NUTRITIONAL STATUS OF 6 TO 59 MONTHS OLD CHILDREN AND EXISTING FOOD TABOOS IN *THARU* COMMUNITY OF *KHANAR, SUNSARI*

by

Samiksha Niroula

Department of Nutrition and Dietetics

Central Campus of Technology

Institute of Science and Technology

Tribhuvan University, Nepal

2017

Nutritional Status of 6 to 59 Months Old Children and existing food taboos in *Tharu* Community of *Khanar, Sunsari*

A dissertation submitted to the Department of Nutrition and Dietetics, Central Campus of Technology, Tribhuvan University, in partial fulfillment of the requirements for the degree of B.Sc. Nutrition and Dietetics

by

Samiksha Niroula

Exam roll no: 80090

TU Registration no.: 5-2-0008-0067-2012

Department of Nutrition and Dietetics

Central Campus of Technology

Institute of Science and Technology

Tribhuvan University, Nepal

July, 2017

Tribhuvan University

Institute of Science and Technology

Department of Nutrition and Dietetics

Central Campus of Technology, Dharan

Approval Letter

This *dissertation* entitled *Nutritional Status of 6 to 59 months old children and existing food taboos in Tharu community of Khanar, Sunsari* presented by Samiksha Niroula has been accepted as the partial fulfillment of the requirement for the B.Sc. degree in Nutrition and Dietetics

Dissertation Committee

1. Head of the Department …….

(Mr. Dambar Bahadur Khadka, Asst. Prof.)

2. External Examiner …….

(Mr. Pramod Koirala, Chief RFTQC)

3. Supervisor …….

(Mr. Dambar Bahadur Khadka, Asst. Prof.)

4. Internal Examiner ……..

(Mr. Man Kumar Tamang, Teaching Asst.)

July 23, 2017

Acknowledgements

First and foremost, I offer my sincere gratitude to my supervisor Mr. Dambar Bahadur Khadka for being supportive in every step of my thesis work i.e. proposal writing, data collection, statistics and writing.

I would like to thank my campus Chief Prof. Dr. Dhan Bahadur Karki and assistant campus Chief Dil Kumar Limbu. I would like to thank my college Central Campus of Technology and Nutrition and Dietetics department for their input, valuable discussions and accessibility.

I would like to thank my parents, my friends; Aarem Karkee, Pritika Sakhya, Madan Pandey, Dipak Mandal, Om Prakash Sah, Priyanka Chudal, and brother Bipin Karki for their patience, guidance and invaluable support during study and my personal life. They have been the source of motivation for me. I would like to acknowledge all of my classmates for their kindness and for being good friends.

Particularly I would like to thank Mr. Birnarayan Chaudhary who was key informant for me, for giving the background information about the Chaudhary community of Khanar and informing all the villagers about my thesis work.

Date of submission,

July, 2017 ……

Samiksha Niroula

Abstract

Objective: To access the factors associated with nutritional status of 6 to 59 months children of *Tharu* community as well as to find out the food taboos of that community. Methods: A community based cross-sectional study was conducted among 180 children aged 6 to 59 months of *Tharu* community of *Khanar, Sunsari*. Children were selected by random sampling technique. Anthropometric measurement and semi- structured questionnaires were used. Anthropometric measurement was then used to determine if children were underweight (weight for age), wasted (weight for height) and stunted (height for age) based on WHO reference. KII (Key informant interview) was used to find out the food taboos of that community. Statistical Package for the Social Science (SPSS) version 20 and WHO-Anthro version 3.2.2 were used for analyzing the data. Chi-Square test and Fischer exact test was used to identify the associated factors of malnutrition.

Results: The study revealed 25%, 31.1%, 26.7%, and 1.1% children were stunted, underweight, wasted and overweight respectively. There was no association between any of the factors and stunting. Weight of the child at birth and diversity of food was found to be associated with wasting. Diversity of food was found to be associated with underweight. Conclusion: Result of this study indicates that under nutrition is still an important problem among 6 to 59 months children of *Tharu* community of *Khanar*. Also there is still wide prevalence of food taboos in this community.

Contents

List of Tables

List of Figures

List of Abbreviations

Abbreviation	Full form
ARIs	Acute Respiratory Infections
BMI	Body Mass Index
FCS	Food Consumption Score
HAZ	Height for Age Z-score
HDD	Household Dietary Diversity
HDDS	Household Dietary Diversity Score
IDD	Individual Dietary Diversity
IDDS	Individual Dietary Diversity Score
IYCF	Infant and Young Child Feeding
MoHP	Ministry of Health and Population
MUAC	Mid-Upper Arm Circumference
NDHS	Nepal Demographic Health Survey
ORS	Oral Rehydration Solution
PEM	Protein Energy Malnutrition
SD	Standard Deviation
VAD	Vitamin A Deficiency
WAZ	Weight for Age Z-score
WHO	World Health Organisation
WHZ	Weight for Height Z-score
UNICEF	United Nations International Children Emergency Fund

Part I

Introduction

1.1 General introduction

Nutrition is the science of food and its relationship to health. It is concerned primarily with the part played by nutrients in body growth, development and maintenance. Adequate nutrition is a fundamental right for every human being. If people fail to consume sufficient quality and quantity of nutrients, they will suffer from hunger or malnutrition. Protein energy malnutrition, iron deficiency anemia, iodine deficiency disorder and vitamin A deficiency are some of the common types of malnutrition in Nepal (Joshi, 2012).

Good nutrition is the prerequisite for the national development of countries and for the well-being of individual. Although problems related to poor nutrition affect the entire population, women and children are especially vulnerable because of their unique physiology and socioeconomic characteristics. Adequate nutrition is critical to children's growth and development. The period from birth to age two is especially important for optimum physical, mental and cognitive growth, health and development. Unfortunately, this period is often marked by protein energy and micronutrient deficiencies that interfere with optimal growth. Childhood illness such as diarrhea and acute respiratory infections (ARIs) are common. A women nutritional status has important implications on her health as well as for the health of her children. Malnutrition in women results in reduced productivity, increased susceptibility to infection, slowed recovery from illness and heightened risk of adverse pregnancy outcomes (MoHP, 2011).

41% of children under five years of age are stunted, 11% are wasted and 29% are underweight. Breast feeding is nearly universal in Nepal. 70% of the children less than 6 months are exclusively breastfed, and median duration of exclusive breast feeding is 4.2 months. Complementary foods are not introduced in a timely fashion for all children. 70% of breast feed children have been given complementary food by the age of 6-9 months. Overall, only one-fourth of children age 6-23 months are fed appropriately based on recommended infant and young child feeding (IYCF) practices. 46% of children age 6-59 months is anemic, 27% are mildly anemic, 18% are moderately anemic and less than 1% is severely anemic. 18% of women are malnourished that is they fall below BMI cutoff of 18.5. 14% of women are overweight or obese. 35% of women age 15-49 are anemic, 29%

are mildly anemic, 6% are moderately anemic and less than 1% are severely anemic (MoHP, 2011).

Development of childhood malnutrition is believed to be multi-factorial. According to the United Nations Children's Fund (UNICEF) conceptual framework for development of child malnutrition, an interplay of basic (societal issues like cultural, political, economic and societal systems), underlying (household issues like household food security, maternal and child care practices, water and sanitation) and immediate (dietary intake and disease state) factors determine the child's nutritional outcome (UNICEF, 1990). This framework is generally accepted among scientists but with recognition that the effect of each of these factors will differ from region to region (Lesiapeto, 2009).

Food taboos are the important contributory causes for the wide prevalence of malnutrition among preschool children, expectant and nursing mothers in developing countries. These can be overcome only by education in nutrition. The guiding principles in the educational process are as follows (Swaminathan, 2014):

1. Change cannot be superimposed but must be integrated into the existing cultural pattern,
2. Proposed changes should be acceptable to the individuals concerned,
3. The changes should be minimal and use such foods which are familiar to the people concerned,
4. Participation of representatives of the group in implementing the proposed change is essential and
5. The individual should be satisfied that changes in food habits have improved their health.

1.2 Background

Tharu is the oldest and largest ethnic group of *Terai* region. Out of total population of Nepal, *Tharu* people make up 6.6%. The name *Tharu* believed to be derived from “thar”, simply means “man of the forest”. Some *Tharu* live in longhouses which hold 150 people. The longhouses are built of mud with lattice wall. The economy of *Tharu* community is based on agriculture and forest. They grow barley, wheat, maize and rice, as well as raise animal such as chicken, ducks, pigs and goat. In the big rivers they use large net to fish. *Tharus* have developed a style of decorating the walls, rice containers and other objects in

their environment. The *Tharu* women transform outer wall and verandah of their homes into colorful paintings, said to be dedicated to Lakshmi, the Hindu goddess of prosperity and fertility. There is no one *Tharu* language unifying *Tharu* community of Nepal. They speak variants of Urdu and Awadhi in Western Nepal, Bhojpuri in and near central Nepal, and of Maithili in and near eastern Nepal. The *Tharu* are adherents of Hinduism, but also held Islamic, Animist and Buddhist. With the advent of religious freedom some have converted to Christianity. Traditional *Tharu* worship various gods in the form of animal such as dogs, crow, ox and cow. Most of the *Tharu* people live in Joint family while very few live in nuclear family. The gods are believed to have the ability to heal disease and sickness. *Tharu* would approach shamans as doctors known as Guruba. Such shamans use Buddhist medicine to cure illness. The *Tharu* believes sickness comes when the Gods are displeased and demons are at work (Yuen, 2013).

Khanar lies in *Sunsari* district of *Terai* region. This place is dense habitat of *Tharu* in *Sunsari* district, has about 4000 household of *Tharus*, population not exactly known but children under five years are large in numbers (personal communication).

1.3 Problem

Tharu community is included in *Terai* Janajati group. Among *Terai* Janajati 76% men and 52% women are literate. Early childhood mortality rate (number of dead children per 1000 live birth) among the janajati community is high. Among janajati community neonatal mortality rate is 36 per 1000 live birth, post neonatal mortality rate is 24 per 1000 live birth, infant mortality rate is 59 per 1000 live birth, child mortality rate is 22 per 1000 live birth and under five mortality rate is 80 per 1000 live birth (Bennett *et al.*, 2008).

Prevalence of different food taboos among different ethnic groups of people is the important contributory causes for the wide prevalence of malnutrition among preschool children, expectant and nursing mothers in developing countries. Food faddism can also be taken as a challenge to Nutritionist and Dietitians. Until and unless people stop believing in food taboos, success of any nutrition policy and programs cannot be expected. Child malnutrition also has many functional consequences as it increases the risk of morbidity and mortality. Malnutrition has serious economic consequences not only for the individual affected, but also for the family, community and nation. Poor nutrition impairs cognitive

development and reduces school performance, and work capacity and labor productivity in adults are affected as well (Hartog *et al.*, 2006).

The other reasons for the study of *Tharu* community are as follows:

- They are one of the oldest communities of Nepal.
- Most of them are poor.
- Most of them are illiterate and uneducated, so they are not much aware of food habit and nutrition.
- Health education has been identified as one of the main components in strategies to promoting behavioral changes aiming to improve the nutrition status of mothers and Children. Understanding food taboos among the people of *Tharu* community, the purpose of this work, can inform the design of more efficient health education interventions targeting malnutrition in this definite cultural context.
- There are not much researches carried about them.

1.4 Objectives

1.4.1 General objective

To access the factors associated with nutritional status of 6 to 59 months children of *Tharu* community as well as to find out the food taboos related to nutrition of that community.

1.4.2 Specific objectives

1. To assess the nutritional status of children aged 6 to 59 months of *Tharu* community.
2 To identify associated factors of malnutrition among children aged 6 to 59 months.
3 To find out the food taboos related to nutrition of *Tharu* community.

1.5 Research question

1. What is the present condition of Nutritional status of children (6 to 59 months old age) in *Tharu* community?
2. What are the factors associated with Nutritional status of children (6 to 59 months old age) in *Tharu* community?
3. What are the food taboos related to nutrition of *Tharu* community?

1.6 Significance

The significances of the study are to:

a) Provides the baseline information to the government as well as voluntary organizations to initiate steps to tackle the problem.
b) Encourage government and other stake holders for the development of programs and policies related to nutrition.
c) Discover the problems related to nutrition, care practices and feeding behavior of this community.
d) Identify individual or group of people who are at risk of being malnourished and who need special care and attention.
e) Reflect dietary belief, sanitary condition, socioeconomic variables, degree of malnutrition and condition of mothers and children to make people aware of real situation.
f) Provide information to the government as well as to the voluntary organization about the dietary beliefs of people of this community.
g) Encourage people to improve their nutritional status by avoiding faulty food habits.

1.7 Limitations

a) This study was conducted in the single area, so it may not be representative of whole *Tharu* community of Nepal.
b) This study was conducted with limited resources, due to which it was impossible to include many other important questions and other clinical and biochemical assessment.

Part II

Literature review

2.1 Malnutrition

Human beings need to have adequate nutrition to attain normal physical growth (in children) and for a healthy life. Adequate nutrition is a fundamental right for every human being. If people fail to consume sufficient quality and quantity of nutrients, they will suffer from hunger or malnutrition. Malnutrition takes a variety of forms. The main types of malnutrition seen in Nepal are protein-energy malnutrition, iodine deficiency disorders, iron deficiency anemia and vitamin A deficiency. In particular malnutrition places an enormous burden on children and women. Even mildly and moderately malnourished children and women are more likely to be at high risk of death due to lack of resistance against common infectious diseases. Malnutrition not only affects people's health but also affect the quality of life and the development of socioeconomic situation of the country (MoHP., 2004).

The term 'nutrition' is derived from Latin word 'Nutritic' meaning nourishment. Mal means deviation from a normal phenomenon. Malnutrition is defined as the deviation from a normal nutrition. Globally each year malnutrition is implicated in about 40% of the 11 million deaths of under five children in developing countries and lack of exclusive breastfeeding in infancy causes an additional 1.5 million deaths(Koppad and Dhar, 2015).

Malnutrition is a serious condition that occurs when a person's diet does not contain the right amount of nutrients. Malnutrition means "poor nutrition" and can refer to 'under nutrition, when people don't get enough nutrition and over nutrition, when people get more nutrients than requirement. Under nutrition is caused by having an inadequate diet or a problem absorbing nutrients from food. There are many reasons why this might happen including having reduced mobility, a long-term health condition or a low income (NHS, 2015).

Malnutrition defined as underweight, is a serious public health problem that has been linked to a substantial increase in the risk of morbidity and mortality. Women and young children bear the burnt of the disease burden associated with malnutrition. Many factors can cause malnutrition, most of which relate to poor diet and severe or repeated infections, particularly in underprivileged population. Inadequate diet and disease, in turn are closely

linked to the general standard of living, the environmental conditions, and whether a population is able to meet its basic needs such as food, housing and health care. Malnutrition is thus a health outcome as well as a risk factor for disease (WHO, 2005).

2.1.1 Forms of malnutrition

Malnutrition has recently been defined as a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrient, this state being clinically manifested or detected only by biochemical, anthropometric or physiological tests. There are four forms of malnutrition (Jelliffe, 1966):

1. Undernutrition: The pathological state results from the consumption of an inadequate quantity of food over an extended period of time.
2. Overnutrition: It is the pathological state resulting from the consumption of an excessive quantity of food and hence a calorie excess, over an extended period of time.
3. Specific deficiency: It is the pathological state resulting from a relative or absolute lack of an individual nutrient.
4. Imbalance: This pathological state results from a disproportionate consumption of essential nutrients with or without the absolute deficiency of any nutrient as determined by the requirements of a balance diet.

Malnutrition takes several forms – marasmus, kwashiorkor and marasmic kwashiorkor. The term “marasmus” means, "consumption" and applies to persons suffering chronic loss of muscle mass and subcutaneous fat owing to insufficient energy and protein intake. Kwashiorkor occurs when the diet contains enough energy but little to no protein. Aspects of each of the above-mentioned types of malnutrition are found in marasmic kwashiorkor. In fact "pure" malnutrition disorders are rarely seen today (Molina, 2012).

From the point of view of time, in its early acute stages, malnutrition affects only weight and body composition. When it becomes more deeply chronic, individuals suffer from altered stunted growth, height and impaired physical and intellectual ability. There may be compensation (weight for normal size) or decompensation in intercurrent acute episodes (weight affecting height for age and sex) during a diarrheal or respiratory infection (Molina, 2012).

2.1.2 Protein energy malnutrition

Protein energy malnutrition (PEM) is a nutrition deficiency disorder which occurs due to the deficiency of protein and calories in the diet. Strictly, it is not a single disease, but a spectrum of condition arising from an inadequate diet. Although, it affects people of all ages, the results are more drastic in childhood due to the rapid growth and development (Joshi, 2011).

