

**NUTRITIONAL ASSESSMENT OF EARTHQUAKE VICTIMIZED
CHILDREN AGED (6 – 59) MONTHS IN BHIMTAR VDC,
SINDHUPALCHOK**

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**Nutritional Assessment of Earthquake Victimized Children Aged
(6 – 59) months in Bhimtar VDC, Sindhupalchok**

*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 **Nutritional Assessment of Earthquake Victimized Children Aged (6 –59) Months in Bhimtar VDC, Sindhupalchowk** presented by Anushka Thapa has been accepted as the partial fulfillment of the requirements for the Bachelor degree in Nutrition and Dietetics*

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Abstract

Objective: To investigate and analyze nutritional status of under five year children and factors associated with earthquake in Nepal. Methods: A community based cross sectional study was conducted among 150 children aged 6-59 months in Bhimtar VDC, Sindhupalchok. Children were selected by random sampling technique. Anthropometric measurements and semi - structured questionnaire were used. Anthropometric measurement was then used to determine if children were underweight (weight-for-age), wasted (weight-for-height) and stunted (height-for-age) based on WHO reference. Statistical Package for the Social Sciences (SPSS) version 20 and World Health Organization (WHO) Anthro version 3.2.2 were used for analyzing the data. Fisher exact test and chi – square test was used to identify the associated factors of malnutrition.

Results: The study revealed, 64.7%, 22.7% and 41.3% of children were stunted, wasted and underweight respectively. The main associating factors with wasting ($P < 0.05$) were annual income, birth order, caretaker's knowledge about supplementary food. Stunting was found associated ($P < 0.05$) with only birthweight. And number of children under five year, preparation of ORS was found to be associated ($P < 0.05$) with underweight. Furthermore, inadequate dietary intake especially energy, protein, thiamine, carotene, iron was seen where earthquake plays vital role for it. Conclusion: Daily consumption pattern has been affected by earthquake and this study indicates that under nutrition is an important problem in Bhimtar VDC, Sindhupalchok, especial attention should be given on intervention of malnutrition.

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List of Abbreviations

Abbreviation	Full form
BCG	Bacillus Calmette – Guerin
CBS	Central Bureau of Statistics
CI	Confidence Interval
CIP	Country Investment Plan
DPT	Diphtheria, Pertussis and Tetanus
EBF	Exclusive Breast Feeding
FAO	Food and Agriculture Organization
FCHV	Female Health Volunteers
GON	Government of Nepal
HAZ	Height for Age
ICMR	Indian Council of Medical Research
IDA	Iron Deficiency Anemia
IDD	Iodine Deficiency Disorder
IQ	Intelligence quotient
LAC	Latin America Caribbean
LBW	Low Birth Weight
MAM	Moderate Acute Malnutrition
MDGs	Millennium Development Goals
MOHP	Ministry of Health and Population
MUAC	Mid upper arm circumference
NDHS	Nepal Demographic Health Survey

ORS	Oral Rehydration Solution
OSOCC	On – Site Operations Coordination Center
PDNA	Post Disaster Need Assessment
PEM	Protein Energy Malnutrition
PHC	Primary Health Centre
RDA	Recommended Dietary Allowance
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SLC	School Leaving Certificate
SPSS	Statistical Package for Social Science
TT	Tetanus Toxoid
UNICEF	United Nations Children’s Fund
USGS	United States Geographical Survey
VAD	Vitamin A Deficiency
VDC	Village Development Committee
WAZ	Weight for Age
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight for Height

Part I

Introduction

1.1 General introduction

Food is consumable liquid, semisolid or solid which is digested, absorbed and metabolized. Food nourishes us and assist our body to perform different physical activities as well as mental. The chemical substances present in food that are absorbed and utilized by body are referred as nutrients. Nutrition is a part of food science and it explains about the effect of food in our body of optimum nutrition or adequate nutrition, helps in maintaining good health, which is only possible, if the essential nutrients are utilized in right proportion (Begum, 2008). WHO defines health as “the state of complete physical, mental and social well- being and not merely the absence of disease of infirmity” (Begum, 2008) (Begum, 2008) (Begum, 2008) (Begum, 2008) (Begum, 2008) . Nutritional status is one of the measurement of health and it assists to find out the magnitude of malnutrition in the individuals and in the community. The nutritional status of Nepal is poor which is influenced by the social, cultural, economic, educational and political structures. Nutritional assessment involves anthropometric measurement, biochemical test, clinical observation, dietary survey, ecological study and vital statistics (Chapagain *et al.*, 2005).

Natural disaster affects physical, psychological, economic, material aspect of any community. Disaster leads a community to be paralyzed as it causes casualties, damages, fatalities. Disease is commonly seen among the vulnerable groups. Natural disasters also affect children under the age of growth. At this time of rapid growth, interference or obstacles occur in long term growth result into adulthood. Natural disaster can bring intensive hunger, malnutrition, stress and disease that interfere or create obstacle on natural growth and development of children. Children are more susceptible than adults due to less physical, cognitive, immunological development. Malnutrition prevalence due to natural disaster, was increasing in Indonesia for over 40% under 5 years in 2007, for 116 districts per cities (Rianawati *et al.*, 2016). A 7.0 Richter scale of earthquake struck on Haiti in 2010, which lead to 95 % death in Port-au-Prince area showing high risk to death among children, 18.6% of the households were shown to be experiencing moderate to severe food insecurity (Kolbe *et al.*, 2010).

The total population of Nepal is 26.6 million and the population growth rate is 1.35%. The infant mortality rate and under five mortality rates are 46% and 54% per 1000 respectively (MOHP *et al.*, 2012a). Among 75 districts of Nepal, Sindhupalchok is one of them and its headquarter is in Chautara. Sindhupalchok is near to the capital city of Nepal, where this is one of the least developed district. The total area of the district is 2542 square kilometer (1.73%) (Danuwar, 2014) and the total population of Sindhupalchok is 2,87,798 (CBS, 2014). After the highest magnitude (6.7) aftershock took place in Sindhupalchok district on April, 25 of 2015 (USGS, 2015). Among the total population about 191,419 population was affected (OSOCC, 2015). As stated by the district authorities 63,885 houses were severely and 2,751 houses are moderately damaged (Ministry of Home Affairs, 2015). Around 90,000 people have been identified as in need of assistance based on reporting at VDC level (OSOCC, 2015). It is reported that food stocks are significantly impacted throughout the Sindhupalchok district (WFP, 2015).

1.2 Statement of the problem

Nutritional deficiency is a major public health challenge in Nepal and have tremendous impact not only on health of vulnerable population but to the national economy too (Devkota *et al.*, 2015). PEM is common problem under 5 years children. Stunting is more common in mountain and hilly areas while wasting and underweight are common in Terai areas. 18% of women are malnourished and they fall below the BMI cutoff point (18.5). 46% children age 6 – 59 months and 35% of women age 15 – 49 are anemic (MOHP *et al.*, 2012a). One in every 22 children die before they reach age of one year and one in every 19 doesnot live up to their fifth birthday (MOHP *et al.*, 2012a).

