25%)	54 (75%)		
Vaccination of mother during pregnancy	Yes	27 (15.4%)	148 (84.6%)	12.507	0.002*
	No	3 (60%)	2 (40%)		
Type of vaccines and supplements	Iron	3 (60%)	2 (20%)	17.095	0.001*
	All	11 (11.8%)	82 (88.2%)		
	iron and tt	13 (16.9%)	64 (83.1%)		
	none	3 (60%)	2 (40%)		
Vaccination to child	Yes	29 (16.2%)	150 (83.8%)	11.637	0.003*
	No	1 (100%)	Nil		
Water treatment at household level	Right	25 (14.8%)	144 (85.2%)	26.158	0.001*
	Wrong	5 (45.5%)	6 (54.5%)		
Duration of breastfeeding	1 year	3 (50%)	3 (50%)	12.525	0.014*
	2 yrs	6 (11.3%)	47 (88.7%)		
	3 or more years	21 (17.4%)	100 (82.6%)		

4.8.2 Factors associated with stunting

Table 4.14 showed that there was significant association of stunting with age of the child (in months), birth order of the child, vaccination and supplementation to pregnant mother, type of vaccines and supplementation, vaccination to child, initiation of water feed to child, colostrum feed, frequency of feeding a child and initiation and consumption of vegetable by a child.

Age of child classified as 6-11 months, 12-23 months, 24-35 months, 36-47 months and 48-59 months was found to be significantly associated with height for age scale (p=0.001) where children of age 48-59 months are found to be mostly stunted (68.3%) followed by 36-47 months (42%). Similar result was found in a study conducted among under five population belonging to Tribal population living in Riverine (char) area of Dibrugarh District Assam by Safikul Islam *et. al*. which showed that stunting was highest among children aged 48-60 months (58.6%) followed by 36-47 months (57.3%) (Safikul *et al.*, 2014). Also according to a study conducted by in Padampur VDC, Chitwan, children age is found to be significantly related to stunting. In comparison to first year of life, children were at 6.27 and 13.33 times more risk of being stunted in second and fifth year of life respectively (Ruwali, 2011). Also a study conducted in Hill community of Nepal reported that older age group of children had significant efect on stunting (Gaurak *et al.*, 2014). Stunting, chronic form of malnutrition, probably shown its effect in later period of life rather than earlier period. This refers that child were not taken proper care at their earlier stage due to which, they have not attained their required height for age.

Initiation of water feed classified as within an hour of birth, within a day of birth, before six months and after six months was found to be significantly associated with stunting (p=0.009) where infants who were initiated water feed within a day were found to be more stunted. It is recommended that child should be given breast milk exclusively for six months and should be started breast milk within one hour of birth, no any pre lacteals should be given. Feeding water within one day of birth increases the chance of infection and illness to the child and hence incidence of malnutrition.

Colostrum also known to enhance the immunity to child is also found to be significantly associated with stunting of the child (p=0.044) where, child who were not fed colostrum were

found to be 100% stunted while those fed with colostrum were found to be 41.3% stunted. Deprivation of colostrum came out be significant risk factor for stunting which was also concluded by a study conducted by Dinesh kumar *et al.* at Anganwari areas of urban Allhabad in 2006 (Kumar *et al.*, 2006). Child who are not fed colostrum have high chance of reduced immunity and increased risk of infection, illness and hence malnutrition.

Frequency of feeding of child classified as two times in a day, three times, four times and six times in a day was found to be associated with stunting (p=0.033) where, children fed three times a day were found to be more stunted (57.1%) compared to others i.e. two times/day (50%), six times/day(48.2%) and 4 times (37.4%). Child who were fed three or two times a day did not receive all the nutrients and also consumed less amount of food which had more chance of malnutrition and also out of three one meal was processed food.

Initiation of vegetable to the infants was found to be associated to stunting (p=0.021) where children who were not given any vegetables were found to be comparatively more stunted which is similar to result reported by Masresha Tessema *et. al*. according to their study at Sidama, South Ethopia. Also it was reported that initiation of complete complementary food after six months was 2-3 times more likely to be stunted (Tessema *et al.*, 2013). Less consumption of vegetable refers to low micronutrient intake which increases the incidence of malnutrition.