Failure to grow adequately is the first and most important manifestation of PEM. It often results from consuming too little food, especially energy, and is frequently aggravated by infections. A child who manifests growth failure may be shorter in length or height or lighter in weight than expected for a child of his or her age, or may be thinner than expected for height. There are three necessary conditions to prevent malnutrition or growth failure: adequate food availability and consumption; good health and access to medical care; and adequate care and feeding practices. If any one of these is absent, PEM is a likely outcome. The term PEM is used to describe a broad array of clinical conditions ranging from the mild to the serious. At one end of the spectrum, mild PEM manifests itself mainly as a poor physical growth in children; at the other end of a spectrum kwashiorkor (characterized by the presence of oedema) and nutritional marasmus (characterized by severe wasting) have high case fatality rates (Latham, 1997).

2.1.2.1 Kwashiorkor

This term used by ‘Ga’ tribe in and around Accra in Ghana meant ‘the sickness the older child gets when the next baby is born’. The child with kwashiorkor is apathetic, anemic, anorexic, diarrheic and oedematous. There is severe growth retardation but on account of oedema the weight might not be severely subnormal. The skin changes may involve any part of the body, the more common sites being lower limbs, buttocks and perineum. The skin changes show characteristic areas of desquamation and pigmentation or depigmentation. The muscular wasting is extreme and may result in incapability to crawl or walk. The hair is sparse, softer and thinner than normal. Its colour also might change and become reddish, brown or gray. There are associated symptoms such as angular stomatitis, cheilosis and atrophy of the tongue, anemia, and hepatomegaly (Joshi, 2011).

2.1.2.2 Marasmus

It is the term derived from the Greek word meaning 'too waste'. In marasmus the main deficiency is one of food in general, and therefore also of energy. It may occur at any age, most commonly up to three and a half years. Nutritional marasmus is in fact a form of starvation, and the possible underlying causes are numerous. For whatever reason the child does not get adequate supplies of breast milk or of any alternative food. The appetite may be extreme or reduced. There is extreme shriveling of the body with occasional dehydration, loss of subcutaneous fat, marked wasting of muscles, and low body weight and length. The abdomen may be shrunken or distended with gas. There may also be associated vitamin deficiencies like hypovitaminosis A (Latham, 1997).

2.1.2.3 Marasmic kwashiorkor

Children with feature of both nutritional marasmus and kwashiorkor are diagnosed as having marasmic kwashiorkor. In the Well come classification this diagnosis is given for a child with severe malnutrition who is found to have both oedema and a weight for age below 60 percent of that expected for his or her age. Children with marasmic kwashiorkor have all the features of nutritional marasmus including severe wasting, lack of subcutaneous fat and poor growth, and in addition to oedema, which is always present, they may also have features of kwashiorkor. There may be skin changes including flaky-paint dermatosis, hair changes, mental changes and hepatomegaly. Many of these children have diarrhea (Latham, 1997).

2.1.3 Micronutrient deficiency

Micronutrient deficiency is a major contributor to childhood morbidity and mortality. Children can receive micronutrient from food, food fortification and direct supplementation. Vitamin A is an essential micronutrient for the immune system that an important role in maintaining epithelial tissue in the body. Severe vitamin A deficiency (VAD) can cause eye damage. VAD can also increase the severity of infections such as measles and diarrheal disease in children, and slow recovery from illness. Vitamin A is found in breast milk, other milk, liver, egg, fish, butter, mangoes, papaya, carrot, pumpkin and dark green leafy vegetables. The liver can store adequate amount of vitamin for four to six months. 47% of the children age 6 to 23 months consume vitamin A. Urban children are more likely to consume vitamin A rich food (58 percent) than children in rural areas

(46 percent). Children in the *Hill* zone consume more vitamin A rich food (54 percent) as compared to children in the *Terai* zone (41 percent). Childen in the Eastern mountain sub region (63 percent) are most likely to consume vitamin A rich food than children in the central *Terai* sub region (35 percent). 40 percent of the children whose mother have no education consume vitamin A rich food and 54 percent of the children whose mother have SLC and higher education (MoHP, 2011).

Iron is essential for cognitive development, and low iron intake contributes to anemia. Iron requirements are greatest at the age 6 to 23 months when growth is extremely rapid. NDHS (2011) have shown that one in four children consumed iron rich foods in the 24 hours and the consumption is highest among 18 to 23 months, children in urban area, children in hill zone, children in the Eastern hill sub region and children in the highest wealth quintile. Children whose mothers have some secondary education are twice as likely to consume iron rich food as those whose mothers have no education (MoHP, 2011).

Iodine deficiency, most frequently caused by inadequate iodine intake, has serious effect in the body growth and mental development. Fortification of the salt with iodine is the most common method of preventing iodine deficiency. In Nepal, the compound use for fortification of salt is potassium iodate (KIO3). 73 percent of the children live in household with adequately iodised salt, with more children in urban (91 percent) than in rural (71 percent) areas living in such household. The percentage of children living in household that use adequately iodised salt is lowest in Far Western development region (51 percent), particularly the Far Western hill sub region (41 percent). Mother's education and household wealth are positively associated with the likelihood of children living in the household with adequately iodised salt (MoHP, 2011).

2.2 Dietary diversity

Dietary diversity means consumption of the number of different foods or food groups over a given reference period. Considerable diversity in the daily diet is necessary for adequate nutrient intakes to lessen the chances of deficient or excessive intake of single nutrients (Kariuki, 2011).

Dietary diversity is related to nutrient adequacy and to diet variety or balance, which are two of the main components of diet quality. Dietary diversity, is considered outcome measures 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 or 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; it can be measured by Household Diet Diversity (HDD) score. (HDDS) or by a Food Consumption Scores (FCS), or at the individual level (IDD), in which case it can be measured by an IDD scores (IDDS) (Swindale and Bilinsky, 2006). Studies of the dietary diversity and energy intake at the individual level show mostly a positive, significant relationship (Kennedy *et al.*, 2011).

Some points regarding importance of diversified diet are given below (Swindale and Bilinsky, 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 factor as caloric and protein adequacy, percentage of protein from animal source (high quality protein) and household income.
- Even in very poor households, increased food expenditure resulting from additional income is associated with increased quality and quantity 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.

2.3 Nutritional status

Nutritional status is the condition of the body as it relates to consumption and utilization of food. The nutritional status of a person may be either good or poor. Good nutritional status refers to the intake of a well-balanced diet, which supplies all the essential nutrients to meet the body's requirements. Such a person may be said to receiving optimum nutrition. Poor nutritional status refers to an inadequate or even excessive intake or poor utilization of the nutrients to meet the body's requirement (Joshi, 2011).

Protein energy malnutrition has been a common health problem of third world countries. Stunting and wasting are common pattern of under nutrition in children. In children acute nutritional deficit or disease such as diarrhea produce wasting, characterized by a reduction in weight for height or arm circumference, or both. Prolonged nutritional deficit and/or disease result in stunting characterized by a reduction in height for age. Wasting and stunting are associated with functional consequences. Nutritional assessment involves anthropometric measurement, biochemical test, clinical observation, functional assessment, dietary survey, ecological study and study of vital statistics. However, individual nutritional status has been reported to vary in the basis of person's living condition, available food supply, health and socio economic status. WHO estimates that 175 million children in the world are malnourished as indicated by low weight for age, 230 million are stunted as indicated by low height for age. It is recognized that the majority of the death among children under five in the developing world is associated with malnutrition (Acharya *et al.*, 2013).

In Nepal the nutritional status of mother and children under five is extremely poor. The prevailing high rate of child under nutrition in the country is one of the major contributing factors for under five mortality. Anthropometric deficits among children vary with ecological zone, stunting and underweight are more prevalent in the mountains and hills, wasting in the *Terai*. The *Mountain* zone has highest stunting rate of 56 percent, while the *Terai* has lowest 37.4 percent. NDHS (2011) has shown 41 percent of children under five years of age are suffering from chronic under nutrition (stunting) while more than 10 percent are acutely undernourished (USAID, 2014).

Nepalese women are highly affected by malnutrition especially in non- mountainous region. In Nepal food shortages due to seasonality contribute to malnutrition. Through maternal anthropometric status, seasonality affects birth weight, and seasonality continues to affect growth throughout childhood. As a result of high maternal malnutrition levels, 12% of children are born with low birth weight. Poor growth rate during the "hungry season" increase the deficit compared to the international reference data. NDHS 2011 showed 18.2 percent of non-pregnant women are undernourished or chronically energy deficient (BMI < 18.5 kg/m^2) and 14 percent are overweight or obese which is in increasing trend (USAID, 2014).

2.3.1 Nutritional status of children under five years of age

Nutritional status of children is a proxy indicator for accessing the entire population health status and one of the major predictor of child survival. Despite the various efforts, malnutrition among children is remaining as a public health problem in Nepal. Socio-cultural practices such as less consideration for supplementary child feedings, late weaning and poverty are major casual factors of malnutrition among under five year children. Child health nutritional indicators are used to access the quality of available health services as well as the general health condition of the entire population. Similarly childhood nutritional status also determines the health and disease condition of children in the future life (Bhandari and Chhetri, 2013).

In Nepal 41 percent of children under five are stunted and 16 percent are severely stunted. Stunting is highest (53 percent) in children age 36 to 47 month and lowest (14 percent) in children age 9 to 11 months. Overall 11 percent of the children are wasted and 3 percent are severely wasted. Wasting is highest (25 percent) in children age 9 to 11 months and lowest (7 percent) in children age 36 to 47 months. 29 percent of children under five years are underweight and 8 percent are severely underweight. The proportion of underweight is highest (37 percent) among those age 18 to 23 months and lowest (18 percent) among those under 6 months (MoHP, 2011).

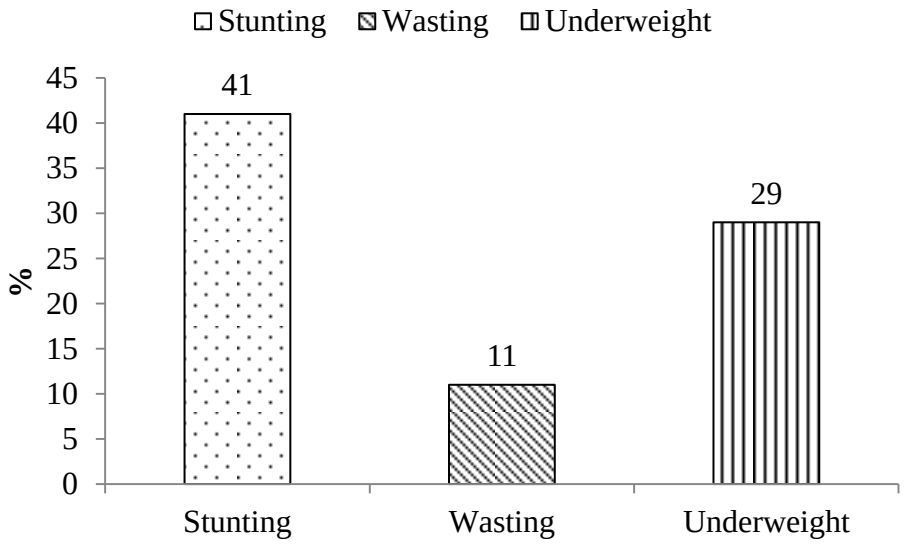

Fig. 2.3.1.a Nutritional status of children under five years of age of Nepal, (MoHP 2011)

Gender wise distribution of stunting, wasting and underweight among 6 to 59 months old children of Nepal is shown below:

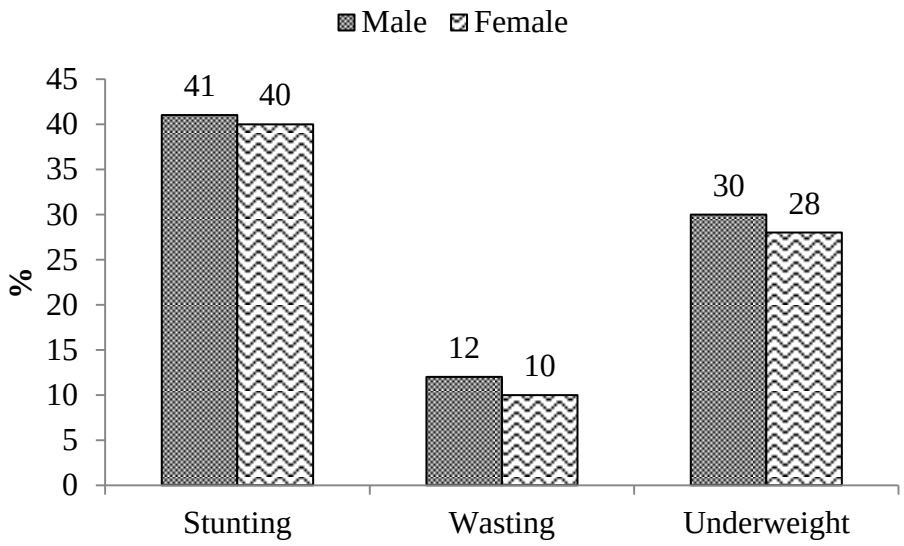

Fig. 2.3.1.b Gender wise distribution of stunting, wasting and underweight among 6 to 59 months old children of Nepal, (MoHP 2011)

Prevalence of different forms of malnutrition among children under five years of age in rural and urban areas of Nepal is shown in the figure below:

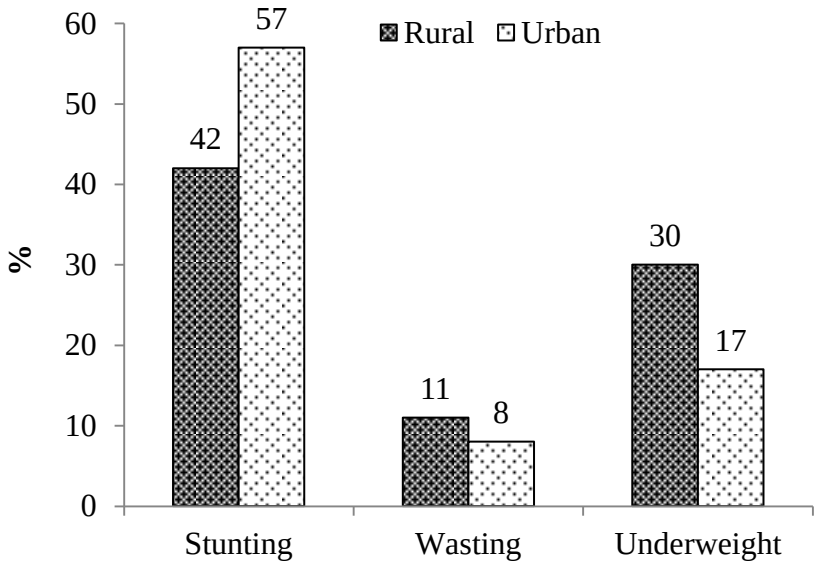

Fig. 2.3.1.c Different forms of malnutrition among children under five years of age in rural and urban areas of Nepal, (MoHP 2011)

Trends in nutritional status of children under five years of age in Nepal is shown in the figure below:

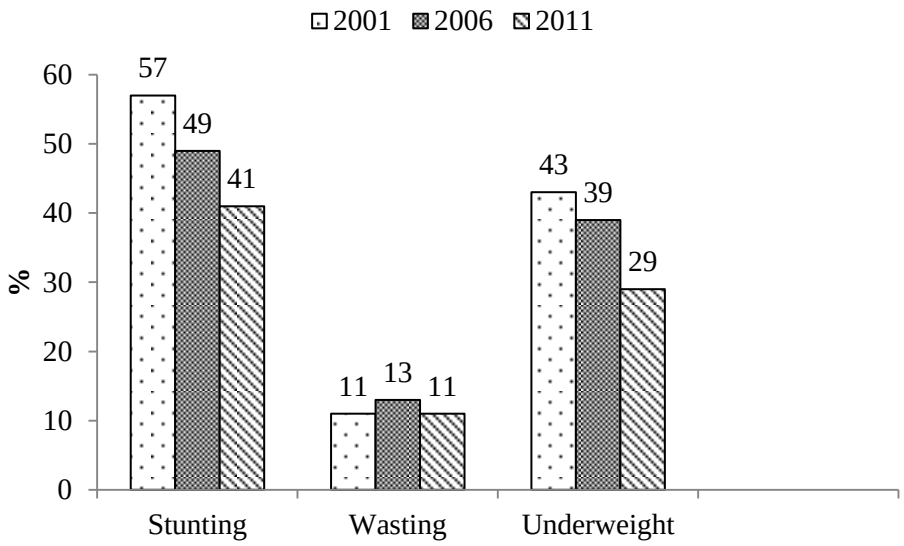

Fig. 2.3.1.d Trends in nutritional status of children under five years of age in Nepal, (MoHP 2011)

In Nepal 46 percent of children under five years of age are anemic. The prevalence of anemia among 6 to 23 months children is particularly high at 69 percent. Infant and young child feeding practice contributes to the high rates of chronic malnutrition and anemia. Breastfeeding in Nepal is almost universal and exclusive breast feeding for the first six month is relatively widespread; 70 percent of all children less than six months are exclusively breastfeed. This represents an improvement from 53 percent found in 2006 NDHS. Of the 98 % ever breastfeed, 45% started breastfeeding within one hour of birth (compared to 35% in 2006) and 85% started breast feeding within one day of birth. Among breastfeeding children 6 to 8 months of age only 66% received solid or semi-solid foods. Appropriate complementary feeding in terms of frequency is also an issue; though 78% were consuming solid/semisolid foods for the minimum recommended number of times per day among all children 6 to 23 months, only 28% were eating from the recommended number of food groups (4+). Only 24% met the three recommended IYCF practices (breastfeeding, number of feedings per day and 4+ food groups) (UNICEF, 2016).