In a survey of 200 countries, Nepal ranks 11th in the world for vulnerability of earthquake (Chaulagain *et al.*, 2013). On the 25th April, 7.8 magnitude earthquake struck Nepal and Sindhupalchok is one of the worst-affected districts as a result of the earthquake that took place. In 2013, pneumonia incidence among children was 230 per 1000, diarrhea incidence 493 per 1000. The stunting prevalence in the Central Mountain region to which Sindhupalchok belongs was 45.5%. The underweight prevalence is 34.7%, the wasting prevalence is 7.9%. Children aged 6-59 months, 33.1% suffered from anemia. Cholera is endemic in Nepal. In 2009, an endemic of severe diarrhea led to 70,000 cases, 330 deaths in the country. Villagers of Sindhupalchok, have found additional water sources or have

temporarily fixed their water source where broken, but the quality of these source is unknown, and hence have high chances to be contaminated. In some villages, there is no access to safe sanitation and soap. The few remaining private latrines are shared by hundreds of residents, and open defecation has been observed by a majority of residents. According to last census Measles vaccination coverage for infants was 67% in Sindhupalchok and 88 % in National. The prevalence of malnutrition in Sindhupalchok, where moderately acute malnutrition is 12.3%, severely acute malnutrition is 2.7% and moderately acute malnutrition and severely acute malnutrition are 8.7% and 2.7% respectively in national level. Likewise, literacy rates in male is 68% and in female is 51.9% at Sindhupalchok, whereas, in national level male with 75% and female with 57% (OSOCC, 2015).

In Nepal, even before the earthquake, close to 4 out of 10 children were in a state of malnutrition. Now with these damages, losses and challenges, children in these earthquakes affected are at a heightened risk of malnutrition (UNICEF, 2015).

1.3 Objectives

1.3.1 General objectives

To determine the nutritional status of earthquake victimized children of age 6-59 months in Bhimtar, Sindhupalchok and investigate the associated risk factor of malnutrition at earthquake devastating situation.

1.3.2 Specific objectives

- a) To assess the prevalence of malnutrition among earthquake victimized children at Bhimtar.
- b) To know about their dietary availability, dietary intake and dietary adequacy.
- c) To investigate the factors associated with malnutrition.

1.4 Significance of the study

The findings of the study will be helpful to:

- a) Acknowledge about the nutritional status of earthquake victimized children of Bhimtar and can also be utilized as reference for those interested ones.

- b) This might be useful for some governmental or non-governmental organizations which are working for the welfare of the children in the earthquake affected area.
- c) Encourage government and other stake holders for the development of programs and policies related to nutrition.
- d) Encourage local people to improve current nutritional status by improving feeding pattern and habit of children, pregnant and lactating women.
- e) Discover the problems related to nutrition, care practices and feeding behavior of this community.
- f) Act as tool to reflect sanitary condition, socio-economic variables, degree and types of malnutrition and condition of 6 to 59 months age group child.
- g) Identify individual or group of people who are at risk of being malnourished and who need special care and attention.
- h) Act of partial submission for the completion of the bachelor degree.

1.5 Limitations

While conducting the survey some of the following limitations might be seen and they are:

- a) This is a single-center experience and may not be representative of the whole Nepal's population thus; the results may not be extrapolated to other population without further study.
- b) This study is conducted with limited resources, which makes impossible to include many other important question and other clinical and biochemical assessment.

Part II

Literature review

2.1 Nutrition

It is the study of the nutrients and their relationship with food and living things. Food is composed of different chemical elements, arranged in variety of ways to form molecules. Those molecules which are used by the body to function correctly and to stay healthy are called nutrients and most of the foods consists of more than one nutrient (Tull, 2001).

2.2 Malnutrition

Malnutrition includes both over and under nutrition as well as specific nutrition deficiency. In the context of the of developing countries, undernutrition is generally the main concerning issue (Webb *et al.*, 2005). According to WHO, malnutrition is defined as “the cellular imbalance between supply of nutrients and energy and the body’s demand for them to ensure growth, maintenance, and specific functions”, (Plan International, 2016). Malnutrition is one of the major risk factor for various non-communicable disease and directly and indirectly effect of health outcomes of individuals and can increase the risk of both morbidity and mortality. Malnutrition in extreme condition can directly cause the death. Protein energy malnutrition has been reported to cause of death for large number of population in developing world (Blossner and Onis, 2005). The state of malnutrition is clinically manifested by anthropometric, biochemical tests (D. B. Jelliffe, 1966b). Nearly every country in the world experiences a level of malnutrition that constitutes a serious public health risk. About 2 to 3 billion people are malnourished all around the world. The faces of poor nutrition are many: from children living under famine conditions, poor infant feeding practices, and exposure to infectious disease (Haddad *et al.*, 2015).

2.3 Causes of malnutrition

The main causes may be inadequate food intake or lack of food supplies and food utilization are the most probable common causes of malnutrition worldwide, especially in developing countries. It’s the result from pathophysiological, psychological and general social problems. Also, nausea and vomiting, which may result from certain diseases, and the use of certain drugs or specific treatments (chemotherapy, radiotherapy) may have a negative effect on

appetite and utilization of nutrients. Poverty and famine, poor food hygiene, inappropriate food supplies and the early cessation of breastfeeding are the other causes (Katsilambros, 2010). There are many causes of malnutrition often interrelated and never occurs alone (Birch, 1972). The strongest and most consistent relation between malnutrition and an increased risk of death was observed due to diarrhea and acute respiratory infection. A less consistent association was observed between nutritional status and death from measles (Rice *et al.*, 2000). Apart from marasmus and kwashiorkor (2 forms of protein– energy malnutrition), micronutrient deficiencies iron, iodine, vitamin A and zinc are the main manifestations of malnutrition in developing countries. A high prevalence of poor diet and infectious disease regularly unites into a vicious circle of malnutrition and can affect generation to generation (Müller and Krawinkel, 2005).

2.4 Types of malnutrition

According to (Das, 2016) the types of malnutrition are:

1. **Undernutrition:** Undernutrition is the pathological condition resulting from insufficient food consumption of an inadequate quantity for extended period of time e.g. PEM.
2. **Starvation:** It's the condition when the undernutrition is extended for longer period.
3. **Specific deficiency:** The pathological state result from a relative or absolute lack of a particular nutrient e.g. IDA
4. **Over nutrition:** The pathological state where food is consumed in excessive quantity and hence a calorie excess, for extended period of time e.g. obesity.

2.5 Nutrition deficiency disorder

2.5.1 Protein energy malnutrition (Chitereka *et al.*)

It's the most common form of malnutrition among infants and young children. Malnourished children are shorter and lighter than they should be for their age. Children under 5 years of age are usually highly affected, as compared to older children and adults. However, many people still refer growth failure as PEM. It is now recognized that growth failure may not only occur due to deficiency of macronutrients energy and protein but also due to various

micronutrients deficiency. The growth failures associated with malnutrition are of two types: wasting (acute malnutrition) and stunting (chronic malnutrition) (WHO, 2000).

2.5.1.1 Wasting

Wasted children are extremely thin and it's the result of recent rapid weight loss or a failure to gain weight. Once the condition is improving its readily reversible. It is globally accepted as index of acute PEM and measured by the weight- for -height index (WHO, 2000).

2.5.1.2 Stunting

Stunted children are short for their age; they may have normal body proportions but look younger than their actual age. It develops over a long period of as a result of inadequate nutrition or repeated infections or both. Unlike wasting, the development of stunting is a slow cumulative process and it may not be evident for some years, at which time the child's nutrition may have improved. By two years of age, height deficits may be irreversible and its measured by height- for-age index (WHO, 2000).

2.5.2 Kwashiorkor

The main distinguishing feature of kwashiorkor is the presence of oedema (usually starts in feet and legs), or fluid accumulation in the body as a result of severe nutritional deficiencies. oedema can be detected by pressing thumb just above the ankle for about three seconds; this leaves a definite pit. Another common feature can be loss of appetite and mental changes are common leading apathetic and irritable child. The child hair becomes thinner and change in color from black to light brown or red. Swollen cheeks known as moon shaped face appearance is another popular symptom. Children suffering from Kwashiorkor is considered to be extremely malnourished and has high risk of dying (WHO, 2000).

