FACTORS ASSOCIATED WITH NUTRITIONAL STATUS OF 6 –59 MONTHS CHILDREN IN SUKUMBASI BASTI NORTHWEST BOUNDARY OF SARDHU KHOLA, DHARAN

by

Swaichchha Basnet

Department of Nutrition & Dietetics

Central Campus of Technology

Institute of Science and Technology

Tribhuvan University, Nepal

2017

Factors associated with nutritional status of 6-59 months children in *Sukumbashi basti* northwest boundary of sardhu khola, *Dharan*

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

by

Swaichchha Basnet

Exam Roll no.:80095

TU Registration No: 5-2-0008-0072-2012

Department of Nutrition & 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 & Dietetics

Central Campus of Technology, Dharan

Approval Letter

This dissertation entitled *Factors associated with nutritional status of 6-59 months children in Sukumbashi basti NorthWest boundary of Sardhu khola, Dharan* presented by Swaichchha Basnet 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 Bdr Khadka, Asst. Prof.)

2. External Examiner ……

(Mr. Birendra kumar Yadav, Assoc. Prof.)

3. Supervisor ……

(Mrs. Babita Adhikari, lecturer)

4. Internal Examiner ……..…

(Mrs. Pallavi Vyas, Teaching Asst.)

July21, 2017

Acknowledgements

First and foremost I offer sincerest gratitude to my supervisor, lecturer Mrs. Babita Adhikari, my research wouldn't have undertaken without the support of her. I would take this opportunity to express my deepest appreciation to all those who provided me the possibility to complete this research and helped me all the way by providing their precious time, support, love, knowledge and guidance.

I would like to express my profound sense of gratitude to my respected co-supervisor Mr. Homnath Baral for his excellent guidance, useful suggestion and proper encouragement during the course of this work.

I would like to thank the Central Campus of Technology especially all teachers of my department committee for their input, valuable discussions and accessibility. In particular, I am also grateful to Dambar Bdr. Khadka, Head of Department of Nutrition and Dietetics, Central Campus of Technology. I am extremely thankful and indebted to him for sharing expertise, and sincere and valuable guidance and encouragement extended to me and also for providing me with all the necessary facilities for the research.

And most importantly, I would like to thank my friends Priyanka chudal, Samiksha Basnet, Sudip Rai, Utsab Dhakal, Samiksh Niroula and Pritika Shakya for their support, encouragement, quiet patience and unwavering love were undeniably the bedrock upon which the past four years of my life have been built. I also place on record, my sense of gratitude to one and all, who directly or indirectly, have lent their hand in this venture.

Date of submission: July21, 2017 …….

Swaichchha Basnet

Abstract

This research was conducted to assess the factors associated with nutritional status of under five year children in *sukumbashi Basti northwest boundary of sardhu khola*, Dharan. Anthropometric measurements and structured questioners were used. Anthropometric measurement was then used to determine nutrition status of children (underweight, wasted and stunted) based on WHO references. Statistical Package for Social Science (SPSS) 20 version and World Health Organization (WHO) Anthro 3.2.2 version were used for analyzing the data. Fischer exact and Chi- Square test was used to identify the associated factors of malnutrition

Based on WHO classification, Out of 162 children, stunted, wasted, underweight and overweight were found to be 32.7%, 6.2%, 15.4% and 3.1% respectively. Severe underweight, severe stunted and sever wasted were found to be 4.9%, 9.9% and 4.3% respectively. Result showed that the highest percentage of stunting, wasting ,underweight and overweight in that age group were found to be 52.4% in 48-59 months, 12.1% in 12-23 months, 24.2% in 12-23 months and 10.7% in 6-11 months respectively. According to MUAC based on WHO classification wasting was found to be 22.2%. Result showed that wasting based on MUAC measurement 2.5% children was found to be severely wasted while 19.7% children were found to be moderately wasted. Wasting, stunting, underweight and overweight were found to be higher in male. The survey result conducted that among the associated factors studies gender was associated with stunting. Weight of birth i.e. low birth weight was associated with underweight and wasting. Age during pregnancy was associated with underweight. Age of mother and education of mother was associated with wasting and underweight. There were no association between weight of birth, age during pregnancy, mother's education and age of mother with stunting.

Contents

List of Tables

List of Figures

List of Abbreviations

Abbreviations	Full forms
BMI	Body Mass Index
BW	Body Weight
CF	Complementary Feeding
HAZ	Height for Age Z-score
ICMR	Indian Council of Medical Research
IDD	Iodine Deficiency Disorder
LBW	Low Birth Weight
MDG	Millennium Development Goal
MoPH	Ministry of Health Population
MUAC	Mid-Upper Arm Circumference
NDHS	Nepal Demographic Health Survey
NGO	Non-Government Organization
NMICS	Nepal Multiple Indicator Cluster Survey
NMIS	Nepal Multiple Indicator Surveillance
RDA	Recommended Dietary Allowance
PEM	Protein Energy Malnutrition
SAM	Severe Acute Malnutrition
UMN	United Mission to Nepal
UNICEF	United Nations International Child Emergency Fund
USAID	United State Agency for International Development
VAD	Vitamin A Deficiency
VDC	Village Development Community
WAZ	Weight for Age Z-score
WB	World Bank
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight for Height Z-score

PART-I

Introduction

1.1 Background

Malnutrition has been defined as a pathological state resulting from a relative or absolute deficiency or excess of one or more of the essential nutrients in the diet (Jelliffe, 1966). Malnutrition remains a serious obstacle to child survival, growth and development in Nepal. Prevalence of malnutrition among under five children is high with 48.6% in the country. Protein-energy malnutrition (PEM) and micronutrient deficiency are most common types of malnutrition. Under nutrition remains as a serious problem in under-developed countries, resulting from consumption of poor diet over a long period (Awan, 1997).

Protein energy malnutrition has been a common health problem of the third world countries Stunting and wasting are common patterns of under-nutrition in children. In children, acute nutritional deficit and/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 tests, clinical observation, functional assessment, dietary survey, ecological study and study of vital statistics. However, individual nutritional status has been reported to vary on the basis of person's living conditions, available food supply, health and socio-economic status. WHO estimates that 175 million children in the developing world are malnourished as indicated by low weight-for-age and 230 million are stunted as indicated by height for age. It is recognized that the majority of deaths among children in the developing world are associated with malnutrition (Acharya *et al.*, 2013).

Malnutrition is a serious problem because it causing the deaths of 3.5 million children under 5 years old per- year in the world, as well as it is at third level in the world of the disease burden in this age group. Even though globally, childhood malnutrition declined relatively during the year 1990's; its prevalence in Africa actually increased even during

1990'. More than 25% under five children in the developing world are malnourished which accounts about 143 million children (Nutrition and science, 2014).

Malnutrition in its several forms of under nutrition, namely wasting, stunting and underweight has been coined as the "silent emergency" by the United Nations Children's Fund (UNICEF). It has been associated with endangering women and children across the world. To address the issue of child hunger and under nutrition, one of the primary objectives of the Millennium Development Goals (MDG) has been to improve the nutritional status of children worldwide under nutrition, which is focus of this study, conversely has been estimated to be an underlying cause for around half of all child deaths worldwide. It has different types of measurements. Due to this fact, malnutrition continues to be a significant public health and development concern not only in developing country but also in the world. Then child malnutrition still remains a public health problem mostly in developing countries including Nepal (Nutrition and science, 2014).

According to 2011 census, the total population of Nepal is 26.6 million. More than 83% of population resides in rural area. The infant and under five mortality rates are 64.2 and 91 per 1000 respectively. The population growth rate in 2011 is 1.41%. Prevalence of malnutrition among under five children is high with 48.6% in the country. Protein-energy malnutrition (PEM) and micronutrient deficiency are most common types of malnutrition. As of the 49% of children below 5 years of age are stunted and 20% are severely stunted. The survey also showed that 13% of the children are wasted and 3% are severely wasted and 39% of the children below 5 years are under weight and 11% are severely underweight. Similarly 2011 shows that 41% of children under 5 years of age are stunted, and 16% are severely stunted. The survey also shows that 11% of children are wasted and 3% are severely wasted and 29% of children below 5 year of age are underweight and 8% are severely underweight (NDHS, 2011).

In general, the nutritional status of children in Nepal has improved over the last 10 years. The proportion of stunted children declined from 57% in 2001 to 41% in 2011 and that of underweight children from 43 to 29% in the same period. The proportion of wasted children declined, too, but only slightly, from 13% in 2006 to 11% in 2011, among the 11% who are

wasted, 3% are severely wasted. Forty-one percent of children under five are short for their age, and 16% are severely stunted (Rijal *et al.*, 2011).

Good nutrition is a prerequisite for the national development of countries and for the well-being of individuals. Although problems related to poor nutrition affect the entire population, women and children are especially vulnerable because of their unique physiology and socioeconomic characteristics. Low birth weight, mother's education, knowledge about the micronutrient (vitamin A, iron and iodine), management of diarrhea, feeding practice and complementary practice, marriage, age, economic status are the factor affecting the nutritional status (Dhungana, 2013). Different studies showed that the causes of malnutrition in the children can be tackled. There are lack of knowledge related to health and nutritional and economic constraints. Social and cultural factors need to be addressed properly before developing and implementing any nutritional programs in Nepal. Our country took a diverse change together in pursuit of a common goal to reduce under nutrition and launched the country's new multi-sector nutritional plan 2013- 2017; in Kathmandu (KantipurNationalDaily, 2012).

1.2 Justification and problem statement

Dharan town is located at the northern part of the Sunsari district, in the foothill of the eastern Mahabharata range, Koshi zone of the eastern development region of Nepal. A dense forest which is a part of famous Charkoshe jhadi lies in the south. The North West boundary is sardu khola and eastern boundary of municipality is Syouti Khola. Selected area include sukumbashi area of Dharan North West boundary. That area lies in Terai region and is nearly about 2.2 km south west from Dharan bhanuchowk which includes Naulo basti, Devi Gaun and Gauri Gaun . This municipality consists of people of different ethnic groups and different economic status. Mostly Rai, limbu, Dalit, Tamang, Malik, Brahmin, Chhetri etc. The major occupation of the place is labor. There are 162 children of 6-59 months of age (Dharan municipality).

Nutritional status of people of developing countries is significantly poor. Much of the burden of deaths resulting from malnutrition, estimated to be over half of childhood deaths in developing countries, can be attributed to just mild and moderate malnutrition, varying

from 45% for deaths due to measles to 61% for deaths due to diarrhea. Malnutrition, especially under-nutrition and various forms of nutrient deficiencies are wide spread and mostly prevalent in rural areas. Major types of nutritional problems in developing countries are under-nutrition and nutritional disorders which are resulting from inadequate food intake both in quality and quantity, particularly of calories, proteins, vitamins and minerals; and parasitic infection and disease (Burk, 1984).

Many of the people in *Sukumbashi basti*, North West boundary of sardhu khola, *Dharan* were employed as labour. They are living as *Sukumbasi*. There are two pipe line for drinking water, one from kali khola and next from tap water. Children under five age are very vulnerable to malnutrition. These children from higher rank family are mostly provided with optimum nutrient and are well breastfed from their parents and they often become overweight. The children from low income family are breastfed properly, complementary foods are also not provided sufficiently and also early marriage i.e. age of mother during pregnancy leads to high chance of malnutrition. Nutritional problem are complex in their etiology, and there are many nutritional deficiency disease in the community. So this survey was undertaken to find the nutritional status and factors associate to it in *Sukumbashi Basti* northwest boundary of sardhu khola, *Dharan* (Personal communication).

1.3 Objectives

1.3.1 General objective

The main objective of the study is to assess factors associated with nutritional status of 6- 59 months children in *Sukumbashi basti* northwest boundary of sardhu khola, Dharan.

1.3.2 Specific objectives

a) To assess the nutritional status of children between 6 – 59 month of age in the community.

b) To find the factor associated with the nutrition status of 6-59 months of age in the community.

1.3 Research question

a) What is the present condition of Nutritional status of children (6-59 months old age) in *Sukumbashi basti* northwest boundary of Sardhu khola, Dharan?

b) What are the factors associated with Nutritional status of children (6-59 months old age) in *Sukumbashi basti* northwest boundary of Sardhu khola, Dharan?

1.4 Significance

The findings of this study will be helpful to

a) Provide information regarding the nutritional status of children between 6 – 59 month of age to the governmental and non-governmental organization which will be helpful to initiate corrective measures for the problem.

b) Make people aware about the current real situation of nutritional status in their surroundings.

c) Encourage people for the improvement of their present status by improving their feeding practices of their children and hygienic condition of their surroundings.

d) Act as guide for the development of proper nutritional program in this community by undertaking the discovered facts.

e) Act as tool to discover the problems related to nutrition and feeding practices of this area.

1.6 Limitations

a) This study was conducted in the single area, so it may not be representative of whole *sukumbashi basti* 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.

1.7 Conceptual framework

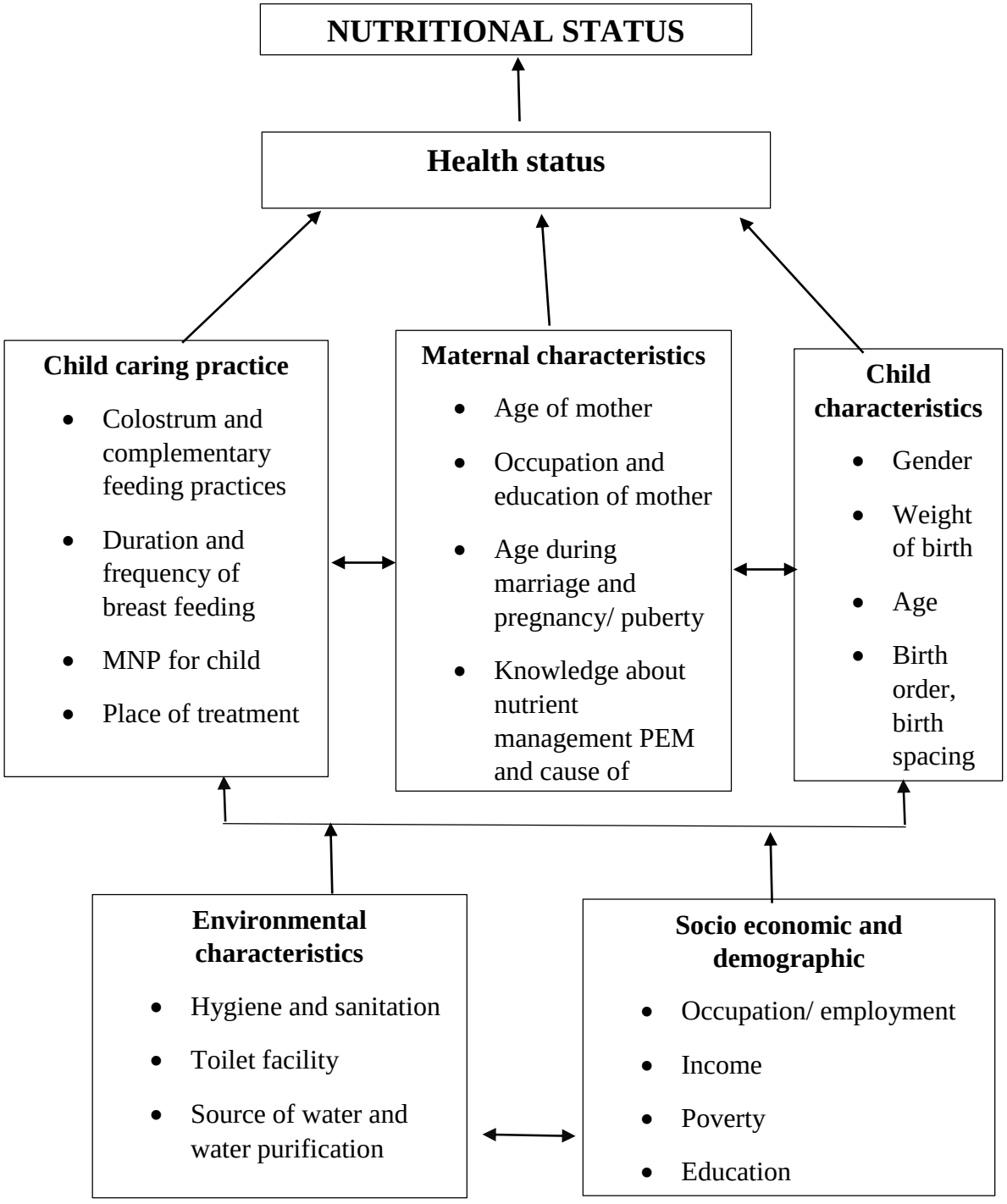

Fig1.1Conceptual framework

Part II

Literature review

2.1 Nutrition status

Malnutrition is not a simple syndrome. The poorly nourished individual, as a rule, suffer from a complexity of deficiencies. The great diversity of body function that may be ill affected by inadequate nutrition complicates the process of assessing nutritional status (Wilson, *et.al*, 1971).Malnutrition itself can have far-reaching impacts on the environment, and can induce a cycle leading to additional health problems and deprivation. For example, malnutrition can create and perpetuate poverty, which triggers a cycle that hampers economic and social development, and contributes to unsustainable resource use and environmental degradation (WEHAB, 2002). Breaking the cycle of continuing poverty and environmental deterioration is a prerequisite for sustainable development and survival (Prüss-Üstün *et al.*, 2005).