2.3.2 Nutritional status of women in Nepal

12 percent of the women in Nepal are shorter than 145 cm. Short stature reflects poor socioeconomic conditions and inadequate nutrition during adolescence and childhood. In women short stature is a risk factor for poor birth outcome and obstetric complications. For example short stature is associated with small pelvic size, which increases the likelihood of difficulty during delivery and the risk of bearing low birth weight babies. A woman is considered to be at risk if her height is below 145 cm. Adolescent women (age 15 to 19) are slightly less likely to be below 145cm (10 percent) than older women. Women in rural areas are more likely to be shorter than 145 cm (12 percent) than women in urban areas (8 percent). Women in western region are more likely to be shorter than 145 cm (14 percent) while women in far western region are least likely (7 percent). Mean BMI among age 15 to 49 is 29 kg/m^2. Urban women have slightly higher mean BMI (23 kg/m^2) than women in urban areas (21 $kg/m^{2)}$. There are only small difference in mean BMI among women living in mountain, hills and *Terai* ecological zones. 18% of women of reproductive age are thin or undernourished (BMI< 18.5 $kg/m^{2)}$. The proportion of mild thinness (17 to 18.4 kg/m^2) and moderate and severe (17 kg/m^2) is 12% and 7% respectively. 11% of women are overweight (BMI 25 to 29 kg/m^2) and 2% are obese (BMI 30 kg/m^2 or above). Younger women are less likely than older women to be overweight or obese. 35% of women age 15 to 49 are anemic. Pregnant women are more likely to be anemic (48%) than women who are breastfeeding (39%) and women who are neither pregnant nor breastfeeding (33%). This could be due to the high demand for iron and folic acid during pregnancy (MoHP, 2011).

Prevalence of different forms of anemia among women in Nepal is shown in the figure below:

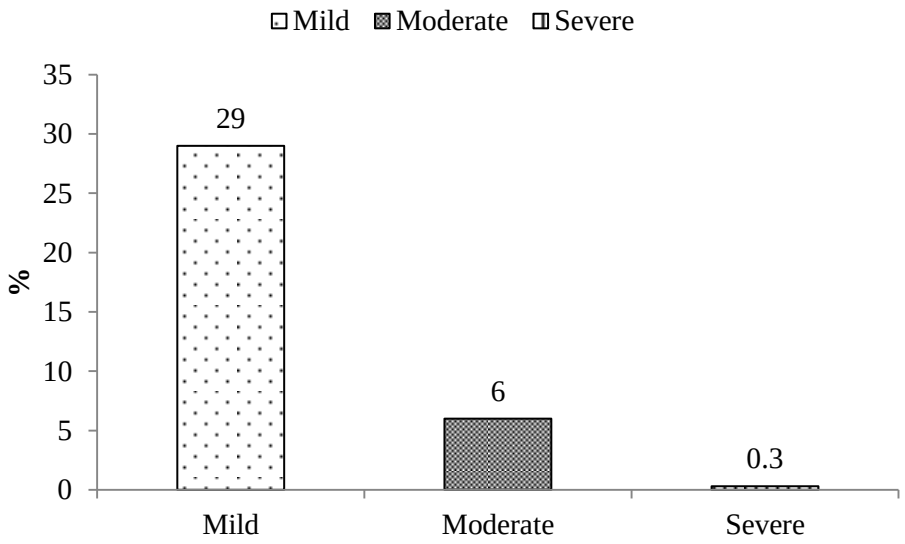

Fig. 2.3.2.a Different forms of anemia among women in Nepal, (MoHP, 2011)

Prevalence of anemia among women in rural and urban areas of Nepal is shown in the figure below:

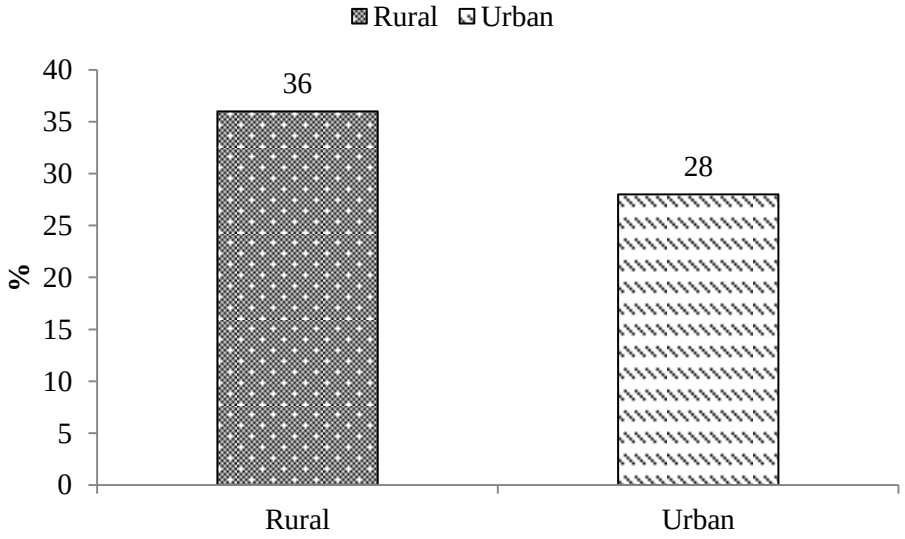

Fig. 2.3.2.b Prevalence of anemia among women in rural and urban areas of Nepal, (MoHP, 2011)

Distribution of anemia among women in different ecological zones of Nepal is shown in the figure below:

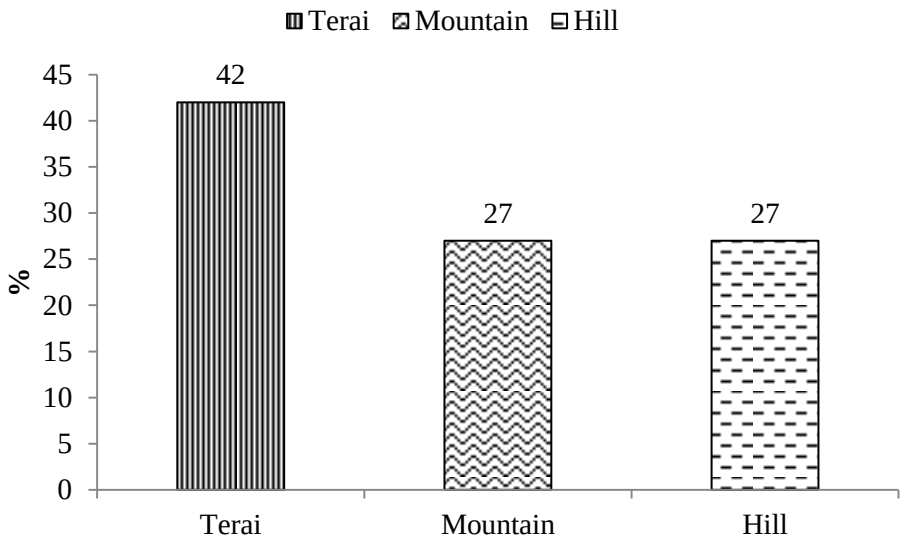

Fig. 2.3.2.c Distribution of anemia among women in different ecological zones of Nepal, (MoHP, 2011)

2.4 Factors affecting nutritional status

There are multiple factors associated with childhood malnutrition and these are often interrelated. One simply cannot say these are the cause of childhood malnutrition because these are the complex phenomenon. However, the major factor associated with childhood malnutrition as mentioned are poverty, education level of mother, faulty feeding practices, vitamin A status, low status of women, birth order, unsafe drinking water, mother's occupation, diarrhea, etc (Chhetri, 2005).

Sex: According to a study done in Kwara state Nigeria, Babatunde (2011) reported that there was a significant relationship between sex of a child and malnutrition, Male children were more likely to be malnourished than their female counterparts. This is probably due to increased attention paid to female children unlike the male children. Another study done in Botswana revealed that stunting, wasting and underweight were also significantly more prevalent among boys than girls (Gilbert, 2014).

Poverty and employment: A key factor affecting most determinants of malnutrition is poverty. A person is considered to be in absolute poverty when the person is unable to satisfy his or her basic needs. Income poverty and unemployment are very closely linked,

and by default unemployment and hunger are correlated. In a country with high unemployment rate, often results in a large part of the population being dependent on subsistence farming.Little extra income is generated and the rural population can become increasingly food insecure and it can thereby affect dietary intake, as well as the access to health facilities. In a 2011 study conducted by Shargi et al, poverty was proved to be linked to child under-weight (Piniel, 2016).

Education of mother: The education of mother's has several positive effects on care of children as compared to mother with no education. The educated mother utilizes the health care facility, discusses more about the illness of the child with health care provider and follows the instruction about feeding and caring practices given by the health worker's. They also take benefit of guidance and information of health workers. They are more likely to keep their environment clean. One study in Indonesia shows that mother's education plays strong role to protect child malnutrition. It is found that the educated mother have less stunted children. In the survey done in Nepal it was found that the children with literate mothers have less risk and severity of diarrhea. However it also says that it is likely to be associated features rather than the literacy itself. In another survey done in Nepal has found the negative relationship between mother's education and child mortality that is higher the mother's education lower the child mortality (Chhetri, 2005).

Feeding practices: The risk of childhood malnutrition increases with not feeding colostrum. The non-use (throwing) of colostrum varies among the different ethnic groups of Nepal. However, it mainly prevails among the ethnic groups of *Terai*. Faulty feeding practices like late initiation of breast feeding, starting artificial feeding before six months and early and late start of complementary foods causes' malnutrition. It was found in *Egypt* that early initiation of breast feeding to the infants was associated with lower rate of diarrhea episodes than those of less initiated breast-feeding. Nevertheless, stunting and severe stunting can be reduced if the baby is exclusively breastfed foe 4 to 6 months and mother does not squeeze the colostrum from her breast. The children older than six months of age need to be given supplementation for reducing the stunting. The children below one year of age who was no longer exclusively breast- fed were found more malnourished. This statement is also supported by the studies in Jamaica and Malawi. A study in Uganda shows that a child who never consumed breast milk has higher incidence of underweight. The same study indicate that breast feeding until 18 months decreases the risk of stunting

in contrast to those who were fed only in infancy. However breast feeding from 18 months to 24 months increases the risk of stunting approximately seven folds. If it is continued to more than 24 months decreases the threat of stunting. A study in Malawi found that giving complementary food to the baby at or after 4 month was associated with better nutritional status in children. A study in Andhra, India also shows that late weaning had a negative impact on child nutrition. A study in Nepal illustrates, that the risk of wasting increases if the child is fed less frequently (less than 6 times a day). In Nepal healthy foods such as green leafy vegetables are considered as low status food and are not fed to the children even though it is accessible and meat is not eaten either because of religious reason or it is prohibitively expensive (Chhetri, 2005).

Vitamin A: A study done in Nepal found that the children taking Vitamin A supplements twice a year regularly had better health outcome for malnutrition, diarrhea and acute respiratory infection than those who did not take one capsule or took only one time. Consumption of vitamin A rich food alone was not enough to protect the children from malnutrition, diarrhea and ARI (Chhetri, 2005).

Women's status: A women having lower status will have less opportunity to interact with others and less freedom for independent behavior. It will restrict her to gain the knowledge and lose self-stem. A women's status in society will determine her physical and mental health and her autonomy and control over household resources. If a woman has weak physical and mental health, she will not be able to give quality care to her children. If a woman is poorly fed or has poor nutrition during her childhood, adolescence and pregnancy, her child is more likely to be low birth weight and affect subsequent growth. If a woman has relatively less status compared to men this will restrict her to act for her own and her child's interest. A study report from Uttar Pradesh and Karnataka, India did not reveal the strong relationship between women's autonomy and stunting. According to a study conducted in Nepal it was found th.at there was increased risk of childhood malnutrition with frequent abuse to the mother. A study in Bangladesh has made public that female children are more vulnerable to be severely malnourished in comparison to the male children. The female had a 44% higher risk of being malnourished than male children. The possible reason might be the discrimination against female children for food and health care (Chhetri, 2005).

Birth order: According to the study done in Uganda, there is no role of birth order in stunting and underweight among children. A study in Jamaica kept up the evidence that birth order is not significantly associated with birth order of children. However a study done in Nepal shows a relationship between birth order and child malnutrition. It shows that higher the birth order, higher the stunting and underweight in children. This statement is supported by another study in Indonesia. It also shows that the first born children have advantage over later born children. Nevertheless, on the contrary a study in Ethiopia revealed that first birth order children were found to be at more risk for stunting than the children of higher birth order (Chhetri, 2005).

Source of water: Clean water is prerequisite for preventing child malnutrition. Contaminated water lead to diarrhea and diarrhea in turn lead to malnutrition, even if the food supply is sufficient. Clean water reduces infant and child mortality. A study in Malawi established that private tap followed by public tap is linked with better child nutrition. Poor water supply especially the unprotected wells were found negative impact on child nutrition. A study in Uganda supports the evidence of Malawi that the children having unprotected water were found more underweight. Nevertheless it has no consequence in stunting. Studies done in Rural Punjab of India and Ethiopia also revealed that one of the factors for the improvement in child malnutrition was improvement in safe drinking water (Chhetri, 2005).

Diarrhea: Diarrhea has negative effect on child nutrition. A study in Jamaica also found that there was an association between diarrhea and underweight. A higher episode of diarrhea was found to be short term and long term effect on malnutrition in Andhra Pradesh, India (Chhetri, 2005).

Birth interval: In study in Malawi an association was found between birth interval and child malnutrition. A child born four years after his preceding sibling was found to be better weight for age than first born child or child born within four years. A study in Ethiopia also revealed that there was significant risk for the children of lower preceding birth interval. An Indian study reveals significant association between mortality risk and preceding birth interval. Short birth intervals (<18 months) were found to be more risk for child mortality (Chhetri, 2005).

Immunization: Immunization has no association with chronic malnutrition but has significant effect on current nutrition status as per the study in Andhra Pradesh. Nevertheless a study done in rural Punjab has advocated the coverage of immunization as one of the factors for improvement in nutrition (Chhetri, 2005).

Age: It was observed in an Ethiopian study that there was a significant high risk of stunting among the children age 12 to 23 months in comparison to 6 to 11 months age group. A study in Dhanusa district of Nepal has also revealed that higher age children are at more risk of stunting and underweight. The most vulnerable age groups for malnutrition are under fifteen years. However, the most victim of malnutrition is the children under the age of 5 years. It is because the growth rate is so fast among the children in their first five years of age. Inadequate nutrition adversely affects the growth and development of children (Chhetri, 2005).

2.5 Assessment of nutritional status

Nutritional assessment can be defined as the interpretation of the information obtained from anthropometric, dietary, biochemical and clinical studies. The information obtained is used to determine the health status of individual or population groups as influenced by their intake and utilization of nutrients. Nutritional assessment is done for survey, surveillance, screening and monitoring. Nutritional assessment systems utilize basically four types of methods, which are used either alone or in combination. The methods used are:

1. Anthropometric assessment
2. Biochemical assessment
3. Clinical assessment
4. Dietary assessment

They are popularly known as ABCD. For the assessment of nutritional status in a community, basically Dietary and Anthropometric measurements are used, since they are not invasive technique, quite simple, less time consuming and do not require sophisticated instruments (Joshi, 2008).

2.5.1 Techniques of assessment of malnutrition in children

Weight for Age: The development of child is determined from the increase in weight over a given time. This in turn is determined by weight measurements over regular intervals. Here the child's weight is compared with reference weight value for his age. This is easy to access if the child age is known. Weight for age has been widely used over the years for assessing the nutritional status of children (Joshi, 2008).

Height for Age: Height for age is used as an indicator of nutritional status of groups of population for estimating past and chronic malnutrition but not necessarily the present nutritional status. The disadvantage of using height as an indicator is that the deficit's in height takes some time to occur and it may not be manifested in malnourished infants. When found in infants or young children, it may be the consequence of small size at birth rather than an indication of postnatal nutrition. Genetically determined differences are partly responsible for the variation in height in any age group in any population (Joshi, 2008).