2.5.3 Marasmus

It is noticeable by severe weight loss or wasting. The ribs are very prominent, the limbs emaciated, and the muscles and fats are extremely wasted, where the body breaks down for energy, leaving skin and bones. In contrast, the belly appears protuberant. Marasmic children often have good appetite and are quite alert. If treated correctly, a child suffering from marasmus has a good prognosis. Some children pose both the characteristics of kwashiorkor and marasmus and thus known as marasmic kwashiorkor (WHO, 2000).

2.5.4 Iron deficiency anemia (IDA)

IDA are most common in young children (aged 6- 24 months) and women of reproductive age (particularly pregnant women). Lack of micronutrient like iron, folate or vitamin B¹² causes anemia. It is difficult to diagnose accurately from clinical signs and symptoms unless it becomes severe, which include pallor, tiredness, headaches and breathlessness. Cereals, pulses, fortified blended food are the rich source of iron. Impairment of cognitive functions and attentiveness in children and adolescents, risk of low – birth- weight (LBW) infants and perinatal and maternal mortality in pregnant women, reduced work and capacity in all individuals are some major manifestation of IDA (WHO, 2000). The situation of IDA in Nepal is also not good. A recent study in Nepal has revealed that nearly half (46.2%) of children aged 6-59 months, two thirds (69%) of young children aged 6-23 months, 35% of women aged 15-49 years, and 47.6% of pregnant women were found to be anemic (MOHP *et al.*, 2012a).

2.5.5 Vitamin A deficiency (VAD)

It occurs in several developing countries. Lack of micronutrient; Vitamin A causes Night blindness which is, inability to see well in the dark or in a darkened room which is an early sign of VAD. Xerophthalmia, including Bitot's spots and corneal ulceration and then night blindness. VAD also weakens the immune system and hence increases the severity, complications and risk of death from measles, maternity mortality, etc. (WHO, 2000). More than two hundred fifty million of the world's children suffer from VAD and sixty-nine percentage of children in southeast Asia have VAD Nepal is one of 60 countries in which this deficiency constitutes a significant public health problem (Ramakrishnan, 2002). Each year vitamin A deficiency (VAD) claims the lives of almost 670,000 children under five in the world (Black *et al.*, 2008) and precipitates the deaths of approximately 6,900 children in Nepal (World Bank, 2012). Only forty-seven percent of children age 6-23 months consumed foods rich in vitamin A daily. Almost 90% of 6-59 months' children received vitamin A supplements. The proportion of children receiving a vitamin A supplement increases with age from 70% at 6-8 months to 93% at 24-35 months before declining to 91% at 48-59 months. Children in rural areas are more likely to receive vitamin A supplements (91%) than those in urban areas (86%) (MOHP *et al.*, 2012a).

2.5.6 Iodine deficiency disorder (IDD)

It's present in most of the developing world especially where the soil is poor in iodine and iodine content of plant foods consequently low, resulting to low iodine intake in the population. Lack of micronutrient iodine causes cretinism, preventable brain damages, rise to still births, miscarriages and goiter. It causes mental and physical disability which occurs in the offspring of women with sever Iodine deficiency at the first trimester of pregnancy (WHO, 2000). The World Health Organization estimated in 2007 that 2 billion people around the world live in areas at risk of insufficient intake of iodine (De Benoist *et al.*, 2008). Iodine deficiency is seen in almost 40% of women and school going children and only 63% of households use adequately iodized salt (NMSS *et al.*, 1998). Similarly 27% population of Nepal are still are in risk of developing iodine deficiency disorders because iodized salt hasn't been reached to those population (MoHP *et al.*, 2012b).

2.6 Impact of nutritional deficiencies

Malnutrition weakens the immune system and makes children more susceptible to fatal infections and may also cause death. Under nutrition along with pneumonia and diarrhea is estimated to cause death of 60% of child in the world (WHO, 2006) (Appendix A). In Nepal, 21% babies have reported to be born with low birth weight. Low birth weight babies are always in risk of developing disease and have a greater chance of (MOHP *et al.*, 2012a). Short maternal stature, early pregnancy, high parity, smoking, small birth intervals are some factors responsible for low birth weight. Also, in Nepal, study has shown that neonatal deaths are high for babies whose mother has short stature (Paudel *et al.*, 2013). About 20-60% children living in third world countries are physically stunted. Nutritional deficiencies are responsible for causing various disabilities too. Iodine deficiency alone is responsible for lowering children's IQ by 10-15 points. In Nepal 27% people are still lack iodized salt and about 200,000 babies a year will be born with mental impairment (World Bank, 2012). The cycle of poverty, disease and illness will aggravate this situation. Undernourishment will cause children to start life at sub optimal mental levels. This becomes a serious threat in development (Paudel *et al.*, 2013).

2.7 Nutritional status

A state of human body resulting from balance between intake of food and expenditure of energy is called nutritional status. Observation varies from person to person; someone who

looks fat to one person may look thin to another. To avoid such problem and to be more precise, actual recording of the body measurement are taken and compared with the values considered normal to find out the nutritional status of an individual. A significant proportion of the Nepalese children are malnourished as they are shorter or lighter than the children of the same age in the well-nourished communities (K. R. Adhikari and Krantz, 2013).

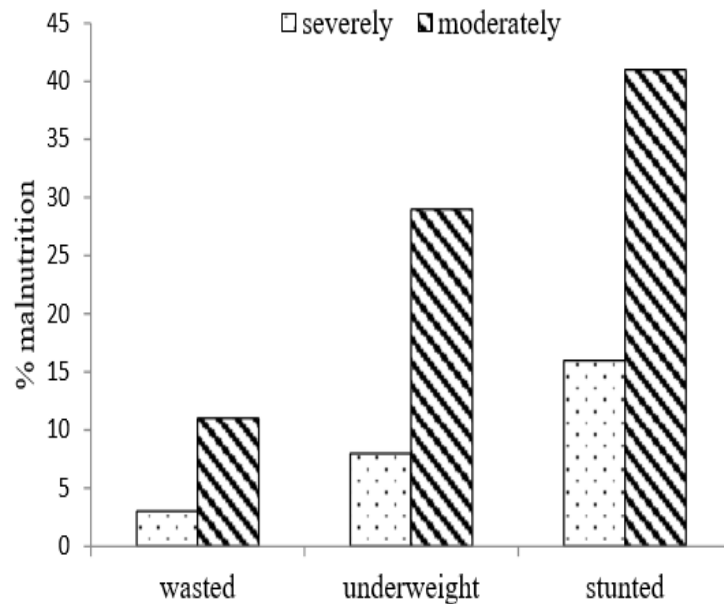


Fig. 2.1 Prevalence of different forms of Malnutrition in Nepal (MoHP *et al.*, 2012b)

The prevalence of all types of malnutrition is still high in Nepal, 41% of under five children are stunted and 16% are severely stunted, 11% are wasted and 3% are severely wasted and 29% are underweight and 8% are severely underweight which is shown in fig 2.1 (MOHP *et al.*, 2012a). Stunting is highest (53%) in children age 36 – 47 months and lowest (14%) in 9-11 months, wasting is found to be highest (25%) in children age 9 - 11 months and lowest (7%) in children age 36 - 47 months and proportion of underweight children is highest (37%) among age 18 - 23 months and lowest (18%) among under 6 months’ children. Male children are more likely to be stunted, wasted and underweight as compared to female children (MOHP *et al.*, 2012a). The trend in prevalence of malnutrition of under five years’ age children in Nepal is presented in the figure 2.2. There is downward trend in stunting and underweight over time. The percentage of stunted children declined by 14% between 2001 and 2006 and declined by an additional 16% between 2006 and 2011. A similar pattern is observed for the percentage of underweight children, which dropped by 9% between 2001

and 2006 and by 26% between 2006 and 2011. Similarly, the percentage of wasting has declined by 15% between 2006 and 2011 (MOHP *et al.*, 2012a).