Nutritional Status is the state of balance between nutrient supply (intake) and demand (requirement). An imbalance between intake and requirement can result in over nutrition or under nutrition.(Graves and Nitzke, 2002) It is the condition of health of the individual as influenced by the utilization of nutrient. It can be determine through a careful medical and dietary history, a thorough physical examination, and appropriate laboratory investigation (Robinson, 2000)

Based on Maslow's Hierarchy of Needs, food and nutrition rank on the same level as air in the basic necessities of life. Obviously, death eventually occurs without food. But unlike air, food does so much more than simply sustain life. Food is loaded with personal, social, and cultural meanings that define our food values, beliefs, and customs. That food nourishes the mind as well as the body broadens nutrition to an art as well as a science. For most people, nutrition is not simply a matter of food or no food but rather a question of what kind, how much, and how often. Merging want with need and pleasure with health are key to achieving optimal nutritional status (Graves and Nitzke, 2002).

The prevalence of poor nutrition status on developing country is mainly due to the low income, low production of food, low productivity of crops and livestock, unequal

distribution of food, low literacy, socio-culture and poor environmental sanitation (Nabarro, 1984). The poor nutritional status has both direct and indirect effect on learning skills, mental performance as well as a working capacity resistance to disease (Scrimshaw, 1997). Broadly speaking the development of nation depends on the nutritional status of its people (Katawal, 1989).

2.2 Factor affecting the nutritional status

The factor affecting nutritional status are mother's food security, types of food given to the young children, feeding frequency, poverty, illiteracy, ignorance to the child for care and feeding, status of woman and child nutrition and last but not the least who feed the child and how the child eat (NMIS, 1996). Also factor influencing the nutritional status are food availability and its distribution system, consumption, income and purchasing power, price of commodities, illiteracy, family size, socio-culture and religious belief. The main important associated factors of under nutrition include the education, income, and nutritional situation of the parents, access to clean water and sanitation, access to primary health care, sex and age of child. Factors that are contributing to malnutrition may differ among regions, communities and over time (Mengistu *et al.*, 2013).

2.2.1 Education of mother

The education of mother's has several positive effects on care of children as compared to mother who are illiterate. 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 as well as maintain hygiene and sanitation. Study conducted in Gimbi district show that the main associated factors of wasting were childhood illness indicated by fever, low household income and maternal lack of education. It is found that children born to educated women suffer less from malnutrition which manifests as underweight and wasting in children (Benta *et al.*, 2012). Weight-for-age measurement revealed the protective importance of maternal education i.e. mother who were illiterate or whose study were done up to primary level tend to have underweight children (Bhandari and Chhetri, 2013).Risk of underweight were 0.194 and 0.131 times lower for children of mother attended primary and secondary or more level of education respectively (Ruwali, 2011).

2.2.2 Poverty

Poverty is an established cause of malnutrition. Malnutrition is highly prevalent in the places where people are struggling with severe poverty. According to a study in Indonesia malnutrition is a practical indicator of poverty. The World Bank economic review also mentions that the higher per capita income lower the malnutrition. Base on a cross-country and household study it is concluded that malnutrition can be reduced with sustainable economic growth. There is an assumption that income plays an important role for the underlying factors for malnutrition. The underlying factors e.g. education, safe drinking water, health services; etc. can be raised with the increment in per capita income (Chhetri, 2005).

2.2.3 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).

2.2.4 Breast feeding and complementary feeding

Primary school children are more likely to be undernourished than preschool and secondary school children. Preschool children, mainly depend on breastfeeding and may be protected by the mother's immune system at birth and breast milk protects small children from infectious diseases. With the increasing of age, children start to take complementary food in addition to breastfeeding and get nutrition from many food sources. Some studies have reported that the deviation of normal growth rates in children starts from several months after birth because breastfeeding is no longer enough to fulfill the requirements of growing children. Inadequate complementary foods also might be a reason of increasing trends of malnutrition in older children. This might be attributed by stopping or reducing breastfeeding and insufficient intake of complementary food.

2.2.5 Occupation of mother and socioeconomic status

Children with mother doing other occupation were in 0.27% more risk than children with mother, who were housewives. As compared to the rich socioeconomic status, children from the poor socioeconomic status were 2.551 times more likely to stunting. The mother's working in the informal sectors was found to have the highest risk factor for child malnutrition. The working mothers are able to earn money to fulfill the necessity of their own and of their children but its opportunity cost will be higher because they will not be able to give time to look after their children (Chhetri, 2005).

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 that 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).

According research conducted in Belahara VDC of Dhankuta district in Nepal located in south Asia, poor socioeconomic status was found risk factors for both stunting and underweight, Children reared in the jointly family were found less like to be stunted than those in nuclear family. Also ethnic group and age of mothers at pregnancy seems to have significance association with stunting but maternal education not associated. Nevertheless, study conducted in a decertified area of Sudan - Alrawakeeb valley revealed that maternal education was found to be the strongest factor associated with malnutrition among under five children (Mengistu K *et al.*, 2013).

2.2.6 Birth order

According to the study done in Uganda, there was no role of birth order in stunting and underweight among children. A study in Jamaica kept up the evidence that birth order were not significantly associated with nutritional status of children. However a study done in Nepal had shown a relationship between birth order and child malnutrition. It showed that higher the birth order, higher the stunting and underweight in children. This statement was supported by another study in Indonesia. It had also shown 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).

2.2.7 Health and diet

Diet and health are recognized as the most significant proximate risk factors of child malnutrition. They may, however, interact with one another often making it difficult to discern their independent role in development child malnutrition.

a) Diet: To attain good nutritional status one has to consume a diet adequate in all nutrients to meet their nutritional needs. Micronutrients known to be important in child growth include zinc, calcium and iron though currently only zinc interventions have been associated with increases in child linear growth. This can mean both macro nutrients (fat, protein, carbohydrate) and micro nutrients (vitamins and minerals). Though insufficient macro nutrient intake has serious implications for health and well-being, micro nutrients also play large role in immune function (Bhatta and Gurung, 1998).

b) Health: Illnesses can alter nutrient needs, use, loss and storage. Diarrhoea, especially if prolonged or recurrent, is associated with increased risk of child stunting through increased nutrient losses and/or resultant poor appetite. Parasitic infections like malaria and intestinal parasites may increase nutrient losses and needs while tuberculosis (TB) and HIV/AIDS may impair protein, carbohydrate, fat and micronutrient intake and/or metabolism (Smuts, 2009).

2.2.8 Maternal and child-care practices

Provision of adequate care is crucial for attainment of good nutritional status and may even reduce the effects of poverty and poor maternal education on the nutritional status of children. The WHO recommends that children be exclusively breastfed for the first six months (initially it was 4-6 months) followed by timely introduction of nutritious complementary foods at six months with continued breastfeeding up to two years and beyond (WHO, 2003). Although breastfeeding is a common practice in South African communities, exclusive breastfeeding rates are low and children are introduced to complementary foods poor nutritional quality before the time recommended by the "WHO (Smuts, 2009).

The relationship between infection and type of feeding has long been recognized with observations of reduced incidences of infections in breastfed children when compared to non-breastfed children (Dewey *et al*., 1995). The relationship between infection and type of feeding has long been recognized with observations of reduced incidences of infections in breastfed children when compared to non-breastfed children. Bottle-feeding on the other hand may increase the risk of feed contamination (by using unsafe water for milk preparations and/or using inadequately sterilizing feeding utensils) resulting in increased 34 risk of infections and malnutrition (Smuts, 2009)

Maternal under nutrition during pregnancy is associated with intrauterine growth retardation leading to increased risk of delivering a low-birth-weight « 2500 grams) infant. Low-birth-weight infants are more likely to be underweight if they continue not meeting their nutritional needs. On the other hand, high-birth-weight is associated with increased risk of obesity. Maternal obesity during pregnancy is postulated to increase nutrient transfer across the placenta to the foetus resulting in permanent changes in appetite' and energy metabolism in the unborn baby thus pre-disposing them to obesity in later life. Fifty-nine percent of South African women older than 15 years are either overweight or obese (SADHS, 2003).

2.2.9 Hygiene and sanitation

Living in a clean, and healthy environment and having access to clean water reduces the risk of contracting infectious diseases. Unhygienic environment leads unhealthy life bringing up disease condition which effects on health and lead to malnutrition. (Smuts, 2009).

2.3 Nutritional Requirements

Nutritional Requirements refers to the amount of food, energy and nutrient needed on an average per day by specific group and sex categories to meet the needs of healthy individuals for normal functioning of the body for work and growth (Burk, 1984).The establishment of human nutrient requirement is the common foundation for all countries to develop food-based dietary guidelines for their populations. Establishing requirements means that the public health and clinical significance of intake levels – both deficiency and excess – associated disease patterns for each nutrient, need to be thoroughly reviewed for all age groups (WHO, 2000). Nutritional requirements can be defined as the minimum amount of the absorbed nutrient that is necessary for maintaining the normal physiological functions of the body (SriLakshmi, 2014). The amount of the nutrients needed by individuals vary with different ages, activities and sex (Joshi, 2008). The recommended daily allowance (RDA) of nutrients for infants and pre-school children (1-6) years as recommended by ICMR is shown in Table2.1

Table 2.1 RDA for pre-school children

Nutrients	**Age (in months)**		**Age (in years)**	
	0 to 6	**6 to 12**	**1 to 3**	**4 to 6**
Calories (Kcal)	92	80	1060	1350
Protein (g)	1.16	1.69	16.7	20.1
Fat (g)	..	19	27	25
Calcium (mg)	500	500	600	600
Iron (mg)	46 ug/kg	5	9	13
Retinol (µg)	350	350	400	400
β- carotene (µg)	2800	2800	3200	3200
Thiamine (mg)	0.2	0.3	0.5	0.7
Riboflavin (mg)	0.3	0.4	0.6	0.8
Niacin Equivalent (mg)	710	650	8	11
Pyridoxine (mg)	0.1	0.4	0.9	0.9
Ascorbic acid (mg)	25	25	40	40
Folic acid (µg)	25	25	80	100
Vitamin B12 (µg)	0.2	0.2	0.2-1	0.2-1
Magnesium (mg)	30	45	50	70
Zinc (mg)	.	.	5	7

Source: (SriLakshmi, 2014)

2.4 Malnutrition

Malnutrition has been defined in different ways some believe that it is a result of an imbalance in the intake of nutrient; whereas other say that it is the result of too little or even too much intake of certain nutrient. There are still other who say it is a clinical syndrome with typical symptoms and signs depending on the type of nutrient responsible for the disease. Nevertheless, both over nutrition and under nutrition are considered malnutrition. Malnutrition has been defined as a pathological state resulting from a relative or absolute deficiency or excess of one or more of the essential nutrients in the diet (Jelliffe, 1966).

Malnutrition as a pathological condition of varying degree of severity and diverse clinical manifestation, resulting from the deficient assimilation of components of the nutrient complex. The disease affects the physiological pattern of tissues, reduces the defensive capability to withstand different environmental condition and lowers both the efficacy and ability in work and shortens life. The most common form of malnutrition that is visible and thus easy to diagnose in children is protein energy malnutrition. (PEM)Protein energy malnutrition is a deficiency disease caused by inadequate intake of protein or calorie or both of them (Gomez *et al.*, 1955).

2.4.1 Form of malnutrition

a) Under nutrition

The pathological state results from the consumption of an inadequate quantity of food over an extended period of time (Jelliffe, 1966).

b) Over nutrition

It is the pathological state resulting from the consumption of an excessive quantity of food, and hence a calorie excess, over and extended period of time (Jelliffe, 1966).

c) Specific deficiency

It is the pathological state resulting from a relative or absolute lack of an individual nutrient (Jelliffe, 1966).

d) Imbalance

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

2.4.2 Types of malnutrition

The different type of malnutrition is as follows (Katwal, 1989).

a) Acute malnutrition

Acute malnutrition relates to the present state of nutrition, for example: weight for height (wasting).

b) Chronic malnutrition

Chronic malnutrition relates to the past state of nutrient, and the measurable parameters are height for age (stunting).

2.4.3 Most common malnutrition problems

There are a number of types of malnutrition. The most common types of malnutrition problems in the developing countries like Nepal are PEM (protein energy malnutrition), vitamin A deficiency, iron deficiency anemia and iodine deficiency disorders (NDHS, 2011).

2.4.3.1 Protein-energy malnutrition

PEM occurs characteristically in children under-5years of age when severe the diet is poor in protein and calorie. The two major symptoms of PEM of early childhood are kwashiorkor and nutrition marasmus (Jelliffe, 1966).

2.4.3.1.1 Kwashiorkor

The term of kwashiorkor means the disease which the child gets when the next baby is born, i.e. sickness of deposed child. The disease is appertaining when the child is weaned onto traditional diet that may be low in protein. In many rural areas where kwashiorkor is endemic, the food supply become scarce each year before the harvest, at during this hungry season the incidence of kwashiorkor in other nutritional disease increases (Passimore and

Eastwood, 1986). Characteristics of symptoms of Kwashiorkor are, growth failure, edema, muscle wasting, moon face, apathy and peevishness, crazy pavement dermatitis and fatty liver (Swaminathan, 2014).

2.4.3.1.2 Marasmus

Nutritional marasmus is principally due to the consumption of diet markedly deficient in both protein and calories and is usually participated by diarrheal diseases (Swaminathan, 2014).

A child suffering from marasmus is less than 60% of normal weight for its age (R. Shrestha, 1996). Characteristic symptom are growth failure and low body weight wasting, severe of muscles and of subcutaneous fat and dry and atrophic skin. The infant looks like old man or has monkey face (Swaminathan, 2014).

2.4.3.1.3 Marasmic- kwashiorkor

When the incidence of PEM is high a large number of cases show and symptoms of marasmus and Kwashiorkor (Swaminathan, 2014).

