NUTRITIONAL ASSESSMENT OF EARTHQUAKE VICTIMIZED CHILDREN OF 6-59 MONTH RESIDING IN THREE SHELTERS OF DAMGADE, SANKOSH AND ALCHIIDADA OF DHADING DISTRICT

by

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Nutritional Assessment of Earthquake Victimized Children from 6-59 Month Residing in Three Shelters in Damgade, Sankosh and Alxidada in Dhading District

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

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Approval Letter

This dissertation entitled Study of nutritional assessment of earthquake victimized children from 6-59 month residing in three shelter in damgade, sankosh and alxi dada in Dhading district by Sundar mani silwal has been accepted as the partial fulfillment of the requirement for the B.Sc. degree in Nutrition and Dietetics

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Abstract

The study was conducted to assess the nutritional status of under-five year children and to find out the factors associated with it. A community based cross sectional study was conducted on 98 children aged 6-59 months for assessing the nutritional status of under-five children and factors associated with it in three shelters in Damgade, Sankosh and Alchidada of Dhading. Anthropometric measurements were used to identify nutritional status. Statistical Package for the Social Sciences (SPSS) 20 version and World Health Organization (WHO) Anthro 3.2.2 version were used for analyzing the data. Chi-square test was used to identify the associated factors of malnutrition.

The analysis of the study showed that 38.8% stunting and 19.4% severe stunting, 16.3% wasting and 7.1% severe wasting, 28.6% underweight and 13.3% severely underweight. The pregnancy age of mother was found significantly associated with stunting. The stunted rate was found higher in the children born by mother above 20 years in c omparison to the mother below 20 years. Wasting was significantly associated with birth order of child and immunization during pregnancy. Result showed higher the birth order, higher was the wasting prevalence and child from immunized mother during pregnancy were less wasted. Underweight was significantly associated with mothers knowledge about malnutrition. Children from mother having knowledge about malnutrition were highly underweight in compare to children from mother who didn't have proper knowledge about malnutrition. There was inverse relationship between underweight and mother's knowledge about malnutrition. Results of this study indicate that under nutrition is still an important problem among 6-59 months children residing in three shelters of Dhading. Hence the nutrition interventional programs focusing these risk factors should be launched immediately to overcome the problems.

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Abbreviations

Abbreviations	Full forms
WHO	World health organization
SPSS	Statistical Package for social science
NDHS	National demographic health survey
UNICEF	united nation international children emergency fund
MOPH	Ministry of population and health
IQ	intelligent quotient
PEM	Protein energy malnutrition
IDD	iodine deficiency disorder
HIV	Human immune deficiency virus
AIDS	acquired immune deficiency syndrome
IYCF	infant and young child feeding
BMI	body mass index
MUAC	Mid-upper arm circumference
HAZ	height for age z score value
WHZ	weight for height z score value
WAZ	weight for age z score value
INGO	international non-governmental organization
NGO	Non-governmental organization
SAM	severely acute malnutrition
IDA	iron deficiency anemia
VDC	village development committee
FCHV	Female community health volunteers
NCHS	National center for health statistics

PART-I

Introduction

1.1 Background to the study

Nutrition is the science of food and its interaction with an organism to promote and maintain health. Thus, nutrition is the combination of process by which all parts of the body receive and utilize the materials necessary for the performance of their function and for growth and renewal of all the components. Optimum nutrition means that a person is receiving and utilizing essential nutrient in proper proportion as required by the body. Nutrition status is the condition of the body as it relates to consumption and utilization of food. The nutrition status of a person may be either good or poor. Good nutrition status refers to the intake of a well-balanced diet, which supplies all the essentials nutrients to meet the body's requirements. Similarly, poor nutrition means to an inadequate or even excessive intake or poor utilization of the nutrient to meet the body requirement (Joshi, 2016).

Malnutrition is the condition characterized either by the excess or the deficiency of the nutrients availability in the body. Children under the age of five are mostly prone to the malnutrition. Malnutrition is widely prevalent in many parts of the worlds: malnutrition especially under nutrition is the most serious human health and social problems that affect the majority of the population of the developing country like Nepal. Malnutrition is also associated with infection and its complex links fertility, family size, physical and mental health and growth and development and immunity mechanism of the body is certainly new dimension (Gartaulla, 1998).

As of the Nepal Demographic and Health Survey 2006, 49% of children below 5 years of age are stunted and 20% are severely stunted, 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 NDHS 2011 shows that 41% of children under 5 years of age are stunted, and 16% are severely stunted, 11% of children are wasted and 3% are severely wasted and 29% of children below 5 year of age are underweight and 8% are severely underweight (MoHP, 2011).

Damgade, Sankosh and alchi dada (Survey area) lies in lap of Nilkantha municipality located 19 km inside from Mahendra highway (Malekhu) in Dhading. Almost all tamang people are found residing there. The major occupation of the people is labor there.

Dhading is one of the worst affected districts as a result of the 7.8 earthquake that struck Nepal on 25 April. As of 11 May, 718 people had been reported killed in Dhading, and 702 people injured. Initial Government estimates suggested that 20,000 buildings have been completely destroyed in the district, and 15,000 buildings were damaged. According to initial assessment reports, in 21 VDCs 90% of houses have been damaged, in 18 VDCs 70% of houses have been damaged, and in the remaining 7 VDCs the damage was below 70%. The 7.3 magnitude aftershock that struck on 12 May is not reported to have caused significant further damage to Dhading district (OSOCC, 2017).

Many people are still sheltering in the tent. They feel suffocated in the tent. It didn't block the heat, rain and cold climate. The earthquake has ruined everything. The victims said they faced hunger, shortage of drinking water, toilet, electricity and medication. They do not have necessary clothes, only the tent. Children and the elderly have been affected most. They are suffering from common cold, cough, diarrhea and fever due to the lack of proper sanitation around the camp area. Nepal Red Cross Society, Dhading chapter has managed a regular mobile health camp fearing the spread of diseases due to poor sanitation at the campsite. It has been managing drinking water, health check-up and sanitation facilities for victims(Times, 2015).

1.2 Problem statement and justification

Malnutrition is a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients. It refers a state of nutrition where the weight for age, height for age and weight for height indices are below -2 Z-score of the NCHS reference. Malnutrition is still a major public health problem in developing countries. It is the most important risk factor for the burden of disease causing about 300, 000 deaths per year directly and indirectly responsible for more than half of all deaths in children(Muller O and Krawinkel, 2005). Health and physical consequences of prolonged states of malnourishment among children are: delay in their physical growth and motor development; lower intellectual quotient (IQ), greater behavioral problems and deficient social skills; susceptibility to contracting diseases. 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, 1984a).

Nepal suffers from extensive malnutrition, ranking in the top 10 countries with the highest prevalence of stunting (less than -2 SD scores) .The World Health Organization estimates that approximately 150 million children younger than 5 years in developing countries are underweight and an additional 200 million children are stunted (Laura, 2004). Under nutrition remains a devastating problem in many developing countries affecting over 815 million people causing more than one- half of child death. Although, WHO, UNICEF and National breastfeeding policy recommended that infants be exclusively breastfed from birth to 6 months and continue breastfeeding to 24 months and beyond for optimal survival, growth development only 70% of infants under six months of age are exclusively breastfed in Nepal. The poor breastfeeding and inadequate complementary feeding explained the protein energy malnutrition level in children as they grow older (MoHP, 2011).

Malnutrition during childhood can lead to a risk of life-style diseases in the future as well as immediate risk of morbidity and mortality, according to recent study. The World Health Report 2002 clearly describes how childhood and maternal underweight are the greatest risk factor among several main factors that affect people's health and disease status in the world, particularly in Asia (WHO, 2002). Malnutrition especially under-nutrition among under five year age group children may lead to the consequences like, falling to grow (underweight, stunted and wasted), reduced learning ability, reduced resistance and immunity against infection and reduced productivity in future(MoHP, 2005).

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 not breastfed properly and complementary foods are also not provided sufficiently so there is high chance of malnutrition. Children under 5 year are very vulnerable to malnutrition. Therefore, this study is designed to assess the prevalence of malnutrition and associated factors among children aged 6-59 months which can be used as a reference in priority setting and designing effective nutritional programs.

1.3 Objectives of the study

1.3.1 General objectives

General objectives of the study is nutritional assessment of earthquake victimized children

from 6-59 month residing in three shelters in Damgade, Sankosh and Alchidada of Dhading district.

1.3.2 Specific objectives

To fulfill the general objectives following are the specific objectives which are to be carried out:

A) To determine the Nutritional status of earthquake victimized children aged 6-59 months residing at 3 camps in Dhading district.

B) To identify associated factors of malnutrition among children aged 6-59 month residing in three shelter

1.4 Research questions

The purpose of this study is to determine the nutritional status and factors that influence the nutritional status of earthquake victimized child of age 6 month to 59 month residing in 3 shelter in Dhading. This thesis addresses the following question.

1. What is nutrition status of earthquake victimized child of age 6 month to 59 month residing in 3 shelters of Dhading?
2. What are the contributing factors to determine the nutritional status of earthquake victimized child of age 6 month to 59 month residing in 3 shelters of Dhading?

1.5 Significance

The finding of the study will be useful to;

1. Provide the information about the Nutrition status of child to different governmental and non-governmental bodies which helps in formulation and implementation of different plan and policies to uplift the current situation of children residing in shelter.
2. Create the awareness and encourage people to uplift their real present situation of nutrition status by improving their dietary pattern, hygiene and sanitation.
3. Identify the individual or group of people who are at the risk of malnutrition
4. Provide information to organization who are working in the field of nutrition to intervene proper solution for the current prevailing problems.

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1.6 Limitation of the study

a. The study is cross-sectional in design, it neither represents seasonal variation of nutritional outcomes particularly to wasting status nor establishes correct temporal causal relationship of predictors and the outcomes variables.

b. This study is conducted with limited resources. It makes impossible to include many important question and many others clinical, biochemical and dietary assessment.

c. Due to the limited time frame study couldn't be conducted to whole district.

Part II

Literature review

2.1 Nutrition status

Nutrition is the science of food and its interaction with an organism to promote and maintain health. Thus, nutrition is a combination of process by which all parts of the body receive and utilize the materials necessary for the performance of their function and for the growth and renewal of all the components. Nutrition status is the condition of the body as it relates to consumption and utilization of food. The good nutrition status refers to the intake of a well-balanced diet, which supplies all the essential nutrients to meet the body requirements. Such a person may be said to be receiving optimum nutrition. Poor nutrition status refers to an inadequate or even excessive intake or poor utilization of the nutrients to meet the body's requirements. Overeating can also result in poor nutritional status of a person (A. S. Joshi, 2004).

Nutritional status of children is an indicator of the level of development and future potential of the community. The nutritional status of infants and children under five years of age is of particular concern since the early years of life are crucial for optimal growth and development. Nutritional deficiencies affect long term physical growth and development and may lead to high level of illness and disability in adult life. Moreover, high prevalence of malnutrition jeopardizes future economic growth by reducing the intellectual and physical potential of entire population (Beatrice *et al.*, 2011).

Under nutrition among children remains common in many parts of the world. According WHO (2011), about 178 million children under five years worldwide are too short for their age group; while 115 million are underweight. The same report showed that stunting rate among children is higher in Africa and Asia than elsewhere. In Kenya, 35% of children under five are stunted, while the proportion severely stunted was 14%; 16% are underweight (low weight-for-age) and 4% are severely underweight(Q.D. Badake *et al.*, 2014).

The major types of nutritional problems in developing countries are under nutrition and malnutrition which result from inadequate food intake both in quality and quantity, particularly calories and protein, specific nutrients (e.g. vitamin A, iron, iodine) and parasitic infections (Burk, 1984b). The vulnerable groups such as babies, adolescent of the poor and

uneducated, pregnant and lactating are badly affected. The prevalence of poor nutritional status in developing countries 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 or environmental sanitation.(Naborro, 1984)

2.2 Factor affecting nutrition status

Socio-cultural practices such as less consideration for supplementary child feedings, late weaning and poverty are major causal factors of malnutrition among under-five year. The factors affecting nutritional status are mother's food security, breast feeding practices, types of food given to young children, feeding frequency, status of women and Child nutrition and last but not the least who feeds the child and how the child eats (NMICS, 2010). There are many other factors that influence the nutritional status some of which are food Availability and its distribution system, consumption of food, income source and Purchasing power, family size, illiteracy, sociocultural and religious belief, Environmental sanitation and health facility, mothers food security, type of food given to younger children, feeding frequency, illiteracy and so on. Some of them are given below:-

A) **Conditioning influences: -** Infection diseases are important conditioning factor responsible for malnutrition, particularly in small children diarrhoea, intestinal parasite, measles, whooping cough, malaria, tuberculosis all contribute to malnutrition. It has been shown that where environmental condition are poor, small children may suffer from some infection or others for almost half of their first three years of life (Amruth, 2012).

B) **Cultural influence:** - Lack of food is not only cause of malnutrition. Too often there is starvation in the midst of plenty. People choose poor diet when good one are available because of cultural influence which vary wide from country to and from region to region. These may be state as

I.   Food habit, custom, belief, tradition and attitude: - Food habits are among the oldest and most deeply entrenched of any culture. They have deeply psychological root and are associated with love, affection, self-image and social prestige. The family plays an important role in shaping of the food habit, and these habit are passed from one generation to another generation. The crux of the problem is that many custom and belief apply most often the vulnerable group; i.e. in infants, toddlers, expectant and lactating women. Papaya is avoided during pregnancy because it is believed to cause

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abortion. There is widespread belief that if the pregnant women eat more, her baby will being and delivery will be difficult. Certain food is "forbidden" as being harmful for the child. Then there certain belief about hot and cold food, light and heavy food. In some communities men eat first and women eat last and poorly. Consequently, the health of women in these societies may be adversely affected. Chronic alcoholism is another factor which may lead to serious malnutrition.(Amruth, 2012)

II.   Religion: - Religion has powerful influences on the food habit of the people. Hindus do not eat beef and Muslim pork. Orthodox Hindu does not eat meat, fish, egg and certain vegetable like onion. These are known as food taboos which prevent people from consuming nutritious food even these are easily available(Amruth, 2012).