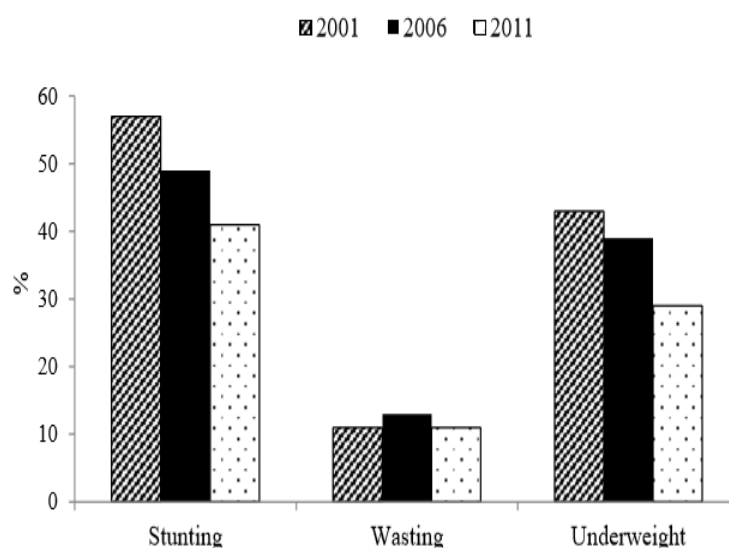


Fig. 2.2 Trends in Nutritional Status of children under five years of age (MOHP *et al.*, 2012a)

Currently, the infant mortality rate in Nepal is 46 deaths per 1,000 live births for the five-year period before the survey, just two deaths below the infant mortality reported in 2006. Under-five mortality is 54 deaths per 1,000 live births, down from 61 deaths per 1,000 in 2006 (MOHP *et al.*, 2012a). Mortality rates are much higher in rural than urban areas; 55 deaths per 1,000 live births in rural areas compared to only 38 in urban areas. 87% of Nepalese children aged 12–23 months have received all recommended vaccines one dose each of BCG and measles and three doses each of DPT and polio (MOHP *et al.*, 2012a). Only 3% of children did not receive any of the recommended vaccines. Almost half (46%) of children have moderate anemia, and 1% are severely anemic. More than 70% of children age 6-17 months are anemic compared with 25% of children age 48- 59 months (MOHP *et al.*, 2012a). Vitamin A, which prevents blindness and infection, is particularly important for children and new mothers. In the 24 hours before the survey, 47% of children age 6–23 month ate fruits and vegetables rich in vitamin A. Nine in ten children age 6–59 months received a vitamin A supplement (MOHP *et al.*, 2012a).

Globally in 2011, 165 million children under five years of age, or 26%, were stunted. Over 101 million or 16% were underweight. 52 million or 8% were wasted, and 43 million

or 7% were overweight (De Onis *et al.*, 2012). Nepal is country with diverse ecology and culture. Half of its people live in low lying southern Terai place followed by 43% in middle hill and 7% in Southern mountains (DARA, 2016). Chronic poverty and deep – rooted social divisions and discrimination in terms of caste, ethnicity, gender, culture and religion creates much vulnerability to poverty, food insecurity and malnutrition (FAO, 2010). Wasting in children does not vary significantly by ecological zone or development region. However, wasting levels across subregions are substantial, ranging from a low of 8 % among children in the Eastern and Central mountain, Western and Mid – western hill, and Far- western terai subregions to a high of 15 % among children in the Central hill and Western terai subregions (MOHP *et al.*, 2012a). According to the ethnicity among children under 5 years, stunting is highest among Muslims and Hill Dalits (both 26%), Hill Janjati (25%) (Appendix B). There is little difference in overall rates of stunting between the tarai/ Madhes origin and Hill/ Mountain origin groups (18 and 21 %, respectively). Likewise, nearly 15% women in Terai / Madhes origin groups are considered moderately or severely thin compared with only 5% for women in Hill/ Mountain origin group . Tarai Janjati and Muslim women also have above average proportions of underweight (Appendix C). Biggest risk of anemia appears to be regional identity with 26% among women from Hill/ mountain groups (Bennett *et al.*, 2008).

2.7.1 Nutritional status of women in Nepal

Women's nutritional status has improved only slightly over the years in Nepal. 12% women are shorter than 145 cm and 18% women are malnourished, that is, they fall below the body mass index cutoff of 18.5. 14% women are overweight or obese. 35% of women age 15-49 year are anemic, 29% are mildly anemic, 6% moderately anemic and less than 1% severely anemic (MOHP *et al.*, 2012a).

2.7.2 Factors affecting nutritional status

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, birth order, family occupation, environmental sanitation and health facility. The major causes of nutritional deficiency in developing country like Nepal is poverty, lack of food security and nutrition education (Devkota *et al.*, 2015). Study conducted in Ethiopia revealed that there was

significant relationship family size and stunting ($P < 0.05$). Children from larger families were at greater risk of getting stunted than from small families (Mekides W *et al.*, 2015). A study conducted in Qazvin, Iran whose findings depicted that there was significant association between stunting and family size ($P < 0.05$) while no significant association between gender and stunting and underweight and also between underweight and parent educational status ($P > 0.05$) (Mahyar *et al.*, 2010).

Negative significant association was observed between the household size and stunting and between child age and wasting in a study done in Mbeere South district, Kenya (Badake *et al.*, 2014). A study conducted in India showed that birth order was significantly associated with wasting (Panigrahi and Das, 2014). Underweight was not significantly associated with child's gender and family income in a study conducted in Mahottari district, Nepal (Mishra and Sharma, 2010).

2.7.3 Food availability and nutritional status

Food is not just something to eat; it is an integral part of culture of a community, region, or nation. Food is a relative concept. Good health depends on an adequate and safe food supply and this in turn on sound agricultural policy and a good system of food production, processing and distribution (Hartog *et al.*, 2006). Seasonal variation in food availability has long been recognized as a contribution to nutrition and health problems in many third world countries. The extent and duration of the seasonal hardships has been related to a number of climatic characteristics, such as rainfall modality, the distinctness of the season and length of period (Wandel and Holmboe-Ottesen, 1992). Low agricultural productivity, weak market linkage, poor infrastructure and lack of awareness among general public about healthy food habit lead to the household food deficiency. Productivity of major crops is also significantly lower than the national average which is already among the lowest in South Asia. Government of Nepal has developed Country Investment Plan (CIP) to address the gap of funding in the area of agriculture and food security issues including availability, access and utilization of food. Food security can be improved by increase in food availability, possible through increasing productivity of agriculture (both crop and livestock). Likewise nutrition security can be improved by improving dietary intake, promoting diversified diets and improved feeding and caring practices for pregnant and nursing women and children up to 2 years of age (Food and Environment, 2013).