Weight for height: Weight for height can be expressed as a percentage of the reference median weight for median height at each age. The advantage for using weight for height as an index of nutritional status is its apparent age independence. Its age independency allows its use in populations where ages are uncertain or unknown. Marked decrease in weight for height is a more reliable finding in the determinant of protein energy malnutrition (PEM). The limitation in using weight for height criteria is the difficulty in measuring body length in young infants, which may make it difficult or sometimes impossible to obtain correct data in this age group (Joshi, 2008).

Mid Arm Circumference (MUAC): MUAC has been one of the most widely used indicators for the assessment of nutritional status especially during childhood because the tape used is inexpensive and portable. The measurement of this parameter is easy and simple and has many practical advantages over weight for height, especially under field conditions. Compared with weight for height, MUAC takes less time to perform, it involves only a single measurements, can be readily taught to lay personnel, and the equipment used is inexpensive (Jelliffe, 1966).

Table 2.5.1 WHO and national MUAC cut-off points for children of age 6 to 59 months

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

2.6 Anthropometry

Anthropometry is concerned with the physical measurements of body weight and dimensions. Body composition may be estimated from anthropometric measurements. The measurements vary with age and degree of nutrition and as a result are useful in assessing imbalance of protein and energy. They can be used to detect moderate as well as severe degree of malnutrition in children as well as in adults (Joshi, 2008).

Nutritional anthropometry is concerned with the measurement of the variations of the physical dimension and gross composition of the human body at different age levels and degree of nutrition. In its modern scientific form, it is a comparatively recent development requiring well organized research-center, elaborate equipment and highly sophisticated mathematical knowledge. Its newer technique has been used to a limited extent in the developing region of the world, especially in young children. The interpretation of findings anywhere is always complex and often controversial, even to leading authorities. The normal healthy well-fed human body can vary so much that the interpretation of the nutritional significations of variations in physical dimension is peculiarly difficult (Jelliffe, 1966).

Advantages of anthropometric assessment (Joshi, 2008):

1. The procedures used are simple, safe and non-invasive and can be used for large population surveys.

2. Equipment required is inexpensive.
3. A semiskilled person can also perform the measurement procedure.
4. The methods are precise and accurate.
5. Information on past long term nutritional history can be obtained.
6. Mild to moderate malnutrition can be detected.
7. Changes in nutritional status over time or over the generation changes can be observed.

2.7 Oedema

Bilateral pitting oedema 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-kwashiorker. Children with bilateral oedema are automatically categorized as being severely malnourished, regardless of their weight-for-height index, and referred immediately to the nearest center. Usually first appears over the ankle and feet, it may extend to other areas of the extremities. It may involve the genitals face and hand. It is commonly seen in kwashiorkor (Jelliffe, 1966).

2.8 Breastfeeding and complementary feeding

Babies need the right food at the right time to grow and develop to their full potential. The most critical time for good nutrition is in the brief 1000 day period from the start of the women's pregnancy until a child second birthday. Breast milk is the best food for children's health and development during this critical window. It provides all of the vitamins, minerals, enzymes and antibodies that children needs to grow and thrive. Breast milk is safe, it is always at the right temperature, requires no preparation, and is available even in the environment with the poor sanitation and unsafe drinking water. In this way breast feeding guarantees baby access to reliable, sufficient quantity of affordable, nutritious food. Breastfeeding also supports healthy brain development, higher educational achievement and lower risk of obesity and other chronic diseases (UNICEF, 2017).

Breastfeeding is a miracle investment. It is a universally available, high impact, cost effective solution for saving baby's life. Breastfeeding is the closest thing the world has to a magic bullet for child survival. In developing countries, optimal feeding- starting within one hour of birth, exclusively breastfeeding (no additional food or liquid, including water) for 6 months, and continued breastfeeding until 2 age or longer- has the potential to

prevent 12 percent of all death in children under age 5. Exclusively breastfed children are less susceptible to diarrhea and pneumonia and are 14 times more likely to survive than non-breastfed children (UNICEF, 2017).

When breast milk is no longer enough to meet the nutritional need of the infant, complementary food should be added to the diet of the child. The transition from exclusively breast feeding to family foods, referred to as the complementary feeding, typically covers the period from 6 to 18-24 months of age and is a very vulnerable period. It is the time when malnutrition starts in many infants contributing significantly to the high prevalence of malnutrition in children under five years of age worldwide. WHO estimates that 2 out of five children are stunted in low income countries. Complementary feeding should be timely, meaning that all infants should start receiving food in addition to breast milk from 6 months onwards. It should be adequate, meaning that the complementary food should be given in amounts, frequency and consistency and using a variety of foods to cover the nutritional needs of the growing child while maintaining breastfeeding. The adequacy of the complementary feeding (adequacy in short for timely, adequate, safe and appropriate) not only depends on the availability of variety of foods in the household, but also on the feeding practices of care givers. Feeding young infants require active care and stimulation, where the caregiver is responsible to the child clues for hunger and also encourages the child to eat. This is also referred to as active or responsive feeding (Dewey, 2001).

WHO recommends that the infant start receiving complementary food at six months of age in addition to breast milk. Initially 2 to 3 times a day between 6-8 months, increasing to 3-4 times daily between 9-11 months and 12-24 months, with additional nutritious snacks offered 1-2 times per day as desired. Inappropriate feeding practices are often a greater determinant of inadequate intakes than the availability of foods in the household. WHO has developed a protocol for adopting feeding recommendations that enables program manager to identify local feeding practices, common problems associated with feeding, and adequate complementary foods. The protocol builds upon available information and proposes household trials to test improve feeding recommendations. WHO recommends that the protocol be used to design interventions for improved complementary feeding, and is included as a part of adaption process of the Integrated Management of Childhood Illness strategy (Dewey, 2001).

2.8.1 Definition of breastfeeding categories

Definition of breast feeding categories are given below (Dewey, 2001):

1. Exclusive breastfeeding: Exclusive breastfeeding is defined as no other food or drink, not even water except breast milk (including milk expressed or from a wet nurse) for six months of life, but allows the infants to receive ORS, drops and syrups (vitamins, minerals and medicine).
2. Predominant breastfeeding: It means that the infant's predominant source of nourishment has been breast milk (including milk expressed or from a wet nurse as the predominant source of nourishment). However the infant may also have received liquids (water and water base drinks, fruit juice), ritual fluids and ORS, drops or syrups (vitamins, minerals and medicines).
3. Partial feeding: When infant's feeding included non-breast milk foods such as animal/powdered/condensed milk and/or solid/semisolid food (i.e. cereals, vegetables, fruits, lentils or meat)

2.9 The Z-score or standard deviation classification system

There are three different systems by which a child or a group of children can be compared to the reference population: Z-scores (standard deviation scores), percentiles, and percent of median. For population-based assessment—including surveys and nutritional surveillance-the Z-score is widely recognized as the best system for analysis and presentation of anthropometric data because of its advantages compared to the other methods. At the individual level, however, although there is substantial recognition that Z-score is the most appropriate descriptor of malnutrition, health and nutrition centers (e.g. supplementary feeding programs in refugee camps) have been in practice reluctant to adopt its use for individual assessment (WHO, 1997).

In this database, weight-for-height, height-for-age and weight-for-age are interpreted by using the Z-score classification system. The Z-score system expresses the anthropometric value as a number of standard deviations or Z-scores below or above the reference mean or median value. A fixed Z-score interval implies a fixed height or weight difference for children of a given age. For population-based uses, a major advantage is that a group of Z-scores can be subjected to summary statistics such as the mean and standard deviation (WHO, 1997).

Interpreting the results in terms of Z-scores has several advantages as follows (WHO, 1997):

- The Z-score scale is linear and therefore a fixed interval of Z-scores has a fixed height difference in cm, or weight difference in kg, for all children of the same age. For example, on the height-for-age distribution for a 36-month-old boy, the distance from a Z-score of -2 to a Z-score of -1 is 3.8 cm. The same difference is found between a Z-score of 0 and a Z-score of +1 on the same distribution. In other words, Z-scores have the same statistical relation to the distribution of the reference around the mean at all ages, which makes results comparable across age groups and indicators.
- Z-scores are also sex-independent, thus permitting the evaluation of children's growth status by combining sex and age groups.
- These characteristics of Z-scores allow further computation of summary statistics such as means, standard deviations, and standard error to classify a population's growth status.

2.10 Food taboos

A food taboo is a prohibition against consuming certain foods. The word "taboo" (also spelled "tabu") is Polynesian and means 'sacred' or 'forbidden'; it has a quasi-magical or religious overtone. The term was introduced in the anthropological literature in the second half of the nineteenth century. In the field of food and nutrition, food taboos are not necessarily connected with magical-religious practices, and some nutritionists prefer to speak of "food avoidance" (Hartog *et al.*, 2006).

Every social group has their own beliefs and practices. These are based on centuries of trial and error. Some of these beliefs may be useful while others are harmful. Some of these beliefs and practices are related to foods that should be eaten by members of the society. While some foods are considered fit for consumption by a particular group of people, others are not. Those foods that are restricted are referred to as taboos. Food taboos can be said to actions to avoid certain foods based on causal explanation which may be supernatural, logical or sometimes difficult to explain rationally. According to whitehead, food taboos are part of complex of attitudes relating to the sense of taste, feelings and

abstentions which are concerned in the creation and maintenance of culture differences, male authority and gender inequalities (Gadegbeku *et al.*, 2013).

A food considered as a taboo is strictly forbidden, for health, cultural or spiritual reasons. Food taboos are known from virtually all human societies and may be found in various forms all over the world. Pregnancy is viewed as a critical period in the life of women and is usually subjected to a number of food taboos as a way of safeguarding their lives and that of the unborn baby. Poor maternal nutrition, especially in rural settings adversely affects pregnancy and birth outcomes. In many local communities, pregnant women have food taboos with consequent depletion of vital nutrients (Zepro, 2015).

Food taboos are known virtually from all human societies. Events such as menstrual period, pregnancy, child birth, lactation that govern particular phases of human cycle and special events like preparation of hunt, weeding, etc are linked to certain dietary rules and regulations. Seemingly many food taboos seems to make no sense at all, as what may be declared unfit by one group may be accepted by others.however food taboos have a long history and has been respected and recognized by members of community as a customs and rule (Nkengla and Teri, 2016).

Food habits differ most widely in regard to which food of animal origin are likes, dislikes, eaten or not eaten in society. The food in question comprises many of those that are rich in good quality protein and contain heme iron, both of which are important nutrients. People who do not consume these foods are deprived of an opportunity of obtaining these nutrients easily. On the other hand those who over consume animal flesh, some seafood's, eggs and other foods of animal origin will have undesirable amount of saturated fat and cholesterol in the diet (Latham, 1997).

A number of food habits and practice are poor from nutritional point of view. Some practices results from traditional point of view about food that are liable to change under the influence of neighboring people, travel, education, etc. Other food practices are governed by definite taboos. A food taboo may be followed by a whole national groups or tribe, by a part of the tribe, or by certain group in a society. Within the society different food customs may be practiced only by women or children, or by pregnant women or female children. In certain cases traditional customs are practiced by certain particular age group, and in other instances a taboo may be linked with an occupation. At other times or

in other individuals a taboo may be imposed because of some particular events such as illness or as an initiation ceremony (Latham, 1997).

All societies have traditional belief regarding harmful and beneficial foods for woman during pregnancy. There are also beliefs regarding the optimal amount of food taken during pregnancy for successful reproductive outcomes. These belief may or may not confirm modem biomedical notions about the proper types and amounts of food needed by pregnant women to safeguard maternal nutrition, adequate growth of foetus and safe delivery (Nag, 1994).

2.10.1 Permanent food avoidance

Foods that are permanently avoided are always prohibited for a specific group. The classic example of a permanent food taboo is the prohibition of pork practiced by Jews and Muslims. Some anthropologist point out that food taboos are based on the failure of these foods to fit into the usual systems of classifications. Foods that do not fit into these classifications are unsuitable for consumption, or unclean. According to Koran, Muslims should not only avoid pork, but also blood, non-ritually slaughtered animals, cadavers, and alcohol (Benkheira, 2000). In the case of both Jewish and Muslim avoidances, the foods themselves are considered unclean. A different concept of food avoidance is found in Hinduism. Hindus abstain from eating beef because cows are considered sacred. Various arguments have been used to explain the origins of such food taboos or food avoidance including religion, culture, and hygiene (Hartog *et al.,* 2006).

Cats and dogs are not consumed in Western societies because of the emotional relationship developed with these pet. Pets are increasingly being “humanized” in such a way that eating them is seen as an act of anthropophagy or cannibalism. The feeling of closeness to certain animals can also be found in the savannah regions of West Africa. Certain West African clans consider dogs clan animals, based on the fact that they have been beneficial to the clan in the past; as clan animals they are unfit for consumption. Hippocrates regarded dog meat favorably as a light meal, but in later antiquity, dogs were considered unclean and unfit to eat. This is still the case in the Mediterranean area and the Middle East. By contrast, dog meat is popular in China and the mountainous regions of the Philippines. From a nutritional point of view, dog meat is an excellent source of animal

protein, and dogs do not require the grazing area demanded by cattle or other large ruminants (Hartog *et al.,* 2006).

2.10.2 Temporary food avoidance

Some foods are avoided for certain periods of time. These restrictions often apply to women and relate to the reproduction cycle. The times of temporary food avoidances related to particular periods of the life cycle include:

- Pregnancy
- Birth
- Lactation
- Infancy
- Initiation
- Illness or sickness

From a nutritional point of view, temporary food avoidances are of great importance as they concern vulnerable groups: pregnant women, breast-feeding women, and infants and children during the period of weaning and growth. Food regulations and avoidances during these periods often deprive the individual of nutritionally valuable foods such as meat, fish, eggs, or vegetables. In a number of African countries pregnant women avoid green vegetables. They also do not consume fish. When asked why, women say the unborn child might develop a head shaped like that of a fish. Some of these avoidances may seem odd from a scientific point of view, but there is often an unnoticed logic behind it. In the first place, women are aware of the critical period and know that much has to be done to ensure the successful delivery of a healthy child. Observing the rules of avoidance will give her the strength of knowing that everything possible has been done for the benefit of the child (Hartog *et al.,* 2006).

2.10.3 Food practices of mothers and IYCF practices

A large number of studies and surveys conducted in Nepal with a focus on Maternal and child health have collected the following information (Adhikari, 2010):

- Many believe that pregnancy is a natural condition and does not need any particular attention.
- Any special treatment of mother tends to be for the protection of the unborn child rather than for her own health and well-being.

- One widely held belief is that if a woman eats more during pregnancy she will have a bigger baby which can cause problems during labor.
- Foods of animal source are considered good for pregnant women.
- Social factors also influence the diet of pregnant women: women and girls usually eat after male members and children have eaten and have less access to food from animal sources and other special food.
- Mothers who have recently delivered a baby are considered impure and are not allowed to eat with other family members until the purification ceremony has been held. In some communities mother food intake is limited during this period.
- In some cultures, it is believed that a connection between stomach and womb exists and womb and stomach are rested together by not giving food to the mothers.
- Ghee, meat and milk are considered good for new mothers for breastfeeding. However, for mothers in many families, the diet for lactating mothers is the usual family diet because they can't afford different foods.
- The diet for a lactating mother is further restricted when her baby is ill.

Some findings about infant and child feeding are as follows (Adhikari, 2010):

- Almost all babies are breast-fed. Some are exclusively breast-fed for a period beyond the recommended six months of age. Giving pre-lacteal feeds, not giving colostrum's, prolonged exclusive breastfeeding beyond six months of age, starting complementary food before six months old, are some of the problems. Most babies are breastfed up to two years old as recommended, but some goes beyond this age.
- The period of exclusive breastfeeding is shorter than 4 or 6 months and it is more so in the hills. Many mothers give liquid or solid within a few months of birth. Some babies are fed complementary foods earlier than the recommended age because mothers have to go to work. Some mothers start early complementary feeding because they think their breast milk is not sufficient. However, there are some mothers who feel that the breast milk alone is sufficient in the first year of life and the infants should be given solid foods once they show interest in it.
- The reasons for stopping breastfeeding include pregnancy, work commitments, and the mother sickness.

- The complementary feeding for infants and young children is mostly infrequent and unsupervised. The children are allowed to eat what they want, but are not encouraged if they don't want to.
- Some babies start to have solid foods after the rice feeding ceremony at five or six months. Many children are given a family diet without special preparation. If the infants or children don't show any interest in solid foods, mothers may not persevere with feeding the infants.
- The complementary foods generally lack variety: they are based on rice and daal. Meat, Fish or eggs are infrequently given to the children.
- Some food items like green leafy vegetables are considered cold and are not given to the infant or children.