III.   Food fad: - In the selection of food, personal likes and dislike play an important parts. These are called food fad. The food fad may be stand in the way of correcting nutritional deficiencies(Amruth, 2012)

IV.   Cooking practices:- Draining away the rice water at the end of cooking, prolonged boiling in open pans, peeling of vegetable all influences the nutritive value widely from region to region and influence the nutritive value food(Amruth, 2012)

V.   Child rearing practices: - These vary widely from region to region and influence the nutritional status of infants and children. Examples of these situation are premature curtailment of breast feeding, the adoption of bottle feeding and adoption of commercially produced refined food, during eating time the roaming around, active eating and watching television also effect the nutrition status of child(Amruth, 2012).

C) **Socio-economic factor:-** Malnutrition is largely the byproduct of poverty, ignorance, insufficient education, lack of knowledge regarding the nutritive value of food, inadequate sanitary environment and large family size(Amruth, 2012)

D) **Food production: -** Increased food production should lead to the increase food consumption. But it will not solve the basic problem of hunger and malnutrition in much of the developing world. Scarcity of food, as a factor responsible for malnutrition may be true at the family level, but it is not true at global basis nor is it true for most of the countries when malnutrition is still a serious problem. It is a problem of uneven distribution between the countries and within the countries(Amruth, 2012)

E) **Health education: -** It is opined that by appropriate educational action, 50% of nutrition problem can be solved. Health education and nutrition education programe in nutrition

is often a week component. Its reinforcement is a key element in all health service development(Amruth, 2012)

F) **Occupation: -** Occupation is the major factor that enhance to introduce the malnutrition in many habitats. As family is more engaged to earn by implying the occupational activities more chances of having the food intake by purchasing from marked or self-production. Among the group of different occupation mostly wage earner by daily purpose they spend all of money on food or daily commodities(Amruth, 2012).

G) **Inadequate dietary intake:** - This can mean both macronutrients (fat, protein and carbohydrate) and micro nutrients (vitamins and minerals) though insufficient macronutrient intake has serious implications for health and well-being, micro nutrient also play large role in immune function (Bhatta *et al.*, 1998).

H) **Impact on immune function: -** Insufficient macro nutrient intake can result in growth stunting (in children) as well as weight loss. Micro nutrient such as vitamin A, zinc and a large number of others are essential to a number of immune responses, and deficiency can lead to suppressed immunity, which in term increases risk of acquiring infection. In addition, in adequate intake can also weaken immune response through changes in mucus membranes of the body(Bhatta *et al.*, 1998).

I) **Infection: -** Once immune function is lowered, it may lead to infectious disease. Malnutrition not only affects the occurrences infectious diseases, it can also increase the severity of illness, and the length of time they are experienced(Bhatta *et al.*, 1998).

J) **Poverty: -** At micro level, child malnutrition is related to poverty, but at the macro community level poverty does not appear to be strongly related to child malnutrition in many cases. Others actors are equally important. One of these is related to the intra-household use of resources such as the time management and knowledge of the main caregiver, who is usually the mother. For example, how much time is allocated to feeding, caring and ensuring a healthy environment for child?(Bhatta *et al.*, 1998).

k) **Food availability and nutrition status: -** Good health depends on adequate food supply and consumption. The food distribution determines the state of health and the incidence of disease among population. If the food supply is inadequate than the physiological needs, malnutrition and under nutrition could result (Yadav, 1994)

Increased production of food groups making the national diet balance is one of the most important measures of achieving nutritional adequacy. Where the national diets are deficient in nutrient, adverse consequences manifest themselves. For example, there is

high prevalence of anaemia due to iron deficiency, blindness among children due to vitamin A deficiency etc. Thus, the real solution to overcome the deficiencies disease is to consume diet rich in these nutrients (Katwal, 1992).

For a desirable nutrient balance, cereal contributes about 70-80% of the total dietary energy in the diet of people in developing countries. All other food commodities contribute only from 15 to 30% of total dietary energy. Diets in general are bulky, monotonous and nutritionally imbalanced. Household food insecurity can negatively affect food consumption, including reduced dietary variety, nutrient intake, and nutritional status of household members (Yadav, 1994).

2.3 Malnutrition

The term malnutrition refers to the syndrome of inadequate intake of protein, energy, and micronutrients, combined with frequent infections which result in poor growth and body size. The deficiency of nutrients other than protein and energy play a significant role in the causation of malnutrition. The presentation of malnutrition varies from simple failure to gain weight to severe forms of under nutrition such as marasmus, kwashiorkor and marasmic-kwashiorkor and life threatening complication thereof. Malnutrition is more commonly seen in infants and young children less than two years age. (K.Ramesh and Krantz, 2013).

Malnutrition is a state in which a prolonged lack of one or more nutrients retards physical development or causes specific clinical disorders, e.g. iron deficiency anemia, goiter, etc. Malnutrition can also be defined as an impairment of health resulting from deficiency, excess or imbalance of nutrients. It include over nutrition and under nutrition. Some characteristic of people suffering from malnutrition are dull lifeless hair, greasy pimpled facial skin, dull eyes, slumped posture; fatigue and depression are easily evident by their spiritual expression and behaviors, and lack of interest in their surroundings.(A. S. Joshi, 2004).

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                        ┌─────────────────────┐
                        │    Malnutrition     │
                        └─────────────────────┘
                                  ↑
       ┌──────────────────┐       │       ┌──────────────────┐
       │ Inadequate dietary│ ←───────────→ │    Diseases      │
       │      intake       │               │                  │
       └──────────────────┘  Immediate     └──────────────────┘
                ↑              Causes               ↑
                │                ↓                  │
 ┌─────────────────┐  ┌──────────────────┐  ┌─────────────────────┐
 │ Inadequate access│  │ Inadequate care for│  │Insufficient health │
 │    to food       │  │ children and women │  │service and unhealthy│
 │                  │  │                    │  │    environment      │
 └─────────────────┘  └──────────────────┘  └─────────────────────┘
          ↖            Underlying Causes          ↗
            ┌──────────────────────────────────────┐
            │        Resources and control         │
            │ Human, Economic and organizational   │
            │             resources                │
            └──────────────────────────────────────┘
                           ↑
                   ┌──────────────┐
                   │ Basic Causes │
                   └──────────────┘
                   ┌──────────────────┐
                   │Potential resources│
                   └──────────────────┘
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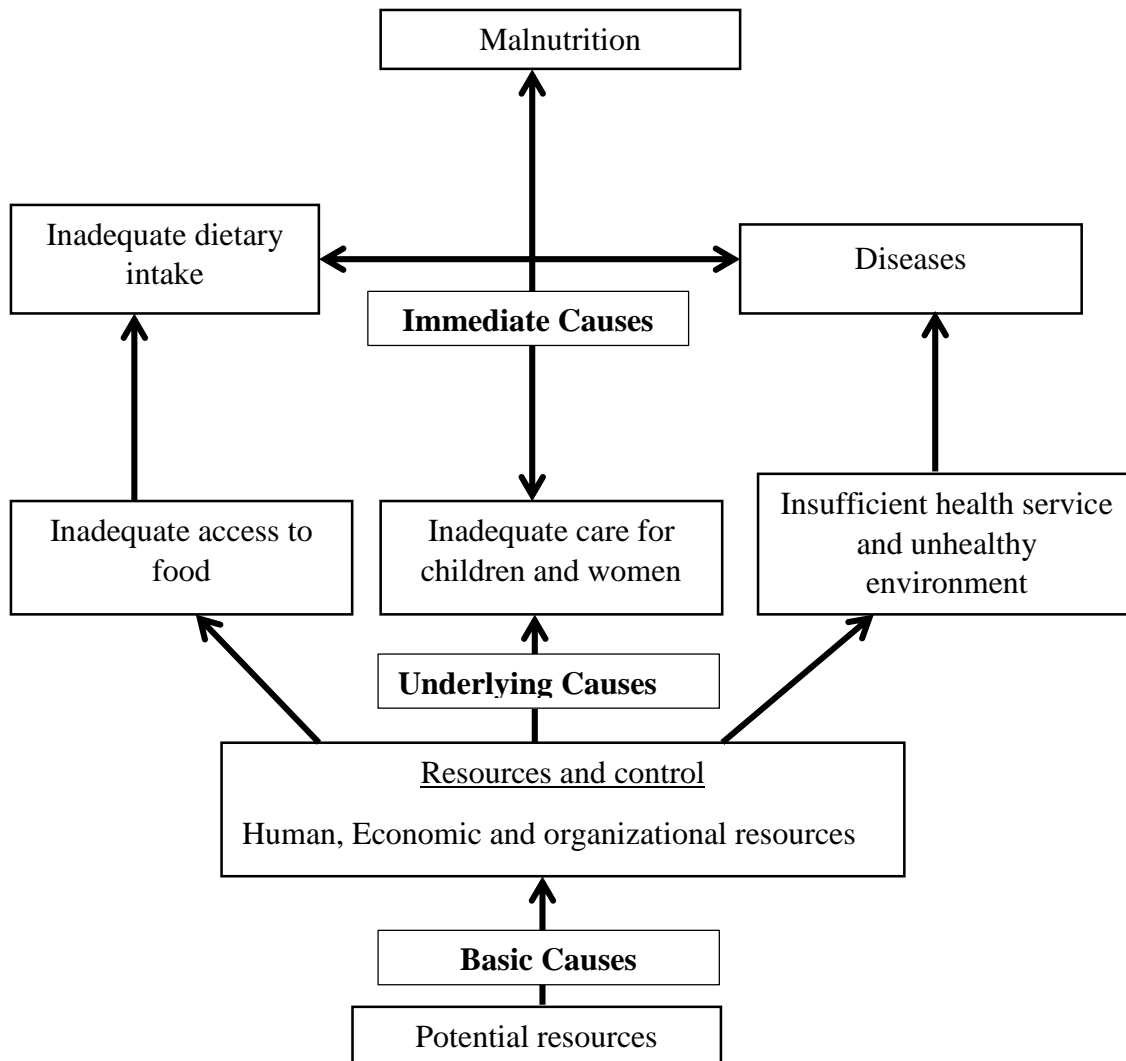
Fig 1: - Conceptual framework of malnutrition by UNICEF (Hartog *et al.*, 2006)

Control in the resources plays role in the distribution of the food in family and the community, care for women and children, facilities of health services and environmental condition also depends upon the type of community. Inadequacy of the food supply, care facilities and the care practices can result inadequate dietary intake and diseases. The insufficient intake means unfulfilled nutritional requirement and this leads to malnutrition. Also, insufficient care leads to disease. Disease cause insufficient intake and improper use of nutrients. Thus causes malnutrition.

2.4 Malnutrition and infection cycle

The vicious cycle of malnutrition, impaired immune response, increased infection and diseased food intake is well recognized (Caballero and Maqboal, 2003). Malnutrition (both macro and micronutrients) affect epithelial mucosal integrity, mucociliary clearance,

immunoglobulin synthesis, lymphocyte differentiation and thus lead to impaired immunity which leads to recurrent infection (Chandra and Kumari, 1994).