Type of supplementary feed and vaccines given to pregnant mother was also found to have significant relation with stunting (p=0.032) where children whose mother had not taken any vaccines and supplements were more prone of being stunted followed by those who took only iron tablets. Mother who didn't take any supplement during pregnancy had high chance of poor fetal growth and hence high incidence of malnutrition.

Vaccination to the children was also found to be associated with stunting of the child (p=0.044). The study showed that fully immunized child had better nutritional status which was supported by a study conducted at Lucknow. The study showed that majority of the children were malnourished and most were unimmunized (Abedi and Srivatava, 2012). The result was also supported by Das and Hossain (2008) in Bangladesh. Also Anekw *et al*. evaluated the impact of India's Universal immunization Program on child anthropometry and

found that it reduced HFA deficit among children below 5 years by 22-25%. Child who are not given any immunization have high chance of illness and risk of malnutrition.

Table: 4.13 Factor associated with stunting

		Stunting		$\chi 2$	p-value
		Stunted	Normal		
Age of child in month	6-11	3 (37.5%)	5 (62.5%)	31.1	0.001*
	12-23	9 (39.1%)	14 (60.9%)		
	24-35	14 (24.1%)	44 (75.9%)		
	36-47	21 (42%)	29 (58%)		
	48-59	28 (68.3%)	13 (31.7%)		
Colostrum feed	Yes	78 (41.3%)	105 (58.7%)	6.235	0.044*
	No	1 (100%)	Nil		
Frequency of feeding of child in a day	2 times	1 (50%)	1 (50%)	13.692	0.033*
	3 times	4 (57.1%)	3 (42.9%)		
	4 times	43 (37.4%)	72 (62.6%)		
	6 times	27 (48.2%)	29 (51.8%)		
Initiation of feeding vegetables	Before 6 months	5 (29.4%)	12 (70.6%)	14.112	0.021*
	6 months	51 (42.1%)	84 (57.9%)		
	after 6 months	6 (42.9%)	8 (57.1%)		
	donot consume	3 (75%)	1 (25%)		
Type of vaccines	Iron	3 (60%)	2 (40%)	13.771	0.032*
	All	42 (45.2%)	51 (54.8%)		
	iron and tt	26 (33.8%)	51 (66.2%)		
	None	4 (80%)	1 (20%)		
Vaccination to child	Yes	74 (41.3%)	105 (58.7%)	6.235	0.044*
	No	1 (100%)	Nil		
Initiation of water feed	within an hour	5 (33.3%)	10 (66.7%)	17.043	0.009*
	within a day	16 (64%)	9(36%)		
	before six month	20 (29.4%)	48 (70.6%)		
	after six month	36 (50%)	36 (50%)		

4.8.3 Factors associated with underweight

Table 4.15 showed that there was significant association of underweight with age of child, birth order of child, education status of mother, type of vaccine and supplements to mother during pregnancy, vaccination to child and initiation of feeding vegetables.

Weight for age scale was found to be significantly associated (p= 0.007) with age of child classified according to month as 6-11, 12-23, 24-35, 36-47 and 48-59 months where 48-59 months aged children were found to be most prone of being underweight. According to their study conducted in Addis Abba, Ethopia reported that risk of being underweight increases significantly with increasing age (Degarega *et al.*, 2015). Also, similar result was obtained in the study conducted. among under five children attending a tertiary care hospital in Kolkata, West Bengal (Chakraborty *et al.*). Similarly, according to study conducted in Riverine Areas of Dibrugarh district Assam by prevalence of underweight was highest in age group 48-60 months (Safikul *et al.*, 2014). Children of age elder age are more physically active compared to the younger ones and also thee is lot of struggle to make them consume all the food. Also, along with acute form, undernutriton is the form of chronic malnutrition and its result may be seen in the later period.