2.11 Literature review from previous studies

In the Nepal Demographic Health survey, 41% of children under five years are stunted, 11% are wasted and 29% are underweight. Breastfeeding is nearly universal in Nepal, and half of the children born in three years before the survey were breastfed for about 34 months or longer. 70% of children less than age 6 months are exclusively breastfed, and the median duration of exclusive breastfeeding is 4.2 months. Complementary foods were not introduced in a timely fashion for all children. 70% of breastfed children have been given complementary foods by age 6 to 9 months. Overall, only one-fourth of children age 6-23 months were fed appropriately based on recommended infant and young child feeding (IYCF) practices. Infant mortality was 67 deaths per 1,000 live births and under-five mortality is 76 deaths per 1,000 live births. 94.87% household did not have toilet which is much more than national data where 40% rural household did not have toilet. More than 95% of households were using iodised salt (MoHP, 2011).

A community based cross sectional study was conducted on 820 children age 6 to 59 months at Hidabu Abote district. Data were collected using Anthropometric measurement and structured questionnaire. It was found that 47.6%. 30.9% and 16.7% of the children were stunted, underweight and wasted respectively. The main associated factors of stunting were found to be child's age, family monthly income, children were received butter as pre lacteal feeding and family planning. Treatment of water in HHs the only variable associated with wasting (Mengistu *et al.*, 2013).

A community based cross- sectional descriptive study was conducted on 443 children from *Sunsari* district of Eastern Nepal. 53.3%, 30%, 36.6% children were underweight, wasted and stunted respectively. There was no significant difference in the prevalence among male and female children. Malnutrition was more among the older age groups, significant relation with maternal education, mother's age at marriage, socioeconomic status, paternal education, feeding practices and the presence of toilet facilities (Chhetri, 2005).

A community based cross-sectional descriptive survey in *Padampur* VDC, *Chitwan* found that prevalence of underweight, stunting and wasting was 22.7%, 37.3% and 25.7% respectively. Study indicated that the risk of stunting increases with age. Socioeconomic status was most important factors associated with stunting, underweight and wasting. Meeting the minimum dietary diversity, minimum meal frequency and minimum acceptable diet was associated with better nutritional status of children (Ruwali, 2011).

A community based cross-sectional descriptive survey in *Kapilvastu* district of Nepal found that better socio-economic status, mother's age 20-35, birth order up to second, gap more than two years between two pregnancies, recommended exclusive breastfeeding, early recommended supplementary foods, complete immunization and timely care seeking had positive effect on children health, which were also statistically significant. Considering the weight-for-age, height-for-age, BMI-for-age and Muac-for-age, 5% to 60% children were below -2SD, and nearly one-fourth below -3SD (Bhandari and Chhetri, 2013).

A community based cross-sectional descriptive survey in *Belahara* VDC in Nepal found that prevalence of underweight, stunting and stunting was 27%, 37% and 11% respectively. Comparatively, the risk of being underweight in the children from the poor socioeconomic status is almost four times as much as from the rich socioeconomic status. Children from joint family were found protective against stunting than children in the nuclear family. Other covariates such as age at pregnancy and ethnicity of the child were found to be significantly associated only at 10% level of significance (Sapkota and Gurung, 2009).

A cross-sectional study conducted in rural hill communities of Ilam district found that 70% of under five children were moderately and 10.4% were severely underweight. Similarly 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 exclusive breast feeding practice had significant effect on stunting. More than 50% children were affected with stunting, wasting and underweight at the same time (Gaurav *et al.*, 2004).

A cross sectional study done in Bangladesh found that 45% of children under five years were suffering from chronic malnutrition, 10.5% were acutely malnourished and 48% had underweight problem. The main contributing factor for under five malnutrition were found to be previous birth interval, size at birth and parents education (Rayhan and Khan, 2006).

Part III

Methodology

3.1 Research design

A cross sectional study was carried out to find out the nutritional status and its associated factors of children under five years of age as well as to find out the food taboos of *Tharu* community. The survey consists of:

1. Household survey with the help of questionnaire: A set of questionnaires containing questions related to the factors that have direct or indirect influence in the nutritional status of the children were asked to the mothers of the children who are to be studied. The question asked to the respondent give the both qualitative and quantitative data.
2. Key Informant Interview: Questions related to food taboos were asked to some elder people and teacher of that community.
3. Anthropometric measurement of 6 to 59 month age children: The following indices were used
   i. Weight-for-age
   ii. Height-for-age
   iii. Weight-for-height
   iv. Arm circumference
4. Oedema check for protein energy malnutrition (PEM)
5. The 24 hour dietary recall: In this method respondent were asked to remember details of the types of foods given to their children during the previous 24 hour. These information were collected to know common types of food they eat.

3.2 Study area

The study was carried out in *Khanar* which lies in *Sunsari* district of *Terai* region.

3.3 Target population

The target populations were children of 6 to 59 months of *Tharu* community of that place and their parents or caretakers.

Inclusion criteria: Children of 6 to 59 months age of this community as well as their parents or care takers.

Exclusion criteria: The study participants who are seriously ill or who are not available in the household during the time of study are avoided.

3.4 Sampling technique

Cross-sectional descriptive study was conducted in *Khanar, Sunsari.* Simple random sampling method was used to select the children from household. From 5 wards of this place 3 wards (10, 12 and 13) were selected by simple random sampling (lottery method). The basic criteria for the selection of household sample was that the household with at least one child 6 to 59 months of age was included in the sample. In household with more than one children of age between 6 to 59 months, only one child was chosen by lottery method.

3.5 Sample size

The calculation of sample size was done by using the statistical formula,

$N= z^2 \times P(1-P)/m^2$ source(www.survrysystem.com)

Where, N= required sample size

Z= confidence interval at 95% (standard value of 1.96)

P= estimated prevalence of malnutrition in project area

m= margin of error at 7% (standard value of 0.07)

Here, P (29.7%) is estimated on the basis of research conducted by Mr. Sambhu Chaudhary in *Tharu* children of Itahari 7, *Sunsari* district. The reason to select the data from his study is that, it is closely related to my research work (Chaudhary, 2015).

The sample size was obtained as below:

$$N = z^2 \times P(1-P)/m^2$$

$$= (1.96)^2 \times 0.297(1-0.297)/(0.07)^2$$

$$= 164$$

As some of the parents may refuse or may not be reachable so considering non response rate at 10% the adjusted sample size was calculated to be 164+16= 180. Therefore the sample size was 180.

3.6 Measurement methods

3.6.1 Height measurement

The length of each child aged 6 to 24 months was measured by lying flat and centrally on the measuring board placed on a hard flat surface on the ground. The height of children above 24 months was measured standing straight on a measuring board placed on a hard flat surface. The child was guided to stand on the stadiometer without shoes or slippers and to stand parallel to the stadiometer with heels, buttocks, shoulders and back of head touching the board. Head was held comfortably erect with its line of sight vertically perpendicular to the surface of board. Any objects like clips and bands on the hair were removed before the measurements and also the thick hair was taken into account. The measurement was taken nearest to 0.1 cm. The measurements were taken three times for each child.

3.6.2 Weight measurement

Weight of the child was measured by electronic digital weight scale. The weight of the child was taken with the minimum clothes in order to reach nearer to the actual value. The weight was noted as indicated by the machine. Child weight was measured to the nearest 100 gm on a weighing scale. The machine was checked regularly for its accuracy using standard weight. (1 kg used in shop). The measurements were taken three times for each child.

3.6.3 Mid upper arm circumference

For the measurement of mid upper arm circumference Shakir's tape was used. MUAC was taken on the left hand midway between the elbow and the shoulder joint so that that hand was simply relaxed and hanging by the side.

3.6.4 Estimation of dietary diversity

Dietary diversity was estimated by using formula,

Children 6 to 59 months of age who received food from ≥4 food groups during the previous day / children of 6 to 59 months of age.

Here 24 hr dietary recall was done to determine the food taken by child during previous day and the formula was calculated using seven food groups:

1. Grain, roots and tubers
2. Legumes and nuts
3. Dairy products
4. Flesh foods
5. Eggs
6. Vitamin A rich fruits and vegetables
7. Other fruits and vegetables

3.6.5 Oedema checkup

Firm pressure for three seconds with one digit on the lower portion of the median surface of the tibia was applied. The sign was taken as positive if there was a visible and palpable pit that persists after the pressure is removed. And recorded only if present bilaterally.

3.7 Research instrument

Equipment needed 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

3.8 Pre-testing

The equipment were tested before the actual survey by measuring some of the children. The questionnaires were also pre-tested among some of the mothers. By taking suggestions from the people the questions were modified.

3.9 Validity and reliability

3.9.1 Validity

Validity reveals the degree to which an instrument measures what it is supported to measure to assist the researches in solving the research problem. To ascertain the degree to which the data collection instrument will measure what the purposed to measure, the instrument was validated by a group of professionals from Central Campus of Technology, Central department of Nutrition and Dietetics. The aspects tested in the questionnaire will also be drawn from the available literature in food taboo and nutrition about the preschool children. The questionnaire was also pre tested prior to data collection to ascertain content and face validity.

3.9.2 Reliability

A measuring instrument is reliable if it provides consistent result. Reliable means the same instrument under similar conditions which should be dependability, stability, consistency and accuracy of the scale used. Thus, reliability means absence of errors of measurement in a measuring instrument.

Reliability refers to quality control measure of data collected. Questionnaire will be checked daily for completeness, consistency and clarity. The methods used to increase the validity and reliability of the survey is mentioned in the different topics above.

3.10 Data analysis

The anthropometric data was analyzed by the help of WHO anthro v3.2.2. Z score of height-for-age, weight-for-age and weight-for-height was calculated and the curve was made. Then the data obtained by Who classification of malnutrition as well as qualitative data was transcribed and coded by assigning labels to various categories and entered into SPSS V 20. The chi-square test and Fischer exact test were applied to test the association between nutritional status and its associated factors.

3.11 Logistic and ethical consideration

Permission was taken from Central Campus of Technology. Verbal consent from parents or caretakers of the study subject was obtained and the objective of the study was explained to them. Privacy and confidentiality of the information obtained was ensured at all level.

Part IV

Result and discussion

Among 180 respondents, all the respondents responded to the study with 100% response rate. The results and findings of the study are expressed into several following headings.

4.1 Demographic and socio-economic characteristics

Most (41.7%) of the family members were labor in the factories which were located near to the village, 22.2% were involved in foreign employment and service, 7.8% were involved in business and 6.1% were involved in agriculture which is shown in the table 4.1.a. Annual income of 62.8% of the family was between 1 to 3 lakh, 22.8% of the household earn more than 3 lakh and 14.4% of the household earns less than 1 lakh as shown in the table 4.1.a.

Table 4.1.a Economic characteristics of population (N=180)

Variables	Frequency	Percent
Occupation		
Agriculture	11	6.1
Business	14	7.8
foreign employment	40	22.2
Job	40	22.2
Labor	75	41.7
Annual income (NRs.)		
less than 1 lakh	26	14.4
1 to 3 lakh	113	62.8
more than 3 lakh	41	22.8

Most of the families (48.9%) were joint and 51.1% were nuclear as shown in the table 4.1.b. Mean of family members was 4.61~ 5, family with minimum household member was 3 and maximum 9 and the most of the household had 3 family members as shown in table 4.1.c. The house were mostly owned (85.6%) by the respondents whereas 14.4% respondents live in the rented house. 35% of children's father had only primary education, 33.9% had secondary, 15% had higher

secondary and above, 5.6% were illiterate and education of 10.6% of children's father was not revealed (Table 4.1.b).

Table 4.1.b Socio-demographic characteristics of study population (N=180)

Variables	Frequency	Percent
Type of family		
Joint	88	48.9
Nuclear	92	51.1
Type of house		
Permanent	154	85.6
Temporary	26	14.4
Education of father		
Higher secondary and above	27	15.0
Illiterate	10	5.6
Non response	19	10.6
Primary	63	35.0
Secondary	61	33.9

Table 4.1.c Distribution of family members

Measurements	Values
Mean	4.61
Mode	3
Minimum	3
Maximum	9

4.2 Child characteristics

Out of 180 children, 53.3% were females whereas 46.7% were males. Mean age of children was 31.3 months with standard deviation of 14.9. Majority of the children were in 24-35 months (26.1%) followed by 36-47(23.9), 48-59 (18.3%), 12-23 (17.8%) and 6-11(13.9%).

57.8% children were more than 2.5 kg during birth, 30% children were equal to 2.5 kg, whereas 12.2% children were less than 2.5 kg during birth. 71.7% of the children were first child, 23.3% second, 3.3% third and 1.7% were other.

Table 4.2 Child characteristics of study population (N=180)

Variables	Frequency	Percent
Gender		
Female	96	53.3
Male	84	46.7
Weight at birth		
Less than 2.5 kg	22	12.2
More than 2.5 kg	104	57.8
Equal to 2.5 kg	54	30.0
Birth order		
First	129	71.7
Second	42	23.3
Third	6	3.3
Other	3	1.7
Age in month(group)		
6-11	25	13.9
12-23	32	17.8
24-35	47	26.1
36-47	43	23.9
48-59	33	18.3

4.3 Child caring practices

Out of 180 children, 65% were breastfed on first day of birth, 42.8% of children were breast fed within 1 hour of birth, 11.1% within 8 hour of birth, 11.7% within 24 hour . 78.9% children were fed colostrum whereas 21.1% were not. 71.7% children were exclusively breastfed whereas 28.3% children were not breastfed exclusively. Breastfeeding in Nepal is almost universal and 70% of children under 6 months are exclusively breastfed. In this survey 71.7% children were exclusively breastfed which is slightly higher than NDHS (2011) while only 65% were breastfed on first day of birth which is lower than NDHS (2011) i.e 85%. Also the rate of children who were breastfed within one hour of birth was lower (42.8%) than that of the findings of NDHS (2011) which is 45% (MoHP, 2011).

Rate of exclusive breast feeding as well as rate of colostrum feeding and rate of breast feeding within one hour of birth (71.7% , 78.9% , 42.8%respectively) was lower than that of the findings of the survey done in Itahari where the rate of exclusive breastfeeding was 80%, colostrum feeding was 84.16% and rate of breastfeeding within one hour of birth was

63.36% (Chaudhary, 2015). Breastfeeding within one day of birth was found to be slightly higher (65%) than that of Eastern *Terai* (63.8%) while breast feeding within one hour of birth was found to be slightly lower (42.8%) than that of the Eastern *Terai* (46.8%) (MoHP, 2011).

57.8% children were fed nothing before the initiation of breast milk whereas 20.6% children were fed other milk (cow milk and goat milk), 9.4% were given lactogen, 8.9% were given honey, 2.2% were given ghee and 1.1% was given molasses. 55.6% children were given weaning food at 6 months of age which is slightly lower than NDHS findings which is 66% (MoHP, 2011). 20.6% were given at 7 months of age, 12.2% at the age greater than 7 months whereas 7.2% at 4 months of age and 4.4% children were given weaning food at five months of age.

100% of children were vaccinated. Out of 180 children 178 (98.9%) were supplemented with vitamin A and worm medicine whereas 2 children i.e. 1.1% were not. The effectiveness of vitamin A supplementation program was similar to that of the country as the national data on vitamin A supplementation revealed that 9 in 10 children aged 6 to 59 months received vitamin A supplement. 100% of the household used iodised salt which is higher than the rate of Eastern *Terai* (82.9%) (MoHP, 2011).

The percentage of the people who took their children to hospital for treatment were 64.4%, 27.8% people took their children to both hospital and *Dhami* for treatment. Most of them took their children to witch doctor at first and only if the disease was not cured they visit to hospital. 4.4% people took their children to pharmacy whereas 3.3% of family took their children to *Dhami* for treatment.

Dietary pattern of children

Out of 180 children, 106 children (58.9%) children were given foods from less than 4 food groups whereas only 74 children (41.1%) children were given food from more than 4 food groups. The seven food groups were used for the calculation of diversity of food (food groups other than the breast milk). Seven food groups include (WHO, 2010):

1. Grain, roots and tubers
2. Legumes and nuts
3. Dairy products

4. Flesh foods
5. Eggs
6. Vitamin A rich fruits and vegetables
7. Other fruits and vegetables

The rate of children who were given foods from more than four food groups is higher (41.1%) than that of the eastern *Terai* region which is 27.7% (MoHP, 2011).

Table 4.3 Child caring practices (N=180)

Variables	Frequency	Percent
Initiation of breastfeeding on first day of birth		
Within 1 hr	77	42.8
Within 8 hr	20	11.1
Within 24 hr	21	11.7
No	62	34.4
Breastfeeding on first day of birth		
No	63	35.0
Yes	117	65.0
Exclusive breastfeeding		
No	51	28.3
Yes	129	71.7
Colostrum feeding		
No	38	21.1
Yes	142	78.9
Initiation of weaning food		
4 month	13	7.2
5 month	8	4.4
6 month	100	55.6
7 month	37	20.6
> 7 month	22	12.2
Diversity of food		
Less than 4	106	58.9
More than or equal to 4	74	41.1
Type of salt		
Iodised	180	100.0
Place of treatment		
Hospital	116	64.4
Pharmacy	8	4.4
Dhami	6	3.3
Hospital and *Dhami*	50	27.8

Variables	Frequency	Percent
Vaccination		
Yes	180	100.0
Prelacteal food		
Other milk	37	20.6
Honey	16	8.9
Molase	2	1.1
Ghee	4	2.2
None	104	57.8
Lactogen	17	9.4

4.4 Maternal characteristics

Highest percentage of mothers (83.3%) was found to be housewives whereas only 16.7% of mother's were found to be working. 36.7% of mothers were found to have secondary education followed by 23.9% primary education, 17.2% with education level of higher secondary and above whereas 22.2% mothers were found to be illiterate. 98.3% of mothers were found to be vaccinated during pregnancy whereas only 1.7% was not vaccinated. 98.3% mothers had taken iron and folate tablet during pregnancy whereas only 1.7% had not taken. 76.1% of mothers were found to be more than 20 years of age during first pregnancy whereas 23.9% were found to be less than 20 years of age during first pregnancy.