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                    ┌─────────────────────────┐
                    │ Inadequate dietary intake│
                    └─────────────────────────┘
        ┌──────────────────┐        ┌──────────────────┐
        │  Appetite loss   │        │   Weight loss    │
        │  Nutrient loss   │        │ Growth faltering │
        │  Malabsorption   │───────▶│ Immunity lowered │
        │ Altered metabolism│       │  Mucosal damage  │
        └──────────────────┘        └──────────────────┘
                    ┌─────────────────────────┐
                    │    Disease-incidence    │
                    │        Severity         │
                    │        Duration         │
                    └─────────────────────────┘
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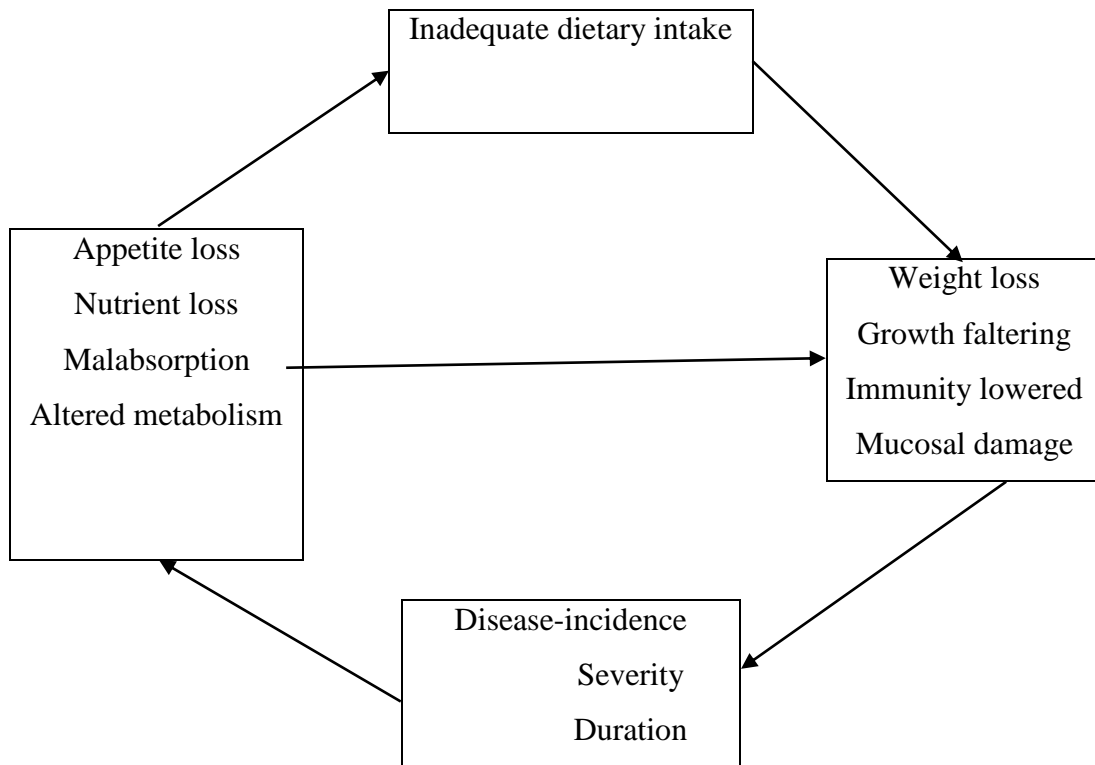
Fig: 2 Vicious cycle of malnutrition (Caballero and Maqboal, 2003)

Non-availability of food seems to be the major cause of malnutrition. Protein energy malnutrition (PEM) and micronutrient deficiencies are major contributors to higher mortality rates from illness and diseases such as pneumonia, malaria, diarrhea and measles in the developing world (Caballero and Maqboal, 2003)

Micronutrient malnutrition refers to a group of condition caused by deficiencies of essential vitamin and minerals such as vitamin A, calcium, iodine, iron and zinc. It is estimated that about 2 million people are affected by this type of malnutrition. Vitamin A deficiency is still the most common cause of preventable childhood blindness worldwide; iodine deficiency causes goiter, cretinism and brain damage; and anemia result from insufficient iron intake (Park, 2011).

2.4.1 Forms of malnutrition

According to WHO (WHO, 1966) there are four forms of malnutrition. They are as follows:-

2.4.1.1 Under nutrition

Under nutrition is a nutrient deficiency from not eating enough food. Under nutrition usually affects the balance of all the nutrients in your body. Nonetheless, problems relating to a deficiency in carbohydrates and fats will manifest first and most acutely. Initially, the body starts using its glycogen or sugar reserves, stored water and body protein. Then, your body consumes stored fatty acids and lean muscle. These two effects of under nutrition result in a dramatic decrease in body weight(Naomi, 2015).

2.4.1.2 Over nutrition

Over nutrition is frequent or habitual overconsumption of nutrients by eating too much food to the point that it becomes dangerous to your health. Nutrients are all compounds necessary for bodily function, including minerals, vitamins, fats, carbohydrates and proteins. Although most nutrients can be harmful in excess, the danger of over nutrition relates mostly to carbohydrates and fats. Overeating differs conceptually from over nutrition, although they are essentially the same thing in action; whereas overeating is a compulsion considered a psychological disorder, over nutrition is volitionally choosing to eat more food than you need, even if you don't realize it (Naomi, 2015).

2.4.1.3 Specific deficiency

It is the pathological state resulting from a relative or absolute lack of an individual nutrient. The body requires many different vitamins and minerals that are crucial for both development and preventing disease. These vitamins and minerals are often referred to as micronutrients. They aren't produced naturally in the body, so you have to get them from your diet. A nutritional deficiency occurs when the body doesn't absorb the necessary amount of a nutrient. Deficiencies can lead to a variety of health problems. These can include problems of digestion, skin problems, stunted or defective bone growth, and even dementia. The amount of each nutrient you should consume depends on your age. In the United States, many foods that you buy in the grocery store (such as cereals, bread, and milk) are fortified with nutrients that are necessary to prevent nutritional deficiency. But sometimes your body is unable to absorb certain nutrients even if you are consuming them. Some of common types of nutrient deficiency are iodine deficiency, iron deficiency, Vitamin A deficiency, Calcium deficiency, Vitamin B1 and B3 deficiency and so on (Uauy and Hertrampf).

2.4.1.4 Imbalance

It is the pathological state resulting from a disproportion among essential nutrient with or without the absolute deficiency of any nutrient. An imbalance between dietary protein and energy intake is associated with relatively high insulin and low plasma cortisol levels, which impede mobilization of muscle protein from the peripheral to the visceral compartments. The resulting protein deficit primarily compromises protein synthesis in the liver. The related low levels of serum proteins, specifically albumin (edema), ferritin (anemia), ceruloplasmin (hair depigmentation), retinol-binding protein (xerophthalmia), and lipoproteins (fatty infiltration of the liver) may explain the clinical features of kwashiorkor best. Despite this florid symptomatology, which might suggest multiple specific nutrient deficiencies, kwashiorkor responds well to protein supplementation of the diet (Uauy and Hertrampf).

2.5 Types of malnutrition

The World Food Programme, a United Nations agency, has identified five main types of malnutrition as the most deadly forms: protein energy malnutrition, in which the body lacks sufficient quantities of all major macronutrients, and deficiencies in iron, vitamin A, iodine and zinc. If your diet is lacking in important nutrients, you may be malnourished even if your appearance is normal. Malnutrition (or under nutrition) is when the body lacks some or all the nutrients needed to function properly (Margoals and R, 2015).

2.5.1 Protein energy malnutrition

Protein energy malnutrition, also known as starvation, is defined as a diet with insufficient amounts of all the major macronutrients: proteins, carbohydrates and fats. A starving person becomes skeletally thin and weak and is in danger of death. The term protein-energy malnutrition (PEM) applies to a group of related disorders that include marasmus, kwashiorkor, and intermediate states of marasmus-kwashiorkor (Noah S Scheinfeld *et al.*, 2016).

2.5.1.1 Marasmus

Marasmus is one of the 3 forms of serious protein-energy malnutrition (PEM). Marasmus may occur at any time but is more common in between 9 month and 3 years of age. These forms of serious PEM represent a group of pathologic conditions associated with a nutritional and energy deficit occurring mainly in young children from developing countries

at the time of weaning. Marasmus is a condition primarily caused by a deficiency in calories and energy, whereas kwashiorkor indicates an associated protein deficiency, resulting in an edematous appearance. Marasmus is most frequently associated with acute infections (e.g. gastroenteritis, respiratory illnesses, and measles), chronic illnesses (e.g. tuberculosis, HIV infection) or drastic natural or manmade conditions (e.g. floods, droughts, civil war). Socio-economic factors including access to a kitchen/toilet and parental education are also significantly associated with the rate of malnutrition. Specifically, poverty and hygiene related issues contribute to stunting and to being underweight(Rabinowitz, 2016).

Children with marasmus have marked loss of subcutaneous fat resulting in loose folds of skin, the muscle under the skin feels soft. There will be marked decrease in mild upper arm circumference which indicates loss of subcutaneous fat and muscle mass. Children with marasmus may show feature of deficiency of vitamin A or D and other micronutrients. Similarly, they may be suffering from life threating severe infections (K.Ramesh and Krantz, 2013).

2.5.1.2 Kwashiorkor

This form of severe under nutrition is also common in children between the ages of 6 month and 3 years; a period of life when complementary feeding plays an important role in child's growth and development. The child may have complaints like inactivity, loss of interest in the surroundings, increase swelling of the body and refusal fat, diarrhea for a prolonged period of time, excessive crying and irritability, vomiting, oozing ulcers in the skin etc. The child may appear moon face but on a close look wasting of muscle is observed over the buttocks and things. The child weighs less than 80% of expected for age; sometimes if there is severe edema, the weight may be above 80% of expected. Oedema is present, initially mild and involving only the lower limbs, becoming gradually generalized later on. The child may have feature of vitamin A deficiency such as dry conjunctiva or cornea, clouding or ulcer in the cornea or night blindness. The child may be anemic and have cold and pale extremities due to poor circulation (K.Ramesh and Krantz, 2013)

2.5.1.3 Marasmic-kwashiorkor

The child with marasmic kwashiorkor will have the features of both marasmus and kwashiorkor. A child suffering from marasmic-kwashiorkor weighs less than 60% of expected weigh for his age and has oedema. Feature of both marasmus and kwashiorkor are

present in different degree of severity. Children weighing less than 60% despite having oedema are in great danger of dying of various complications and need urgent attention and treatment (K.Ramesh and Krantz, 2013).

2.5.2 Vitamin A deficiency

Vitamin A's most important function is as a building block in the structure of your eyes, according to the Merck Manual. Symptoms of deficiency include seeing poorly at night, blindness, dry skin, respiratory infections and an impaired immune system. Vitamin A deficiency can be reversed or prevented by eating foods that contain a lot of vitamin A, including carrots, green leafy vegetables, colored fruits, such as oranges and papayas, yellow vegetables, such as squash or pumpkin, liver, egg yolks and fish-liver oils, as well as milk and cereals with added vitamin A (K.Ramesh and Krantz, 2013)

The vitamin A deficiency occurred due to diet poor in vitamin A or carotene, diarrhea for prolonged time period, measles and massive infestation with roundworms also can aggravate vitamin A deficiency. Vitamin A deficiency causes xeropthalmia (xeros: dryness, opthalmia: eyes). The changes in eyes like dry, muddy wrinkled conjunctiva first followed by grayish, silvery or foamy patches on the temporal side of the cornea .these children avoid light and keep their faces away from light sources (photophobia). In the later stages, the cornea becomes dry, soft and ulcerated and blindness sets in rapidly. (K.Ramesh and Krantz, 2013)

Vitamin A supplementation is most effective when received twice a year and it administered in bi-annual dose to children under the age of five in many developing countries (Bhaskumar, 2002). 40% of women receive a vitamin A dose during the postpartum. A slight difference can be seen among women who receive postpartum vitamin A by urban (46%) and rural residence (40%). The 2011 NDHS collected data on vitamin A supplements for children under age 5 shows that 90 percent of children age 6-59 months were given vitamin A supplements in the six months before the survey. The proportion of children receiving a vitamin A supplement increases with age from 70 percent at 6-8 months to 93 percent at 24-35 months before declining to 91 percent at 48-59 months. Children in rural areas are more likely to receive vitamin A supplements (91 percent) than those in urban areas (86 percent). There is only a slight difference in the proportion of children receiving vitamin A supplements by ecological zone and sub region.(MoHP, 2011)

2.5.3 Anemia

Nutritional anemia refers to the condition that results from the inability of the erythropoietin tissue to maintain a normal hemoglobin concentration on account of inadequate supply of one or more nutrients leading to reduction in the total circulating of hemoglobin.

Anemia is caused by the absence of any dietary essential that is involved in hemoglobin formation or by poor absorption of these dietary essentials. Some anemia are caused by lack of either dietary iron or high quality protein; by lack of pyridoxine, which catalysis the synthesis of the haem portion of the hemoglobin molecules; by lack of vitamin C which influence the rate of iron absorption into the tissue; or by lack of vitamin E which effects the stability of the red blood cell membrane. Copper is not part of the hemoglobin molecule but aids in its synthesis by influencing the absorption of iron, its release from the liver or its incorporation into hemoglobin molecules. The common causes of anemia are dietary deficiency, hook worm infestation, excess blood loss due to pregnancy and accident, late weaning and so on. (Srilakshmi, 2014)

NDHS 2011 shows that 46 percent of children in Nepal are anemic; 27 percent are mildly anemic, 18 percent are moderately anemic, and less than 1 percent are severely anemic. The prevalence of anemia among children under age 5 has declined by only 2 percentage points in the past five years (MoHP, 2011).

2.5.4 Iodine Deficiency Disorder

Iodine is essential for the normal functioning of the thyroid gland. If iodine intake is inadequate, the thyroid gland enlarges (goiter). In some children iodine deficiency may cause delay in mental development resulting in a condition known as cretinism. Till recently Nepal used to have a very high prevalence of iodine deficiency disorders. However with continued efforts to supply the total population with iodized salt becoming successful, goiter is almost non-existent in the country. The latest health surveys shows that almost 80% of the households in Nepal consume iodized salt thus reducing the possibility of suffering from IDD.

Mainly iodine deficiency causes cretinism and goiter. Cretinism has two types; nervous cretinism and myxedematous cretinism. The principle feature of nervous cretinism are unsteadiness of gait, deaf mutism, spasticity of limbs and mental deficiency. The myxedematous cretin have short stature, mental deficiency and feature of myxedamaa(coarse skin, non-pitting oedema, lethargy, cold intolerance etc.). Adequate iodine intake is

the main approach to prevent IDD. So use of iodine packaged salt should encouraged. Goitre is characterized by abnormal growth of the thyroid gland. Hypothyroidism causes dullness, gain in weight, decreased work efficiency and protrusion of the eyeballs and low levels of thyroxin (A. S. Joshi, 2004).

2.5.5 Zinc Deficiency

Zinc deficiency can occur due to a diet poor in zinc or it may develop after prolonged diarrhoea or infection. People with diarrhea excrete zinc in their stools, often losing many times their daily intake of zinc. Malnourished children with diarrhea especially those with marasmus or kwashiorkor are often lacking in zinc. Zinc is also lost as a result of tissue damage that causes fever. The common features include poor growth, less resistance to infection, poor inflammatory response to infection, and excessive fluid loss during diarrhea or persistence of diarrhea and skin changes. Skin becomes dry, hyper or hypo pigmented and there will be scales seen in the skin. Zinc deficiency can be stopped or prevented by eating nuts, legumes, yeast and whole grains. Zinc is also found in beef, pork and lamb. continued breast feeding is a good source of zinc (K.Ramesh and Krantz, 2013).