2.4.3.1.4 Runche

"Runche" is the primary state of PEM, a common malnutrition problem in Nepal (UMN, 1995). The restricted food intake of the marasmic child is sometimes the result of maternally imposed restriction. The child is cry baby crying all the time for food (Raj laxmi, 1996).

2.4.3.2 Iron deficiency anemia

Iron deficiency is the most widespread disorder in developing countries and contributes significantly to reduced work and productivity and economic output as well as to morbidity and mortality. The deficiency disorders are widely prevalent among infants, children, adolescent girls and expectants and nursing mother worldwide (Yip, 1993).

Common indicators of anemia are paleness of lip, tongue, inside the eyelids and hands. The child with severe anemia becomes tired and restless and has a rapid pulse. Iron deficiency anemia has also been shown conclusively to delay psychomotor development and impair the cognitive performance of infants and pre-school children (Scrimshaw, 1997).

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

2.4.3.3 Iodine deficiency disorder

Iodine is a mineral that is also a part of the hormones produced by the thyroid gland located in the front of the neck. When iodine intake falls below recommended levels, the thyroid may no longer be able to synthesize sufficient amounts of thyroid hormones in the blood is responsible for the damage done to the developing brain and the other harmful effects known collectively as the iodine deficiency disorders (WFP, 2005).

The main manifestation of iodine deficiency are goiter, impaired mental function and increased rates of fetal wastage, still births, and infant deaths. Severe mental and neurological impairment known as cretinism occurs among infants born to mother who are seriously iodine deficient. The extent of iodine deficiency disorder is usually assessed by the prevalence of goiter in affected populations (Swaminathan, 2014).

2.4.3.4 Vitamin-A deficiency

Vitamin-A deficiency, as defined by eye damage, has been identified as a widespread public health problem in the developing countries. Each year it is estimated that between 250,000 and 500,000 preschool children go blind from vitamin A deficiency, and that within months of going blind, two-third of these children die. The peak prevalence seems to fall in the age range of two to four year (Scrimshaw, 1997). Xerophthalmia is sometimes used to cover all the clinic disorders of the eyes due to VAD. Xerophthalmia and keratomalacia are progressive disease of the eye due to VAD. The earliest symptoms are night blinds, dryness of conjunctiva and affected cornea. Softening of the cornea is likely to follow unless promptly treated. Necrosis and ulceration may occur and lead to permanent blindness (Davidson and Passimore, 1986).

2.5 Breast feeding practice and weaning process in Nepal

2.5.1 Breastfeeding Practices

The WHO and the UNICEF recommend that all mothers should breastfeed their children exclusively for the first 6 months and thereafter they should continue to breastfeed for 2 years or longer (UNICEF, 2011). Breastfeeding alone with no water provides the ideal nourishment for infants for the first six months of life as it provides all the nutrients, antibodies, hormones, immune factors and antioxidants an infant needs to thrive. It protects babies from diarrhea and acute respiratory infections and stimulates their immune systems (WHO and UNICEF, 2009).

The indicators of appropriate breastfeeding practices include: early initiation of breastfeeding, exclusive breastfeeding for children under six months and continued breastfeeding at 1 year and for 2 year or beyond (UNICEF, 2013).

2.5.2 Weaning practices

The word weaning comes from the word "wemian" which means to accustom. Weaning begins from the moment supplementary food is started and continues till the child is taken off the breast milk completely (Srilakshmi, 2002).

During the weaning period, good food sources of energy, protein, calcium and iron are particularly important. On the basis of body weight, children require twice as much as protein, calcium and iron as do adult. In many traditional society, the weaning child seldom receives especially formulated food rather they are gradually introduced to adult food. Some of the weaning foods given to child in different regions of Nepal are *sattu, dalbhat, jaulo, dhindo, sarbottam pitho* etc (Vaidya, 1987). Common traditional weaning foods include:

- Porridge *(Lito),* made from roasted rice flour (occasionally maize or millet), ghee (clarified butter) and sugar
- *Jaulo,* made from rice and turmeric or rice and salt
- *Dhido,* made from maize flour (or millet or wheat)
- *Maar,* made in lowland areas by cooking rice, cracked maize and soybeans together

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

2.6 Nutritional status of women in Nepal

The nutritional status of women in Nepal is very poor during the beginning of childhood. Because of a son preference country the women who give a female birth gets less care and so is the situation for new born female child (Dhakal, 1995).

A women's health is her total well-being, not solely determined solely by biological factors and reproduction but also by the effect of work load, nutrition, stress, war and migration, among others, women's health outside the reproductive window has been mostly overlooked in international development work (Swaminathan, 2014). Many Nepalese girl are married soon after the puberty and almost 40% of the Nepalese women have their first child between the age 15 and 19.Most of the women do not get appropriate food during pregnancy , the average family diet is the regular food during the period. NDHS (2006) collected data on maternal mortality through sisterhood method. In other words, ever married women of reproductive age were asked whether they had any sisters if yes, whether they are still alive, if dead whether the death was a maternal death. The maternal mortality usually not estimated frequently due to the lack of sufficient cases of deaths in the sample, however some surveys and studies done in Nepal has estimated it. Estimation of maternal mortality ratio utilizing the sisterhood method yielded a ratio of 281 deaths per 100000 live births. This ratio is one of the highest in the world indicting that a large number of mothers die due to causes related to childbirth. Even though the Maternal Mortality and Morbidity Study 2008/9 conducted in eight districts of Nepal is not a national representative survey, it revealed that the maternal mortality ratio is 229 deaths per 100000 live births. In order to combat this high ratio of maternal mortality Government of Nepal has embarked on a number of programs under Family Health Division's Safe Motherhood Program (Nepal population Report, 2011).

2.7 Nutritional status of under-five children in Nepal

The nutritional status of children under age five is an important measure of child's health. Children's nutritional status is a reflection of their overall health. When children have access to an adequate food supply, are not exposed to repeated illness, and are well cared for, they

reach their growth potential and are considered well nourished. Malnutrition is associated with more than half of all child deaths worldwide. Undernourished children are more likely to die from common childhood ailments and, for those who survive, have recurring sicknesses and faltering growth. Three quarters of the children who die from causes related to malnutrition are only mildly or moderately malnourished showing no outward sign of their vulnerability. One of the MDGs is to halve the proportion of people who suffer from hunger between 1990 and 2015. A reduction in the prevalence of malnutrition will also assist the MDG on reducing child mortality (NMICS., 2012).

The nutritional status of children under age five is an important measure of child's health. The study conducted by MoHP (2011) reveals that 41% of under five children are stunted and 16% are severely stunted, 11% are wasted and 3% are severely wasted and 29% are underweight and 8% are severely underweight which is shown in Fig 2.1.

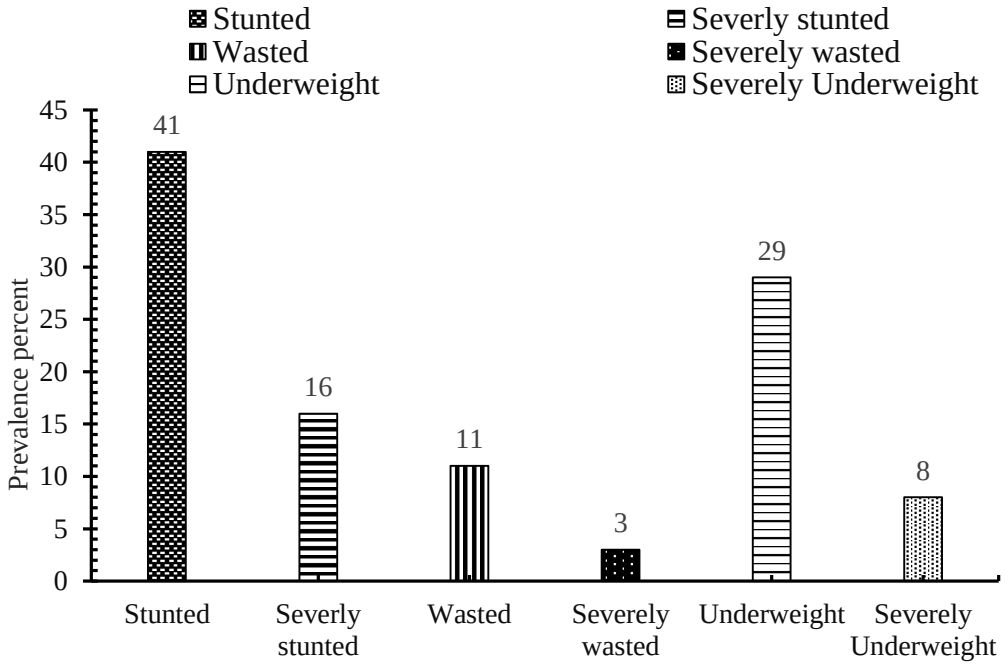

Fig. 2.1 Prevalence of different forms of malnutrition (MoHP, 2011)

Analysis of NDHS data by age shows that stunting is highest (53%) in children age 36 – 47 months and lowest (14%) in 9-11 months, wasting is found to be highest (25%) in children age 9-11 months and lowest (7%) in children age 36-47 months and proportion of

underweight children is highest (37%) among age 18-23 months and lowest (18%) among under 6 months children. Male children are more likely to be stunted, wasted and underweight as compared to female children (MoHP, 2011).

The nutritional status of children in Nepal has improved over the past 15 years and is close to achieving the Millennium Development Goal (MDG) target of reducing the percentage of underweight children age 6-59 months to 29% by 2015 ((NPC)[Nepal], 2010).The percentage of stunted children declined by 14% between 2001 and 2006 and declined by an additional 16% between 2006 and 2011. A similar pattern is observed for the percentage of underweight children, which dropped by 9% between 2001 and 2006 and by 26% between 2006 and 2011. Similarly, the percentage of wasting has declined by 15% between 2006 and 2011(MoHP, 2011).

Currently, the infant mortality rate in Nepal is 46 deaths per 1,000 live births for the five year period before the survey, just two deaths below the infant mortality reported in 2006. Under-five mortality is 54 deaths per 1,000 live births, down from 61 deaths per 1,000 in 2006. Mortality rates are much higher in rural than urban areas. For example, infant mortality is 55 deaths per 1,000 live births in rural areas compared to only 38 in urban areas. According to the (2011) NDHS, 87% of Nepalese children aged 12–23 months have received all recommended vaccines one dose each of BCG and measles and three doses each of DPT and polio. Only 3% of children did not receive any of the recommended vaccines. Almost half (46%) of Nepalese children age 6-59 months are anemic. 18% of children have moderate anemia, and 1% are severely anemic. More than 70% of children age 6-17 months are anemic compared with 25% of children age 48- 59 months. Vitamin A, which prevents blindness and infection, is particularly important for children and new mothers. In the 24 hours before the survey, 47% of children age 6–23 month ate fruits and vegetables rich in vitamin A. Nine in ten children age 6–59 months received a vitamin A supplement (MoHP, 2011).

According to the WHO (2011), over 101 million children under the age of 5 were underweight (low weight for age), 165 million were stunted (low height for age), and approximately 52 million were wasted (low weight for height).

A study conducted in Padampur VDC, Chitwan showed that 23%, 37% and 26% of children are underweight, stunted and wasted respectively. It also reveals that children's age,

occupation of mother and socio-economic status were significantly related to stunting (Ruwali, 2011).

According to a survey conducted by Shrestha (2014) in Western Nepal, 20% of under-five children were underweight, 34% were stunted and 15% were wasted. Out of them 4.7% were severely underweight, 14% severely stunted and 7.2% severely wasted. Significant association of underweight and stunting was found among different ethnic group while the association of wasting with sex, ethnicity and age groups were not found to be statically significant (Shrestha, 2014).

A study conducted in Jirel children, the MUAC measurement among 309 children, 51.13% were found to be normal and 12.62% were severely malnourished, according to Gomez classification, 37% children were normal but no one was found to be severely malnourished. 64% were found to be having mild to moderate malnutrition. According to Waterlow‟s classification 71% were found to be normal and 29% were stunted while no one was found to be wasted (Chapagain *et al.*, 2005, October).

Cross-sectional study conducted in Kunchha VDC, Lamjung among 50 children shows that 82% was satisfactory and only 18% followed by mild moderate nutritional status and there was no severe malnutrition by MUAC. According to Gomez classification the nutritional status of children was 60% normal followed by 32% mild and 4% moderate and severe malnutrition (Dhungana, 2013).

A study conducted in Rupandehi district concludes that 46% of children aged 36 – 59 months were underweight and 65% were found to be stunted. 50% children born to illiterate mother were underweight and 58% born by mother less than 18 years of age were underweight (Acharya *et al.*, 2013).

Cross-sectional study conducted in Kapilvastu district reveals that better socioeconomic status, mother's age 20-35 years, birth order up to second, gap more than two year between two pregnancies, recommended exclusive breast feeding, early recommended supplementary feeding, complete immunization and timely care seeking had positive effect on children health which are also statistically significant (Bhandari and Chhetri, 2013).

A meta-analysis on 18 published and unpublished individual studies up to 2008, showed males were 5% less likely to be malnourished compared with their female counterparts (Mehata, 2008).

2.8 Assessment of nutritional status

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

The nutritional assessment may require encompassing nations, communities, vulnerable segments of communities or individuals. It may be done as a part of an exercise to document current status as compared with post status or as specific attempt to evaluate the, impact of an intervention program (Ramchandran, 1987).

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

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

2.8.1 Anthropometric assessment

It is the physical measurement of the human body and is commonly used to estimate the nutritional status of children. Anthropometry measures have been extensively used for

identification and classification of children suffering from protein-energy malnutrition (PEM). Different anthropometric measurements are combined as ratios or indices such as weight-for-age, weight for height and height for age (Pietsch, 2000).

2.8.1.1 Height-for-age (H/A)

H/A is an indicator of past or chronic malnutrition. H/A cannot be used to measure short term changes in malnutrition. Deficits in L/A or H/A are signs of stunting. Stunting, usually results from extended periods of inadequate food intake, disease or a combination of both, especially during the periods of greatest growth for children when the slowing of skeletal growth results in reduced stature or length (Pietsch, 2000). Stunting begins in utero; therefore, the pro-pregnancy health and nutritional status of women and the nutrition and health of mothers during pregnancy is critical. Stunting is a result of a process over time; most of the damage occurs before 2 years of age. Emphasis should be on prevention.

Children whose height for age Z – score is below minus two standard deviations (-2SD) from the median of the WHO reference population are considered short for age (stunted), or chronically malnourished. Children who are below minus three standard deviations (3SD) are considered severely stunted (WHO, 2015).

Stunted growth is a reduced growth rate in human development. It is a primary manifestation of malnutrition in early childhood, including malnutrition during fetal development brought on by the malnourished mother. In developing countries, stunted growth is a common problem affecting a large percentage of children. Once established, stunting and its effects typically become permanent. Stunted children may never regain the height lost as a result of stunting, and most children will never gain the corresponding body weight. It also leads to premature death later in life because vital organs never fully developed during childhood (Badrialaily, 2008).

2.8.1.2 Weight-for-height (W/H)

Weight-for-Height (W/H) helps to identify children suffering from current or acute malnutrition. It is used to examine short term effects, i.e. recent rapid weight loss associated with a period of starvation and/or severe disease (Gomez *et al.*, 2000).

Children with Z – scores below minus two standard deviations (-2SD) are considered thin (wasted) or acutely malnourished. Children with weight for height index below minus three standard deviations (-3SD) are considered severely wasted and children with more than two standard deviations (+2SD) above the median weight for height are considered overweight or obese (WHO, 2015).