2.8 Nutritional requirements

Nutritional Requirements refers to the amount of food, energy and nutrient needed on an average per day by specific group and sex categories to meet the needs of healthy individuals for normal functioning of the body for work and growth (FAO, 2010). The recommended daily allowance (Department of Statistics/Jordan and Macro International) of nutrients for preschool children 1-5 years is shown in Table 2.1

Table 2.1 RDA of pre – schoolers children

	6 to 12 month	12 to 36 month	36 to 59 month
Body weight (kg)	8.4	12.9	18
Energy (kcal/d)	80kcal/kg/d	1060	1350
Protein (g/d)	1.69g/kg/d	16.7	20.1
Fat (g/d)	19	27	25
Calcium (mg/d)	500	600	600
Iron (mg/d)	05	09	13
B Carotene (µg/d)	2800	3200	3200
Thiamine (mg/d)	0.3	0.5	0.7

Sources: (ICMR, 2010)

2.9 Nutrition, health promotion and human development

Nutrition and health education has been defined as educational measures for including desirable behavioral changes for the ultimate improvement in the nutritional and health status of individual. This is one of the most commonly implemented measures, not only of the health sector, but of other sector concerned with development of human resources. Growth is influenced by nutrition. Frequent attacks of infectious diseases affect their growth and increase the requirements of various nutrients (Srilakshmi, 2014).

2.10 Population growth in Nepal

Although Nepal's birth and death rate are both relatively high, the population is growing at a fairly rapid rate. More than two fifths of the population are younger than 15 years of age. However, the population growth rate in 2011 is 1.35 % (MOHP *et al.*, 2012a).

2.11 Breastfeeding and weaning process in Nepal

Breast feeding is usually continued together with the provision of cereal weaning until child is 2-3 years of old or until the mother is pregnant again. In certain communities, children receive only breast milk until they begin to eat adult's food. Mother will generally feed their infants on demand but workloads interfere with the frequency of feeding. 70% of children under age 6 months are exclusively breastfed, and 66% of children 6-8 months (breastfed and no breastfed) are introduced to complementary foods at an appropriate time. Ninety-three percent of all children are still breastfeeding at age 1, and the same proportion are still breastfeeding at age 2. Four of five Nepalese children ages 0-23 months are breastfed appropriately for their age. This includes exclusive breastfeeding for children age 0-5 months and continued breastfeeding along with complementary foods for children age 6-23 months. Four-fifths of children under 6 months are predominantly breastfed. This percentage includes children who are exclusively breastfed and those who receive breast milk and only plain water or non-milk liquids such as juice. Finally, 6% of children under age 2 are bottle fed (MOHP *et al.*, 2012a).

2.11.1 Colostrum feeding

Colostrum is the first immunization to the infant. It contains an interferon like substance which possesses strong antiviral activity. Colostrum contains B12 binding protein which renders B12 unavailable for the growth of *E. coli* and other bacteria. It contains antibodies against viral diseases such as small pox, polio, measles and influenza. Enzymes like lysozyme, peroxidase and xanthine oxidase that promote cell maturation are found to be more in colostrum. It contains large quantity of protective substances and enhances the development and maturation of the baby's gastrointestinal tract. Colostrum helps a baby to pass his or her first stool (Srilakshmi, 2014).

2.12 Weaning pattern

Weaning pattern is the process of providing other nutritive food to the child besides mother's milk. Such foods help the child to grow in healthy way and to keep the children away from the malnutrition; growing child cannot only depend on the mother's milk, so other foods should be given to the child on the requirement quantity. Similarly, most of the mother's start to work in the field after one month of their child birth and they have less time to feed their infants. If the baby is hungry when the mother is absent, the baby may be fed with "Jaulo", milk etc. This provides the temporary relief, although it is inappropriate for infants less than four months old (Alnwick *et al.*, 1988). Among many families in Nepal, the fifth or sixth months of the life are marked by the rice feeding ceremony i.e, "pasni" in which the baby is offered rice or "kheer" as maintained by the economic condition of the family for the first time. After this ceremony, the baby can take supplementary foods. But the mother will continue to give breast milk beyond and the first year (Pradhan *et al.*, 1997).

2.13 Weaning practice

The children are nutritionally most vulnerable member of a community. The period of childhood especially the second year of life is notoriously fraught with risk. The young child is "transitional" as regard diet immunity to infection and psychologically dependence. This is a period of rapid growth with high nutrients needs, particularly of proteins for swiftly increasing muscle tissue. It is a time when several meals a day required and when foods should be taken in a correct way and should be easily digestible (D. Jelliffe, B., 1966a). If the baby is to maintain the expected rate of growth, remain healthy and well nourished, supplementary feeding has to be started after 6th month in addition to breastmilk (Srilakshmi, 2014). During the weaning period, good food source of energy, protein calcium and iron are particularly important. On the basis of body weight, children required twice as much as protein calcium and iron as do adults. In an under developed country like Nepal the average family food, "Dal Bhat" in small quantities and in diluted form is given to the infant's child, likewise "Dhindo" is common food in hilly region among low income group family. Roasted soybean or corn, flattened rice (*chiura*) and puffed rice are also given as snacks food. As mentioned earlier, after *pasni* the child can take supplementary food and the infants are fed with "lito". *Lito* is a traditional blend rice porridge made with green vegetables is also given to infants, but it is specially given to convalescing young children (Alnwick *et al.*, 1988).

2.14 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 of malnutrition in different geographic areas to identify the risk groups and to determine the contributory factors. In addition, factual evidence of the exact magnitude of malnutrition is essential to sensitize government officials and policy makers to obtain allocation of materials and human resources and to plan appropriately (Srilakshmi, 2006). The nutritional assessment may require encompassing nations, communities, vulnerable segments of communities or individuals. It may be done as a part of an exercise to document current status as compared with past status or as specific attempt to evaluate the, impact of an intervention program (Ramachandran *et al.*, 1987).

The assessment of nutritional status can be done using the following information as stated by (D. Jelliffe, B., 1966a):

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

2.15 Indicator in nutritional status

A variety of indicators, which can be used for the purpose of assessing nutritional status, are currently available. Among many possible indicators of nutritional status only few are suitable for the evaluation of field program. The main indicator of nutritional status that are applicable in a large scale and for which a suitable experience is those based on anthropometric indicators are best applicable in the evaluation of nutritional status. 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 those indicators is weight for age (Keller, 1983).

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 (Seoane and Latham, 1971). The three indicators weight-for-age, height-for-age, and weight-for-height have since found wide acceptance and application and probably more is known today about these indicators in different population and different health situations than any of other indicators that have been prepared in the past (Keller, 1983). 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 growths of different ethnic groups under favorable conditions is almost identical (Bohdal and Simmons, 1969).

2.15.1 Anthropometry

Anthropometry is used to assess and predict performance, health and survival of individuals and reflect the economic and social well-being of populations. Anthropometry is widely used, inexpensive and non-invasive measure of the general nutritional status of an individual or a population group. Anthropometry can be used for various purposes, depending on the anthropometric indicators selected. Some of the enlisted indices are commonly used in assessing the nutritional status of children (Cogill, 2003).

2.15.2 Height/length-for-age (stunting)

Low height-for-age index identifies past under nutrition or chronic malnutrition. It cannot measure short term changes in malnutrition. For children below 2 years of age, the term is length-for-age; above 2 years of age, the index is referred as height-for-age (Cogill, 2003). Stunting begins in utero; therefore, the pro-pregnancy health and nutritional status of women and the nutrition and health of mothers during pregnancy is critical. Stunting is a result of a process over time; most of the damage occurs before 2 years of age. Emphasis should be on prevention.

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

chronically malnourished. Children who are below minus three standard deviations (3SD) are considered severely stunted (De O and Blössner, 1997). Stunted growth is a reduced growth rate in human development. It is a primary manifestation of malnutrition in early childhood, including malnutrition during fetal development brought on by the malnourished mother. In developing countries, stunted growth is a common problem affecting a large percentage of children. Once established, stunting and its effects typically become permanent. Stunted children may never regain the height lost as a result of stunting, and most children will never gain the corresponding body weight. It also leads to premature death later in life because vital organs never fully developed during childhood (Silabutra and Ramosoota, 2008).