2.6 Nutritional situation

2.6.1 Incidence of under nutrition

Under nutrition defined as the outcome of insufficient food intake and repeated infectious diseases. Under nutrition includes being underweight for one's age, too short for one's age (stunted), dangerously thin (wasted), and deficient in vitamins and minerals (micronutrient malnutrition) . When individuals are undernourished, they can no longer maintain natural bodily capacities, such as growth, resisting infections and recovering from disease, learning and physical work, and pregnancy and lactation in women. Poor feeding of infants and young children, especially the lack of optimal breastfeeding and responsive complementary feeding, along with such illnesses as diarrhea, pneumonia, malaria and HIV/AIDS, often exacerbated by helminthes, are major causes of under nutrition(UNICEF, 2006).

According to NDHS 2011 Forty-one percent of children under five years of age are stunted and 16% are severely stunted, 11 percent are wasted and 3% are severely wasted, and 29 percent are underweight where 8% are severely underweight. Breast feeding is nearly

universal in Nepal, and half of the children born in the three years before the survey were breastfed for about 34 months or longer. Seventy percent of children less than age 6 months are exclusively breastfed, and the median duration of exclusive breastfeeding is 4.2 months. Complementary foods are not introduced in a timely fashion for all children. Seventy percent of breastfed children have been given complementary foods by age 6-9 months. Overall, only one-fourth of children age 6-23 months are fed appropriately based on recommended infant and young child feeding (IYCF) practices. Forty-six percent of children age 6-59 months are anemic, 27 percent are mildly anemic, 18 percent are moderately anemic, and less than 1 percent are severely anemic. (MoHP, 2011)

2.6.2 Nutrition status of Nepal
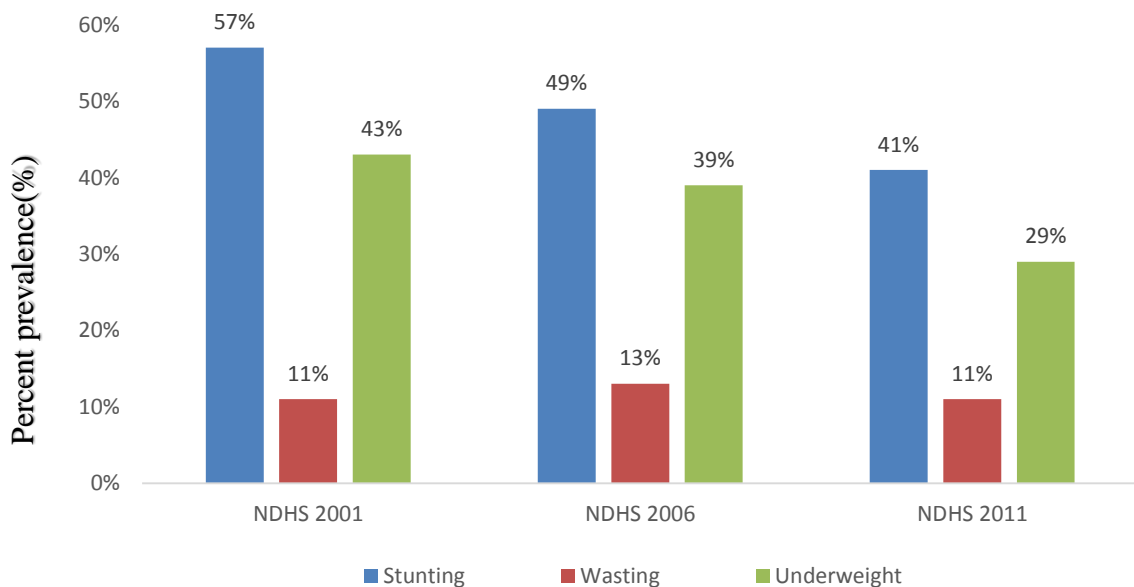
Figure 3: - Trends of malnutrition prevalence in Nepal (MoHP, 2011)

Comparing the data of NDHS 2001, 2006 and 2011 it shows that the trend of malnutrition prevalence goes in decreasing order. The stunting was found 57%, 49%, and 41% in 2001, 2006 and 2011 respectively. Similarly, wasting rate was 11%, 13% and 11% in 2001, 2006 and 2011 respectively which shows slight increase rate of prevalence from 2001 to 2006. The underweight prevalence rate was 43%, 39% and 29% in 2001, 2006 and 2011 respectively. These shows the malnutrition problem is in decreasing order. According to NDHS 2011, Forty-six percent of children age 6-59 months are anemic, 27 percent are mildly anemic, 18 percent are moderately anemic, and less than 1 percent are severely

anemic. Eighteen percent of women are malnourished, that is, they fall below the body mass index (BMI) cutoff of 18.5. Fourteen percent of women are overweight or obese. Women's nutritional status has improved only slightly over the years. Thirty-five percent of women age 15-49 are anemic, 29 percent are mildly anemic, 6 percent are moderately anemic, and less than 1 percent are severely anemic (MoHP, 2011).

2.6.3 Breast feeding practices in Nepal

Breast feeding plays a critical role in child development. The health and nutritional status is directly affected by poor feeding practices which may result in poor physical and mental growth. Early initiation of breast feeding is beneficial for both child and mother health. The colostrum milk contain very important nutrient. So child should feed with colostrum milk as soon as possible. Breast-feeding is nearly universal among the Nepalese mothers, but its duration and frequency are not always optional. 51% of children in urban areas found breastfeeding within 1 hour of birth whereas 44% in rural. Similarly, 55% in far western region breastfeed within one hour of birth where as 34% in central region. Initiation of breastfeeding within one hour of birth was highest in the Western mountain, Far-western hill, and Far-western terai sub regions (54 percent each). The children deliver under health facility breastfeed by 56% with in hour of delivery whereas only 36 % child deliver in home. 28% of child were feed by prelacteal food. Prelacteal feeding is high in the terai (37 percent) as in the mountain (17 percent) and hill (18 percent) zones. Regionally, 41 percent of children receive a prelacteal feed in the Central region, compared with only 8 percent of children in the Far-western region. Among the sub regions, the highest proportion of children receiving a prelacteal feed is observed in the Central terai sub region (53 percent), while the lowest is seen in the Far-western hill sub region (3percent). Prelacteal feeding rate is found high to child born in home (32%) than child born in hospital (24%) (MoHP, 2011).

70 percent of children under age 6 months are exclusively breastfed, and 66 percent of children 6-8 months (breastfed and non-breastfed) are introduced to complementary foods at an appropriate time. Ninety-three percent of all children are still breastfeeding at age 1, and the same proportion are still breastfeeding at age 2. Four of five Nepalese children age 0-23 months are breastfed appropriately for their age. This includes exclusive reastfeeding for children age 0-5 months and continued breastfeeding along with complementary foods for children age 6-23 months. Four-fifths of children under 6 months are predominantly breastfed. This percentage includes children who are exclusively breastfed and those who

receive breast milk and only plain water or no milk liquids such as juice. Finally, 6 percent of children under age 2 are bottle fed (MoHP, 2011).
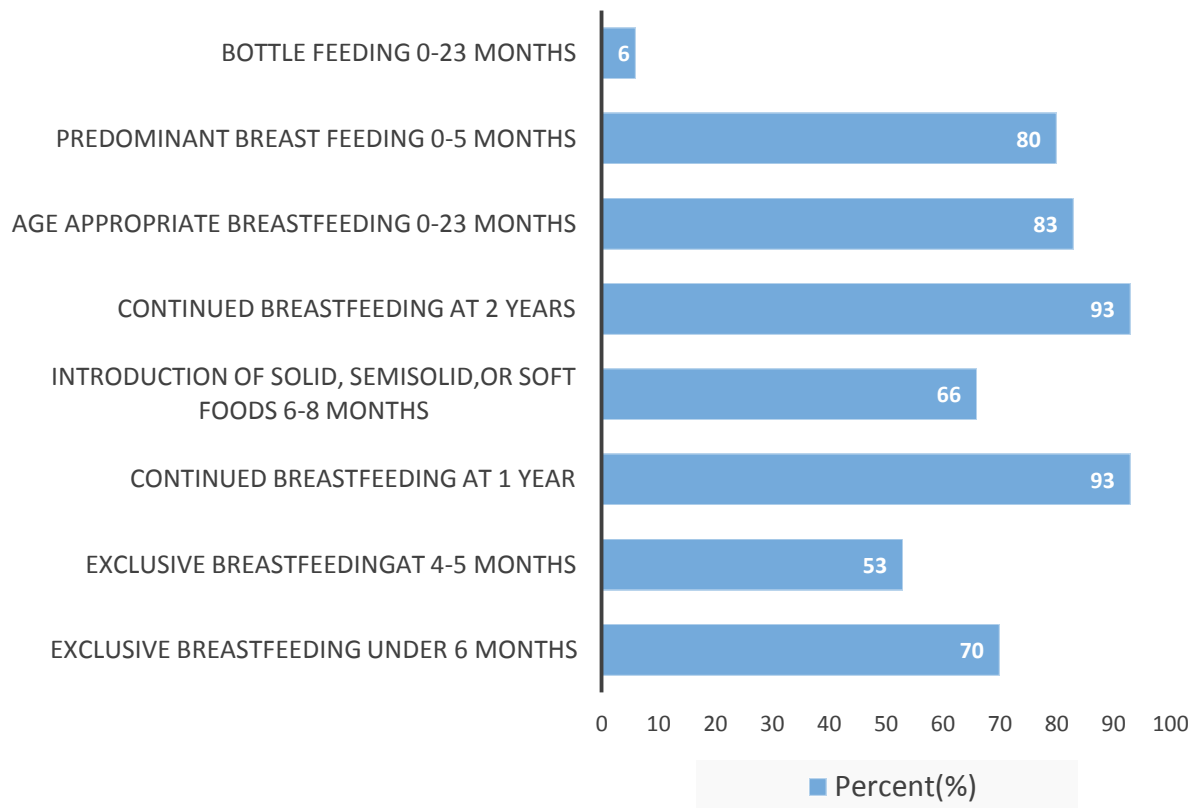
Figure 4:- Breast feeding status of Nepal (MoHP, 2011)

2.7 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 three main aims of nutritional assessment of a community are:-

➢ To judge the magnitude and geographical distribution of malnutrition

➢ To know the effect of ecological factors that may directly or indirectly be responsible.

> To suggest corrective measures especially with the participation of the affected community.

   The methods of assessment of nutrition status are:-

❖ Direct method

- Anthropometric methods
- Biochemical methods
- Clinical methods
- Dietary methods

❖ Indirect method

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

2.8 Indicator in Nutritional Status

There are many indicators used for the purpose of assessing nutritional status, are currently available. Among them only few method are suitable for the evaluation of field program. The only indicator of nutritional status that are applicable in a large scale and for which a suitable experience if available are those based on anthropometric indicators are best applicable in the evaluation of nutritional status (Keller, 1982). A report by WHO in 1976 listed the lowering nutritional status indicators based on body dimensions, birth weight, weight for height, height for age , weight for age, mid upper arm circumference. The measurement of weight and height is relatively simple and reliable and their changes and distribution over ages are well documented for healthy well-nourished reference populations. The simplest of these indicators is weight –for age (Keller, 1982).

   It is widely used for both the assessment of child population and the monitoring of individual development. Weight is the measure of total body mass but gives no indication of its structure, a tall thin child may have same mass as a short, well-proportioned one, a fact that introduces a considerable error in to the classification of malnutrition by weight for age particularly in the categories of mild and moderate malnutrition. Therefore, a refinement that

has long been used by anthropologist was introduced into the nutritional anthropometry of children (Scoane and Lathan, 1971). By relating the weight to the attained height a distinction was made between chronic and acute malnutrition (Scoane and Lathan, 1971) or between; stunting (low-height-for-age), and wasting (low-weight-for–height), (Waterlow, 1972). The three indicators weight-for-age , height-for-age, and weight-for-height have since found wide acceptance and application and probably more is known today about these indicators in different population and different health situations than any of other indicators that have been prepared.

An essential component of these indicators and their use is the reference population. It provide the indicator value of the population that are considered normal i.e., healthy and without significant deficiencies, and against which measured indicator value are compared while the indicator weight-for-height is apparently independent of age during childhood (Rapa, 1988; Waterlow, 1972). In the case of dependent indicators weight-for-age and height-for age, it has been argued the major difference in growth potential between ethnic groups would require local references population. It has however, been shown that with few exception growth of different ethnic groups under favorable conditions is almost identical (Bondal, 1996)

2.8.1 Anthropometric measurement

Anthropometry is concerned with the measurement of the variation in the physical dimensions and the gross composition of the human body at different age levels and degree of nutrition (Jelliffe, 1966). Nutrition anthropometry has most commonly been conducted on pre-school children, the age group in which PEM is usually most prevalent and most severe. Such children are often referring to as being members of a 'vulnerable group' as their nutritional status is prone to affect the surrounding environment(Rapa, 1988).

Nutritional anthropometry appears to be of greatest value in the assessment of growth failure and under nutrition, principally from lack of protein and calorie. In particular the often numerous less advanced stages of PEM in early childhood can probably be best detected characteristics of this age group as shown especially by a low body weight and by depletion of protein stores as indicated by a subnormal muscles mass. Growth is influenced by biological determinants, including sex, intrauterine environment birth order, birth weight in single and multiple pregnancies, parental size and genetic constitution and by environmental factors including climate seasons and socio-economics level.