Wasting results from weight falling significantly below the weight expected of a child of the same length or height. Wasting indicates current/acute malnutrition resulting from feeding practices, diseases and infection, or, more frequently, a combination of these factors. Wasting in individual children and population groups can change rapidly and shows marked seasonal patterns associated with change in food availability or disease prevalence (Smith and Haddad, 2000).

2.8.1.3 Weight-for-age (W/A)

Low weight-for-age identifies the condition of being underweight at a specific age. W/A may reflect both past (chronic) and present (acute) under nutrition; however, it is unable to distinguish between the two (Smith and Haddad, 2000).

Children whose weight for age Z – score is below minus two standard deviations (2SD) are classified as underweight while children whose weight for age Z – score is below minus three standard deviation (-3SD) are considered severely underweight (WHO, 2015).

W/A is used to identify the nutritional condition underweight, which is a composite measure of stunting and wasting. Just over 15% of the study children were severely malnourished, having a Z- score $\leq$ -3 standard deviations (SD) for any index (Hommes, 2005).

2.8.1.4 Mid-upper-arm circumference (MUAC)

Measurement of the mid-upper arm appears to be most useful in practice. This reason is easily accessible, even with a young child sitting infront of the examiner on his mother's lap. The arm circumference is measured to the nearest 0.1 cm with a flexible steel or fibre-tape, which must be placed gently, but firmly, round the limb to avoid compression of the soft tissue (WHO, 1966)

PART III

Materials and methods

3.1 Materials

Equipment needed for performing the survey are:

a) Weighing Machine

b) Height measuring scale (Stadiometer)

c) MUAC Tape: For measuring mid-upper arm circumference.

d) Questionnaire: A well designed and pretested set of questionnaire to collect household information (Appendix-A)

3.2 Methods

3.2.1 Research design

Nutrition survey of children of 6 to 59 months age group in *Sukumbashi basti* northwest boundary of sardhu khola, *Dharan* at household level consists of following;

a) Anthropometric measurements of the 6-59 months of age children.

b) House hold survey with the help of questionnaires.

3.2.2 Study population

All household were visited and all the population under the study i.e. children of age group 6 month to 59month were taken.

3.2.3 Study area

The household situated in *Sukumbashi basti* northwest boundary of sardhu khola, *Dharan* municipality Sunsari, Nepal. It includes Naulo basti, devi gaun and gauri gaun. It is located at Dharan-16 and Dharan 11, Sunsari District, Koshi Zone. There are 450 households among them 162 household were 6-59 months of age children. Generally, people of low economic status reside here and they mainly engage in labour for earning.

3.2.4 Study variables

Study variable were categorized into two groups:

Dependent variable: Dependent variable of this study was nutritional status of 6-59 months children as indicated by stunting, wasting and underweight.

Independed variable: It includes:

a) Socio-demographic: Sex, Caste, Socio- economic (Poverty, Income)

b) Maternal Characteristics: Age, education of mother, age during marriage and pregnancy, iron and folate intake etc.

d) Child Characteristics: Age, Sex, weight of birth, birth order, birth type, breast feeding status.

e) Child care practices: feeding practices, hygiene.

f) Environmental and hygiene characteristics: water supply, sanitation and housing condition.

3.2.5 Sample size

All the household were visited and the sample were taken according to census. So, the sample size was equal to the total number of children who lies in between age group of 6 months to 59 months living in *Sukumbashi basti* northwest boundary of sardhu khola Dharan municipality. According to personal communication the total population of 6-59 months of age children was found to be 162. Thus the sample size for the study was 162.

3.2.6 Target population

Children under five years of age were included as the target population of the study. **Inclusion criteria**: children who were house in that of age criteria mentioned as above.

Exclusion criteria: children who were out of house at the time of survey and children who were serious ill.

3.2.7 Pre-testing

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

3.2.8 Validity and reliability

To ascertain the degree to which the data collection instruments was measure what they purposed to measure, the instruments was validated by a group of professionals from Central Campus of Technology, Department of Nutrition and Dietetics. Reliability refers to quality control measure of data collected. Questionnaire was checked for completeness, consistency and clarity.

Validity and reliability of the study was ensured by pre-testing of the tools, using standardized instruments. Instruments was set at 0 reading before taking measurements with standardized reference one. Close supervision was done in the field.

3.2.9 Data collection technique

Data obtained from the respondents was collected on a structured form of questionnaire in which each questionnaire was given a unique identity number for each child.

The instruments used for data collection were follows:

a) Questionnaire for household survey:

Out of 450 houses, 162 houses were taken for the household survey. A questionnaire given in appendix was used to collect the various kinds of information which are directly or indirectly indicative of causes of malnutrition. The questionnaire provided information such as family size, parent's education, annual income, occupation, knowledge about breastfeeding and complementary feeding, sanitations etc.

b) Anthropometric measurement:

Anthropometric measurements (height, weight and MUAC) were obtained from all children 6-59 months of age.

Weight: The weight was taken using electronic digital weighing scale and recorded to the nearest 0.1kg.The weight of the child was measured when he/she was standing on the weighing nude or with a minimum of clothes and no shoes. If the child was not able to stand on the scale by her/his own, the mother's weight was taken first and then mother's weight while carrying the infant was taken. The child's weight was found by subtracting the mother's weight from mother's weight while carrying the child. The scales were checked for accuracy before taken to the field (Mekides *et al.*, 2015).

Height/length: The length of each child aged 6 - 24 months was measured lying flat and centrally on measuring boards placed on a hard flat surface on the ground. The length was read to the nearest 0.1 cm (head and feet against the base of the board and foot piece respectively)(Mekides *et al.*, 2015). The height of children aged above 24 months was measured standing straight on measuring board placed on hard flat surface with line of sight perpendicular to the horizontal surface. Children were made to stand bare foot on height board and with feet parallel and joined together and with heels and buttock touching the wall. It was made sure that that head was held erect and hands were hung closely at the sides. The child's height was measured to the nearest one decimal place.

Mid arm upper circumference (MUAC): MUAC was measured on children aged 6-59 months. MUAC of the left arm was taken and recorded to the nearest mm. The enumerator located the mid- point between the shoulder and the tip of the elbow with the arm bent. The measurement was taken at this midpoint with the arm extended and relaxed. A cut- off 115 mm was used to distinguish the well-nourished with the children that were severely wasted (also called severely acute malnourished) (WHO and UNICEF, 2009).

MUAC, height and weight were taken twice and the mean was calculated. The statistic program, SPSS, did the same calculation in order to check for accuracy.

Date of birth: The date of birth for each child was inquired from the caretaker/mother and recorded in months. An event calendar was used to state the age as accurate as possible. Age was written down with "day/month/year" and "age in months". The date was converted to months and compared with "age in months" for consistency. The Nepali date was converted into English date.

3.2.10 Data analysis

Quantitative data was firstly cleaned, coded and was entered in SPSS 20 and WHO Anthro version 3.2.2. Similarly qualitative data was transcribed and coded by assigning labels to various categories. Fischer exact and Chi-square test was used to identify the associated factors of malnutrition. Verified test parameters were used to establish the relationships between the variables and nutritional status of children.

Anthropometric indices were calculated using reference medians recommended by the World Health Organization (WHO) and classified according to standard deviation units (z scores), based on the WHO criteria. Wasting (weight-for-height z-score–WHZ) indicates thinness. It is usually the result of recent nutritional deficiency and is affected by seasonal shifts associated with availability of foods and/or prevalence of disease. A WHZ of <-2 defines the presence of acute malnutrition (wasting). Stunting, represented by low height for-age z-score (HAZ), results from extended periods of inadequate food intake, poor dietary quality, increased morbidity, or a combination of these factors. A HAZ of <-2 defines chronic malnutrition (stunting). Weight-for-age z-score (WAZ) is essentially a composite of weight-for-height and height-for-age, thus a measure of both acute and chronic malnutrition. A WAZ of <-2 is used for defining a child as underweight. A z-score of <-3 defines severe levels of each of the indices (Mekides *et al.*, 2015).

3.2.11 Logistical and ethical considerations

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

Results and discussions

Among 162 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

Out of 450 households Table 4.1.1 shows that the major occupation in *Sukumbashi basti* northwest boundary of sardhu khola , *Dharan* were laborer (60.5%) , foreign employment (18.5%) followed by agriculture (2.5%), job or service(16.7%) and doing nothing (1.9%). Considering the estimated annual income depicted in Table 4.1.1 of all respondents, those with annual income between NRs one hundred thousand to three hundred thousand had the highest percentage (38.3%) and the household that earn below one hundred thousand and above three hundred thousand annually were 36.4 % and 25.3 % respectively.

Table 4.1. Economic characteristics of population (N=162)

Variables	Frequency	Percent
Occupation		
Agriculture	4	2.5
Labour	98	60.5
Job	27	16.7
foreign employment	30	18.5
Nothing	3	1.9
Annual income		
less than 1 lakh	59	36.4
1 to 3 lakh	62	38.3
more than 3 lakh	41	25.3

The breakdown for family size of household were as follows, household with greater than 5 members (54.3%) had the highest percentage while less than 5 members sized household is 45.7%. The educational status in father of children was superseded by secondary level

(43.8%) followed by primary level (29.0%), illiterate (17.3%) and higher secondary level and above (9.9%)

Table 4.2 Socio - demographic characteristics of study population N=162

Variables	Frequency	Percent
Family size		
Less than 5	74	45.7
5 or greater than 5	88	54.3
Education of father		
higher secondary	16	9.9
Illiterate	28	17.3
Primary	47	29.0
Secondary	71	43.8

4.2 Child characteristics

From the total of 162 children included in the study 94 (58%) were males and 68 (42%) were females. Majority of children fall between 24-35(25.9%) months age group followed by 36-47 (23.5%), 12-23 (20.4%), 6-11 (17.3%) and 48-59 (13%).

9.9% of children's weight at birth was below normal (less than 2.5 kg), 88.9 % was above normal (above 2.5 kg) and 1.2% was equal to 2.5 kg.

Table 4.3 Child characteristics of study population N=162

Variables	Frequency	Percent
Gender		
Female	68	42.0
Male	94	58.0
Weight of birth		
Less than 2.5 kg	16	9.9
Equal to 2.5 kg	2	1.2
More than 2.5 kg	144	88.9
Age in month		
6 to 11	28	17.3
12 to 23	33	20.4
24 to 35	42	25.9
36 to 47	38	23.5
48 to 59	21	13.0
Birth order		
First child	98	60.5
Other child	64	39.5
Birth type		
normal delivery	145	89.5
caesarian section	17	10.5

98 (60.5%) families under the survey had only one child below 5 years of age while 64(39.5%) families had other or more than one children.

145 (89.5%) children were born through normal delivery whereas 17 (10.5%) children were born through caesarian section.

4.3 Child caring practices

99.4% majority of infant were feed colostrum and 0.6% did not feed colostrum .The mean duration of breastfeeding was found to be 2.09 $\pm$ 1.4 years in *Sukumbashi basti* northwest boundary of Sardhu khola, Dharan.

The age at which complementary diet given was below 6 months in 25.9% and above 6 months in 73.5% and 0.6% did not feed complementary food. The type of complementary food given to children was same as other family members in 9.9% (16), followed by lito 63.0% (102), jaulo or porridge 17.3% (28), sarbattom pitho ko lito (supper flour porridge) 9.3% (15), other foodstuff 0.6% (1). Out of 162 children, 66.0 %(105) were feed micronutrient powder whereas 34 %(55) were not feed micronutrient powder.

Almost 100% of household used packaged iodized salt. The finding was similar to that of National Demographic and Health Survey 2011 which revealed that more than 95% of households were using iodized salt (NDHS, 2011). Regarding Vitamin A and deworming tablet supplementation, 162 (100%) children were supplemented with Vitamin A and deworming tablet. The effectiveness of national vitamin A supplementation program was similar to that of the country as the national data on vitamin A supplementation revealed that nine in ten children aged 6-59 months received vitamin A supplement (NDHS, 2011).The preference of health services for treatment of children during acute illness was highest 91 (56.2%) to nearby health Centre/post followed by 67 (41.4%) to pharmacy, 3 (1.9%) to dhami and 1 (0.6%) to traditional healer or none.

The mean duration of breastfeeding in Sukumbashi basti northwest boundary of sardhu khola, Dharan was 2.01±1.47years which is higher than national average data (28.8 months). Initiation of complementary food at six month is notably higher (73.5%) than NDHS findings (66%)(MoHP, 2011). While 25.9% of children were fed complementary food at early age i.e below 6 months.

Table 4.4 Distribution of different child caring practices N=162

Variables	**Frequency**	**Percent**
Colostrum feeding		
No	1	.6
Yes	161	99.4
Initiation of complementary food		
Above 6 months	119	73.5
Below 6 months	42	25.9
Still not	1	.6

Type of complementary food		
Similar to family member	16	9.9
Lito	102	63.0
No	1	.6
Porridge	28	17.3
Super flour	15	9.3
Micronutrient powder for child		
No	55	34.0
Yes	107	66.0
Duration of breastfeeding		
Continue	99	61.1
6 months	6	3.7
Less than 6 months	11	6.8
Less than 2 yrs.	34	21.0
More than 2 yrs.	12	7.4
Frequency of breastfeeding		
Less than 6 times	95	58.6
6-8 times	18	11.1
More than 8 times	15	9.3
No	34	21.0
Type of salts		
Iodized	162	100.0
Place of treatment		
Hospital	91	56.2
Pharmacy	67	41.4
Dhami	3	1.9
None	1	0.6

4.4 Maternal characteristics

The mean SD of mother's age under the study was found to be 25.4 ±5.9 years. 59 (36.4%) of mothers had primary level education, 57 (35.2%) of mothers had secondary level

education while 42 (25.9%) were illiterate and 4 (2.5%) with higher secondary educational status. Highest percentage (87.7%) 142 of mothers in *sukumbashi basti* northwest boundary of Sardhu khola, Dharan were housewives while 12.3% were engaged in service and labourer as working wife .The minimum and maximum age of mother during pregnancy were 95 (56.6%) at the age of less than 20 and 67 (41.4%) were pregnant at the age of more than 20. While the maximum and minimum age of mother during marriage were found to be higher in 15-20 years and 25 and above respectively.

Almost 92 (56.8%) of mothers were well known about supper flour (sarbottam pitho) and among them only 26 (16%) knew the correct proportion of cereals and legumes in supper flour.32.1% mothers were well known about malnutrition while 67.9% did not know about it. Mothers who were known about cause of disease, 133 mothers (82.1%) mentioned that the cause of disease is lack of hygiene and sanitation while 14 (8.6%), 9(5.6%), 6(3.7%) reported the cause to be lack of hygienic food, no vaccination and others such as evil eye respectively. All mother that is 162 mentioned that additional nutrients are necessary during pregnancy .Among them 87(53.7%) mother consumed more nutrients than usual during pregnancy while 45(27.8%) and 30 (18.5%) mentioned that they consumed nutrients less than usual and as usual during their pregnancy.