Similar to wasting and stunting, underweight was also found to be significantly associated with birth order of child (p-value=0.014) where, 4^{th} or above child were found to be more prone of being underweight (63.6%) compared to other. Risk of being underweight increases significantly with birth order which was also reported according to the study conducted in Addis Abba Ethopia (Degarega *et al.*, 2015). Similarly, children with birth order 4-5 were more likely to be underweight than other was reported according to the study among under five in Haramaya district, Eastern Ethopia (Yisak *et al.*, 2015). Also, according to Hari Shankar and S. Dwivedi's study in Allhabad, 2012, maximum prevalence of being underweight was found to be in fourth birth order child followed by birth order one(Harishankar and Dwivedi, 2012). As discussed earlier, it was seen that later child were left with their elder siblings on their own at home which result with incrased incidence of malnutrition on later child.

Education status of mother is found to be in direct relation to the nutrition status of child (p=0.001) where children of illiterate mother are found to be comparatively more underweight followed by those having primary education and then having secondary education. Similar result i.e. the prevalence of underweight was significantly high among illiterate mother's child compared to literate was found according to a study conducted in Madhya Pradesh District, Umaria by G.N.V Brahmam *et.al.* in 2011 (Brahmam *et al.*, 2011). According to a study conducted by Ruwali D. in Padampur VDC, Chitwan, risk of underweight were 0.194 and 0.11 times fewer fo children of mother attending primary and secondary or more level of education respectively as compared to children of illiterate mother (Ruwali, 2011). Similarly, study by Meshramll *et al.* in preschool tribal children of Maharastra state, India reported that risk of underweight was 1.7 times higher among children of illiterate mother (Meshramll *et al.*). According to study conducted by Harishankar and S Dwivedi in 2012, 12.1% children of illiterate mother were underweight followed by 12.0% to that of those having primary education (Harishankar and Dwivedi, 2012). Children with mother with primary level education are highly probable of being underweight or severely underweight (twice) than the mother who were educated over primary level was reported by a report according to the study conducted among under five children attending a tertiary care hospital in Kolkota, West Bengal by Arup Chakraborty *et al.* (Chakraborty *et al.*). Also, underweight was found to be highest among the children whose mothers were illiterate in the study conducted by Safikul Islam *et al.* in Riverine area of Dibrugarh District Assam (Safikul *et al.*, 2014). Similar result was found in the study conducted by Mahmood S. in Rawalpind. Similarly, a study by Parimita sengupta, Nina Philip and A.I. Benjamin in urban slum of Ludhiana reported higher maternal education appears to be associated with better child nutrition(Sengupta *et al.*, 2010). As the education increses, malnutrition rate decreases. Education increases the knowledge as well inspires to improve the attitude and finally the behaviour and hence rate of malnutrition decreases.

Association between underweight child and type of supplements and vaccination to mother during was found (p=0.005) which was seen a bit contradictory where children of mother taking no vaccines and supplements were found to be 60% underweight and those taking only iron tablets were found to be 80% underweight. Also those who took iron tablet and tt vaccine,

31.2% were found to be underweight and those taking all, 23.7% were found to be underweight.

Weight for age scale was found to be associated with vaccination to child (p=0.022) where children taking no or incomplete vaccine were found to be more prone of being underweight. Similar result was reported in a report by Arup Chakraborty *et al.* according to the study conducted in Kolkata, west Bengal. It was reported that, incompletely or no immunization status found significantly associated in development of underweight or severely underweight child(Chakraborty *et al.*). Similarly as Anekw *et al.* found that Vaccination as stunting reduces underweight among under 5 children by 15%(Prendergast, 2015). Also, study by Ali Jafer Abedi *et al.* in Lucknow also reported that fully immunized children had better nutritional status (Abedi and Srivatava, 2012). Study showed that majority of children were malnourished (underweight and stunted) and most were unimmunized which was also supported by Das and Hossain (2008) in Bangladesh.

Underweight was also found to be associated with initiation of feeding vegetable to child (0.004) where children who were not given vegetables are more prone of being underweight. According to study conducted by Tsedeke Wolde Hailemariam in 2014 in rural area of Western Ethopia, those children who consumed fruits and vegetables were less likely to be underweight(Hailemariam, 2014).