Growth is influenced by biological determinants including sex, intrauterine environment, birth order, birth weight in single and multiple pregnancies, parental size and genetic constitution and by environmental factors including climate, season and socio-economic level. In the final analysis, the environment seems to produce its effect mostly by presence or absence of infective, parasitic and psychological illness and above all, by the plan of nutrition. The environmental influences, especially on nutrition are of greater importance than genetic background and other biological factors. Certainly, the physical dimensions of the body are greatly influenced by the nutrition, particularly in the rapid growing period of early childhood (Chilton *et al.*, 2007)

Growth assessment is the single measurement that best defines the health and nutritional status of children because the disturbance in health and nutrition, regardless of their etiology, invariability, affect child growth. The most commonly use anthropometric indexes for assessing child growth are, weight-for-age, height-for-age, weight-for-height and mid-upper-arm-circumference (Onis and Habitch, 1997)

❖ Advantages of anthropometry

    a) Simple, non-invasive,

    b) Some equipment's are inexpensive, portable,

    c) Relatively unskilled personnel can perform measurements,

    d) Methods are reproducible,

    e) Measures with long term nutritional history,

    f) Quickly identifies mild to moderate malnutrition,

    g) Measure many variable of nutritional significance like height, weight, skin fold thickness, head circumference waist-hip ratio and BMI,

❖ Limitation of Anthropometry

    a) Relative insensitive to short term nutritional status,

    b) Cannot identifies specific nutrient deficiencies,

    c) Measurements like skin-fold are difficult to carry out in obese people,

    d) There may be ethnic differences in fat deposition

The commonly used anthropometric measurements are briefly discussed below. These are the most common indicators to detect the problem of malnutrition.

2.8.2 Weight for age

Weight is the anthropometric measurement most in use. Its potential value, especially for children, is appreciated not only by health personnel, but often by less educated parents, for whom it is useful as a source of health education. In developing countries the prevalence of Protein Energy Malnutrition appears to be best indicated by weight deficiency in all age-group and by growth failure in children. Weighing is the key anthropometric measurement. Weighing machines based on two different principles are available: Beam balance scale and spring balance scale. The latter should not be used as it easily become stretched and inaccurate from frequent use (WHO, 1996)

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

2.8.3 Height for age

The height of an individual is made up of the sum of four components; leg, pelvis, spine and skull. While, for detailed studies of body proportions, all of these measurements are required, in field nutritional anthropometry usually only the total height is measured (WHO, 1996).

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

A given deficit in height may represent a short period of growth failure at any early age or a larger period of growth failure at a later age. Ht/age gives a picture of past history (Gopaldas and Seshadari, 1987)

2.8.4 Weight for height

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

2.8.5 Mid - upper-arm circumference

Measurement of the mid-upper arm appears to be most useful in practice. This reason is easily accessible, even with a young child sitting in front 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). Muscle and fat constitute the soft tissues that vary with a deficiency of protein and calories. Measurement of the mid-upper-arm circumference is the most useful method for assessing muscle mass and is also useful for rapid screening of children for severe malnutrition, as this region is easily accessible and measurement requires only a flexible fiber glass tape (Rapa, 1988).

Part-III

Materials and methods

A cross-sectional nutrition survey was conducted among the age of 6-59 months old child in three shelters where earthquake victimized people are residing in Dhading. Anthropometric measurements like height and weight were measured and specially designed questionnaire was used for data collection during survey. Stadiometer and Weighing machine was used for anthropometric measurement.

3.1 Research design

The research method applied was combined form of qualitative and quantitative method i.e.

    a) Anthropometric measurement of under-five children

    b) Household survey with the help of questionnaires.

3.2 Study area

Study area was in 3 shelters (Damgade, Sankosh and Alchidada) of Nilkantha municipality in Dhading District, Nepal which is located in the central hilly region which is 19 km north from mehendra highway (Malekhu).

3.3 Study variable

Study variable were categorized into two groups:

a) **Dependent variable:** Malnutrition indicated by stunting, wasting and underweight.

b) **Independent variables:** Five categories of factors were assessed as independent variables**;**

1) Socio-economic and demographic variables; Economic Characteristics have been categorized into 3 groups less than 1 lakhs, 1 to 2 Lakhs and more than 2 Lakh. Marital status, family size, annual income, education, occupation.

2) Child characteristics and caring practices; Age, Sex, birth order, Birth weight, breastfeeding status, introduction of complementary food

3) Maternal characteristics; age, extra food during pregnancy/lactation, care during pregnancy or lactation, mother's education, marriage age, first pregnancy age.

4) Environmental Health condition; Water supply, water purification method, way of waste management

3.4 Sampling technique

The census sampling technique was used for data collection. The data of every children from 6-59 months of all family residing in shelters were collected.

3.5 Target population

All the children from 6-59 month residing in three shelter and parents or care takers were the target for the nutrition status assessment.

Inclusive and exclusive criteria

➢ Inclusive criteria: All those children age from 6-59month residing in 3 shelters included in the study. The mothers and caretakers of selected children were also selected for the questionnaire.
➢ Exclusive criteria: In absence of the study subject (child) at the time of household survey.

3.6 Sample size

Method of census sampling was applied in the survey. The sample size was equal to the total number of children between the ages of (6-59) months living in 3 shelters of Dhading. Altogether 98 children were selected as sample during the survey.

3.7 Research instrument

➢ Weighing machine (Seca scale): The weight of the child measured using Seca Scale. Child weighing capacity of 100 kg (1 piece).

➢ Height measuring stand (Stadiometer):- The height measuring tape of 5ft capacity (1 piece).

➢ Questionnaire: A well designed and pretested set of questionnaire to collect information on household characteristics, socio-economic and demographic characteristics, maternal characteristics, child caring practices, hygiene and environmental characteristics, etc.

3.8 Pre-testing

The study was conducted among under five children from selected area under sampling procedure. The pretesting was conducted to establish accuracy of questionnaire, to check for consistency in the interpretation of questions and to identify ambiguous items. After review of instruments all suggested change was made before being administrated in the actual study.

3.9 Validity and reliability

To ascertain the degree to which the data collection instruments will measure what they purported to measure, the instruments was validated by a group of professionals from Central Campus of Technology, Central department of Nutrition and Dietetics. The questionnaire was also pre-tested prior to data collection to ascertain content and face validity.

Reliability refers to quality control measure of data collected. Questionnaire was checked daily for completeness, consistency and clarity. In addition, the academic supervisor had checked the collected questionnaires during the process of data entry and analysis.

3.10 Data collection technique

Primary data was collected using semi structured questionnaire and anthropometric measurements. Interview was conducted with caretakers/ parents of the children according to the questionnaire.

There were two sets of tools to gather information. First was the structured interview schedule to generate data pertinent to factors associated with nutritional status of children and second a form consisting of child information anthropometric measurements. Form was developed to record the measurements of height, weight, mid upper arm circumference .The questionnaire comprised mainly of details on household profiles like age, sex, educational level, occupation of household members, etc. Anthropometric measurements taken for children aged (6-59) months included:

- Height(cm)
- Weight(kg)

3.11 Data analysis

Data was checked for completeness and consistency. The collected data was organized, coded and entered into WHO anthro 3.2.2 and into statistical package for social science (SPSS) version 20.0. . The collected data was analyzed by using both descriptive and interferential analysis. Descriptive analysis was done to describe the percentage and number distribution of respondents and the data was presented in the table. The nutritional status was measured by WHO standard.

Anthropometric indices were calculated using reference medians recommended by WHO and classified according to standard deviations units (z scores) based on the WHO criteria. The chi-square test was applied to test the association between nutritional status and its associated factors.

3.12 Logistical and ethical consideration

Ethical clearance was obtained from Central Campus of Technology, Department of Nutrition and Dietetics. Prior consent to conduct the research was obtained from the parents/caretakers of the respective children. The purpose of data collection was clarified and was also assured that the data was collected just for the study purpose. Privacy and confidentiality of collected information was ensured at all level.

Part IV

Results and Discussion

An anthropometric and household schedule questionnaire survey was conducted in earthquake victimized child residing shelters in Damgade, Sankosh and Alchidada of Dhading district. From the survey the Nutrition status of child was determined. Some of the important finding are listed below.

4.1 Socio-economic and demographic characteristics

Table 1: Socio-economic and demographic Factors (N=98)

Variable	Frequency	Percent (%)
Father education		
Primary level	47	48
Secondary	13	13.3
higher secondary	1	1
Illiterate	37	37.8
Father occupation		
Business	4	4.1
Agriculture	11	11.2
Job	7	7.1
Labor	51	52
Others	25	25.5
Annual income of family		
Less than 1 lakh	1	1
1 to 2 lakh	84	85.7
More than 2 lakh	13	13.3
Is annual income enough		
Yes	72	73.5
No	26	26.5
Type of family		
Single	76	77.6
Joint	22	22.4

A total of 98 under-five children were included in the study with a response rate of 100%. Survey showed that 77.6% percentage were living in nuclear family, followed by joint family 22.4%. Survey showed 3.1% mother engaged in business, 15.3% in agriculture, 2% in job, 32.7% in labor and 46.9% in other activities respectively. Similarly 4.1% of father involved in business, 11.2% in agriculture, 7.1 in job, 52% labor, and 25.5% in others activities respectively.

Annual income of the family showed that the income range of 1 lakhs to 2 lakhs had the highest 85.7% followed by more than 2 lakhs 13.3% and the lowest percentage 1% from the less than 1 lakhs. Survey shows 73.5% of those family were sufficiently feed by their annual income and 26.5% family were not sufficiently feed by their annual income.

The major occupation of family was labor. Talking about the father education 37% were illiterate, 47% studied up to primary level, 13% up to secondary level and 1% up to higher secondary level respectively. The frequency of all the socio-economic and demographic characteristics of study population is expressed in table.

These result showed the very poor education status of father in study area. Those people were from Ri, Tipling (remote part) VDC of Dhading where number of schools were very few and have to walk many hours to reach school and people were not aware about the importance of education. Similarly, mostly father were involved in labor work. They are uneducated and unskilled due to which it is difficult to get other job, opportunities to them. Annual income of family is very low because mostly people are involved in labor work and in other low income activities and even sometimes they have to stay unemployed.

4.2 Mother's characteristics

Table 2: mother's characteristics of survey population (N=98)

Variable	frequency	Percent
Mothers education		
Primary	27	27.6
Secondary	25	25.5
Illiterate	46	46.9
Can you prepare sarbotham pitho		
Yes	34	34.7
No	64	65.3
First pregnancy age		
Less than 16 year	3	3.1
16 to 2o year	75	76.5
more than 20 year	20	20.4
Do u used iron folate		
Yes	84	85.7
No	14	14.3
Idea about malnutrition		
Yes	69	70.4
No	29	29.6
Your marriage age		
Below 16 year	19	19.4
16 to 20 year	73	74.5
More than 20 year	6	6.1
Any idea of complementary feeding		
Yes	83	84.7
No	15	15.3
Mother occupation		
Business	3	3.1
Agriculture	15	15.3
Job	2	2
Labor	32	32.7
Others	46	46.9

The survey showed most of the women involve in labor work 32 % followed by agriculture 15 % where as 3% in business and 2% in job. On the other hand 46% of women involved in different activities like housewife, handicraft preparation, and foreign employment and so on.

Women (74.5%) married at the age of 16 to 20 followed by 19% of women at age below 16 years and 6% of women married after 20 years. The study showed highest percent

33

(76.5%) of first pregnancy age between 16 to 20 year and 20% of mother were pregnant at age more than 20 year and 3% at age below 16 year. About 84.7% women were well known about complementary food where as 15.3% women were unknown about complementary food. 70.4% of women had general knowledge about causes and consequence of malnutrition where as 29.6% were unknown about malnutrition.

About 34.7% of women were able to prepare sarbotam pitho and well known about importance of sarbotam pitho whereas 65.3% didn't had any idea about preparation of sarbotam pitho. 85.7% of women used iron folate tablet during pregnancy where as 14.3% of women din't used iron folate tablet during pregnancy. Most of the women were illiterate (46.9%) and only few had complete higher secondary level. 46.9% were illiterate followed by 27.6% up to primary level and 25.5% up to secondary level. All most all the women used more amount of food during pregnancy and lactation period compare to normal time period and all the family's used iodized salt.

Highest percentage of women (46.9%) were illiterate in the study area. These is because schools and colleges are in few numbers and have to walk many hours to reach schools. On the other hand they don't give priority to women education thinking that they have to marry and send them to other's homes one day. There is tradition of early marriage. Mostly girls get married before 20 year due to which their pregnancy age is highest in age group of 16 to 20 year. Highest percentage of mother are involve in labor work and other different work like handicraft preparation, foreign employment, housewife and so on. Due to poor knowledge about nutrition, balance diet and food, most of the women cannot prepare *sarbotham pitho*.

4.3 Child characteristics and care practices

Table 3: Child characteristics and care practices (N=98)

Variables	frequency	percent
Gender		
Female	55	56.1
Male	43	43.9
Birth order of child		
First	48	49
Second	36	36.7
Third	14	14.3
Birth weight		
Less than 2 KG	5	5.1
2 to 3 kg	48	49
More than 3	32	32.7
Don't know	13	13.3
Initiation of breastfeeding		
Before 1 hour	54	55.1
before 8 hour	35	35.7
Before 24 hour	9	9.2
Breastfeed duration		
Up to 1 year	44	44.9
Up to 1 year and 6 month	19	19.4
Up to 2 year or more	34	34.7
Exclusive breastfeeding		
Yes	85	86.7
No	13	13.3
Vitamin A and deworming tablet to child		
Yes	89	90.8
No	9	9.2

Majority of the children were females 55 (56.1%) and remaining 43 (43.9%) were males. Similarly, 49% (48) of child were first child, 36.7% (36) were second child and 14.3% (14)

were third child. Most of the child birth weight falls to the range 2kg to 3 kg with 49% (48) followed by 32.7% (32) of child more than 3 kg and 5.1% (5) of child below 2 kg.