2.15.3 Weight-for-height (wasting)

Weight-for-Height (W/H) helps to identify children suffering from current or acute malnutrition. It is used to examine short term effects, i.e. recent rapid weight loss associated with a period of starvation and/or severe disease (Gómez, 2000). Children with Z-scores below minus two standard deviations (-2SD) are considered thin (wasted) or acutely malnourished. Children with weight for height index below minus three standard deviations (-3SD) are considered severely wasted and children with more than two standard deviations (+2SD) above the median weight for height are considered overweight or obese (WHO, 1997). This helps to identify children suffering from current /acute malnutrition and is useful when exact ages are difficult to determine (Cogill, 2003). Wasting results from weight falling significantly below the weight expected of a child of the same length or height. Wasting indicates current/acute malnutrition resulting from feeding practices, diseases and infection, or, more frequently, a combination of these factors. Wasting in individual children and population groups can change rapidly and shows marked seasonal patterns associated with change in food availability or disease prevalence (Smith and Haddad, 2000).

2.15.4 Weight-for-age (underweight)

The advantage of this index is that it reflects both past (chronic) and/or present (acute) under nutrition (although it is unable to distinguish between the two) (Cogill, 2003). Low weight-for-age identifies the condition of being underweight at a specific age. W/A may reflect both past (chronic) and present (acute) under nutrition; however, it is unable to distinguish between the two (Smith and Haddad, 2000). Children whose weight for age Z – score is

below minus two standard deviations (2SD) are classified as underweight while children whose weight for age Z – score is below minus three standard deviation (-3SD) are considered severely underweight (WHO, 2016). W/A is used to identify the nutritional condition underweight, which is a composite measure of stunting and wasting. Just over 15% of the study children were severely malnourished, having a Z- score ≤ -3 standard deviations (SD) for any index (Des h, 2006).

2.15.5 MUAC (Mid upper arm circumference)

Its relatively easy to measure and a good predictor of immediate risk of death. It's used for rapid screening of acute malnutrition from the 6-59 month of age range and is used in emergency situation (Cogill, 2003). 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 lap. The arm circumference is measured to the nearest 0.1 cm with a flexible steel or fiber- tape, which must be placed gently, but firmly, round the limb to avoid compression of the soft tissue (D. Jelliffe, B., 1966a).

2.16 Dietary intake

There are various classifications devised and suggested for the dietary data collection and there are major two methods. The first is group method and the second is dietary intake of individual. The group method includes food balance sheet and food account method. The individual dietary intake method includes diet recall (24 hour), diet history, food frequency method, questionnaire method and food composite analysis (Joshi and Joshi, 2008). In 24-hour recall method, the respondent is asked to remember and report all the foods and beverages consumed in the preceding 24 hours or in the preceding day. The recall typically is conducted by interview, in person by computer- assisted or using a paper and pencil form. When interviewer administered, well trained interviewers are crucial because much of the dietary information is collected by asking probing questions. There are many advantages to the 24- hour recall. When an interviewer administers the tool, and records the responses, literacy of the respondent is not required. However, for self – administered versions, literacy can be a constraint. Because of the immediacy of the recall period, respondents are generally able to recall most of their dietary intake. Since there is relatively little burden on the respondents, those who agree to give 24-hour dietary recalls are more likely to be

representative of the population than are those who agree to keep food records. Thus, 24-hour recall method is useful across a wide range of populations (Coulston *et al.*, 2013).

2.17 Burden of Poverty

According to shoppers in a New jersey mall and farmers in Tamil Nadu, India, it was found that lower income people performed poorly in the expensive condition whereas performance didn't alter in low cost. While higher income people performed well in both situations. Projected financial burden affected to poor people with cognitive pressure. Poverty reduces cognitive capacity since; poverty concerns reserves mental resources (Mani *et al.*, 2013).

2.18 Prelacteal feed and EBF

Prelacteal feed is introduction of any food to newborn, beside mother's milk before initiating breastfeeding. Some examples of prelacteal feed may be ghee (refined butter), honey, sugar/salt solution, cow/goat milk, any herbal paste, water, fruit juice etc which is influenced by different culture. The cultural practices depend upon development region, ethnicity and ecological regions of Nepalese community. Clearing throat/ bowel, thinking mother's milk is insufficient or colostrum to be heavy for child to digest are some of the reasons behind providing prelacteal feed to child. Prelacteal feed comprises with less immunoglobulins, nutrients and cause infection due to introduction of contaminants. This practice is prevalent mostly in South Asian regions & is a major barrier to EBF. Exclusive breast feeding (EBF) for first six month of life is important to both mother and child. Since EBF prevents from undernutrition, gastroenteritis, leukemia, type 2 diabetes, obesity, respiratory illness. Moreover, EBF promotes to neurocognitive development of child and prevents breast cancer to mothers. Therefore, WHO, UNICEF & Ministry of Health and population Nepal recommend and promote for EBF for 6 months and its continuation (Khanal *et al.*, 2013).

2.19 Mother's education

Research conducted in slums of Nairobi shows that there is a strong linkage between maternal education and children's health. Children born to educated women suffer less from malnutrition which manifests as underweight, wasting and stunting in children. Studies have found that there is a strong link between maternal education, social economic status and child nutritional status. This is because educated women are more likely to get steadier, higher income; to live in better neighborhoods, which have influence on child health and survival

(Abuya *et al.*, 2012). In the opinion of, (Glewwe, 1999) health highlights three links through which education may affect child.

Formal education of mothers directly transfers health knowledge to future mothers. The literacy and numeracy skills that women acquire in school enhance their ability to recognize illness and seek treatment for their children. Additionally, they are better at reading medical instructions for treatment of childhood illness and apply the treatment.

Increased number of years in school makes women more receptive to modern medicine.

Literacy and social status of mothers are also key factors contributing to malnutrition in children. NDHS (2011) reported that a mother's level of education generally has an inverse relationship with wasting, ranging from 6-10 percent of children of mothers with at least some secondary education to 13 percent of children of mothers with no education. As with wasting and stunting, mother's education is associated with underweight, with the percentage of children who are underweight being lowest among children of mothers with an SLC and higher (13 percent) and highest among children of mothers with no education (38 percent). Similarly, 58 percent of children born to mothers with some secondary education started breastfeeding within one hour birth, compared with 35 percent of children of mothers with no education (MOHP *et al.*, 2012a). While a study conducted in the slums of Nairobi showed the prevalence of stunting among children aged up to 42 months was close to 40 percent which concluded that mother's education is an important predictor for child stunting (Abuya *et al.*, 2012). Similarly a study from Tamilnadu, India has shown that the prevalence of under nutrition among children whose mothers were illiterate was found to be 78.6% (Anuradha *et al.*, 2014).

2.20 Family income

Income of the family plays vital role in the nutritional status of under-five children. Children from poorer households were shown to be four times underweight (40%) as compared to the children from wealthiest household (10%) (MOHP *et al.*, 2012a).

2.21 Family type

Study in India carried out in rural households in the state of Andhra Pradesh in 1980 revealed that the mean intake of proteins and calories among joint families was higher than that of nuclear families, and the nutritional status of young children in joint families also tended to

be better. High nutritional status was not just a function of income, however; within the same income group joint families had higher levels of consumption than nuclear families, suggesting that type of family influence nutrient intake. A higher proportion of normal children (Gomez classification) and lower childhood mortality observed in joint families could be attributed, perhaps, to better childrearing practices which was confirmed by the high sibling ration observed in joint families. The data suggested that the joint family has distinct advantages over the nuclear family such as better nutrition, childrearing practices, low childhood mortality, and better socioeconomic status (Murthy *et al.*, 1985).