42.8% mothers were found to have knowledge about malnutrition whereas 57.2% of mothers had no knowledge of malnutrition. 48.9% of mothers were found not to know about the cause of under nutrition whereas 46.7% mothers believed lack of food as a cause of under nutrition, 2.8% mothers believed curse of god as a cause of under nutrition and 1.7% mothers believed that the factors other than these are the cause of under nutrition. 57.2% mothers were found to have knowledge about *sarbottam pitho* whereas 42.8% of mothers were found to have no knowledge about *sarbottam pitho*. 15% of mothers were given fewer nutrients than the usual during the time of pregnancy, 61.1% mothers were given more nutrients than the usual during the time of pregnancy, and 23.9% of mothers were given as usual during the time of pregnancy.

Table 4.4 Maternal characteristics of study population (N=180)

Variables	Frequency	Percent
Occupation of mother		
Housewife	150	83.3
Working	30	16.7
Education of mother		
Higher secondary and above	31	17.2
Illiterate	40	22.2
Primary	43	23.9
Secondary	66	36.7
Vaccination during pregnancy		
No	3	1.7
Yes	177	98.3
Iron and folate tablet		
No	3	1.7
Yes	177	98.3
Knowledge about malnutrition		
No	103	57.2
Yes	77	42.8
Cause of undernutrition		
Lack of food	84	46.7
Curse of god	5	2.8
Others	3	1.7
Don't know	88	48.9
Management of nutrients for pregnant women		
Give more than usual	110	61.1
Give less than usual	27	15
Give as usual	43	23.9
Age during first pregnancy		
Less than 20	43	23.9
More than 20	137	76.1
Knowledge of *sarbottam pitho*		
No	77	42.8
Yes	103	57.2

4.5 Environmental characteristics

Table 4.5 Environmental characteristics of study population (N=180)

Variables	Frequency	Percent
Source of water		
Tap	2	1.1
Tube well	178	98.9
Water purifying technique		
Boiling	3	1.7
Filtration	2	1.1
None	175	97.2
Waste management		
Burying	140	77.8
Burning	15	8.3
Management by municipality	10	5.6
Others	15	8.3
Toilet at home		
Yes	180	100.0

Out of 180 households 178 (98.9%) household were found to have tube well as a source of water whereas only 2 (1.1%) household have tap as a source of water. 97.2% household were found to drink water without purifying. 1.7% household drink water by boiling whereas 1.1% drink filtered water. 77.8% household were found to manage waste by burying, 8.3% by burning, 5.6% household waste was managed by municipality while 8.3% household use techniques other than these for waste management. 100% of households were found to have toilets at home.

4.6 Prevalence of malnutrition

In survey, among 180 children the overall magnitude of malnutrition was found to be 25%, 31.1%, 26.7%, and 1.1% stunting, underweight, wasting and overweight respectively.

The prevalence of stunting was found to be lower i.e. 25% than that of the findings of NDHS (2011) which is 41% while the findings of underweight and wasting was higher than that of the findings of NDHS (2011) (MoHP, 2011) . The prevalence of stunting was found to be similar with the result of the survey done in Itahari where 25% of children under five years of age of *Tharu* community were stunted, the rate of wasting was found to be lower than that survey where 29.7% children were wasted and the rate of underweight

was found to be higher than that survey where 26.73% children were underweight (Chaudhary, 2015).

The prevalence of stunting was found to be lower than that of Eastern *Terai* region (31.4%), while wasting and underweight was found to be higher than that of Eastern *Terai* (10.3% and 24% respectively) (MoHP, 2011).

Table 4.6.a Prevalence of malnutrition among 6 to 59 months old children of *Tharu* community of *Khanar, Sunsari*

Nutritional indicator	Percent
Length/height for age(stunting)	25
Weight for age(underweight)	31.1
Weight for height(wasting)	26.7
Weight for height(Overweight)	1.1

Moreover, 8.3% children were found to be severely stunted while 16.7% children were moderately stunted. Among 31.1% of underweight children 13.9% were severely underweight while 17.2% were moderately underweight. 15% of the children were found to be severely wasted while 11.7% were moderately wasted. The rate of severely stunted children was found to be lower than that of the findings of NDHS(2011) which is 16% severely stunted while the rate of severely wasted and underweight children was found to be higher than that of NDHS (2011) findings (3% severely wasted and 8% severely underweight) (MoHP, 2011).

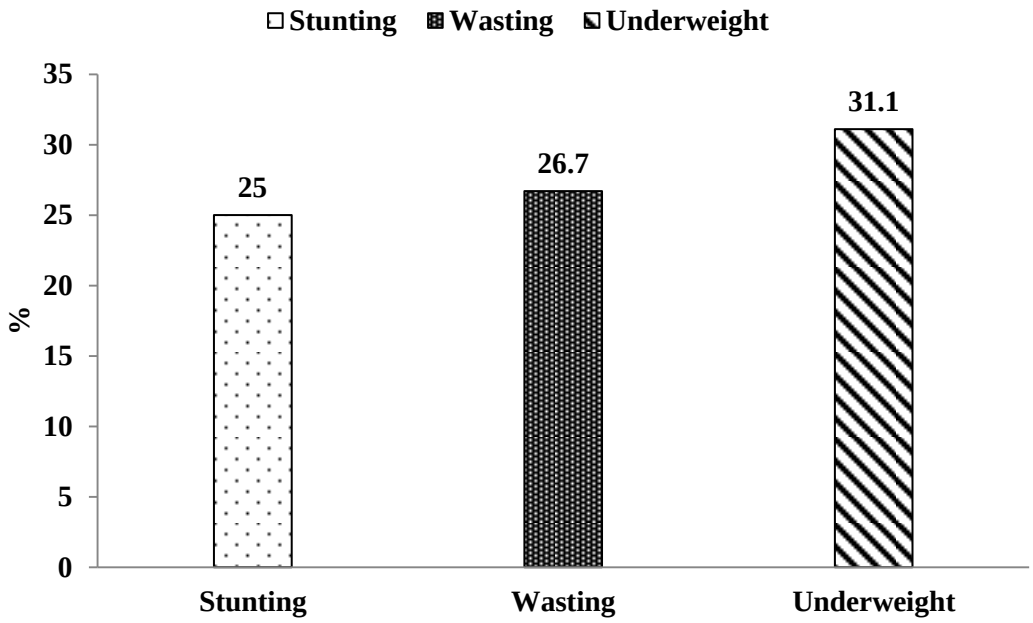

Fig 4.6 Prevalence of malnutrition among 6 to 59 months old children of *Tharu* community of *Khanar, Sunsari*

The prevalence of wasting was found higher in females (29.2%) than that in males (23.8%) which is opposite than that of the findings of NDHS (2011). The rate of stunting was found to be similar in both males and females i.e. 25% while in case of NDHS (2011) findings, stunting was slightly higher in male than female. The prevalence of underweight was found to be higher in females (32.3%) as compared to males (29.8%) and this finding is opposite than that of the findings of NDHS (2011). Overweight was found to be 1.2% in males and 1% in females (MoHP, 2011).

Among 84 males, 15.5% males were found to be severely wasted and 8.3% were moderately wasted, 8.3% severely stunted and 16.7% were moderately stunted while 14.3% severely underweight and 15.5% were moderately underweight. Rate of severely wasted and moderately wasted females was found to be similar i.e. 14.6%. 8.3% females were found to be severely stunted while moderately stunted females were 16.7%. In case of underweight, 13.5% females were severely underweight while 18.8% females were moderately underweight (Table 4.6.b).

Table 4.6.b Gender wise distribution of wasting, stunting and underweight

	Characteristics	Male (%)	Female (%)	All (%)
WHZ	Severely wasted (<-3)	15.5	14.6	15
	Moderately wasted (>-3& <-2)	8.3	14.6	11.7
	Overweight(>+2)	1.2	1	1.1
	Normal	75	69.8	72.2
HAZ	Severely stunted (<-3)	8.3	8.3	8.3
	Moderately stunted (>-3&<-2)	16.7	16.7	16.7
	Normal	75	75	75
WAZ	Severely underweight (<-3)	14.3	13.5	13.9
	Moderately underweight (>-3&<-2)	15.5	18.8	17.2
	Normal	70.2	67.7	68.9

Wasting was found to be higher in children of age group 12 to 23 months (41.9%) and lower in age group 48 to 59 months (15.2%). Stunting was higher in case of children of age group 36 to 47 months (36.4%) and lower in age group 6 to 11 months (8%) while underweight was found to be higher in children of age group 24 to 35 months (40.4%) and lower in case of age group 48 to 59 months (15.2%) as shown in the Table 4.6.c.

The pattern of prevalence of stunting among different age groups can be supported with the fact that nursing during early life is protective so there is lesser risk of stunting during early months of life and stunting becomes more likely as the child becomes more dependent for calorie from foods which should be grown or brought by household. Also stunting is the chronic effect of malnutrition which generally predisposes in late childhood

Table 4.6.c Distribution of wasting, stunting and underweight among children of different age groups

Age groups (months)	N	WHZ (%)			HAZ (%)		WAZ (%)	
		<-3	<-2	>+2	<-3	<-2	<-3	<-2
(6-11)	25	8	24	4	4	8	4	16
(12-23)	31	32.3	41.9	3.2	3.2	22.6	19.4	38.7
(24-35)	47	14.9	25.5	0	17	31.9	21.3	40.4
(36-47)	44	13.6	27.3	0	6.8	36.4	13.6	36.4
(48-59)	33	6.1	15.2	0	6.1	15.2	6.1	15.2
Total	180	15	26.7	1.1	8.3	25	13.9	31.1

4.6.1 Nutrition status comparison with WHO standard

The length for age curve obtained from the survey is different than that of the WHO standard curve. The median height for age z-score of the children was found to be -1.25 i.e. the median value is slightly shifted to the left showing the prevalence of stunting among the study population.

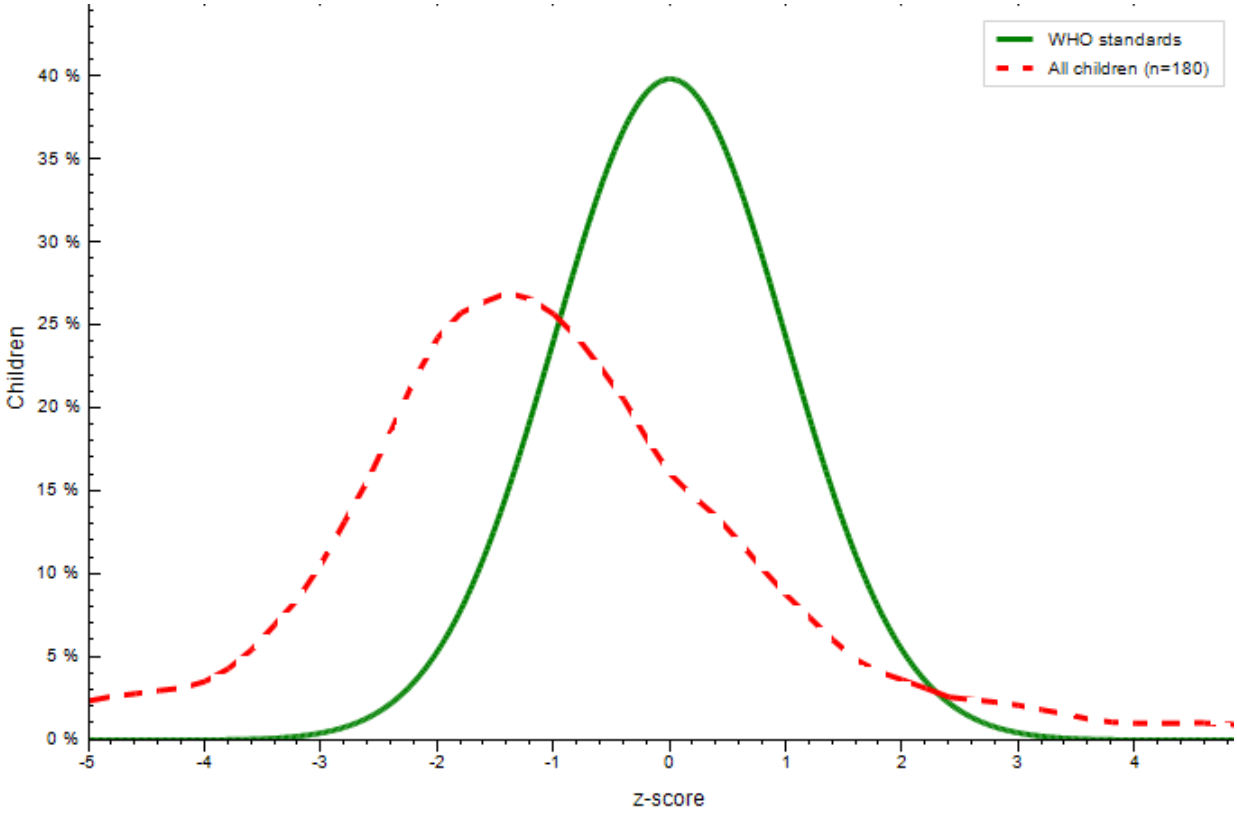

Fig 4.6.1.a Distribution of stunting among 6 to 59 months children of *Tharu* community of *Khanar* based on WHO standard (N=180)

The weight for length curve obtained from the survey is different than that of the WHO standard curve. The median weight for length z-score of the children was found to be -0.9 i.e. the median value is slightly shifted to the left showing the prevalence of wasting among the study population.

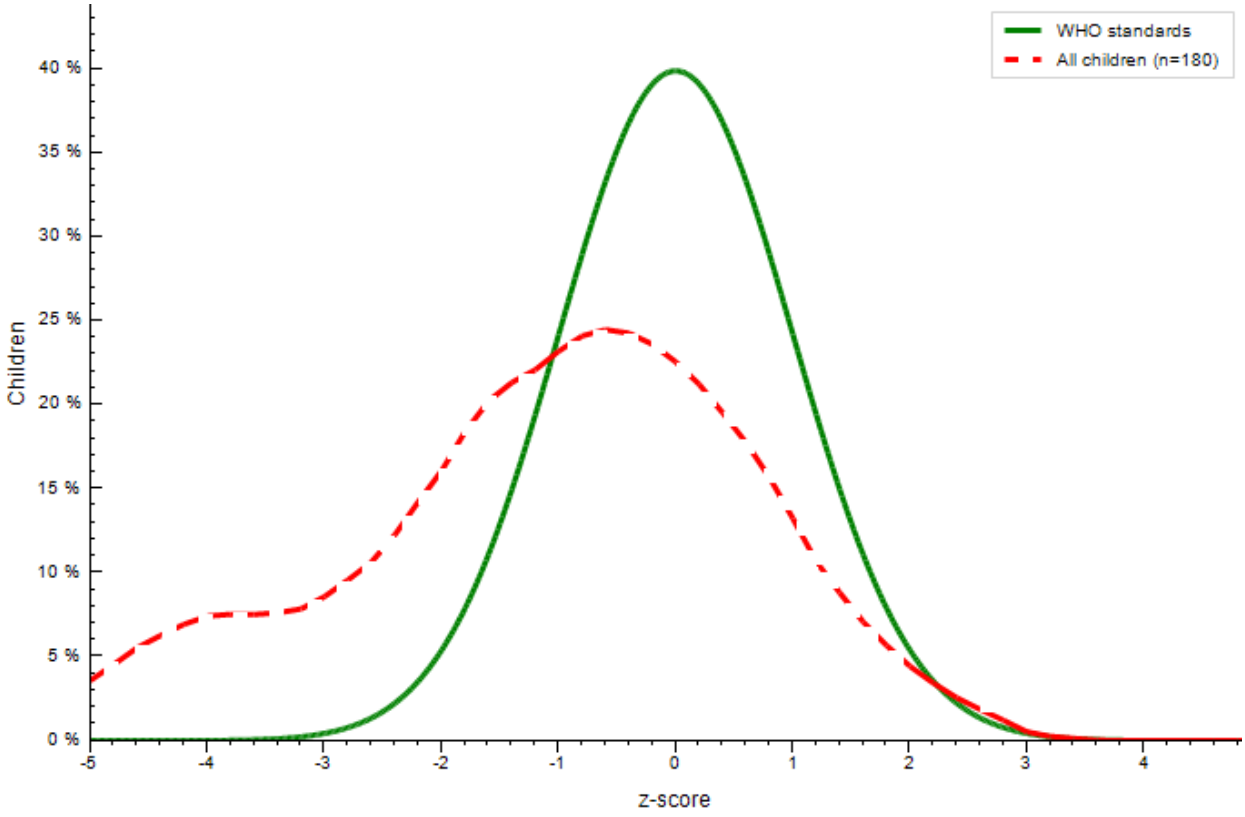

Fig 4.6.2.b Distribution of wasting among 6 to 59 months children of *Tharu* community of *Khanar* based on WHO standard (N=180)

The weight for age curve obtained from the survey is different than that of the WHO standard curve. The median weight for age z-score of the children was found to be -1.18 i.e. the median value is slightly shifted to the left showing the prevalence of underweight among the study population.