Out of total respondents 55.1% (54) were initiated for breastfeeding during the first hour of birth, 35.7% (35) were breastfed within 8 hours and remaining 9.2% (9) were breastfed after 24 hours. Although 86.7% (86) of the children were breastfed exclusively for the first 6 months the remaining child were not exclusively breastfeed which include 13.3% (13). 44.9% (44) of child were breastfeed up to 1 year, 19.4% (19) were breast feed for one and half years and remaining 34.7% (34) were breastfeed up to 2 years. The highest percentage of children 51%(50) were introduced complementary food at the age of 6 months followed by 27.6%(27) from 7 month; 16.3%(16) from 5 month; 2%(2) from 4 month and finally 3.1%(3) were still not introduced with complementary food.

Similarly, 34.7% (34) of the child were given milk immediately after birth whereas 25.5% (25) were given honey and 1% (1) child was given herbs and shrubs and remaining 38.8% (38) were not given anything. Almost all the children 90.8% (89) were given with Vitamin A capsule and deworming tablets and only 9.2% (9) children had not received Vitamin A and deworming tablets. 90.8% (89) child were immunized and 9.2% (9) were not immunized.

Most of the mother breastfeed their child before one hour of child born. These showed that mother have good knowledge about colostrum feeding. Mostly mother breast feed their child up to one year and the rate decrease because they whether have to feed to next child or are busy in work. According to NDHS 2011 breastfeeding is nearly universal in Nepal, and half of the children born in the three years before the survey were breastfed for about 34 months or longer. Seventy percent of children less than age 6 months are exclusively breastfed, and the median duration of exclusive breastfeeding is 4.2 months (MoPH, 2011). Result showed that 90.8% child supplement with Vitamin A and deworming tablet during distribution time. The supplementation rate is high because government have different plans, policies and strategies to increase the rate of supplementation of Vit A and deworming tablet. Twice in a year Vit A and deworming tablet are distributed in different places with the help of FCHV (female community health volunteers) in the community. Mostly mother start complementary feeding to child from 6 month which is very right time to introduce complementary food. From 6 month baby nutrient requirement increases and breast milk alone cannot fulfill the increased requirement of baby.

4.4 Environmental and hygienic practice of the household

Table 4: environmental and hygienic practice of the household (N=98)

Variables	frequency	percent
Waste management method		
Bury	35	35.7
Burning	17	17.3
Management from municipality	5	5.1
Others	41	41.8
Water purification method		
By filtering	8	8.2
Boiling	25	25.5
without any process	65	66.3

Survey showed that almost all people use tap water as source of drinking water. The highest population did not use any water purification method which includes of 66.3% (65); 25.5% (25) people used drinking water by boiling and 8.2% (8) people used filtration process for water purification. 100% people use toilet in the survey area and all use soap water for washing hand after toilet. 35.7% (35) people used burying method for waste management whereas 17.3% (17) burns their waste for its management; negligible amount of people 5.1% (5) use VDC's facility of waste management and 4 1.8% (48) people use other ways for waste management. All the major environmental and hygienic characteristics under study are shown in table below:

People manage their waste product mostly by burning and burying which is easy and convenient way of waste management. Under others way of waste management, people throw their waste in *Thopal* river. Almost all people use tap water as a drinking water and only few people use purification methods. So vulnerable group (child and old age people) are very susceptible to diarrhea, dysentery, cholera, intestinal worms and so on (Respondent, 2016)

4.5 Prevalence of malnutrition

In a survey among 98 children the overall magnitude of malnutrition among 6-59 month children in three shelters (Damgade, Sankosh and Alchi dada) of Dhading were 38.8%, 16.3% and 28.6% for stunting, wasting and underweight respectively. Among them 19.4% were severe stunted and 19.4% were moderately stunted, severe wasting was 7.1% and moderate wasting was 9.2%, severe underweight was 13.3% and moderate underweight was 15.3%. No overweight or obese children were found in the survey population. The prevalence of stunting was found higher in girls than boys, wasting was higher in male than female and underweight was found higher in male compare to female. Based on WHO growth standard of under nutrition indicators, about 14.28% and 24.48% male and female were stunted, 12.24% and 4.08% male and female were wasted, 15.3% and 13.26% male and female were underweight. The similar prevalence rate was also found in the assessment of Malnutrition Status among Under - 5 Children in a Hill Community of Nepal. Study conducted in rural hill region found 28%, 41 % and 18% of underweight, stunting and wasting among under-5 children respectively. The NDHS report 2011 in hill region also reported high percentage of stunting (58%) followed by underweight (33%) and wasting (13%). That study found that stunting is the results of long term nutrient deficiency, or may be affected by recurrent or chronic illness like diarrheal disease, acute respiratory infection, heart disease, worm infestation and deficiency of micro or macro nutrients (Gaurav *et al.*, 2014)

4.5.1 Distribution of nutritional situation of 6-59 month of child residing in three shelters of Dhading

From the study, it shows higher percent of stunting prevalence in female than in male, wasting rate is higher in female and underweight rate is higher in male.

Table 5: Distribution of Nutritional situation of 6-59 months of children residing in three shelters of Dhading (N=98)

	(<-3 Z Score)	(<-2 to >-3)	(>-2 Z score)	Percent (%)
Height for Age(Stunting)				
Male	8	6	29	14.28
Female	11	13	31	24.48
Weight for Height(Wasting)				
Male	6	6	31	12.24
Female	1	3	51	4.08
Weight for Age(Underweight)				
Male	10	5	28	15.30
Female	3	10	42	13.26

The underweight and wasting rate is found higher in male similar result was found in the Study of Nutritional Status Among Under Five Children Attending Out Patient Department at A Primary Care Rural Hospital, Bareilly(UP) (Singh *et al.*, 2013). Where underweight and wasting rate is slightly higher in male compare to female. 8 and 11 number of male and female are severely stunted respectively and 6 and 13 number of male and female are moderately stunted respectively. Similarly, 6 and 1 number of male and female are severely wasted respectively and 6 and 3 number of male and female are moderately wasted.

On the other hand, 10 and 3 number of male and female are severely underweight respectively and 5 and 10 number of male and female were moderately underweight respectively. The stunting rate was low in male. Wasting and underweight rate was high in male in comparison to female.

4.5.2 Prevalence percentage of weight for length (wasting) of child residing in three shelters of Dhading

The study result showed that wasting (21.4%) was found highest in the age group (12-23) month.

Table 6: prevalence percentage of weight for length (wasting) (N=98)

Age group	N	Weight for length (%)	
		<-3SD	**<-2SD**
Total	98	7.1	16.3
6-11	18	0	16.7
12-23	14	7.1	21.4
24-35	26	7.7	15.4
36-47	17	11.8	17.6
48-59	23	8.7	13

This result was also similar in study of nutrition status of under 5 year children in Mbeere south district, Kenya where highest percentage of wasting was found in age group of 12 to 23 month (Q.D. Badake *et al.*, 2014) and less wasting prevalence (13%) in the age groups (48-60) months. But NDHS shows highest percent of wasting (25%) in the age group (9- 11) months.
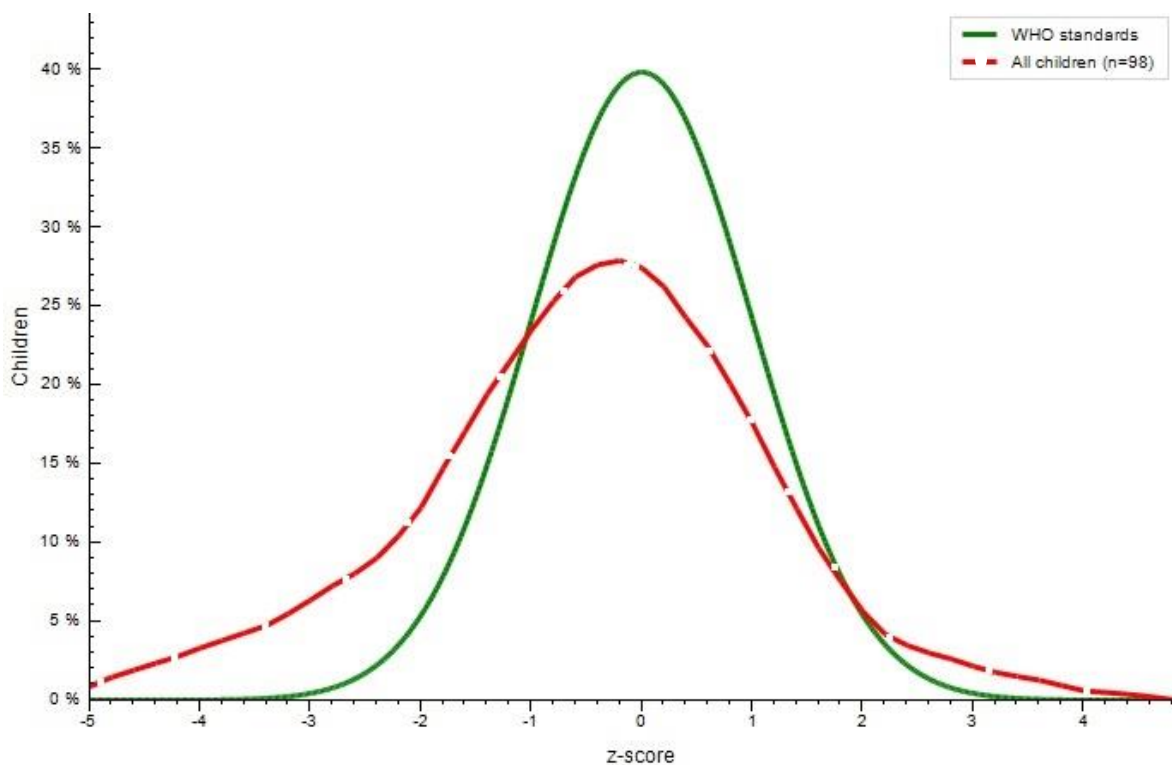

Figure 3: Distribution of Weight for height (wasting) among 6-59 month children (N=98)

The median weight for height z-score of survey children was found to be -0.35 which is less by 0.35 with the reference to WHO standard. This cause the curve slightly skewed to the left side of WHO standard curve showing the prevalence of wasting among study population. The wasting was more in the study area than national data. The inappropriate time of initiation of complementary feeding, outbreaks of diarrhoea and other disease may be the reason behind this. This may be due to poor hygiene and sanitation in the shelters which may cause disease outbreak and parasitic infection in children causing wasting in children. The other causes may be inadequate amount of diversified food consumption result in calorie and protein deficit. The similar high prevalence rate of wasting was also found in the assessment of Malnutrition Status among Under - 5 Children in a Hill Community of Nepal. Study conducted in rural hill region found 18% wasting among under-5 children. The NDHS report 2011 in hill region also reported high percentage of wasting (13%). That study found that wasting was the results of delayed and non-exclusive breastfeeding, Inadequate and infrequent feeding practices, low energy content and less diversified food consumption pattern, chronic illness and so on (Gaurav *et al.*, 2014)

4.5.3 Prevalence percentage of height for age (stunting) of child residing in three shelters of Dhading

Among 98 children, study showed that highest percentage of stunting (56.5%) was found in the age group 48-60 month whereas children in the range of age 6-11 are less stunted (5.6%) as shown in the table.

Table 8: Prevalence percentage of height for age (stunting) (N=98)

Age group	N	Length/height for age (%)	
		<-3SD	<-2SD
Total	98	19.4	38.8
6-11	18	5.6	5.6
12-23	14	7.1	35.7
24-35	26	23.1	38.5
36-47	17	17.6	52.9
48-60	23	34.8	56.5

The similar result is found in the study of nutritional status of children under five years and associated factors in Mbeere south district, Kenya where stunting rate is lowest in age group 6-11 month (Q.D. Badake *et al.*, 2014). This may be due to short maternal stature, poor care practices, low calorie intake and infection and inflammation. This could be attributed to poor

weaning and complementary feeding practices resulting into inadequate energy and protein intake. The poor feeding practices may be due to either lack of knowledge by the mother or lack of adequate food. The stunting rate was also found less in age group below 12 month in study of nutritional status of children under five years of age and factors associated in Padampur VDC, Chitwan. This study find that nursing during early life is protective and that stunting becomes more likely as the child becomes more dependent for caloric intake on foods that have to be grown or bought (Ruwali, 2011).

Figure 4: Distribution of height for age (stunting) among 6-59 months children (N=98)

The median Height for Age z-score of survey children was found to be -1.63 which is less by -1.63 with the reference to WHO standard. This is why curve is slightly skewed to the left side of WHO standard curve showing the prevalence of stunting among study population. In the study area there was poor knowledge about nutrition among mothers and poor feeding practices was found. Hence long term inappropriate feeding behavior causes nutrient deficiency in children leading them towards malnutrition. Due to very low income family couldn't invest enough amount for food, quality of food might not be maintained, and there was poor healthcare services which may be the reason of stunting in child. The similar high prevalence rate of stunting was found in the assessment of Malnutrition Status among

Under - 5 Children in a Hill Community of Nepal. Study conducted in rural hill region found 41 % stunting among under-5 children. The NDHS report 2011 in hill region also reported high percentage of stunting (58%). That study found that stunting is the results of long term nutrient deficiency, or may be affected by recurrent or chronic illness like diarrheal disease, acute respiratory infection, heart disease, worm infestation and deficiency of micro or macro nutrients, poor feeding practices, low birth weight of child (Gaurav *et al.*, 2014).