Table 4.5 Distribution of maternal characteristics in study population N=162

Variables	**Frequency**	**Percent**
Education of mother		
Higher secondary	4	2.5
Illiterate	42	25.9
Primary	59	36.4
Secondary	57	35.2
Occupation of mother		
Housewife	142	87.7
Working	20	12.3
Age of mother during pregnancy		
Less than 20	95	58.6
More than 20	67	41.4

Age of mother during marriage		
Less than 15	13	8.0
15-20	95	58.6
20-25	45	27.8
25 and above	9	5.6
Iron tablet		
Yes	162	100.0
Knowledge about sorbottom pitho		
No	92	56.8
Yes	70	43.2
cereals and legumes proportion		
2 part legumes one part cereal	26	16.0
Equal	11	6.8
1 part legume 2 part cereal	17	10.5
Proportion doesn’t matter	108	66.7
Knowledge of PEM		
No	110	67.9
Yes	52	32.1
Cause of disease		
Lack of hygiene and sanitation	133	82.1
Lack of hygienic food	14	8.6
No vaccination	9	5.6
Other	6	3.7
Additional nutrient during pregnancy		
Yes	162	100.0
Management of nutrient during pregnancy		
Give more than usual	87	53.7
Give less than usual	45	27.8
Give as usual	30	18.5

4.5 Environmental characteristics

The main source of drinking water used by household was 161 (99.4%) tap. Only 0.6% of households used river as source of drinking water. 86 (53.1%) households treated/purified water by filtration and 7(4.3%) household purified by boiling before they drink while rest of household that is 69(42.6%) did not. All i.e. 100% households had toilet facility. Major sources of cooking fuel as shown in Table 4.6, indicated that larger percentage of households used gas i.e. 155 (95.7%) as cooking fuel and 7(4.3%) used firewood as cooking fuel.

Table 4.6 Environmental characteristics of study population N=162

Variables	Frequency	Percent
Source of water		
River	1	.6
Tap	161	99.4
Purification of water		
Boiling	7	4.3
Filtration	86	53.1
None	69	42.6
Toilet facility		
Yes	162	100.0
Cooking fuel		
fire wood	7	4.3
Gas	155	95.7

4.6 Prevalence of malnutrition

In survey, among 162 children the overall magnitude of malnutrition was found to be 32.7%, 15.4%, 6.2%, and 3.1% stunting, underweight, wasting and overweight respectively.

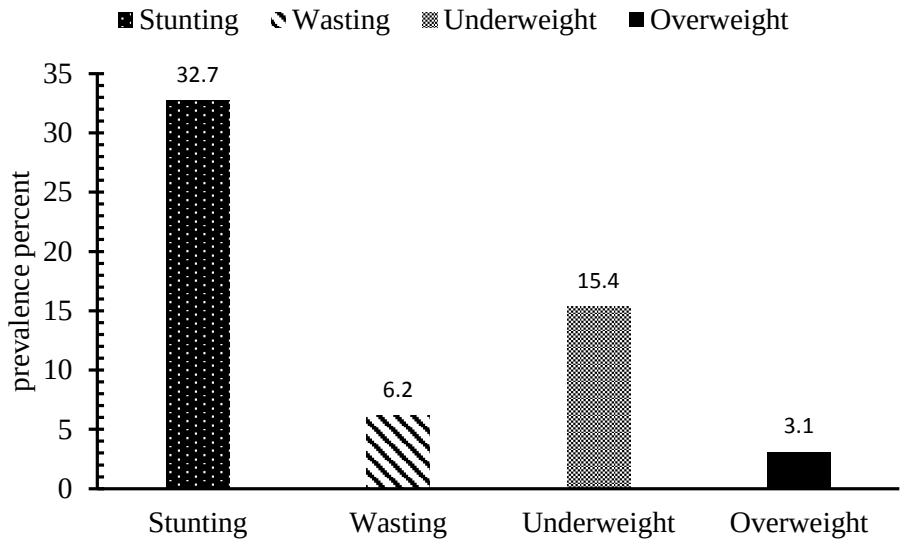

Fig 4.1 Prevalence of malnutrition among 6 to 59 months old children of the studied area

The prevalence of stunting was found to be lower i.e. 32.7% than that of the findings of NDHS (2011) (41%) while the findings of underweight 15.4% which was found to be lower than that of NDHS (2011) (29%) and wasting i.e. 6.2% was also found to be lower than that of the findings of NDHS (2011) (11%). The prevalence of stunting was found to be lower with the result of the survey done in *Nirajan basti (sukumbashi area), Dharan15* where 42% of children under five years of age of that basti were stunted, the rate of wasting was found to be higher than that survey where 9% children were wasted and the rate of underweight was found to be lower than that survey where 18% children were underweight. (Adhikari, 2015)

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

Table 4.7 Prevalence of malnutrition among 6 to 59 months of children in *sukumbashi basti* northwest boundary of sardhu khola, *Dharan.*

Nutritional indicator	Percent
Length/height for age(stunting)	32.7
Weight for age(underweight)	15.4
Weight for height(wasting)	6.2
Weight for height(Overweight)	3.1

Moreover, 9.9% children were found to be severely stunted while 22.8% children were moderately stunted. Among 15.4% of underweight children 4.9% were severely underweight while 10.8% were moderately underweight.4.3% of the children were found to be severely wasted while 1.9% were moderately wasted. The rate of severely stunted children was found to be lower than that of the findings of NDHS 2011 (16% severely stunted) while the rate of severely wasted was found to be higher and underweight children was found to be lower than that of NDHS (2011) findings (3% severely wasted and 8% severely underweight (MoHP, 2011).

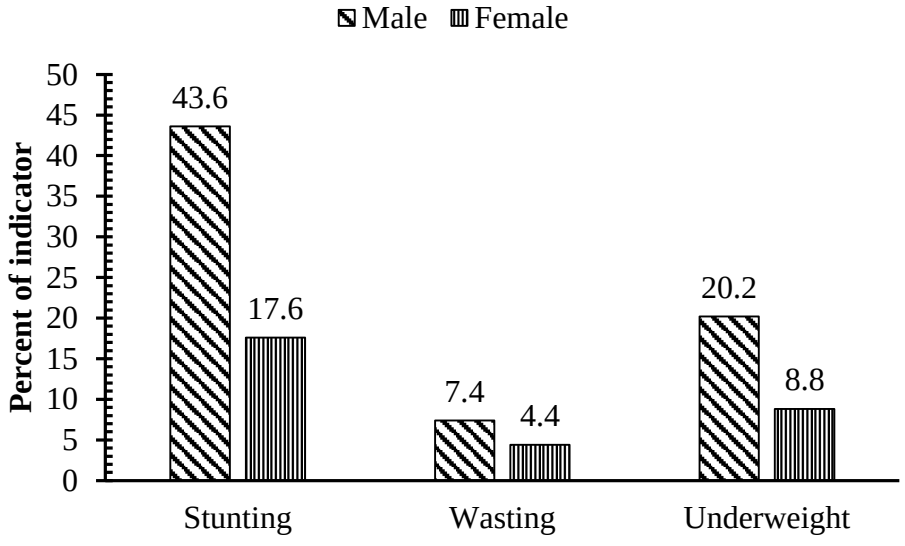

Fig.4.2 Gender wise distribution of wasting, stunting and underweight

.

The prevalence of wasting was found slightly higher in females (7.4%) than that in males (4.4%) which was similar than that of the findings of NDHS (2011). The rate of stunting was found to be higher in males (43.6%) than that of females i.e. 17.6% as in case of NDHS (2011) findings, stunting was higher in male than female. The prevalence of underweight was found to be higher in males (20.2%) as compared to females (8.8%) and the finding was similar than that of the findings of NDHS (2011). Overweight was found to be 3.2% in males and 2.9% in females.

Among 94 males, 4.3% males were found to be severely wasted and 3.1% were moderately wasted, 12.8% severely stunted and 30.8% were moderately stunted while 5.3% severely underweight and 14.9% were moderately underweight. Rate of severely wasted females was found to be 4.4% whereas moderately wasted were none. 5.9% females were found to be severely stunted while moderately stunted females were 11.7%. In case of underweight, females were severely underweight were similar to moderately underweight i.e. 4.4% females. 3.2% of male and 2.9% female were found to be overweight.

Table 4.8 Gender wise distribution of wasting, stunting and underweight

	Characteristics	**Male (%)**	**Female (%)**	**All (%)**
WHZ	Severely wasted (<-3)	4.3	4.4	4.3
	Moderately wasted (>-3&<-2)	3.1	Nil	1.9
	Overweight(>+2)	3.2	2.9	3.1
	Normal	89.4	92.7	90.7
HAZ	Severely stunted (<-3)	12.8	5.9	9.9
	Moderately stunted (>-3&<-2)	30.8	11.7	22.8
	Normal	56.4	82.4	67.3
WAZ	Severely underweight (<-3)	5.3	4.4	4.9
	Moderately underweight (>-3&<-2)	14.9	4.4	10.5
	Normal	79.8	91.2	84.6

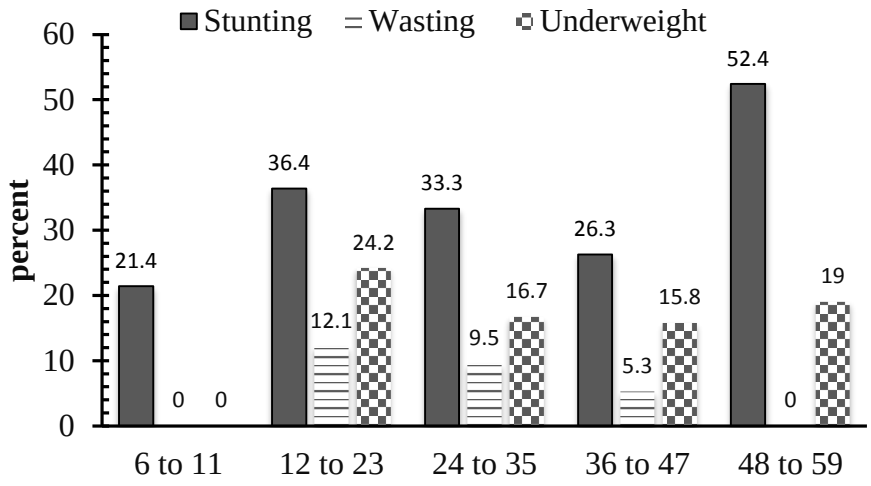

Fig 4.3 Distribution of stunting, wasting and underweight among different age groups.

Stunting was found to be higher in 48 to 59 months children whereas wasting and underweight was found to be higher in 12 to 23 months of children.

Table 4.9 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	Nil	Nil	10.7	7.1	21.4	Nil	Nil
(12-23)	31	9.1	12.1	Nil	9.1	36.4	9.1	24.2
(24-35)	47	7.1	9.5	4.8	11.9	33.3	4.8	16.7
(36-47)	44	2.6	5.3	Nil	7.9	26.3	5.3	15.8
(48-59)	33	Nil	Nil	Nil	14.3	52.4	4.8	19
Total	180	4.3	6.2	3.1	9.9	32.7	4.9	15.4

Wasting was found to be higher in children of age group 12 to 23 months (12.1%) and lower in age group 36 to 47 months (5.3%) whereas no children were wasted in age group 6 to 11 months and 48 to 59 months. Stunting was higher in case of children of age group 48

to 59 months (52.4%) and lower in age group 6 to 11 months (21.4%) while underweight was found to be higher in children of age group 12 to 23 months (24.2%) and lower in case of age group 36 to 47 months (15.8%). overweight was higher in case of children of age group 6 to 11 months i.e. 10.7% and lower in other age group as shown in the fig 4.3. and table 4.8

4.6.1 Nutrition status comparison with WHO standard

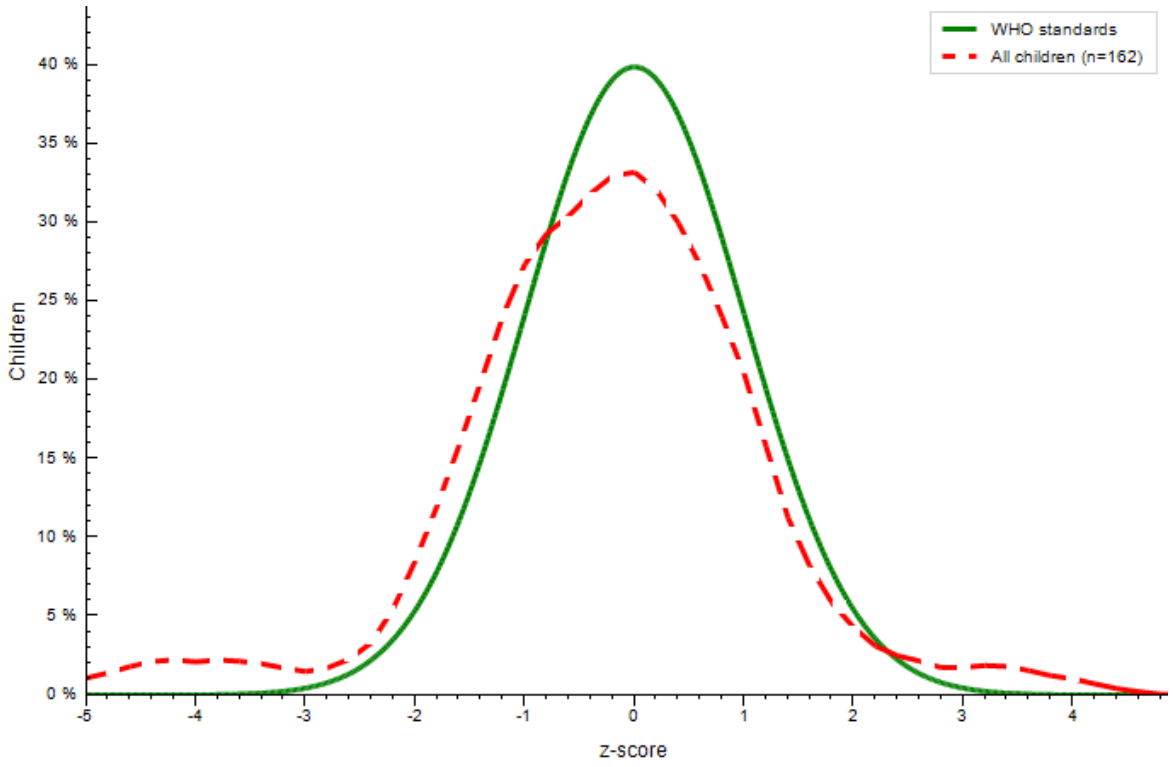

Fig. 4.4 Distribution of wasting among 6 - 59 months children of studied area based on WHO standard (N=162)

The weight for height curve obtained from the survey is different than that of the WHO standard curve. The median weigh for height z-score of the children was found to be -0.26. i.e. the median value is slightly shifted to the left showing the prevalence of wasting among the study population.