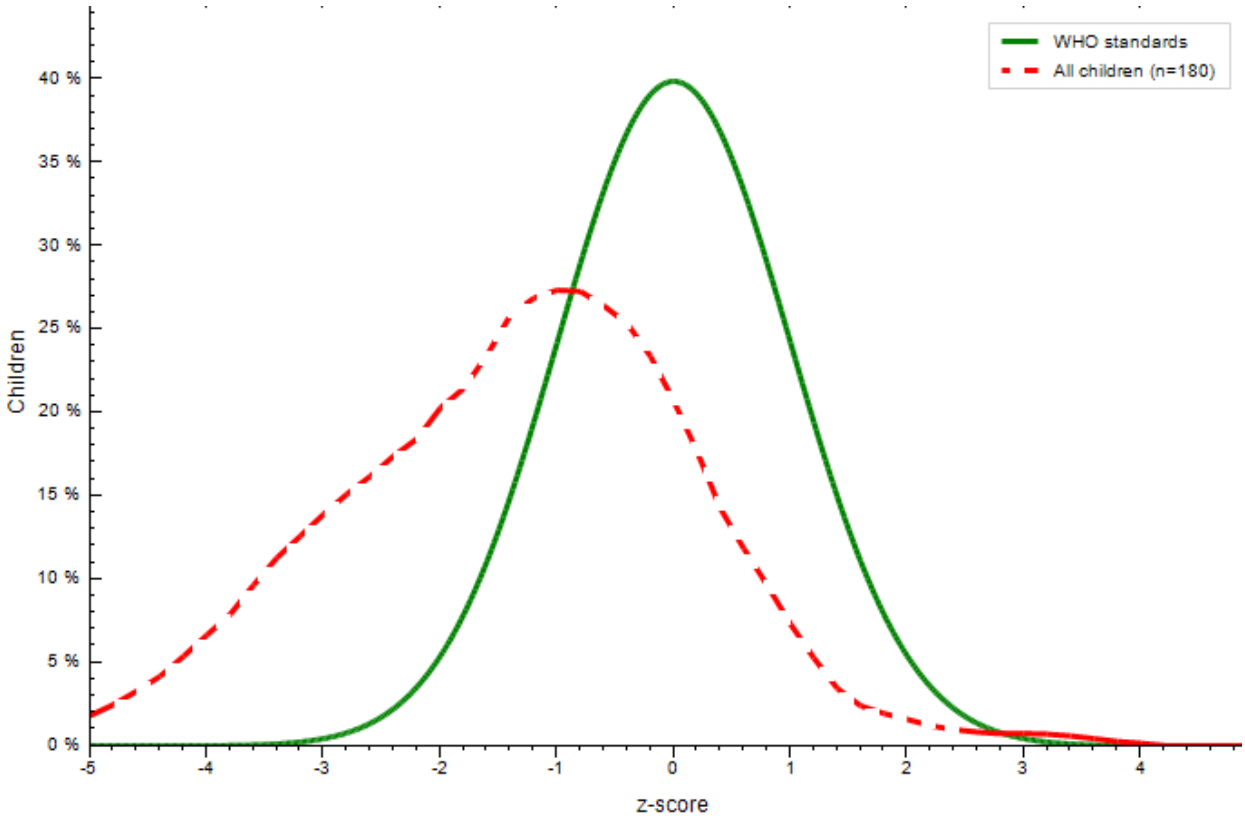

Fig 4.6.1.c Distribution of underweight among 6 to 59 months children of *Tharu* community of *Khanar* based on WHO standard

The MUAC for age curve obtained from the survey is different than that of the WHO standard curve. The median MUAC for age z-score of the children was found to be -1.22 i.e. the median value is slightly shifted to the left showing the prevalence of wasting among the study population.

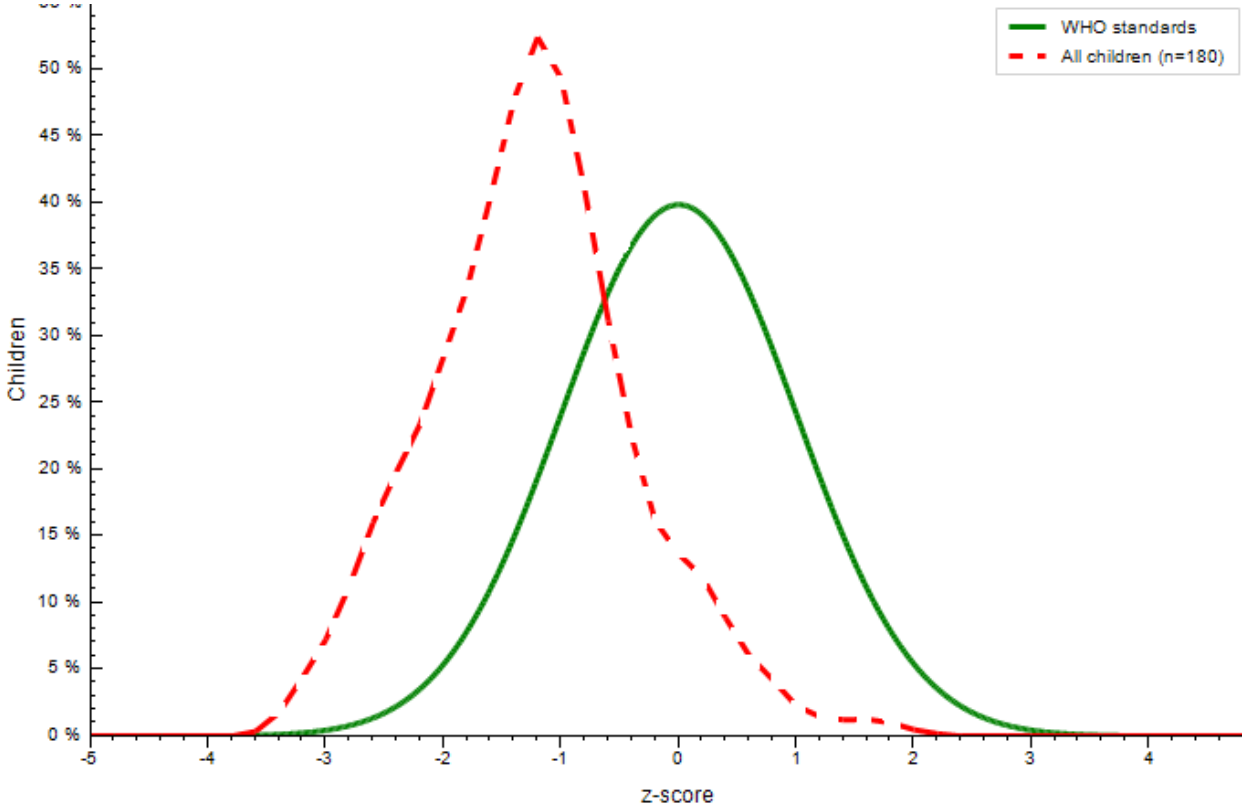

Fig 4.6.1.d Distribution of MUAC for age among 6 to 59 months children of *Tharu* community of *Khanar* based on WHO standards

The prevalence of wasting based on MUAC measurement is shown in table 4.6.d. Based on MUAC measurement 0.6% children was found to be severely wasted while 9.4% children were found to be moderately wasted.

Table 4.6.1 Distribution of wasting based on MUAC measurement

MUAC	Frequency	Percent
Severe	1	0.6
Moderate	17	9.4
Normal	162	90

In this study the rate of stunting was found to be lower than that of the national data while the rate of underweight was slightly higher but wasting was found to be around 2.5 times higher than that of the national data. The higher prevalence of wasting might be due to unhygienic practices, low diversity of food and inappropriate time for initiation of weaning food. Another reason for higher prevalence of wasting might be due to seasonal

variation as the data collection was done during summer season. Also the lower prevalence of stunting might be due to protective nursing during early life, proper care of mother during pregnancy and the greater coverage of health facilities regarding private and governmental health institutions in the study area.

4.7 Factors associated with under nutrition of children

Under nutrition was assessed by stunting, wasting and underweight. Chi-square test and Fischer exact test was used to identify the characteristics that were related to nutritional status of children.

4.7.1 Factors associated with stunting

Table 4.7.1 shows, Fischer exact test and chi-square test analysis results of factors associated with stunting. No association was found between stunting and any of the factors such as type of family, annual income, weight at birth, exclusive breast feeding, colostrum feeding, diversity of food and age in month. This may be due to most of the children were exclusively breast fed till 6 months of age, most of them were fed colostrum. Also the another reason for no association between stunting and any of the factors might be due to the greater coverage of health facilities regarding private and governmental health institutions in the study area.

Table 4.7.1 Factors associated with stunting among 6 to 59 months children of *Tharu* community of *Khanar, Sunsari*

		STUNTING			
Factors		Stunted	Normal	$\chi 2$	P-value
Type of family	Joint	19 (21.6%)	69 (78.4%)		
	Nuclear	26 (28.3%)	66 (71.7%)	2.179	0.336
Annual income	Less than 1 lakh	4 (15.4%)	22 (84.6%)		
	More than 1 lakh	41 (26.6%)	113 (73.4%)		0.461*
Weight at birth	Less than 2.5 kg	3 (13.6%)	19 (86.4%)		
	2.5 or more than 2.5 kg	42 (26.6%)	116 (73.4%)		0.531*
Exclusive breast feeding	No	10 (19.6%)	41 (80.4%)		
	Yes	35 (27.1%)	94 (72.9%)	1.158	0.56
Diversity of food	Less than 4	25 (23.6%)	81 (76.4%)		
	More than or equal to 4	20 (27.1%)	54 (73.0%)	1.423	0.491
Colostrum feeding	No	8 (21.1%)	30 (78.9%)		
	Yes	37 (26.1%)	105 (73.9%)	0.467	0.792
Age in month	< 24 month or 24 month	9 (16.1%)	47 (83.9%)		
	>24 month	36 (29%)	88 (71.0%)	3.923	0.141

* Fischer exact p- value

4.7.2 Factors associated with wasting

Weight of the child at birth (p= 0.007) and diversity of food (p=0.000) was found to be significant with wasting. While the factors like type of family, annual income, exclusive breastfeeding, colostrum feeding and age of children were found to be insignificant with wasting.

The association of weight of the child at birth and wasting was found to be statistically significant. The findings of the study revealed that the children weighing less than 2.5 kg at birth were found to be more wasted than the children weighing 2.5 or more than 2.5 kg at birth.

This findings can be supported by the findings of study conducted by Adeba *et al.*, in Ethiopia which revealed that low birth weight of child is significantly associated with wasting ($p<0.01$) (Adeba *et al.*, 2014).

The findings of our study can also be supported by the findings of study conducted by Amrita *Pradhan* in *Lalitpur* Nepal which showed that birth weight of child has significant

association with wasting. The study shows that wasting is higher among children with smaller size at birth than children with average or bigger size at birth (Pradhan, 2010).

Diversity of food was also found to be significantly associated with wasting (p= 0.000). Children who were given foods from less than 4 food groups were found to be more wasted than children who were given foods from more than or equal to 4 food groups.

The findings of our study can also be supported by the findings of the study conducted in Filipino which revealed that dietary diversity was found to be significantly associated with wasting (Guirindola *et al.*, 2015).

The findings of our study can also be supported by the findings of Kariuki, 2011 in the study of relation between dietary diversity and nutritional status of children under five years in kitui district, Kenya which revealed that there was positive correlation between dietay diversity and wasting (Kariuki, 2011).

Table 4.7.2 Factors associated with wasting among 6 to 59 months children of *Tharu* community of *Khanar, Sunsari*

		WASTING			
Factors		Wasted	Normal	$\chi 2$	p-value
Type of family	Joint	29 (32.9%)	59 (67%)		
	Nuclear	19 (20.7%)	73 (79.3%)	3.641	0.162
Annual income	Less than 1 lakh	10 (38.5%)	16 (61.5%)		
	More than 1 lakh	38 (24.6%)	116 (75.3%)		0.281*
Weight at birth	Less than 2.5 kg	11 (50%)	11 (50%)		
	2.5 or more than 2.5 kg	37 (23.5%)	121 (76.6%)		0.007*^{o}
Exclusive breast feeding	No	12 (23.5%)	39 (76.5%)		
	Yes	36 (27.9%)	93 (72.1%)	0.384	0.825
Diversity of food	Less than 4	41 (38.7%)	65 (61.3%)		
	More than or equal to 4	7 (9.5%)	67 (90.5%)	19.027	0.000^{o}
Colostrum feeding	No	9 (23.7%)	29 (76.3%)		
	Yes	39 (27.5%)	103 (72.5%)	0.221	0.895
Age in month	<24 month or 24 month	19 (33.9%)	37 (66.1%)		
	> 24 month	29 (23.4%)	95 (76.6%)	2.873	0.238

***** Fischer exact p- value, ^{o}Statistically significant (p<0.05)

4.7.3 Factors associated with underweight

Diversity of food was found to be significantly associated with underweight of children (p=0.000). Children who were given foods from less than four food groups were found to

be more underweight than those who were given foods from more than or equal to four food groups.

The findings of our study can be supported by the findings of dietary diversity and nutritional status of Urban primary school children from Iran and India which revealed that dietary diversity scores was lowest for underweight children (Hooshmand and Udipi, 2013).

Table 4.7.3 Factors associated with underweight among 6 to 59 months children of *Tharu* community of *Khanar, Sunsari*

		UNDERWEIGHT			
Factors		Underweight	Normal	$\chi 2$	p-value
Type of family	Joint	34 (38.6%)	54 (61.4%)		
	Nuclear	23 (25%)	69 (75.0%)	4.102	0.129
Annual income	Less than 1 lakh	9 (34.6%)	17 (65.4%)		
	More than 1 lakh	48 (31.1%)	106 (68.8%)		0.303*
Weight at birth	Less than 2.5 kg	9 (40.9%)	13 (59.1%)		
	2.5 or more than 2.5 kg	48 (30.4%)	110 (69.6%)		0.568*
Exclusive breast feeding	No	16 (31.4%)	35 (68.6%)		
	Yes	41 (31.8%)	88 (68.2%)	0.366	0.833
Diversity of food	Less than 4	46 (43.7%)	60 (56.6%)		
	More than or equal to 4	11 (14.9%)	63 (85.1%)	16.8	0.000^{o}
Colostrum feeding	No	11 (29%)	27 (71.1%)		
	Yes	46 (32.4%)	96 (67.6%)	0.178	0.915
Age in month	<24 month or 24 month	17 (30.4%)	39 (69.6%)		
	>24 months	40 (32.2%)	84 (67.7%)	0.134	0.935

*****Fischer exact p-value, **^{o}**Statistically significant ($p<0.05$)

4.8 Food taboos

Key Informant Interview was done to collect information's on food taboos. Two teachers (males) and five old peoples (3 males and 2 females) were interviewed about taboos of *Tharu* community. Different types of food taboos were found to be followed by the mothers during pregnancy. Those taboos were found to be followed due to the fear of abortion, fear of affecting their health as well as in the fear of affecting child's health. Some mothers were also found to follow those taboos because those taboos were being followed by their ancestors since long time.