4.5.4 Prevalence percentage of weight for age (underweight) of child residing in three shelters of Dhading

Result showed that highest percent of underweight (39.1%) was found in the age groups 48-60 months.

Table 8: Prevalence percentage of weight for age (Underweight) (N=98)

Age group	N	Weight for age (%)	
		<-3SD	<-2SD
Total	98	13.3	28.6
6-11	18	5.6	16.7
12-23	14	14.3	28.6
24-35	26	15.4	23.1
36-47	17	17.6	35.3
48-60	23	13	39.1

Similar result was found in study of nutritional status of children under five years and associated factors in Mbeere south district, Kenya where the underweight rate is found highest in age group 48-59 month. This is probably due to increased physiological activities of the child at this age, which may necessitate more nutrient intake to support growth and development. Children at this age are outside homes either in school or playing, failing to feed regularly to replenish their energy (Q.D. Badake *et al.*, 2014). Children in the range of age (6-11 months) less underweight (16.7%) as shown as below table. These may be due to sufficient nutrient and energy intake at the age of 6-11 month from breast milk, weaning food and complementary food. Whereas, NDHS shows highest prevalence of underweight in the age group 18- 23 months with 37%.
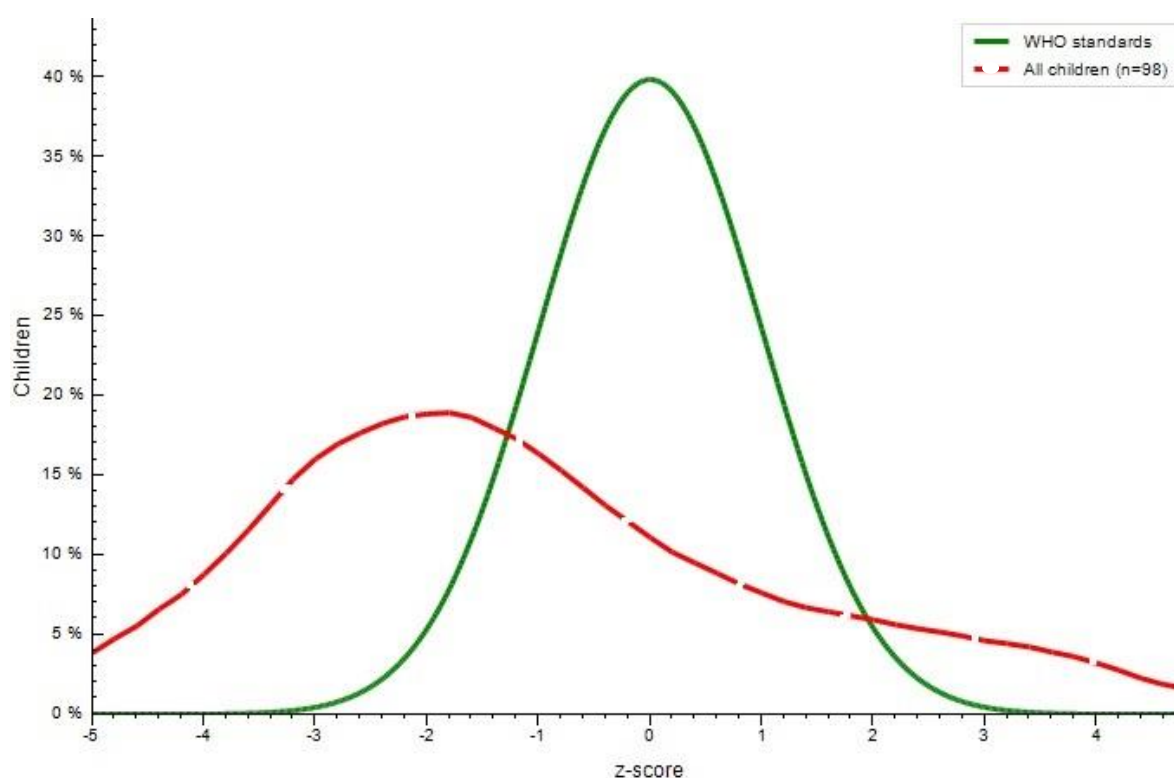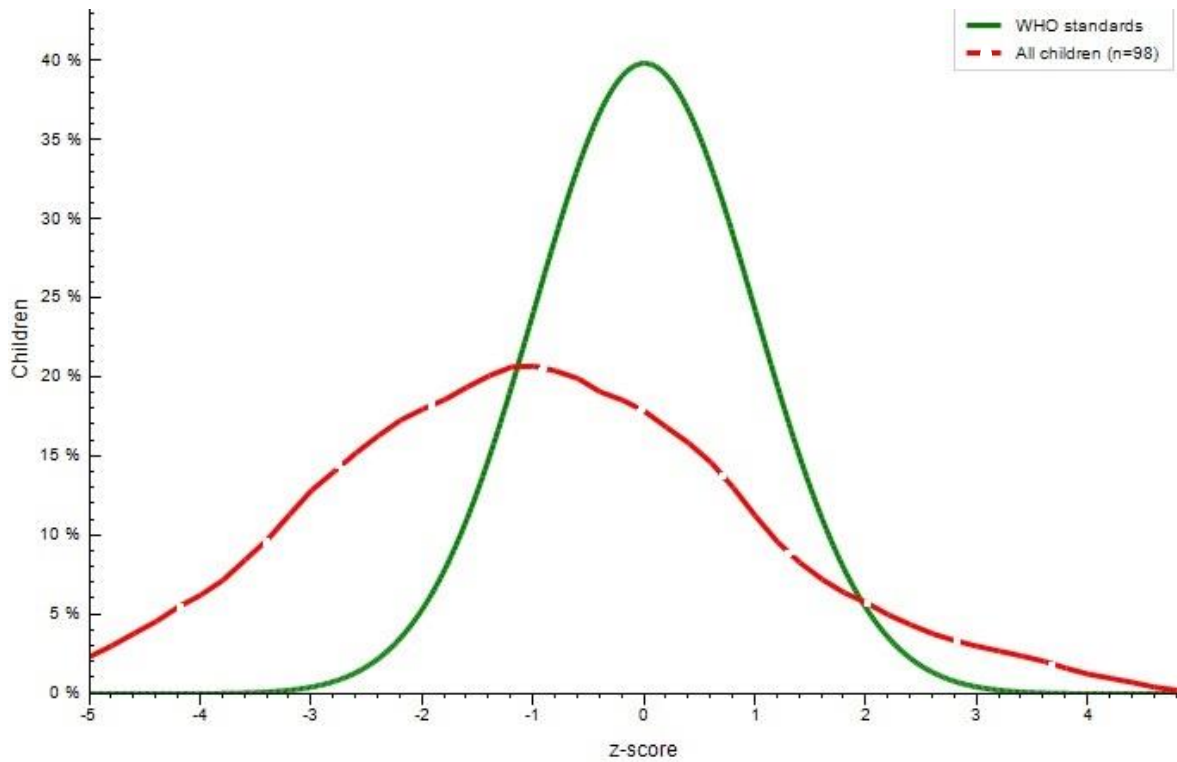
Fig 5: Distribution of Weight-for-Age (underweight) children among 6-59 month (N=98)

The median Weight for Age z-score of survey children was found to be -1.08 which is less by 1.08 with the reference to WHO standard. This cause the curve slightly skewed to the left side of WHO standard curve showing the prevalence of underweight among study population. The underweight rate is still very high there. The cause may be consumption of poor quality food, poor feeding practices, infection, poor hygiene and sanitation, delayed and non-exclusive breastfeeding practices, food insecurity and so on. The high prevalence rate of underweight was also found in the assessment of Malnutrition Status among Under - 5 Children in a Hill Community of Nepal. Study conducted in rural hill region found 28% of underweight among under-5 children. The NDHS report 2011 in hill region also reported high percentage underweight (33%). That study found that underweight is the results of recurrent or chronic illness, poor supplementary feeding, poor mother education status, poor economic condition of family, poor hygiene and sanitation (Gaurav *et al.*, 2014).

Prevalence of malnutrition (N=98)
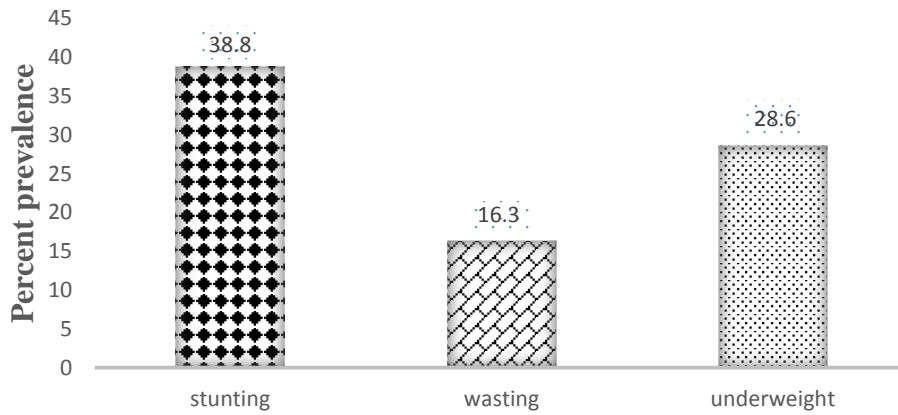
Fig 7: Prevalence of malnutrition among 6-59 months children

Among 98 children, Stunting, wasting and underweight were found 38.8%, 16.3% and 28.6% respectively. Stunting and underweight was found slightly less than national data whereas wasting was slightly higher than national data.

Fig 8: prevalence percentage of severe and moderate malnutrition (N=98)

Among 98 sample, 19.4% is severely stunted and 19.4% is moderately stunted. 7.1% child is severely wasted and 9.2% of child is moderately wasted. 13.3% of child is severely underweight and 15.3% of children are moderately underweight. The similar prevalence rate was also found in the assessment of Malnutrition Status among Under - 5 Children in a Hill Community of Nepal. Study conducted in rural hill region found 28%, 41 % and 18% of

underweight, stunting and wasting among under-5 children respectively. The NDHS report 2011 in hill region also reported high percentage of stunting (58%) followed by underweight (33%) and wasting (13%). That study found that stunting, wasting and underweight are the results of long term nutrient deficiency, or may be affected by recurrent or chronic illness like diarrheal disease, acute respiratory infection, heart disease, worm infestation and deficiency of micro or macro nutrients, poor supplementary feeding, delayed and non-exclusive breastfeeding practices, poor hygiene and sanitation, low family income, low birth weight of child and so on (Gaurav *et al.*, 2014).

4.6 Factors associated with under nutrition

Under nutrition was assessed by stunting, wasting, and underweight. Accordingly factor associated with these categories were assessed separately using chi-square test.

4.6.1 Factor associated with stunting

Table 9: Factor associated with stunting of 6-59 month children (N=98)

Factors		Height for Age status		Chi square value	P-value
		Normal	Stunted		
Age at first pregnancy	Below 20 year	53(67.9%)	25(32.1%)	7.279	0.007*
	Above 20	7(35%)	13(65%)		
Birth order of child	First	24(50.0%)	24(50.0%)		
	Second	27(75.0%)	9(25.0%)	5.48	0.065
	Third	9(64.3%)	5(35.7%)		
Marriage age	Below 16 years	14(73.7%)	5(26.3%)		
	16 to 20 years	44(60.3%)	29(39.7%)	3.242	0.198
	above 20 years	2(33.3%)	4(66.7%)		
Knowledge about malnutrition	Yes	41(59.4%)	28(40.6%)		
	No	19(65.5%)	10(34.5%)	0.320	0.572
Father occupation	Business	2(50%)	2(50%)		
	Agriculture	3(27.3%)	8(72.7%)		
	Job	2(28.6%)	5(71.4%)		
	Labor	30(58.8%)	21(41.2%)	5.312	0.257
	Others	18(72%)	7(28.0%)		
Immunization during pregnancy	Yes	55(64.0%)	31(36.0%)	0.739	0.390
	No	5(45.5%)	6(54.5%)		

There was significant association of stunting with age at first pregnancy (p<0.05). Marriage age, Knowledge about malnutrition, Father Occupation and immunization during pregnancy were insignificant with stunting in survey area.

The survey showed that age at first pregnancy is significantly associated with stunting. The prevalence of stunted is found highest in children 13(65%) birth by mother age above 20 year and prevalence rate is lowest 25(32.1%) in child birth by mother age below 20 year.

The children whose mothers were pregnant at age 20 and above 20 were more likely to be stunted compared to the children whose mother were first pregnant at age below 20 years. The similar result was found in the study of "Assessment of factor affecting the Nutritional status of 6-59 month of children in Mushar community of Madheli VDC, Sunsari" conducted by Sandeep kumar Chaudhary (Chaudhary, 2016). This may be due to extra care given for younger (age less than 20) mothers and her child unlike the same for mothers who crossed their twenties regarding working load, nutritious foods, proper health checkups prior to pregnancy and delivery etc.