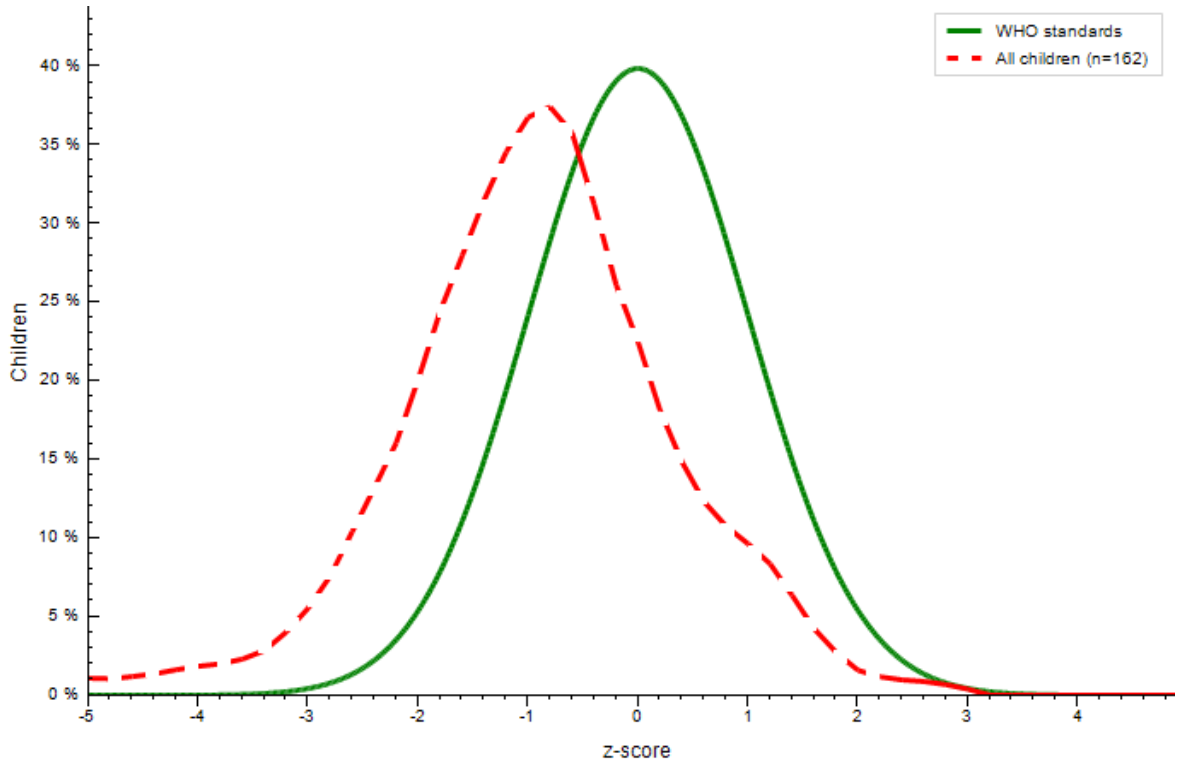

Fig.4.5 Distribution of underweight among 6 - 59 months children of studied area based on WHO standard (N=162)

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 -0.86. i.e. the median value is slightly shifted to the left showing the prevalence of underweight among the study population.

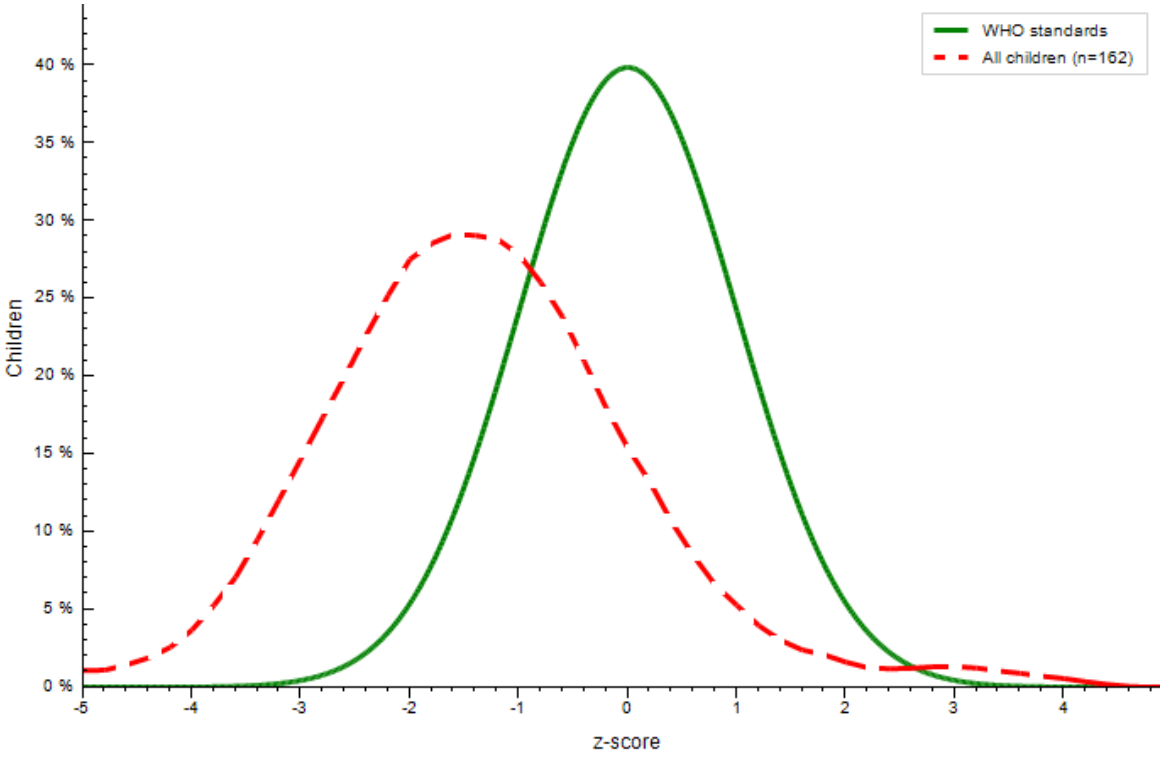

Fig. 4.6 Distribution of stunting among 6 - 59 months children of studied area based on WHO standard (N=162)

The height 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 -1.42 i.e. the median value is slightly shifted to the left showing the prevalence of stunting among the study population.

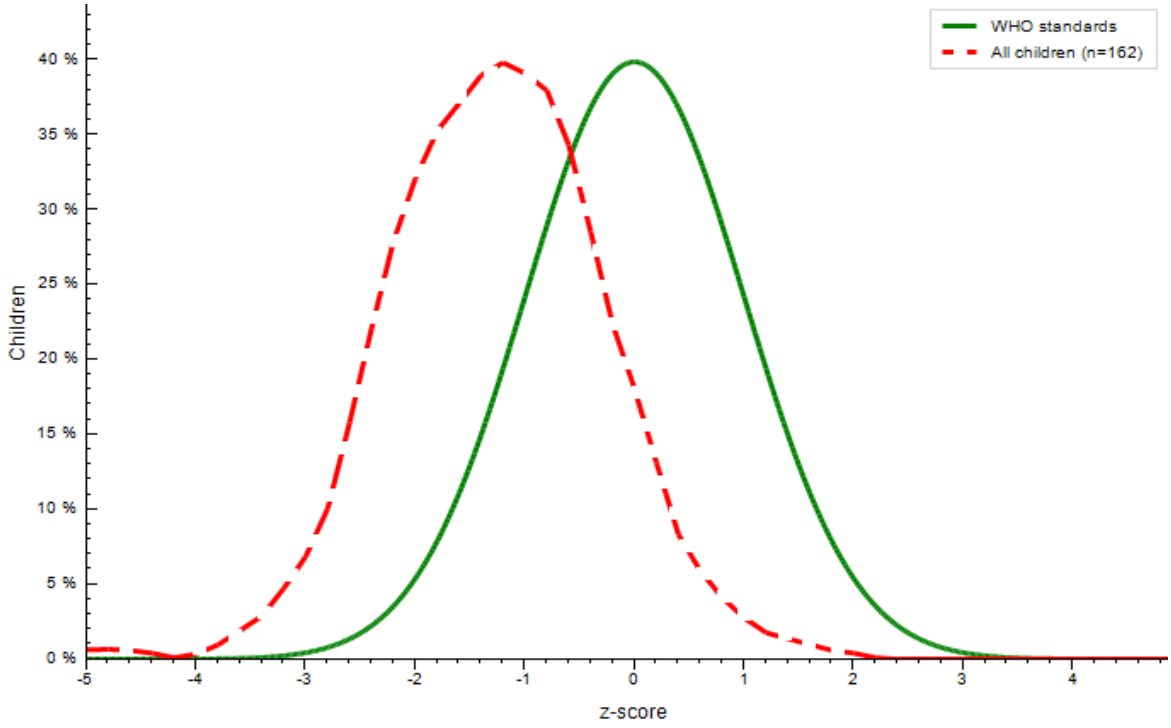

Fig. 4.7 Distribution of MUAC among 6 - 59 months children of studied area based on WHO standard (N=162)

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 -1.23 i.e. the median value is slightly shifted to the left showing the prevalence of wasting among the study population.

The prevalence of wasting based on MUAC measurement is shown in table 4.10 based on MUAC measurement 2.5% children was found to be severely wasted while 19.7% children were found to be moderately wasted.

Table 4.10 Distribution of wasting based on MUAC measurement

MUAC	Frequency	Percent
Severe	4	2.5
Moderate	32	19.7
Normal	126	77.8

4.7 Factors associated with under nutrition of children

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

4.7.1 Factors associated with stunting

Table 4.11 shows, Fischer exact test and chi-square test analysis results of factors associated with stunting. The Fischer exact test and chi-square test revealed that the gender of children (p= 0.001) were significantly associated with stunting. While there was no association in education of mother (p=0.306), age of mother (p=0.185), weight of birth age during first pregnancy (p=0.135), knowledge of PEM (p=0.316) and family size (p=0.755) with stunting.

Table 4.11 Factors associated with Stunting

		Stunting			
		Stunted	Normal	**$\chi 2$**	**P-value**
Gender	Female	12(17.6%)	56(82.4%)		
	Male	42(44.7%)	52(55.3%)	13.048	0.001#
Education of mother	Literate	36(30%0	84(70%)		
	Illiterate	18(48.3%)	24(57.1%)	2.366	0.306
Age of mother	less than 20	14(46.7%)	16(53.3%)		
	20 or >20	40(30.3%)	92(69.7%)	3.373	0.185
Weight of birth	less than 2.5 kg	7(43.7%)	9(56.3%)		
	more than 2.5 kg	47(32.2%)	99(67.8%)		0.355*
Age during pregnancy	less than 20	33(34.7%)	62(65.3%)		
	more than 20	21(31.3%)	46(68.7%)	4.006	0.135
Knowledge of PEM	No	38(34.5%)	72(65.5%)		
	Yes	16(30.8%)	36(69.2%)	2.307	0.316
Family size	Less than 5	27(36.5%)	47(63.5%)		
	5 or greater than 5	27(30.7%)	61(69.3%)	0.609	0.755

* Fischer exact p- value # Statistically significant ($P < 0.05$)

Statistically significant association was found between gender of children and stunting in present study (p=0.001). The study shows that there was greater risk of stunting in male children than female. The study informed that 44.7% of male children and 17.6% of female were found to be stunted. It was supported by the research done in "Prevalence of Malnutrition and Associated Factors among Children Aged 6-59 Months at Hidabu Abote District, North Shewa, Oromia Regional State". Increase of stunting with gender might be due to the inappropriate complementary feeding practices that were limited in quantity, quality and variety (Mengistu *et al.*, 2013).Similarly, the study done in pastoral community of Dollo Ado district, Somali region, Ethiopia shows stunting was more prevalent among boys than girls with a statistically significant of P<0.031 (Solomon and Amare, August 2013).

This findings was significantly supported by Ministry of Health population (2011) which says male children are more likely to be stunted as compared to female children

4.7.2 Factors associated with wasting

Table 4.12 shows, Fischer exact test and chi-square test analysis results of factors associated with wasting. Weight of the child at birth (P= 0.032), age of mother (P=0.024) and education of mother (P=0.004) was found to be significant with wasting. While the factors like gender, education of mother, age during first pregnancy, knowledge of PEM and Family size 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 more than 2.5 kg at birth.

This findings was supported by the findings of study prevalence of wasting and its associated factors of children among 6 to 59 months of age in Guto Gida districts, Oromia Regional state Ethiopia conducted by Adeba et al.,in Ethiopia which revealed that low birth weight of child was significantly associated with wasting (P<0.01) (Adeba *et al.*, 2014).wasting was markedly higher in children with low birth weight i.e. less than 2.5 kg than those with normal birth-weights which is supported by association of low birth weight

with malnutrition in children under 5 years in Bangladesh (Shafiqur Rahman *et al.*, June 29, 2016)

Table 4.12 Factors associated with wasting

		Wasting			
		Wasted	Normal	**χ2**	**P-value**
Gender	Female	0(4.4%)	65(95.6%)		
	Male	7(7.4%)	87(92.6%)		0.441*
Education of mother	Literate	3(2.5%)	117(97.5%)		
	Illiterate	7(16.7%)	35(83.3%)		0.004*#
Age of mother	less than 20	5(16.7%)	25(83.3%)		
	20 or >20	5(3.8%)	127(96.2%)		0.024*#
Weight of birth	less than 2.5 kg	2(12.5%)	14(87.5%)		
	more than 2.5 kg	8(5.6%)	136(94.4%)	11.832	0.032#
Age during pregnancy	less than 20	9(9.5%)	86(90.5%)		
	more than 20	1(1.5%)	66(98.5%)		0.056*#
Knowledge of PEM	No	8(7.3%)	102(92.7%)		
	Yes	2(30.8%)	36(69.2%)		0.745*
Family size	Less than 5	8(10.8%)	66(89.2%)		
	5 or greater than 5	18(20.5%)	70(79.5%)		0.259*

* Fischer exact p-value # Statistically significant ($P < 0.05$)

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 was higher among children with smaller size at birth than children with average or bigger size at birth. (A. Pradhan, 2010).

The association of age of mother classified as less than 20 and wasting was found to be statistically significant. The findings of the study revealed that the mother age less than 20 years were found significant to be more wasted than the mother of age group 20 and above. This findings can be supported by the research of factors associated with nutritional status of under five children in Rupandehi district of Nepal by Acharya et.al which shows there is

higher prevalence of wasting who were born to mothers less than 20 years of age (Acharya *et al.*, 2013).

Children born to educated women suffer less from malnutrition which manifests as underweight and wasting in children can be supported by the findings effect of mother's education on child's nutritional status in the slums of Nairobi (Benta *et al.*, 2012).

4.7.3 Factors associated with underweight

Table 4.13 shows, Fischer exact test and chi-square test analysis results of factors associated with underweight. Education of mother classified as illiterate was found to be significant with underweight (P=0.002), age of mother classified as less than 20 years was found to be significant with underweight (p=0.027), weight of birth classified as less than 2.5kg (P=0.001) and age during first pregnancy classified as less than 20 (P=0.045) was found to be significant with underweight While the factors like gender, knowledge about PEM and family size were found to be insignificant with underweight.

Table 4.13 Factors associated with underweight

		Underweight			
		underweight	Normal	**χ2**	**p-value**
Gender	Female	6(8.8%)	62(91.2%)		
	Male	20(21.3%)	74(78.7%)		0.051*
Education of mother	Literate	11(10%)	108(90%)		
	Illiterate	14(33.3%)	28(66.7%)		0.002*#
Age of mother	less than 20	9(30%)	21(70%)		
	20 to 29.9	17(12.9%)	115(87.1%)		0.027*#
Weight of birth	less than 2.5 kg	7(43.8%)	9(56.3%)		
	more than 2.5 kg	19(13%)	127(87%)		0.001*#
Age during pregnancy	less than 20	21(22.9%)	74(77.9%)		
	more than 20	5(7.5%)	62(92.5%)		0.045*#
Knowledge of PEM	No	20(18.2%)	90(81.8%)		
	Yes	6(11.5%)	46(88.5%)	1.75	0.417
Family size	Less than 5	8(10.8%)	66(89.2%)		
	5 or greater than 5	18(20.5%)	70(79.5%)		0.253*

* Fischer exact p-value # Statistically significant ($P < 0.05$)

Weight-for-age measurement revealed the protective importance of maternal education i.e. mother who were illiterate or whose study were done up to primary level tend to have underweight children which is supported by the assessment of "Nutritional Status of Under Five Year Children and Factors Associated in Kapilvastu District, Nepal"(Bhandari and Chhetri, 2013). Mother's education indicated positive impact over child's weight. The education of mothers showed upbeat effect on weight of the children as per their age the findings were similar to the study conducted Amita Pradhan (Pradhan, 2012).