2.22 Household occupation

Studies have showed the association between occupation of households and nutritional status of children. The study carried out among 300 households and 300 children aged 12-23 months in Kwale District of Kenya revealed the difference in nutritional status (WHZ) between groups of children defined by occupation of their household head was significant ($p < 0.05$). Children from households with a mechanical/factory worker head had better weight for height compared to those from households whose heads were either a teacher/office worker or builder/construction worker ($p < 0.05$) (Adeladza, 2009). A study conducted on 200 preschool children in Udaipur, India showed that the nutritional status of children was affected by the time devoted by mother on child care activities. Children whose mothers did not work and lived in an extended family had better nutritional status than did those whose mothers worked and lived in nuclear family. Children of working mothers in a nuclear family had the lowest intake of calories and protein. The findings suggested that maternal employment, time devoted by a mother to child care, and type of family independently and jointly affect the nutritional status of preschool children (Jain and Choudhry, 1993).

2.23 Impacts of Earthquake

Natural disasters are unfortunate recurring events that happen worldwide. An exposure of lives and property to disasters has increased in the last decades, with natural calamities causing the most damages. The increasing trend of natural disasters is due to an increase in population and urbanization, and global climate change (United Nations, 2010). The prevalence of wasting was seen among children flooded in 2006 and 2008 was 51.6%, 41.4% in those flooded only in 2008. Among repeatedly flooded communities, cases of severe

wasting in children were 3.38 times more prevalent than for those non- flooded (Rodriguez-Llanes *et al.*, 2016). (Foster, 1995) examined the impact of a major flood on children's weight in Bangladesh, finding negative effects on nutritional status for children in credit – constrained households.

Natural disasters may contribute to poverty induces children to fail to reach their growth and educational potential (Ferreira and Schady, 2009). The findings of Colombian earthquake in 1999, reported a strong negative impact of earthquake on child nutrition in the short term (Bustelo *et al.*, 2012). The Children in Haiti earthquake, were born into harshest condition in terms of growth, development, and potential to thrive. Malnutriton rates in Haiti are among the worst in the LAC (Latin America and Caribbean) region. One third of all children under- five suffer from stunted growth and three quarters of children 6 – 24 months are anemic. Malnutriton takes a serious and irreversible toll, making children more susceptible to disease and death and compromising their cognitive and physical development, which results in low human capital and diminished lifetime (Bassett, 2010).

The devastating earthquake of magnitude 7.8 Richter scale in April 25, 2015 and its aftershocks, led 8,622 casualties and 16,808 injured in Nepal. This is also known as “Great Gorkha Earthquake”. Another second major earthquake of magnitude 7.3 Richter scale in May 12 and following more than 75 aftershocks above 4.5 magnitude, has worsened the living of population. The epicenter was in Dolakha. In 21 districts among 4.2 million children, 1.7 million of children population are affected by the earthquake. 1085 public health facilities were damaged (UNICEF, 2015). Sindhupalchok is one of the worst affected districts, as of 7 May, 3057 people were dead and 860 are injured. 3000 people remain uncounted and many VDCs had not been reach due to remoteness and accessibility (GON, 2015). About, 66,636 houses were destroyed or damaged, families are living outside their homes under makeshifts shelters of old tent, plastic, bed sheets, corrugated iron, and wooden boards (Save the Children, 2015). In 6th May (2015), there were 14 assessment reports registered with the Needs Assessment Cell on Sindhupalchok. However, there was no clear picture of needs across all VDCs Assessment reports. It was due to access limitations, there was little to no information on conditions of the affected population in remote or hard to reach areas of Sindhupalchok. The pre-crisis facts as stated in (2011), the total population of Sindhupalchok was 2,87,798 and the estimated affected population on post-earthquake

situation became 1,91,419 (66.5%). Likewise, 48 health facilities in Sindhupalchok were completely damaged out of 79 (OSOCC, 2015).

Table 2.2 Pre-and post-earthquake situations of Sindhupalchok

Pre – crisis facts		Post – earthquake situations	
Total population (2011)	2,87,798	Estimated affected population	1,91,419
Total number of VDC's	79		
Total health facilities	79	Completely damaged health facilities	48

Sources: (OSOCC, 2015).

Part III

Materials and methods

3.1 Research method

The study was semi - quantitative based on primary data. A community based cross-sectional survey was conducted from 1st to 9th January 2016 (Appendix D) excluding pretest in Bhimtar VDC, Sindhupalchok to assess the factors associated with nutritional status of 6-59 month children using semi-structured questionnaire. Measurements of weight, height, mid-upper arm circumference and 24-hour recall have been collected.

3.2 Study variables

Study variables were categorized into two groups: dependent variables and independent variables and enlisted in Table 3.1 a and Table 3.1 b

Table 3.1 (a) Study variables

Study Dimension	Independent variables	Dependent variables
Demographic and socio-economic characteristics	Caste, Economic characteristics, Types of family, Family size, Type of house, Under 5 year children at household, Under 5 year children death, Father and mother education	
Child characteristics	Gender, Child birth weight, Age, Birth order	
Child caring practice	Breastfeeding initiation, Breastfeeding stopped, Exclusive breastfeeding, Colostrum feeding, Prolactate feeding, <i>Litto</i> preparation, ORS, Knowledge about types of supplementary food	

Table 3.1 (b) Study variables

Study Dimension	Independent variables	Dependent variables
Immunization description and health practices	Child vaccination, Vitamin A and deworming tablets consumption, Mother vaccinated, Health seeking practices, Detection of ill child	
Maternal description	Marriage age, Age at first pregnancy, Iron /Folate supplementation, Knowledge about malnutrition, Knowledge on cause of marasmus, Consumption of food during pregnancy, Iodized salt usage	
Environmental characteristics	Tap water, Processing practice of drinking water, Toilet, Disposal	
Earthquake characteristics	Damages from earthquake, still frightened Changes in daily food eating practices, Affected days, Food consumption during earthquake, Food fed to child during earthquake	
Prevalence of malnutrition		Wasting, Stunting, Underweight
Nutrient intake	Energy, Protein, Fat, Calcium, Iron, Carotene, Thiamine	

3.3 Study area and its justification

This study was conducted in Bhimtar VDC, Sindhupalchok district. Sindhupalchok is in Bagmati zone of Central Nepal which constituted the total population of 2,87,798 with

1,38,351 male and 1,49,447 females. There are 9 wards in Bhimtar with population of 4,526 households 892, male population of 2,084, female population of 2,442 (CBS, 2012). Children population of under 5 years in Bhimtar is 414 (GON *et al.*, 2014).

3.4 Target population

The target population of the study was 6-59 month children for nutritional status assessment and parents or caretakers were the targets for the assessment of factors associated with nutritional status of children. In this study, 6-59 month children of Bhimtar VDC were involved as study population.

Inclusion and exclusion criteria:

Inclusion criteria: - Children aged 6-59 months living in Bhimtar VDC were included in the study.

Exclusion criteria: - The study participants who were seriously ill, disabled or who were not available at household during the time of survey were not included in the study.

3.5 Sampling techniques

Cross – sectional descriptive study was conducted in Bhimtar VDC. Random sampling technique was used to select children from households. From 9 wards of the Bhimtar VDC, 4 wards were selected randomly and so the total number of children from 6- 59 month population in each of these wards was selected according to the availability of children.

These 4 wards were highly populated with the ethnic group called Danuwar and Majhi and the remaining ward population were Bhramin, Chetri and other.