4.6.2 Factors associated with wasting

Table 10: Factors associated with Wasting of 6-59 month children (N=98)

Factors		weight for height status		chi square	p-value
		Normal	Wasting		
Birth order of child	First	39(81.3%)	9(18.8%)		
	Second	34(94.4%)	2(5.6%)	7.116	0.028*
	Other than 1st and 2nd	9(64.3%)	5(35.7%)		
Immunization during pregnancy	Yes	75(87.2%)	11(12.8%)	5.369	0.02*
	No	6(54.5%)	5(45.5%)		
feeding pattern after earthquake	Packet food	66(81.55)	15(18.5%)		
	Others	14(100.0%)	(0.0%)	5.785	0.055
	As usual	2(66.7%)	1(33.3%)		
Knowledge about malnutrition	Yes	57(82.6%)	12(17.4%)	0.020	0.888
	No	25(86.2%)	4(13.8%)		
Age at first pregnancy	Below 16 year	1(33.3%)	2(66.7%)	0.551	0.759
	16 to 20 years	52(69.3%)	23(30.7%)		
	Above 20 years	7(35.0%)	13(65.0%)		

Birth order of child and immunization during pregnancy were found significant with wasting (p<0.05) in the survey area. Whereas, feeding pattern after the earthquake, Knowledge about malnutrition and age at first pregnancy were insignificantly associated with wasting (p<0.05) in the survey area. The factor associated are list in the table 12.below.

The birth order of child also shows significant association with wasting. Highest percentage of wasting rate (35.7%) is found in child other than first and second. These result show that higher the number of children in family or higher birth order is associated with wasting. Similar result was found in the report of "Determinants of Nutritional Status of Women and Children in Ethiopia" (Institute, 2002). On the other hand, Similar result was also found in the study of nutritional assessment of earthquake victimized children age (6 – 59) months in Bhimtar VDC, Sindhupalchok conducted by Ms Anushka thapa. Her study also found the significant association between Birth order of child and wasting. She concluded that the proportion of undernutrition in higher birth order (> 3) was more at risk than those with first birth order (Thapa, 2016).

    Immunization during pregnancy also shows significant association with wasting. The result shows that child whose mothers are immunized during pregnancy are less wasted and highly wasted to mother who did not immunized during pregnancy. One such risk is the chance of contracting tetanus during pregnancy. The infection can be transmitted to the fetus and can be life-threatening for both mother and baby. Therefore, it is important to understand about tetanus and its vaccinations in pregnancy. The tetanus bacteria can easily pass into the body through an open wound. Once the bacteria enters into the skin, it produces a toxin known as tetenospasmin in the bloodstream. It thus attacks the nervous system that can lead to death if not treated on time (Verma, 2016).

4.6.3 Factor associated with underweight

Table 11: Factor associated with Underweight 6-59 month children (N=98)

Factors		weight for age status		chi square	p-value
		Normal	Underweight		
Knowledge about malnutrition	Yes	45(65.2%)	24(34.8%)	4.408	0.036*
	No	25(86.2%)	4(13.8%)		
Birth order of child	First	33(68.8%)	15(31.3%)		
	Second	30(83.3%)	6(16.7%)	5.819	0.055
	Third	7(50%)	7(50%)		
Immunization during pregnancy	Yes	64 (74.4%)	22(25.6%)		
	No	5(45.5%)	6(54.5%)	2.699	0.1
First pregnancy age	Before 16 years	1(33.3%)	2(66.7%)		
	16 to 20 Years	57(76.0%)	18(24%)	3.859	0.145
	Above 20 Years	12(60.0%)	8(40.0%)		
Father occupation	Business	1(25%)	3(75%)		
	Agriculture	10(90.9%)	1(9.1%)		
	Job	4(57.1%)	3(42.9%)		
	Labor	37(72.5%)	14(27.5%)		
	Others	18(72.0%)	7(28.0%)	6.907	0.141
	Packet food	56(69.1%)	25(30.9%)	1.841	0.398
Feeding pattern after earthquake	Others	12(85.7%)	2(14.3%)		
	As usual	2(66.7%)	1(33.3%)		

 Knowledge of malnutrition is significantly associated with underweight (p<0.05) in study area. Birth order of children, Immunization during pregnancy, First pregnancy age, Father occupation, feeding pattern after earthquake are found insignificant with underweight (p<0.05).

The study showed that, children from mother having knowledge about malnutrition are highly underweight and vice-versa. In one of the study conducted in Ethiopia in the topic of "Determinants of the Nutritional Status of Mothers and Children in Ethiopia" the under nutrition rate decreases with increase in education level (Institute, 2002). The result showed inverse relationship between knowledge of malnutrition to mother and underweight rate. These may be due to poor economic status of family, infection from different disease, poor

hygiene and sanitation, unhealthy feeding practices and change in feeding pattern due to effect of earthquake. One of the study about "Prevalence and Predictors of Underweight, Stunting and Wasting in Under-Five Children" Mother's educational status wasn't found significant to predict under nutrition (Sapkota and Gurung, 2009). Similarly one of the study conducted in Rupandehi, Nepal in the topic of factors associated with nutritional status of under five children shows that Mother's educational status wasn't found significant to predict undernutrition (Acharya, 2013).

Part V

Conclusion and recommendation

5.1 Conclusion

a) The result of survey shows that the stunting and underweight are slightly less than that of national data of NDHS 2011 i.e.38.8% and 28.6% respectively whereas the wasting rate is slightly greater than national data i.e. 16.3%.

b) The Age at first pregnancy is significantly associated with stunting, birth order of children and immunization to mother during pregnancy is significantly associated with wasting and knowledge about malnutrition is found significantly associating with underweight.

c) Poor hygiene and sanitation practices, Birth order of children, immunization during pregnancy may be the risk elements of malnutrition in the study site.

d) The study point out the need of making a comprehensive, integrated and multi sectorial plan for addressing the problem of malnutrition in long term.

5.2 Recommendations

Based from the results from the thesis the following are the recommended points to improve the nutritional status of earthquake victimized children residing in shelter in Dhading:

1. Nutrition awareness programme should be conducted at root level through health worker and FCHV to improve the feeding practices of parents on appropriate child feeding and care practices

2. Because of large number of people living together in shelter, hygiene and sanitation problem was seen which may spread different diseases .so improvement in hygiene and sanitation was seen there.

3. Effective intervention should be addressed to reduce stunting, wasting, underweight and micronutrient deficiency.

4. Economic status of people are very poor. So income generating programme should be conducted to decrease the risk of malnutrition due to poverty.

5. Survey of this nature should be carried out at regular interval so that it will assist the stakeholder to formulate plan policies for the betterment of Nutrition status.

Part V I

Summary

Nutritional status of children is a proxy indicator for assessing the entire population health status and one of the major predictors of child survival.This study was conducted to assess the nutritional status of under-five year children and to find out the factors associated with childhood malnutrition. 98 earthquake victimized children from 6-59 month were taken during the survey. Anthropometric measurement of 98 children was taken to assess the nutritional status of earthquake victimized children. The data collected was analyzed by using SPSS version 20 and WHO anthro 3.2.2 version and chi square test was used to identify the association factors of malnutrition.

Based on WHO classification out of 98 children, 38.8% stunted and 19.4% were severe stunted, 16.3% were wasted and 7.1% were severe wasted and 28.6% were underweight and 13.3% were severely underweight respectively. No overweight or obese children were found in the survey population. Based on WHO growth standard of under nutrition indicators, about 14.28% male and 24.48% female were stunted, 12.24% male and 4.08% female were wasted, 15.3% male and 13.26% female were underweight respectively, having less than minus 2 z-score values. Survey shows that 77.6% people living in nuclear family and 22.4% live in joint family. Major occupation of family was labor and only few people involve in job and business. Result shows that 85.7% of family have annual income less than 2 lakh and only 13.3% people have more than 2 lakh whereas less than 1% people have less than 1 lakh.

19% of women married at age below 16 year, 74.5% married at 16 to 20 year and 6% women married after 20 year. The highest percent of pregnancy age is found between 16 to 20 year with 76.5% and only 3% women married after 20 year.70.4% of women have general knowledge about malnutrition where as 29.6% of women were unknown about malnutrition. Study shows that 85.7% of women used iron folate tablet during pregnancy whereas 14.3% of women did not used iron folate tablet. Majority of the children were females (56.1%) and less percent male (43.9%). 49% of child were first child, 36.7% were second child, and 14.35 were third and other than third children. Most of the child birth weight range from 2 kg to 3 kg (49%), 32.7% of child more than 3 kg and 5.1% child below 2 kg. Out of total respondents 55.1% (54) were initiated for breastfeeding during the first hour of birth, 35.7% (35) were

breastfed within 8 hours and remaining 9.2% (9) were breastfed after 24 hours. Although 86.7% (86) of the children were breastfed exclusively for the first 6 months the remaining child were not exclusively breastfeed which include 13.3% (13). The highest percentage of children 51%(50) were introduced complementary food at the age of 6 months followed by 27.6%(27) from 7 month; 16.3%(16) from 5 month; 2%(2) from 4 month and finally 3.1%(3) were still not introduced with complementary food. Almost all the children 90.8% (89) were given with Vitamin .A capsule and deworming tablets and only 9.2% (9) children had not received Vitamin A and deworming tablets. Survey shows that almost all people use water tap as source of drinking water. The highest population do not use any water purification method which includes of 66.3%(65); 25.5% (25) people use drinking water bay boiling and 8.2%(8) people use filtration process for water purification. 100% people use toilet in the survey area and all use soap water for washing hand after toilet.

The main factor significantly associated with stunting was found to be first pregnancy age of mother. Wasting is significantly associated with birth order of child and immunization during pregnancy and underweight is found significantly associated with knowledge about malnutrition to mothers. The result of the work can be utilized by government as well as voluntary organization and the local government to initiate steps to tackles the existing malnutrition problems and encourage the people of that population to try to improve their existing poor nutritional status by improving dietary pattern of the under five children as well as pregnant and lactating women. This result can also create awareness of the people about the real situation of that population responsible for the prevalence of malnutrition.

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Appendices

Appendix-A

Consent letter

Namaste!

I Mr. Sundar mani silwal, graduate student in Department of Nutrition and Dietetics conducting a dissertation work for award of bachelor's degree in Nutrition and Dietetics. The topic for the study is "ASSESSMENT OF NUTRITION STATUS OF CHILD FROM 6-59 MONTH RESIDING IN THREE SHELTER IN DHADING."

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 interviewer: _____

Survey questionnaire

Nutrition Survey Form

Nutrition and Dietetics Department

Central campus of Technology, T.U.

Hattisar, Dharan, Nepal

Code no.		Date			
Child Name:					
Date of birth: ………………		Sex: …………………………………..			
Address		VDC		Ward no:	

General information

Family member's description:

S.no.	Members name	Relation to child	Sex	Age	S.no.	Name of under 5-year child	Sex	Age
1								
2								
3								
4								
5								

Family Size: _____

59

Ethnicity: _____

Type of family?   Nuclear/ Joint

What's your occupation? (Mother)   Business/ Agriculture/ Job/ Labor/ Other

What's your occupation? (Father)   Business/ Agriculture/ Job/ Labor/ Other

Father's education   Primary (1 − 5)/ Secondary (6 − 10) / Campus /
                                         None

Mother's education   Primary (1 − 5)/ Secondary (6 − 10) / Campus /
                                         None

Annual income of the family?   _____

Is your annual income enough to eat?   Yes/ No

Household type   Permanent / Temporary

Child description

Child order:

Birth weight: _____

Under 5 year child death?   Yes / No

If yes, how many?   _____

Child caring practice

Did you breastfeed your child right after birth?　　Yes / No

If yes, for how many hours?　　　　　　　　　1/ 8/ 24

When did you stop breastfeeding?　　　　　　—————————————————

Did you exclusively breastfeed?　　　　　　　Yes / No

Did you feed colostrum to your baby?　　　　　Yes / No

Did you introduce any prelacteal feeds to your child?　　　Milk/　honey/　jaggery/　ghee/ herbal paste/ None

Do you know supplementary food?　　　　　　—————————————————

If yes, when did you initiate?　　　　　　　　4/ 5/ 6/ 7/ none

What types of supplementary food are fed?

　　Cereals product (*jaulo, dhiro*)/ egg, meat, milk/ vegetables, fruits/ processed food *(cerelac, litto, packet milk)*

Do you the preparation of *litto*?　　　　　　Yes / No

If yes, how?　　—————————————————————————

Do you know the preparation of ORS?　　　　Yes / No

Health and immunization

Did you have your child vaccinated?　　　　Yes / No

Did your child have Vitamin A and deworming tablets?   Yes / No

Are you vaccinated during pregnancy?   _____

           If yes, which one?   Polio/ B.C.G/ T.T/ None

Where do you take your ill child?   Health center/ Pharmacy/ *Jhakri*/ None

How do you recognize your ill child?   Lazy/ increased body temperature/ vomiting

Maternal description

At what age, did you get marry?   _____

Age at first pregnancy?   _____

Did you have Iron/ folate tablets?   Yes / No

Do you know malnutrition   _____

If yes, how?   Less food intake/ curse of god/ due to witch / other/ don't know

Do you know the causes of marasmus?   Yes / No

What amount food did you eat during pregnancy?   More than usual/ less than usual/ as usual

Which salt is used in your home?   Iodized salt/ *Dhikke*

Environment and Sanitation

Which water source do use?   Tap water/ Well/ River/ Tube well

How do process drinking water?   Filter/ Piyush / Boil/ None

How do you dispose wastes?   Bury/ Burn/ VDC management/ Other

Do you have toilet facility?   Yes / No

Earthquake description

Did the earthquake cause damages in your house?   Yes / No

If yes, what kind of damages?   Human loss or injuries/ cattle loss/ house damages / others

Do you still frightened?   Yes / No

Did you had changes in daily food eating patterns?   Yes / No

If yes, how much did it last?   _____

What did you consume at those days?   Packet food/ other/ regular/ Nothing

What did you feed to your child during those times?

                                        _____

Anthropometric measurement of under five children

Height	2. Weight	3. MUAC	4. OEDEMA (Yes/No)

Survey photos

Map of Study area