Similar result i.e. the prevalence of underweight was significantly high among illiterate mother's child compared to literate was found according to a study conducted in Madhya Pradesh District, Umaria by G.N.V Brahmam et.al. in 2011 (Brahmam *et al.*, 2011). According to a study conducted by Ruwali D. in Padampur VDC, Chitwan, risk of

underweight were 0.194 and 0.11 times fewer for children of mother attending primary and secondary or more level of education respectively as compared to children of illiterate mother (Ruwali, 2011). Also, underweight was found to be highest(33.6%) among the children whose mothers were illiterate and prevalence of underweight decreased as the level of education of the mothers increased in the study conducted by Safikul Islam et. al. in Riverine area of Dibrugarh District Assam (Islam *et al.*, 2014).

Underweight was markedly higher in children with low birth weight i.e. less than 2.5 kg than those with normal birth-weights which is supported by association of low birth weight with malnutrition in children under 5 years in Bangladesh (Shafiqur Rahman *et al.*, June 29, 2016)

Less than 20 years age of mother and age during pregnancy leads to underweight children which is supported by the report timing birth which says delaying a first pregnancy until a girl is at least 18 years or less than 20 years of age helps to ensure a safer pregnancy and childbirth. It reduces the risk of her baby being born prematurely and/or underweight. This is especially important where early marriage is the custom and married adolescents face pressure to become pregnant(UNICEF *et al.*, 2010).

This findings can be supported by the research of factors associated with nutritional status of under five children in Rupandehi district of Nepal by Acharya et.al which shows more than fifty percent (57.75%) were underweight according to weight for age classification who were born to mothers less than 20 years of age(Acharya *et al.*, 2013)

Part V

Conclusions and recommendation

5.1 Conclusions

The Objective of this study was to assess factors associated with nutritional status of 6-59 months of children in Sukumbashi Basti northwest boundary of sardhu khola, Dharan. Overall, mother's education, age of mother, age of mother during pregnancy, gender and weight of birth were found to be important predictor for malnutrition persists as underweight, wasting and stunting. Following points can be concluded from this study:

a) The prevalence of stunting, wasting and underweight among 6-59 months of children in this area were found to be 32.7%, 6.2% and 15.4% respectively.

b) Weight of birth i.e. low birth weight has found a very strong positive association with wasting and underweight.

c) Education of mother and age of mother was associated with wasting and underweight.

d) Age during pregnancy and gender was associated with underweight and stunting respectively.

e) There was no association between weight of birth, age during pregnancy, mother's education and age of mother with stunting.

f) These findings are of great importance because they identify potential actions that can be used to improve the nutritional status of children.

g) Mother's education also plays a significant role to improve nutritional status of children so girls' education should intensify nationally.

h) The result of this study will be useful for the policy makers in their endeavor to formulate various developmental and health care programs.

5.2 Recommendations

Based on the findings of this study, below are few recommendations which are in urgent need of implementation in survey area for the improvement of nutritional status.

a) The education level in parent especially mother education as contributing factor for malnutrition of children level should be improved with health, hygiene and sanitation and nutrition education.

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

c) Timely introduction of complementary feeding and feeding/food behaviors should be advocated.

d) Effective interventions should be addressed to reduce malnutrition.

e) Public awareness should be done about early marriage.

f) Use of family planning should be encourage at community level as there should be at least 5 years of age gap between two child.

Part VI

Summary

All houses were visited so all the population of under 5 years children were included for the study work to assess the factors associated with nutritional status of 6-59 months children in *Sukumbashi basti* northwest boundary of sardhu khola, *Dharan*. 162 children was taken to assess the nutritional status of this area using anthropometric measurements (weight, height, MUAC) were performed to find the nutritional status of children. A structured questionnaire was administered to the mother or caretaker of children to determine the associated factors. Data collected was analysed using WHO Anthro version 3.2.2 and SPSS 20. Fisher exact test and chi- square test were used to analyse the factors associated with nutritional status.

Out of 162 children included in this study 94 (58%) were males and 68 (42%) were females. The major employment of studied area were laborer (60.5%), foreign employment (18.5%) followed by agriculture (2.5%), job or service (16.7%) and doing nothing (1.9%).59 (36.4%) of mothers had primary level education, 57 (35.2%) of mothers had secondary level education while 42 (25.9%) were illiterate and 4 (2.5%) with higher secondary and above educational status.

The prevalence of stunting i.e. 32.7%, underweight i.e. 15.4% and wasting i.e. 6.2% was lower than that of the findings of NDHS (2011). The prevalence of stunting was found to be lower with the result of the survey done in *Nirajan basti (sukumbashi area), Dharan15* where 42% of children under five years of age of that basti were stunted, the rate of wasting was found to be higher than that survey where 9% children were wasted and the rate of underweight was found to be lower than that survey where 18% children were underweight. The prevalence of stunting was found to be slightly higher than that of Eastern *Terai* region (31.4%), while wasting and underweight was found to be lower than that of Eastern *Terai* 10.3% and 24% respectively.

Fischer exact test and chi-square test analysis results of factors associated with wasting. Shows that weight of the child at birth (P= 0.032), age of mother (P=0.024) and education of mother (P=0.004) was found to be significant with wasting. Education of mother classified as illiterate was found to be significant with underweight (P=0.002), age of mother classified

as less than 20 years was found to be significant with underweight (p=0.027), weight of birth classified as less than 2.5 kg (P=0.001) and age during first pregnancy classified as less than 20 (P=0.045) was found to be significant with underweight whereas gender of children (p= 0.001) is significantly associated with stunting.

References

(NPC)[Nepal], N. P. C. (2010). Nepal Millennium Development Goals progress report 2010. [Report]. National Planning Commission. kathmandu, Nepal.

Acharya, D., Gautam, S., Kaphle, H. P. and Naupane, N. (2013). Factors Associated with Nutritional Status of Under Five Children in Rupandehi District of Nepal. Sanjeevani College of Medical Science, Rupandehi, Nepal School of Health and Allied Sciences, Pokhara University, Kaski, Nepal, Masood College of Nursing, Rajiv Gandhi University of Health Sciences, Bangalore- 564001, Karnataka., Butwal, Rupandehi, 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. **24**.

Adhikari, O. (2015). Assessment of Nutritional Status of Children 6 – 59 Months of Age and Factors Associated with it in Nirajan (SUKUMBASI) Basti, Dharan- 15 Bsc. Nutrition and Dietetics dissertation. Department of Nutrition & Dietetics Central campus of Technology, Dharan Institute of Science and Technology Tribhuvan University, Nepal., Nepal.

Awan, J. A. (1997). *Moon Publisher*.

Badrialaily. (2008). Nutritional Status and Related Factors Among Elementary School Students in Banda Aceh Municipality Nanggroe Darussal Province, Indonesia. 64.

Benta, A. a., James Ciera and Kimani-Murage, E. (2012). Effect of mother's education on child's nutritional status in the slums of Nairobi. *j. PMC, US National Library of Medicine , National Institutes of Health*. **12**.

Bhandari, T. R. and Chhetri, M. (2013). Nutritional Status of Under Five Year Children and Factors Associated in Kapilvastu District, Nepal. *Journal of Nutritional Health & Food Science*.

Bhatta, M. K. and Gurung, S. (1998). Nutritional status of Bishanku Narayan village *J. Nepal.Med.Assoc.* (37), 614-619. .

Brahmam, G., Venkaiah, K., Laxmaiah, A., Imeshram, I., Rao, K. M., Reddy, C. G., Kumar, S., Rabindranath, M. and Krishna, K. S. (2011). Assessment of nutritional status of

under 5 year rural children in the district of Madhya Pradesh state, District, Umaria *[Report] National Institite of Nutrition.*

Burk, M. (1984). Brief introduction for food economics to nutrition problems. *Elsevier Publishing. State Avenue, USA* "Integration Nutrition into Agriculture and Rural Development Project." (3rd ed.). A manual nutrition in agriculture.

Chapagain, R., Adhikari, A., Dahal, R., Subedi, J., Blengro, J., Williams, B. and Towne, B. (2005, October). A Study on Nutritional Status of Under Five Jirel Children of Eastern Nepal. *Nepal Health Research Council*. 39 - 43.

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

Davidson and Passimore. (1986). "Human Nutrition and Dietetics" (8th ed.). English Language Book Society, Livingstone, Longman Group.

Dhakal, A. (1995). An area nutritional survey of uttarpani chungbung VDC, Dhankuta. Btech. Food Dissertation. Central Campus of Technology Tribhuvan University, Nepal.

Dhungana, G. (2013). Nutritional status of under five children and associated factors of Kunchha Village Development Committe. *Journal of Chitwan Medical College*. **3** (2), 38-42.

Gomez, Galvan, R. and Cvaviato, J. (1955). "Nutrition in Infancy and childhood with special reference to Kwashiorkor" (S. Levine ed. ed.). Vol. 7. New York Year Book Publishers. New York

Gomez, Ramos Galvan, R., Frenk, S., Cravioto Munoz, J. and Vazquez, J. (2000). Mortality in Second and third degree malnutrition. [Bulletin of the World Health Organization]. [Accessed 1956].

Graves, J. F. and Nitzke, S. (2002). Total diet approach to communicating food and nutrition information. *Journal of the American Dietetic Association*. **102** (1), 100-108. [Cited in P. o. t. A. D. Association. (january,2002). American Dietetic Association.

Hommes. (2005). Nutritional Status of Children Victims of the Armed Conflict in Nepal. A Survey report of IDP Children in Banke Children., 61.

Islam, S., Mahanta, G. T., Sarma, R. and Hiranya, S. (2014). Nutritional Status of under 5 children belonging to Tribal Population living in Riverine (Char) area of Dibrugarh District Assam. . *Indian Journal Community Med.* .

Jelliffe, D. B. (1966). The assessment of Nutritional Status of Community. *WHO monograph Series , World Health Organization.* **53**, 176-207.

Joshi, Y. (2008). "Basics of Clinical Nutrition" (Second ed.). Jaypee Brothers Medical Publishers (P) Limited. New Delhi, India.

KantipurNationalDaily. (2012). Present Condition of Nutrition in Nepal. [Newsletter]. Retrieved from www.ekantipur.com.np. [Accessed 14 June, 2014.]

Katawal. (1989). Livestock production and its impact on nutritional status of the peple in developing countries. *A term paper preapared for food and nutrition planning*. (UPLB,Philippines), 2-19.

Katwal. (1989). Livestock production and its impact on nutritional status of the people in developing countries. *A term paper prepared for food and nutrition planning*. (UPLB,Philippines), 2-19.

Mehata, S. (2008). A meta - analysis on association of gender to malnutrition among under five children in South Asian Countries, . *Nepal Association for Medical Laboratory Sciences*. 41 - 43. .

Mekides, W. T., Belachew, T. E. and Semaw, A. F. (2015). Under Nutrition and Associated Factors Among Under-FiveAge Children of Kunama Ethnic Groups in Tahtay Adiyabo Woreda, Tigray Regional State, Ethiopia: Community based study. . *International Journal of Nutrition and Food Sciences.*, 62.

Mengistu, Alemu, K. and Destaw, B. (2013). Prevalence of Malnutrition and Associated Factors Among Children Aged 6-59 Months at Hidabu Abote District, North Shewa, Oromia Regional State. public health thesis. Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopi, Ethiopi.

Mengistu K, Alemu K and B, D. (2013). Prevalence of Malnutrition and Associated Factors Among Children Aged 6-59 Months at Hidabu Abote District, North Shewa, Oromia Regional State. . *J Nutr Disorders Thesis*.

MoHP. (2011). Nepal Demographic Health Survey. [Report]. Ministry of health and population,New ERA and ICF International, Calverton, Maryland. kathmandu, Nepal.

Nabarro, D. (1984). "Socio economic health and enviroment determinants of nutritional status". *The J. of Food and Nutrition Bulletin.* . **6** (1), 18-23.

NDHS. (2011). Nutritional status pf children. [Report]. Nepal Demographic and Health survey Report. Nepal.

NMICS. (2012). Nepal Multiple Cluster Survey. *Nutritional Status. Nepal: UNICEF*. .

NMIS. (1996). Nepal multiple indicator Surveillance. *Health and Nutrition cycle* **1**.

Nutrition and science, F. (2014). "Nutrition and food science".

Passimore, R. and Eastwood, M. (1986). "Human Nutrition and Dietetics .".Churchil, Livingstone.

Pietsch. (2000). Measurement of Nutritional Status in Children with Cancer. *Nutr Clin Pract. doi* **15** (4), 185-188.

Pradhan. (2012). NutritionL Status among under five children and their mothers with gender perspective. Ph.D degree in statistics Dissertation. Central department of statistics, institute of science and technology, T.U., Nepal.

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

Prüss-Üstün, A., Campbell-Lendrum, D., Corvalán, C. and Woodward, A. (2005). Malnutrition quantifying the health impact at national and local levels. *Environmental burden of disease series*. (12). World Health Organization.

Raj laxmi, R. (1996). "Applied Nutrition".

Ramchandran, P. (1987). Use of Socio-economic and Mortality Data for the Assessmen of Nutritional Status. Dissertation. Oxford University Press, India.

Rijal, P., Shrestha, P., Sharma, A. and Upadhyay, S. (2011). Nutritional assessment of children at Nepal Medical College Teaching Hospital. 184-188. Retrieved from http://library.nhrc.org.np:8080/nhrc/bitstream/handle/123456789/62/613.pdf?sequence=1. [Accessed 3 July, 2015].

Robinson, C. (2000). "Normal and Therapeutic Nutrition " (14th ed.). Robinson, c. New Delhi: Willy Eastern. pvt. Ltd.

Ruwali, D. (2011). Nutritional Status of Children Under Five Years of age and factors associated in Padampur VDC, Chitwan. Health Prospect., 10, 14 - 18

Scrimshaw, N. S. (1997). "Nutrition from womb to tomb" *Food and Nutrition Bulletin* **1**.

Shafiqur Rahman, M., Tamanna Howlader, Mohammad Shahed Masud, Rahman, M. L. and Fakir M Amirul Islam. (June 29, 2016). Association of Low-Birth Weight with Malnutrition in Children under Five Years in Bangladesh: Do Mother's Education, Socio-Economic Status, and Birth Interval Matter? *PLOS, one*. **11** (6).

Shrestha. (2014). Nutritional Status of Under - Five Children in western Nepal. *J Nepal Paediatr Soc*. (http://dx.doi.org/10.3126/jnps.v34i2.10566.), 119 - 124.

Shrestha, R. (1996). A study on socio-economic status on malnutrition in Bungamati village. . 33.

Smith, L. and Haddad, L. (2000). Overcoming Child Malnutrition in Developing Countries: Past Achievements and Future Choices. [Report]. 64. Retrieved from http://cdm15738.contentdm.oclc.org/utils/getfile/collection/p15738coll2/id/125413 /filename/125414.pdf. [Accessed 22 July,2015].

Smuts, C. M. (2009). Factors associated with nutritional status of children aged 0-60 months residing in Eastern Cape and KwaZulu-Natal Provinces degree of Magister Scientiae in Dietetics Mini-dissertation. School of Physiology, Nutrition and Consumer Sciences of the North-West University, Potchefstroom Campus

Solomon, D. and Amare, W. (August 2013). Magnitude and Factors Associated with Malnutrition in Children 6-59 Months of Age in Pastoral Community of Dollo Ado District, Somali Region, Ethiopia. [Report]. Ethiopia. Retrieved from https://www.researchgate.net/publication/256657264_Magnitude_and_Factors_Associated_with_Malnutrition_in_Children_6-59_Months_of_Age_in_Pastoral_Community_of_Dollo_Ado_District_Somali_Region_Ethiopia [Accessed Jul 8, 2017].