Table 4.14 Factors associated with Underweight

		Underweight		$\chi 2$	p-value
		Underweight	Normal		
Age of child in month	6-11	2 (25%)	6 (75%)	20.875	0.007*
	12-23	7 (30.4%)	16 (69.6%)		
	24-35	9 (15.5%)	49 (84.5%)		
	36-47	17 (34%)	33 (66%)		
	48-59	18 (43.9%)	23 (56.1%)		
Birthorder of child	1st child	22 (32.8%)	45 (67.2%)	16	0.014*
	2nd child	15 (25%)	45 (75%)		
	3rd child	9 (21.4%)	33 (78.6%)		
	4th or more	7 (63.6%)	4 (36.4%)		
Education of mother	Uneducated	7 (77.8%)	2 (22.2%)	25.538	0.001*
	Primary	11 (32.4%)	23 (67.6%)		
	Secondary	35 (27.6%)	92 (72.4%)		
	Bachelor and above	Nil	9 (100%)		
	Non formal	Nil	1 (100%)		
Colostrum feed	Yes	52 (29.1%)	127 (70.9%)	4.651	0.098
	No	1 (100%)	Nil		
Frequency of feeding of child in a day	2 times	Nil	1 (100%)	12.02	0.062
	3 times	3 (42.9%)	4 (57.1%)		
	4 times	26 (22.6%)	89 (77.4%)		
	6 times	23 (41.1%)	33 (58.9%)		
Initiation of feeding of vegetables	Before 6 months	6 (35.3%)	11 (64.7%)	19.228	0.004*
	6 months	39 (26.9%)	106 (73.1%)		
	after 6 months	5 (35.7%)	9 (64.3%)		
	donot consume	3 (75%)	1 (25%)		
Type of vaccine and supplement to mother during pregnancy	Iron	4 (80%)	1 (20%)	18.736	0.005*
	All	22 (23.7%)	71 (76.3%)		
	iron and tt	24 (31.2%)	53 (68.8%)		
	None	3 (60%)	2 (40%)		
Vaccination to child	Yes	52 (29.1%)	127 (70.9%)	7.614	0.022*
	No	1 (100%)	Nil		

Part V

5. Conclusion and recommendations

5.1 Conclusion

Conclusively, this study has generally assessed the nutritional status of children in Phidim Municipality along with the infant and child feeding practice which was not explored before and findings are important to understand prevalence and determinants of under–nutrition among 6-59 months children in Phidim municipality. The results of this study indicate that under nutrition is still an important problem among under-five children in Phidim municipality, Panchthar. Following points can be concluded from the study.

1. The assessment of nutritional status using indicator such as wasting, stunting and underweight for children showed that 16.7%, 41.7% and 29.4% were wasted, stunted and underweight respectively.
2. Different factors as age of the caretaker, age of child in month, education of mother, birth order of child, colostrum feed, exclusive breastfeeding, duration of breastfeeding, frequency of feeding of child in a day, initiation of feeding of vegetable, initiation of water feed, water treatment at household level, vaccination of mother during pregnancy, types of vaccine and supplement to mother during pregnancy, vaccination to child etc were the risk factors associated with malnutrition in this area.
3. Hygiene and vaccination practices were found to be good in the study area.
4. These findings are of great importance as they identify potential actions that can be used to improve nutritional status of children.
5. This study point out the need of making a comprehensive, integrated and multi-sectoral plan for addressing the problem of malnutrition in long term.

5.2 Recommendations

Based on the results of this study following recommendations could be made in order to improve the nutritional status of children under five years in the survey area.

a) There is the need for intervening nutritional and health education as educated mother is most likely to provide better care in terms of good nutrition and better hygiene which in turn improve the nutritional status.

b) There is urgent need for more attention on feeding practices, so that problem of malnutrition can be reduced to minimum.

c) Survey of this nature should be carried out at regular intervals so that it will assist the stakeholder to formulate plan and policies for the betterment of nutritional status.

d) Appropriate intervention programs like supplementary feeding programs should be implemented to improve the nutritional status of severely acute malnourished children.

e) Public awareness programs should be launched in the area in regard to improve the anti-natal and post natal care of mother which is important for better nutritional status of child.

f) Similar cross-sectional descriptive or longitudinal survey can be conducted to determine the magnitude and distribution of malnutrition and other probable causes of malnutrition.