Table 4.8 Food taboos of *Tharu* community and their reasons

Food taboos	**Reasons**
Women should avoid dry fish and dry meat till 2 years after giving birth.	The reason behind this was that dry meat and fish will transfer into the stomach of child through breast milk and cause stomach ache. Some mothers also said that consuming dry meat and fish after giving birth to child will cause death of mothers.
Women should avoid cold foods (banana, apple, bottle gourd, ladies finger, pumpkin, green leafy vegetables, etc.) after pregnancy.	The reason behind this was consuming those foods will cause cold to babies.
Women should consume more ginger than usual during and after pregnancy.	The reason behind this was consuming more ginger by mother during and after pregnancy will protect both mother and child from cold.
Women should eat less than usual during pregnancy.	The reason behind this taboo was consuming more food during pregnancy will make the baby fat and will cause problem during labor. Some of the mothers also said that baby born from the fat mother will be thin.
Pea, gram and beaten rice should be avoided by women during pregnancy.	The reason behind this was it will affect the child in the womb.
Women should avoid papaya, cucumber, pineapple, ash gourd during pregnancy.	The reason behind this was consuming papaya, cucumber, pineapple, ash gourd during pregnancy will lead to abortion.
Women should avoid foods like black gram, brinjal, khesari dal, pumpkin, potato, egg, etc. after pregnancy.	The reason behind this was consumption of such foods after pregnancy will lead to the infection of navel of baby as well as it will delay the healing of wound of mother.
Mothers believed that rice should not be given to their child during fever.	The reason behind this was consuming rice during fever will increase fever.
It is believed that eggs should not be given to a child until he/she reaches 2 years of age.	The reason behind this taboo was the children who will be given egg before 2 years of age will not be able to walk.

Food taboos	Reasons
Mothers believed that rice should not be given to their child during fever.	The reason behind this was consuming rice during fever will increase fever.
Mothers believed than meat, fish and egg should not be given to child during fever.	The reason behind this was consuming meat, fish and during fever can cause jaundice.
Yam should be avoided during pregnancy.	Consumption of yam during pregnancy will produce patches on the skin of baby as well as it can also lead to abortion.
Meat and fish should not be eaten together.	People of this community believed that meat and fish are eaten together by the person whose father and mother are dead.
Milk and egg should not be eaten together.	The reason behind this was milk is pure and egg is impure.
If the child suffers from cold then the mother should be given food only one time a day.	The reason behind this was if the mother consumes more then more milk will be produced and child will get cold.

In earlier times pregnant women were given only rice, salt and ginger. And also pregnant women were given food only two times a day. But this taboo is not followed nowadays.

Food taboos influence the nutritional status of people because most of the food tabooed was rich source of carbohydrate, proteins and different micronutrients. Most of the taboos were meant for vulnerable group of society like pregnant women and children. They were being deprived of good source of protein, carbohydrate, vitamins and minerals that were needed for growth and repair of worn out tissues.

Part V

Conclusions and recommendation

5.1 Conclusions

The aim of the present study was to access the prevalence of malnutrition, identify the cause of malnutrition among children age 6 to 59 months of *Tharu* community as well as to find out the different types of food taboos of this community. Following points can be concluded from this study:

1. The prevalence of malnutrition among children under 6 to 59 months age of *Tharu* community was 25%, 26.7% and 31.1% for stunting, wasting and underweight respectively.
2. There was no association between any of the variables and stunting.
3. Low birth weight and diversity of food was associated with wasting.
4. Diversity of food was associated with underweight.
5. There is the wide prevalence of many food taboos in this community that can affect the nutritional status of both mothers and children under five years of age.
6. The result of this study will be useful for the policy makers in their endeavor to formulate various developmental and health care programs.
7. Understanding the food taboos of that community will be helpful in formulating various nutritional programs effectively.

5.2 Recommendations

1. Health education program should be conducted targeting behavior change for pregnant women, lactating mothers and caretakers of the children, with a special focus on hygiene and sanitation and appropriate IYCF practices.
2. Professional in the study should disseminate health information on importance of colostrum feeding and exclusive breast feeding.
3. More attention should be given on feeding and hygienic practices, so that problem of malnutrition can be reduced to minimum.
4. Nutrition education program should be conducted to make people aware of food taboos.

5. Appropriate interventions programs like supplementary feedings programs should be implemented to improve the nutritional status of severely acute malnourished children.
6. Most of the mothers were found to give water to their child before 6 months of age. So proper nutrition education program regarding breastfeeding practices should be conducted.
7. Further study should be done to see other unexplored factors that were not included in the present study.

Part VI

Summary

Nutrition condition of the children does not only serve as a health indicator, but it is also vital for the children susceptibility of many other diseases. Having knowledge of prevalent food taboos of a community helps in the implementation of nutrition education program in an effective way. The study was conducted to access the factors associated with nutritional status of children age 6 to 59 months of *Tharu* community of *Khanar, Sunsari* as well as to find out the food taboos of that community.

The study included 180 children selected randomly from 3 wards of *Khanar, Sunsari.* Cross-sectional descriptive survey using a semi-structured questionnaire was administered to the mother or care taker of children to determine the associated factors while anthropometric measurement was used to determine the prevalence of malnutrition among survey children based on WHO reference. KII questionaires was administered to the teachers and some of the old people of that community to find out the food taboos. Data collected was analysed using WHO anthro version 3.2.2 and SPSS version 20. Chi-square test and Fischer exact test was used to analyse the factors associated with malnutrition.

Out of 180 children 96 were females and 84 were males.22.2% mothers were illiterate while 23.9%, 36.7% and 17.2% mothers were found to have primary, secondary and higher secondary and above education respectively. 71.7% of the children were exclusively breastfed. 76.1% mothers were found to be at age more than 20 during first pregnancy. 98.3% mothers had taken iron and folate tablet during pregnancy. 25% children were found to be stunted, 31.1% were underweight and 26.7% were wasted. Wasting was found to be higher in females than in males 29.2% and 23.8% respectively. Stunting was found to be similar in both males and females. Underweight was found to be higher in females than in males 32.3% and 29.8% respectively.

Birth weight and diversity of food was found to be significantly associated with wasting ($p<0.05$) and diversity of food was found to be associated with underweight ($p< 0.05$). There was no association between any of the factors with stunting.

Result of this study indicate that malnutrition among 6 to 59 months of children of *Tharu* community of *Khanar, Sunsari* is still an important problem and also there is still a wide prevalence of food taboos in this community.

Part VII

References

Acharya, D., Gautam, S., Kaphle, H. P. and Naupane, N. (2013). Factors associated with nutritional status of underfive children in Rupandehi district of Nepal.

Adeba, A., Garoma, S., Fekadu, H. and Garoma, W. (2014). Prevalence of wasting and its associated factors of children among 6 to 59 months age in Guto Gida district, Oromia regional state Ethopia. *Food Science and Quality Management*. 24.

Adhikari, R. K. (2010). Food utilization practices, beliefs and taboos in Nepal an overview [Report]. 10-01-367.

Bennett, L., Dahal, D. R. and Govindasamy, P. (2008). Caste, Ethnic and Regional identity in Nepal: Further Analysis of the 2006 Nepal Demographic and Health Survey [Report].

Bhandari, T. R. and Chhetri, M. (2013). Nutritional status of under five year children and factors associated in Kapilvastu district, Nepal.

Chaudhary, S. (2015). Nutritional status of children 6 to 59 months of age in Tharu Community of Itahari, Sunsari district. Bachelor Central campus of thechnology, Tribhuvan University.

Chhetri, P. S. G. (2005). Factors associated with malnutrition among children in rural Terai of Eastern Nepal. Master Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST).

Dewey, K. (2001). Guiding principles for complementary feeding of the breastfeed child [Report].

Gadegbeku, C., Wayo, R., Ackah - Badu, G., Nukpe, E. and Okai, A. (2013). Food taboos among residents at Ashongman - Accra, Ghana. *Food Science and Quality Management*. 15.

Gaurav, k., Pradhan, P., Bhattarai, S. and Pokharel, P. (2004). Malnutrition Status Among Under - 5 Children in a Hill Community of Nepa. *Kathmandu university medical journal*. **12** (48).

Gilbert, H. (2014). Determinants of malnutrition among under five children in Nakaseke and Nakasongola districts, Uganda. Master Makerere university.

Guirindola, M. O., Malabad, C. G., Maniego, L. V. and Punzalan, S. L. M. (2015). Association between dietary diversity score and nutritional status of Filipino children 6-23 months. *European journal of hospital pharmacy*. 5.

Hartog, A. P. d., Staveren, W. A. v. and Brouwer, I. D (2006). "Food habits and consumption in developing countries".

Hooshmand, S. and Udipi, S. A. (2013). Dietary diversity and nutritional status of urban primary school children from Iran and India. *Nutritional disorders & therapy*.

Jelliffe, D. B. (1966). The assessment of the nutritional status of the community [Report]. Vol. 53.

Joshi, P. C. (2012). Malnutrition in Children: A Serious Public Health Issue in Nepal. *Health Prospect*. 11, 61-62.

Joshi, S. A. (2011). "Nutrition and Dietetics" (Third ed.). Tata McGraw Hill Education Private Limited. 7 West Patel Nagar, New Delhi 110 008.

Joshi, Y. (2008). "Basics of clinical nutrition". Jaypee Brothers Medical Publishers (P) Ltd. . New Delhi.

Kariuki, L. W. (2011). Relation between dietary diversity and nutritional status of children under five years in Kitui District, Kenya. Master of science in applied human nutrition University of Nairobi.

Kennedy, G., Ballard, T. and Dop, M. (2011). Guidelines for measuring household and individual dietary diversity [Report].

Kennedy, G. L. (2009). Evaluation of dietary diversity scores for assessment of micronutrient intake and food security in developing countries. Phd Wageningen University.

Koppad, R. and Dhar, M. (2015). PEM in Relation to Birth Order and Birth Interval in Children Aged 1-6 Years in Urban Slums of Mysore City.

Latham, M. C. (1997). "Human Nutrition in the Developing World". Vol. 29.

Lesiapeto, M. S. (2009). Factors associated with nutritional status of children aged 0 to 60 months residing in Eastern Cape and KwaZulu-Natal Provinces. School of Physiology, Nutrition and Consumer Sciences of the North-West University, Potchefstroom Campus.

Mengistu, K., Alemu, K. and Destaw, B. (2013). Prevalence of malnutrition and associated factors among children aged 6 to 59 months at Hidabu, Abote district, North

Shewa, Oromia Regional State. Institute of Public Health, College of Medicine and Health Sciences, University of Gondar.

MoHP. (2004). National Nutrition Policy and Strategy [Report].

MoHP. (2011). "Nepal Demographic and Health Survey".

Molina, D. H. (2012). The Review of Health and Nutrition Indicators in Early Childhood [Report].

Nag, M. (1994). Beliefs and Practices About Food During Pregnancy [Report].

Nkengla, L. and Teri, D. (2016). Influence of food taboos in nutritional patterns in rural communities in Cameroon. *International Review of Social Research*. **6** (1), 35-39.

NHS. (2015). Malnutrition. Retrieved from http://www.nhs.uk/Conditions/Malnutrition/Pages/Introduction.aspx.

Pradhan, A. (2010). Factors associated with nutritional status of the under five children. *Asian Journal of Medical Sciences*. 1, 6-8.

Piniel, A. (2016). Factors contributing to severe acute malnutrition among the under five children in Francistown-Botswana.

Ruwali, D. (2011). Nutritional status of children under five years of age and factors associated in Padampur VDC, Chitwan. *Health Prospect*. 10 (10).

Sapkota, V. and Gurung, C. (2009). Prevalence and predictors of underweight, stunting and wasting in underfive children. **7** (2), 120-126.

Swaminathan, D. M. (2014). "Food & Nutrition" (Second ed.). Vol. 2. The Bangalore Printing & Publishing CO., LTD. No.88, Mysore Road, Bangalore-560 018.

Swindale, A. and Bilinsky, P. (2006). Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide [Report]. Vol. 2.

UNICEF. (2016). Nepal National Micronutrient Survey (NMS) [Report].

UNICEF. (2017). Breastfeeding and complementary feeding. Retrieved from https://www.unicef.org/nutrition/index_breastfeeding.html.

USAID. (2014). Nepal Nutrition Profile [Report].

WHO. (1997). WHO Global Database on Child Growth and Malnutrition. 30-59.

WHO. (2005). Malnutrition [Report]. 1728-1652. Vol. 12.

WHO. (2010). Indicators for assessing infant and young child feeding practices [Report].

Yuen, I. (2013). Reflections of Nepal: The Tharu of the Terai. Retrieved from https://ekostories.com/2013/01/24/nepaltraveltharuterai/.

Zepro, N. B. (2015). Food taboos and misconception among pregnant women of Shashemene district, Ethopia. *Science journal of public health*. 3 (3).

Part VIII

Appendices

Appendix-A

Questionnaire

Basic information

S.N	Date:	
Name of child:		
Date of birth:	Gender:	
Address:	Municipality:	Ward no:

Detail of family members

S.N	Name	Relation with child	sex	Age	S.N	Name of child under 5 years	sex	Age
1								
2								
3								
4								
5								
6								

1. Number of family members:
2. Type of family: single/joint
3. Occupation (of mother) : business/ agriculture/ service/ others
4. Occupation of husband : business/ agriculture/ service/ others
5. Education level of your husband: primary/ secondary/ higher secondary and above/illiterate/don’t know

6. Mothers educational level : primary/ secondary/higher secondary and above/ don't know
7. Income per annum : less than 1 lakh/ 1to 3 lakh/ more than 3 lakh
8. Is your income enough for food consumption : yes/no
9. Type of house : temporary/ permanent

Child's information

10. Which child is this (first, second, third..):
11. Weight at the time of birth:
12. Death of any child under five : (yes/ no)
13. If yes how many:
14. Cause of death:

Child care information

15. Did you breastfeed the child immediately after birth: yes/ no
16. If yes after how many hours? Within 1 hr/ within 8 hr/ within 24 hr/ no
17. When did you stop breast feeding?
18. Did you breastfeed exclusively? Yes/no
19. Did you feed colostrum immediately after birth? Yes/ no
20. Did you give prelacteal feed to your baby after birth? Milk/ honey/ molasses / ghee/lactogen/ none
21. Do you know about complementary feeding?
22. If yes when did you start? 4 month/ 5 month/6 month/7 month/no
23. Do you know how to prepare lito at home? Yes/ no
24. If yes how?
25. Do you know how to prepare ORS? Yes/no

Health and immunization information

26. Have you vaccinated your child? Yes/ no
27. Have you given vit A and deworming tablet? Yes/ no
28. Did you get vaccination during pregnancy? if yes which one? (polio/ BCG/ DPT/ TT/ No)

29. Where do you take your child if he/ she sick? (health centre/ pharmacy/ *Dhami*/ health centre and *Dhami* both)

Mother's information

30. At what age did you get married?
31. How old were you during first pregnancy? Less than 20/ more than 20
32. Have you taken iron folate tablet? Yes/ no
33. Do you know about malnutrition? Yes/ no
34. If yes how? Inadequate food/ curse of god/ witch craft/ others/ don't know
35. Do you know what are the reason for marasmus? Yes/ no
36. How much have you taken food during pregnancy? More than usual/ less than usual/ as usual
37. What type of salt is used in your household? Iodised salt/ non iodised salt

Environment and sanitation information

38. Which source of water do you use? (tap/ well/ river/ borin)
39. How do you clean your drinking water? (filtration/ chlorination/ by boiling/ none)
40. How do you manage household waste and its disposal? (digging/ burning/ managed by municipality/ others)
41. Do you have toilet at your home? Yes/ no

Anthropometric measurement of children under five

S.N.	**Height**	**Weight**	**MUAC**	**Oedema (Yes/No)**

KII (Key Informant Interview) Questionnaires for food taboos

1. Do women avoid dry fish and dry meat till 2 years after giving birth? Yes/ no. If yes why?
2. Do women should avoid cold foods (banana, apple, bottle gourd, ladies finger, pumpkin, green leafy vegetables, etc.) after pregnancy? Yes/ no. if yes why?

3. Do women should consume more ginger than usual during and after pregnancy? Yes/ no. If yes why?
4. Do women should eat less than usual during pregnancy? Yes/ no. If yes why?
5. Do pea, gram and beaten rice should be avoided by women during pregnancy? Yes/ no. If yes why?
6. Do women should avoid papaya, cucumber, pineapple, ash gourd during pregnancy? Yes/no. If yes why?
7. Do women should avoid bitter gourd during and after pregnancy until they breastfed their babies? Yes/no. If yes
8. Do Women should avoid foods like black gram, brinjal, khesari dal, pumpkin, potato, egg, etc. after pregnancy? Yes/ no. If yes why?
9. Is it true that eggs should not be given to a child until he/she reaches 2 years of age? Yes/ no. If yes why?
10. Is it true that meat, fish or egg should not be given to their children? Yes/ no. If yes who?
11. Is it true that rice should not be given to their child during fever? Yes/ no. If yes why?
12. Is it true that meat, fish and egg should not be given to child during fever? Yes/ no? If yes why?
13. What are the other food taboos prevalent in your community?

24 hour dietary recall

Children

Timing	**Description of food or drink**
Breakfast (6 to 9 a.m.)	
Lunch (9 to 11 a.m.)	
Snacks (1 to 5 p.m.)	
Dinner (9 to 11 p.m)	

Appendix-B

Consent Letter

Namaste!

I Miss Samiksha Niroula, 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 "Nutritional status of 6 to 59 months old children and existing food taboos in *Tharu* community of *Khanar, Sunsari*."

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 Participant:

…….. ……

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 Khanar

Appendix-D

Photo gallery