Srilakshmi, B. (2002). "Nutrition Sciences". New Age International (P) Limited. Delhi, India.

SriLakshmi, B. (2014). "Dietetics" (Seventh ed.). New Age International (P) Limited. India.

Swaminathan, D. M. S. e. V. (2014). "Food and nutrition" (2nd ed.). Vol. 2. The Bangalore Printing & Publishing Co., LTD. Bangalore. India.

UNICEF. (2013). The achievable imperative for global progress. *Improving child nutrition*.

UNICEF. (2015). UNICEF Conceptual Framework. Retrieved from http://www.unicef.org/nutrition/training/2.5/4.html. [Accessed 13 Jun, 2015].

UNICEF, WHO, UNESCO, UNFPA, UNDP, UNAIDS, WFP and Bank, T. W. (2010). "Pregnancy before the age of 18 or after the age of 35 increases the health risks for the mother and her baby." (4th ed.). New york, US. UNICEF, WHO, UNESCO, UNFPA, UNDP, UNAIDS, WFP and the World Bank. p. 24. Retrieved from http://www.factsforlifeglobal.org/resources/factsforlife-en-full.pdf.

Vaidya. (1987). Improving Young Child Feeding in Eastern and Southern Africa Household. Food Technology Process of a Workshop held in Nairobim Kenya. *Weaning Food in Nepal*. ((Schmidt, O. G., Moses, S. and Alnwick, D.)), 349-358.

WEHAB. (2002). A framework for action on health and the environment. [Report]. World Summit on Sustainable Development. Johannesburg, South Africa, Johannesburg, South Africa.

WFP. (2005). "Measuring and Interpreting Malnutrition and Mortality".Rome.

WHO. (1966). The Assessment of the Nutritional Status of the Community. *WHO monograph Series*. (Geneva, Switzerland).

WHO. (2000). Nutrition for Health and Development. France.

WHO. (2015). Global Database on Child Growth and Malnutrition. Retrieved from http://www.who.int/nutgrowthdb/about/introduction/en/index6.html. [Accessed March 10, 2015].

WHO and UNICEF. (2009). WHO child growth standards and the identification of severe acute malnutrition in infants and children. . *The World Health Organization and United Nations Children's Fund New York and Geneva.*

APPENDICES

Appendix A

Questionnaire (English)

Basic information

1. Form No
2. Head of house:
3. Ward No.:
4. Caretaker mother/father/other member
5. Mother's name:
6. Age of mother:
7. Name of child under five years:
8. Gender male/female
9. Age of child:
10. Child's date of birth:

Family and child's information

1. No of family members: male……, female……., 6-59 months children…….
2. Occupation: occupation of mother……., occupation of father……
3. Education: Education of father: primary/secondary/higher secondary/illiterate

   Education of mother: primary/secondary/higher secondary/illiterate
4. Does your child go to the school? Yes/no
5. Monthly income: less than NRs.5000/NRs.5000-10000/NRs.10,000-15,000/NRs.15000-20,000
6. Monthly saving: NRs.5000/NRs.5000-10000/NRs.10,000-15,000/NRs.15000-20,000

7. Money invested in food:
8. Death of any child under 5 yrs of age? Yes/no
9. If yes, how?
10. Which child is this (first/ second/ third...):
11. Birth type? Normal delivery/caesarian section
12. Weight at the time of birth?

Environmental and sanitation information

13. What is your source of drinking water? Tube well/river/tap/well
14. How do you purify your drinking water? Filtration/chlorination/by boiling/none
15. Do you have toilet at your home? Yes/no
16. How many times your child takes shower?
17. What is the source of water for bathing? River/well/tap/other
18. What is the source used for brushing teeth? Ash/paste/wooden brush/other
19. Cooking fuel? Gas/firewood/dung gas/electricity/ other
20. What do you use for washing hands? Soap/ash/sand/others

Questions for mother related to maternal and nutrients/breastfeeding

21. Do you have any health disease? Yes/no
22. If yes what is it?
23. Did you feed colostrum immediately after birth? Yes/no
24. When did you stop breastfeeding? Continue/6 months/less than 6 months/less than 2 yrs./more than 2 yrs.
25. At what age did you get married?
26. How old were you during first pregnancy? Less than 20yrs/ more than 20 yrs

27. Additional nutrients is needed during pregnancy? Yes/no

28. Did you feed MNP to your child? Yes/no

29. Do you know about complementary feeding? Yes/no

30. If yes when did you start? Above 6 months/below 6 months

31. What type of complementary feeding did you introduce to your child? Lito/super flour/porridge/similar dishes/ other

32. What type of food does your child love to eat? Homemade/ others

33. Do you know how to prepare sorbottom pitho? Yes/no

34. If yes which proportion cereals: legumes? 2:1/1:1/1:2/as much as I want

35. How many times do you breast feed your child? Less than/4-6 times/more than 6 times

36. What type of salt is used in your household? Iodized salt/ non iodized salt

37. How much food did you take during pregnancy? More than usual/less than usual/usual

38. In week, how many times do you feed legumes to your child? 1 times/2-4 times/5-7 times/always

39. In week, how many times do you feed green leafy vegetables to you child? 1 times/2-4 times/5-7 times/always

40. Does your child eats meat/fish?

41. If yes how many times? 1 times/2-4 times/5-7 times/always

42. What types of cereals do you consume? Own cultivated/ buying

Health and immunization information

43. Does your child have any health issues? Yes/ no

44. If yes what is it?

45. In your view, how disease take place? Due to lack of hygiene and sanitation/unhygienic food/no vaccination/crush of god/others

46. Where do you take child if she/he get sick? Health centre/pharmacy/dhami/other

47. Do you know about PEM? Yes/no

48. Do you know how to prepare ORS? Yes/no

49. Do you know about balance diet? Yes/no

50. Have you taken iron folate tablet? Yes/no

51. Did you get vaccination during pregnancy? Polio/BCG/DPT/TT/no

52. Have you given vitamin A and deworming tablet? Yes/no

53. Did you get vaccination to you child? Yes/no

54. If yes which?

Questionnaire (Nepali)

प्रश्नहरु

खण्ड१ :१) सामान्यजानकारीहरु

१.फारम नं. .....

२. घरमुलीको नाम : .....

३. वडा नम्बर : .....

४. उत्तरदाता : १. आमा २. बुवा ३. अन्य सदस्य

५. आमाको नाम .....

६. उमेर .....

७. सर्वेक्षणमा परेको बच्चाको नाम :.....

८. ऊमेर ..... ९. जन्म मिति.....

पोषण स्थिति

तौल	उचाइ	म्यूएक	इडिमा	दर्घ रोगहरु

खण्ड २: परीवार र बच्चाको विवरण

१. जम्मा परिवार सङ्ख्या

१. पुरुष २. महिला ३. ६ – ५९ महिनाका बच्चा

२. पेशा

बुबाको

आमाको

३. शिक्षा

बुबाको: १.निरक्षर २.प्राथमिक ३.माध्यमिक ४.उ. माध्यमिक ५.उ शिक्षा

आमाको: १.निरक्षर २.प्राथमिक ३.माध्यमिक ४.उ. माध्यमिक ५.उ शिक्षा

४. बच्चा विद्यालय जान्छ कि जाँदैन?

१. जान्छ २.जाँदैन

५. मासिक आम्दानी (परीवाको)

१.५००० भन्दा कम २. ५०००-१००००

३.१००००-१५००० ४.१५०००-२००००

५. २०००० माथि

६. मासिक बचत (परीवाको)

१.५००० भन्दा कम २. ५०००-१००००

३.१००००-१५००० ४.१५०००-२००००

५. २०००० मथि

७. खानामा खर्च: .....

८. हालसम्म कुनै बच्चाको मृत्यु भएको छ कि छैन?

१.छ २.छैन

९. छ भने कारण .....

१०. यो बच्चा तपाईको कतिऔँ सन्तान हो? .....

११. बच्चाको जन्म कस्तो प्रकारको हो?

१.प्राक्रितिक २.शल्यक्रिया गरेर

१२. बच्चा जन्मदा को तौल?

१.२.५केजी भन्दा कम २.२.५ केजी भन्दा बढी

खण्ड ३: व्यक्तित्व तथा वाताबरणीय स्वास्थ्य

१३. तपाईको पिउने पानीको स्रोत के हो?

१.कल २.खोला ३.इनार ४.खानेपानीको धारा ५.अन्य

१४. पानी शद्धिकरण गर्नुहुन्छ?

१.गर्छु २.गर्दिन

१५. गर्नुहुन्छ भने कसरी? .....

१६. घरमा चर्पी छ?

१.छ २.छैन

१७. बच्चाले हप्तामा कति पटक नुहाउँछ? .....पटक

१८. बच्चालाई नुहाउन प्रयोग गर्ने पानीको स्रोत के हो?

१.कल २.खोला ३.इनार ४.खानेपानीको धारा ५.अन्य

१९. परिवारमा दाँत माझ्न क प्रयोग गर्नु हुन्छ?

१.खरानी २. मंजन ३.दतिउन ४.अन्य

२०. घरमा खाना पकाउन के को प्रयोग गर्नुहुन्छ?

१.ग्यास २. दाउरा ३.गुईठा ४.गोबर ग्यास ५.बिधुत्त ६.अन्य

२१. हात धुन के प्रयोग गर्नु हुन्छ?

१.साबुन २. खरानी ३.माटो ४.अन्य

खण्ड ४: आमालाई सोध्ने पोषण र स्तनपान सम्बन्धी प्रश्नहरु

२२. तपाईलाई कुनै स्वास्थ्य समस्या छ कि छैन?

१. छ २. छैन

२३. छ भने कस्तो समस्या छ? (बहु उत्तर आउन सक्छ)

१. शारिरीक ( )

२. मानसिक

३. दिर्घ रोगहरु ( )

२४. बच्चालाई जन्मने बित्तिकै आफ्नो विगौति दुध खुवाउनु भएको थियो?

१.थियो २.थिएन

२५. बच्चालाई कहिलेसम्म आफ्नो दुध खवाउनु भयो?

१.हालसम्म २.६ महिनासम्म ३.६महिनाभन्दा कम ४.२ वर्षभन्दउ कम

२६. तपाईको विवाह हुँदा कति वर्षको हुनुहुन्थ्यो? .....

२७. पहिलो सन्तान हुँदा कति वर्षको हुनुहुन्थ्यो? .....

२८. गर्भवति आमालाई थप आहार चाहिन्छ कि चाहिँदैन?

१. चाहिन्छ २. चाहिँदैन

२९. तपाईले बच्चालाई बाल भिटा (MNP) खुवाउनुभयो?

१.खुवाए २.खुवाइन

३०. तपाईलाई पुरक आहारबारे थाहा छ?

१.छ २.छैन

३१. बच्चालाई पुरक आहार कति समय पछि खूवाउनु भयो?

१.६ महिना भन्दा अघि २.६ महिना भन्दा पछि

३२. कस्तो किसिमको पुरक आहार खुवाउनु भयो?

१.सर्वोत्तम पीठो २.लिटो ३.जाउलो ४.साधारण खाना ५.अन्य

३३. तपाइको बच्चा कस्तो खानेकुरा खान रुचाउछ?

१.घरमै बनाएको २.बजारको

३४. तपाईलाई सर्वोत्तम पिठो बनाउने तरिका थाहा छ?

१.छ २.छैन

३५. यदि थाहा छ भने काति भाग अन्न र कति भाग गेडागुडि मिसाउनु हुन्छ?

१.२:१ २.१:१ ३.१:२ ४.जति मन लाग्छ त्यति

३६. बच्चालाई एकदिनमा कति पटक स्तनपान गराउनु हुन्छ?

१.६ पटक भन्दा कम २.६-८ पटक ३.८ पटक भन्दा बढि ४.गराउँदिन

३७. बच्चालाई एक दिनमा कति पटक पुरक आहार खवाहुनु हुन्छ?

१.४ पटक भन्दा कम २.४-६ पटक ३.६ पटक भन्दा बढि

३८. घरमा खानकालागि कुन नुन प्रयोग गर्नुहुन्छ?

१.ढिक्के २.आयोडिन युक्त

३९. गर्भवति हुँदा कति खाना खानु हुन्थ्यो?

१.अरु बेला भन्दा कम २.अरु बेला भन्दा वढि ३.अरु बेला जत्तिकै

४०. बच्चालाई हप्तामा कति पटक गेडागुडि वा दाल खुवाउनु हुन्छ?

१.१ पटक २.२-४ पटक ३.५-७ पटक ४.सधैँ

४१. बच्चालाई हप्तामा कति पटक हरियो सागपात खुवाउनु हुन्छ?

१.१ पटक २.२-४ पटक ३.५-७ पटक ४. सधैँ

४२. बच्चाले माछा मासु खान्छ कि खाँदैन?

१.खान्छ २.खाँदैन

४३. खान्छ भने हप्तामा कति पटक खान्छ?

१.१ पटक २.२-४ पटक ३.५-७ पटक ४. सधैँ

४४. तपाईहरु खाने अन्न कस्तो प्रकारको हो?

१. आफै उत्पादन गरेको २.बजारबाट किनेर ल्याएको

४५. बच्चाले हप्तामा कति पटक दुध र त्यसका परिकार खान्छ?

१.१ पटक २.२-४ पटक ३.५-७ पटक ४. सधैँ ५. खादैन

खण्ड ५: रोग र खोप बारे विवरण

४६. बच्चालाई कुनै किसिमको स्वास्थ्य समस्या?

१.छ २.छैन

४७. छ भने कस्तो समस्या? .....

४८. तपाईको बिचारमा रोग कसरी लाग्छ?(बहु उत्तर आउन सक्छ)

१. सरसफाईको कमिले २. सफा खानाको कमिले ३. खोप नलगाउनाले ४. देवी देउताको स्रापले ५. अन्य

४९. बच्चा बिरामी हुँदा सर्वप्रथम कहाँ जानुहुन्छ?

१. स्वास्थ्य चौकि २. औषधी पसल ३. धामि झाक्रि ४. अन्य

५०. तपाईलाइ कुपोषण बारे थाहा छ?

१. छ २. छैन

५१. तपाईलाइ पुनर्जलीय झोल बनाउले तरिका थाहा छ?

१. छ २. छैन

५२. तपाईलाइ सन्तुलित खाना बारे थाहा छ?

१. छ २. छेन

५३. तपाई गर्भवति हुँदा आइरन चक्की खानु भएको थियो?

१. थियो २. थिएन

५४. गर्भवति हुँदा खोप लगाउनु भएको थियो?

१. थियो २.थिएन

५५. बच्चालाई पोलियो थोपा खुवाउनु भएको छ?

१. छ २. छैन

५६. बच्चालाई भिटामिन ए र जुकाको औषधि खुवाउनु भएको छ?

१. छ २. छैन

५७. बच्चालाई खोप लगाउनुभएको छ?

१. छ २. छैन

५८. छ भने कुन खोप लगाउनु भएको छ?.....

Appendix-B

Consent Letter

Namaste!

I Miss **Swaichchha Basnet**, 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 **study on**"**Factors associated with nutritional status of 6-59 months children in *Sukumbashi basti* Northwest boundary of sardhu khola,*Dharan.*** 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 Naulo Basti, Devi Gaun, Gauri Gaun, Dharan (Sukumbashi area northwest boundary of sardhu khola)

Appendix-D

Plates and photographs