PART VI

6. Summary

Child malnutrition in the form of stunting, wasting, underweight and clinical malnutrition has significant implications for healthy human development. This cross-sectional study was conducted to assess the nutritional status and feeding practices of 6-59 months children of Phidim municipality, Panchthar and factors associated with it using anthropometrics measurements and structured questionnaire respectively. Data collected was analyzed using WHO Anthro version 3.2.2 and SPSS version 20. Chi-square test was used to analyze the factors associated with nutritional status.

Out of 180 children, 52.2% were female and 47.8% were male. Most of the families had nuclear family 761% and maximum family‟s main occupation was business i.e. 32.8% followed by abroad (30%). 5% of mothers were illiterate and 70.6% have had some secondary education. Most of the women 58.2% were housewife followed by labour 36.3%. Almost all child (99.6%) were vaccinated and 93.9% families used water at their home only after treatment.

The prevalence of stunting, wasting and underweight was found to be 41.7%, 16.7% and 29.4% respectively which is quite near to national data but wasting is found higher in this community. The survey shows that stunting and wasting was found higher in males while underweight was found higher in females.

Chi-square test analysis showed that there was significant association of wasting with age of caretaker (p=0007), Birth order of child (p=0.019), exclusive breastfeeding (p= 0.036), vaccination of mother during pregnancy (p=0.002), supplementation and vaccines given to mother during pregnancy (p=0.001), vaccination to child (p=0.003), water treatment at household level (p=0.001) and duration of breastfeeding (p=0.014); stunting with age of child (P=0.001), colostrum feed to child (p=0.044), frequency of feeding of child in a day (p=0.033), initiation of feeding vegetables (p=0.021), supplementation and vaccination to mother during pregnancy (p=0.032), vaccination to child (p=0.044) and initiation of water feed (p=0.009) and underweight with age of child (p=0.007), birth order of child (p=0.014), mother education

(P=0.001), initiation of feeding of vegetables (p=0.004), type of vaccine and supplementation to mother during pregnancy (p=0.005) and vaccination to child (p=0.022).

The result of the study revealed that under-nutrition is still an important problem inPhidim Municipality. Similarly, age of caretaker, birth order of child, colostrum feed to child, exclusive breastfeeding to child, vaccination and supplementation to mother during pregnancy period, vaccination to child, initiation of feeding vegetable to child, initiation of water fee to child, water treatment at household level and mother education were found to be risk factors associated with under-nutrition of Phidim Municipality children. This was the first study in this community thus the findings of the study might be helpful for identifying appropriate intervention to reduce the existing prevalence of malnutrition of the community.

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8. Appendices

Appendix A

Questionnaire

Code ☐ Date:_____

GENERAL CHARACTERISTICS

Child name: ☐

Sex: ☐ Male ☐ Female

DOB: ☐

Age in years: ☐

Relation of respondent with child: ☐ Mother ☐ Father ☐ Other

Measurements:

Height (cm)	Weight (kg)	MUAC (cm)	Edema

Father Name: ☐

Mother Name: ☐

Mother age ☐

Address: ☐

Father's education: ☐ Uneducated ☐ Primary ☐ Secondary

☐ Bachelor and above ☐ Non-formal

Mother's education: ☐ Uneducated ☐ Primary ☐ Secondary

☐ Bachelor and above ☐ Non-formal

☐ ☐ ☐ ☐ ☐

Occupation: Service Agriculture Business Abroad None

Family size: ☐

Family type: ☐ Nuclear Family ☐ Joint family

Income of famil ☐ less than1 lakh ☐ 1-3 lakhs ☐ more than 3 lakhs

Is the family income sufficient for living: ☐ Yes ☐ No

Type of house: ☐ Own ☐ Rented

Birth Order of child: ☐ 1st ☐ 2nd ☐ 3rd ☐ 4th or more

INFANT AND CHILD FEEDING PRACTICES

Is prelacteals necessary for your child? ☐ Yes ☐ No

Is colostrum necessary for your child? ☐ Yes ☐ No

What is the minimum duration for breastfeeding? ☐ 1year ☐ 2 year ☐ 3 year

When should you start complementary feed to your child?

☐ Before 6 mths ☐ After 6 mths

Do you think child fed with breast milk is healthier than fed with other milk?

☐ Yes ☐ No

Is complementary food required for infants before six months? ☐ Yes ☐ No

Is complementary food required for infants after six months? ☐ Yes ☐ No

Did you give any prelacteals to your baby? ☐ Yes ☐ No

Did you feed colostrum to your child? ☐ Yes ☐ No

Did you breastfed your child? ☐ Yes ☐ No

Till when did you perform exclusive breastfeeding?

☐ 1 month ☐ 2-3 months ☐ 4-5 months ☐ 6 months or above

Till when did you breastfed your child? ☐ 1 years ☐ 2 years 4 years

How often do you breastfeed your child?

☐ Once in an hour ☐ Once in two hour ☐ Once in three hour

☐ Once in four hour

When did you start giving water to your child?

☐ Within an hour ☐ within a day ☐ Within a month

☐ 2-5 months ☐ After 6 months

When did you start complementary food to your child?

☐ Before six months ☐ 6 months ☐ After six months

When did you start cereals to your child?

☐ Before six months ☐ 6 months ☐ After six months

When did you start pulses to your child?

☐ Before six months ☐ 6 months ☐ After six months

When did you start meat/egg/fish to your child?

☐ Before six months ☐ 6 months ☐ After six months

When did you start meat/egg/fish to your child?

☐ Before six months ☐ 6 months After six months

How often do you feed your child in a day?

☐ 2 times ☐ 3 times ☐ 4 times ☐ 6 times

Do you regularly give breakfast to your child? ☐ Yes ☐ No

In a week, how often do you give _____ to your child?

Food	Never	Daily	Once a week	Twice	Thrice or more	Once a month	Twice a month
Rice							
Dal							
Vegetable							
Green Leafy vegetable							
Milk							
Meat							
Egg							
Fish							
Processed Food							

How often do you feed given food group to your child?

1. Grains, roots and tubers _____
2. Legume and Nuts _____
3. Vitamin A rich fruita and vegetables _____
4. Dairy Product _____
5. Egg _____
6. Flesh Foods _____

Hygiene and Sanitation

Do you treat water before drinking (at your home)? ☐ Yes ☐ No

How do you treat it? ☐ Filter ☐ Boil ☐ Filter and Boil ☐ None

Do you wash hands before preparing food? ☐ Yes ☐ No

Do you wash your hands before feeding food your child? ☐ Yes ☐ No

Do you make your child wash hands before eating food? ☐ Yes ☐ No

Do you make your child wash hands after toilet? ☐ Yes ☐ No

IMMUNIZATION AND VACCINATION

Did you get any supplements or immunization during pregnancy? ☐ Yes ☐ No

Which one? ☐ Iron ☐ Calcium ☐ Vitamins ☐ TT ☐ None

Did you get your child immunized? ☐ Yes ☐ No

24 hour dietary recall

	Description
Breakfast	
Lunch	
Snacks	
Dinner	

Appendix B

Date:_____

Namaste!

I Miss Priyanka Chudal graduate student in Department of Nutrition and Dietetics conducting a dissertation work for award of bachelor's degree in Nutrition and Dietetics.

The topic for the study is "Assessment of factors affecting the nutritional status of 6-59 months children in Phidim Municipality".

I have been told in a language that I understand about the study. I have been told that this is for a dissertation procedure, that my and my son/daughter's participation is voluntary and he/she reserve the full right to withdraw from the study at my own initiative at any time without having to give reason and that refresh to participate or withdraw from the study at any stage will not prejudice my/his/her rights and welfare. Confidentiality will be maintained and only be shared for academic purposes.

I hereby give consent to participate in the above study. I am also aware that I can withdraw this consent at any later date, if I wish to. This consent form being signed voluntarily indicates participate in the study until I decide otherwise. I understand that I will receive a signed and dated copy of this form.

I have signed this consent forms before my participation in the study.

Signature of parent/guardian: _____ Sign of witness: _____

Date: Date:

Place: Place:

I hereby state the study procedures were explained in the detail and all questions were fully and clearly answered to the above mentioned participant /his/her relative.

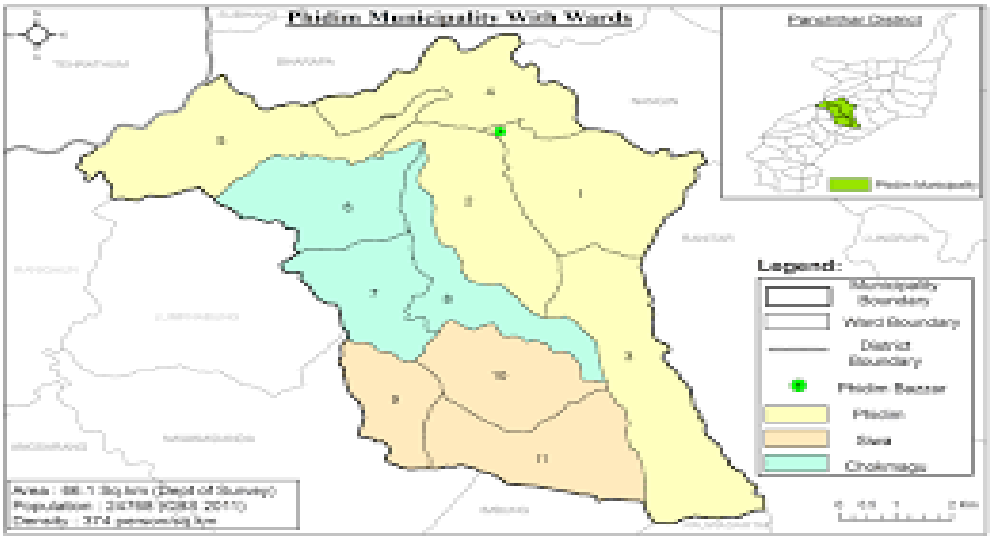
Investigator,,s sign:

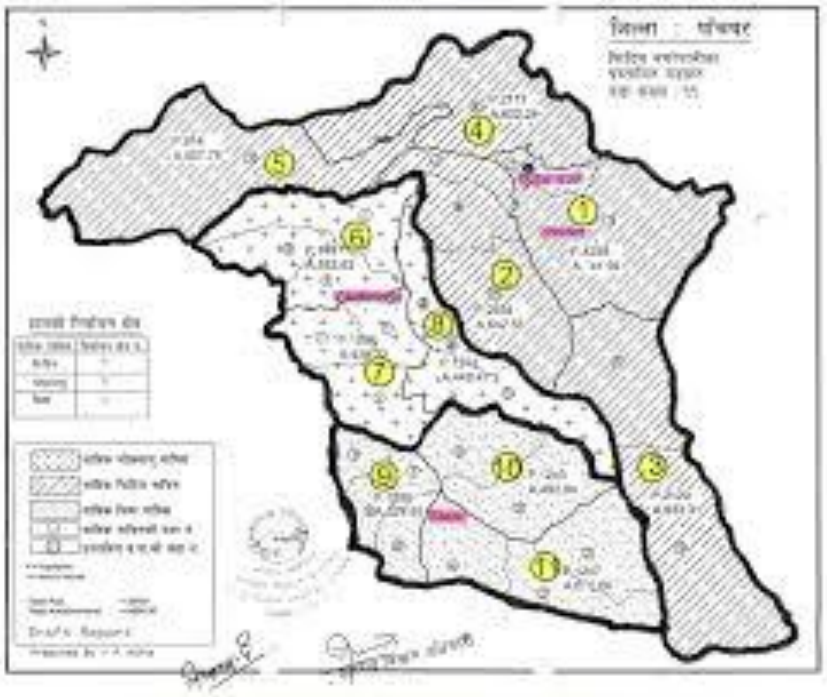
Date:

Contact address:

Appendix C

MAP OF PHIDIM MUNICIPALITY





Appendix D

PHOTO GALLARY