3.6 Sample size

The sample size is determined by using a single proportion formula assuming the prevalence rate of malnutrition to be 50% in the survey area, 95% confidence interval (CI) and 8% margin of error (d).

Calculation of sample size for infinite population: -

$$\text{Sample size (N0)} = z^2 \times p (1-p) / d^2$$

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

P= estimated prevalence of malnutrition (50%)

d = margin of error (8%)

Now

$$N_0 = 1.96^2 \times 0.5 \times (1 - 0.5) / (0.08)^2$$

$$= 150.06$$

$$\approx 150$$

Calculation of sample size for the finite population: -

The total no., of children under 5 years in Bhimtar is 414 and therefore,

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

New SS = New sample size for finite population

n_0 = Sample Size in infinite population

POP = Total number of population (in this case total number of population is number of 5 - 59 month age children of Bhimtar)

New sample size obtains as

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

$$= 150 / [1 + \{(150 - 1) / 414\}]$$

$$= 111.1$$

3.7 Research instruments

Instruments and equipment's used during survey were:

- a) Weighing Machine: Weighing machine with the capacity of 100 kg and having the least count of 0.1 kg. (Microlife pvt. ltd).
- b) Height measuring scale (Stadiometer) was provided from CHD (NMSS *et al.*) which was handover by UNICEF

- c) MUAC Tape: This was used for measuring mid-upper arm circumference which was also provided from CHD handover by UNICEF.
- d) Questionnaire: A well designed and pretested set of semi structured questionnaire to collect household information. (Appendix - E)
- e) Cups and Spoon: Standardized cups and spoon for the dietary recall.

3.8 Sampling frame

All the 6-59 month children were included in the sampling frame from of Bhimtar VDC.

3.9 Pre - testing the data collection tools

Pre- testing of the developed interview schedule was done to identify the consistency of tools. Pre-testing was performed in few mothers of 6-59 month child of Bhimtar VDC. As a result, no modification was made in questionnaire only the techniques of asking and probing the caretakers was learnt from pretest.

3.10 Validity and reliability of the research

To ascertain the degree to which the data collection instruments measure what they purposed to measure, the instruments was validated by comparing with standard known weights (for weighing balance). Reliability refers to quality control measure of data collected. Questionnaire was checked for completeness, consistency and clarity. The one-way ANOVA at 95% level of confidence ($P < 0.05$) showed that the height and weight among pretest and survey is significantly indifferent from each other (Appendix F).

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

3.11 Data collection techniques

Primary data was collected using semi-structured questionnaire and anthropometric measurement. Interview was conducted with parents/care takers of the children to fill the questionnaire.

Secondary data was obtained from Village Development Committee office, Nepal Demographic Health Survey (NDHS 2011), Primary Health Centre (PHC), Central Bureau of Statistics, and key informants like Female Community Health Volunteers (FCHV) etc.

There were two sets of tools to gather the information. Part I is the structured interview schedule to generate data pertinent to factors associated with nutritional status of children. Part II is a form, consisting of child information anthropometric measurements was recorded in it. And Part III is a form for the 24-hour recall. Form was developed to record the measurements of height, weight, Mid Upper Arm Circumference and structured pre-tested interview schedule was used to collect information from the respondents. The questionnaires comprised mainly of details on household profiles like age, sex, education level and occupation of household members and household size, effects of earthquake. Data on sources of income was also collected.

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

Weight: Weight was measured by electronic digital weight scale and read to the nearest 0.1 kilogram with minimum/lightly/clothing and no shoes. Calibration was done before and after weighing every child by setting it to zero. In case of children age below two years and those who were unable to stand alone, their weight was obtained from the difference between weights of mother as she/he holds the child and the weight of the mother alone (Mekides W *et al.*, 2015).

MUAC: Shakir's tape was used. MUAC was taken on the left hand midway between the elbow and shoulder joint so that the hand was simply relaxed and hanging by the side.

3.12 Data management

Collected data was managed carefully and safety of raw information had a paramount importance. The collected data was coded by giving numbers starting from 001 and end at 150 then these were stored safely. Thus, stored data was utilized for the purpose of analysis.

3.13 Data analysis

The data was checked for completeness and consistency. The collected data was first edited, organized, coded and entered into Microsoft excel 2010 and then into statistical package for social science (SPSS) version 20.0. For categorization of nutritional condition of individuals based on weight for height, height for age, weight for age and MUAC, WHO Anthro version 3.2.2 was used. The collected data was analyzed by using both descriptive and inferential statistics. Descriptive analysis was used to describe the percentages and number distributions of the respondents by socio-demographic characteristics and other relevant variables in the study. The data were presented in different table.

Anthropometric indices were calculated using reference medians recommended by the World Health Organization (WHO) and classified according to standard deviation units (z-scores), based on the WHO criteria.

3.14 Logistic and ethical considerations

Ethical clearance was obtained from Nepal Health Research Council and permission to conduct survey in Bhimtar VDC was obtained from office of the Village Development Committee of Bhimtar VDC. Verbal consent from parents/care taker of study subjects was obtained and the objective of the study was explained lucidly to them. Privacy and confidentiality of collected information was ensured at all level.

Part IV

Results and discussion

This study explores, nutritional status based on anthropometric measurement of earthquake victimized children in Bhimtar VDC, Sindhupalchok. Further factors like demographic, socioeconomic characteristics, child caring practices, maternal characteristics, environmental characteristics, earthquake characteristics and dietary intake associated with nutritional status was analyzed. The study population responded and findings of the study are expressed into several following headings.

4.1 Demographic and socio-economic characteristics

4.1.1 Caste distribution

Majhi and Danuwar were the majority population living in Bhimtar VDC (Table 4.1)

Table 4.1 Caste distribution of the study population

Caste	Frequency	Percent
Danuwar	119	79.3
Majhi	31	20.7
Total	150	100.0

The main occupation of mother's in Bhimtar VDC was agriculture (82%) and father's labor (93%) as shown in Table 4.2. Similar major occupation was found in the study conducted in Melamchi (Ghimire *et al.*, 2010). Considering the estimated annual income depicted of all respondents, 70% of the respondent did not reveal about their annual income. Those with annual income less than 50,000 were 20.7% and the household that earn more and equal to 50,000 were 9.3%. (The World Bank, 2015) uses an updated international poverty line of \$1.9 per day (i.e. NRs. 69000 annually), which incorporates new information on differences in the cost of living across countries.

Table 4.2 Economic characteristics of study population (n= 150)

Occupation	Frequency	Percent
Mother's occupation		
Business	4	2.7
Agriculture	123	82.0
Labor	23	15.3
Father's occupation		
Business	9	6.0
Agriculture	48	32.0
Labor	93	62.0
Annual income		
<50,000	31	20.7
>50,000	14	9.3
Not – Revealed	105	70.0

There were 53.3% (80) nuclear families and 46.7% (70) joint families. Similarly the study conducted in Melamchi VDC of Sindhupalchok showed 50% of the households with nuclear family (Ghimire *et al.*, 2010). Further breakdown of types of family are: household with ≤ 4 family members had slight low percentage, than > 4 family members (Table 4.3). Among them most the family were living in temporary house made of tent and only 1.3% of them were living in permanent house made of concrete cement. Several thousands of aftershocks every day for around three months caused enormous property and infrastructure damage. People remained outside their house under tarpaulins / tents for around a month due to frequent aftershocks and also prevailing minor to severe damages (Gautam *et al.*, 2015).

More than half of families under the survey had only one under five-year child and less than half had more than one under five year children as shown in Table 4.3. Majority of the family had no children dead and only 2.7% (4) respondent's children under five years were dead and they mentioned the illness as the cause. Though the educational status was suppressed by mother than father, about half of both gender are illiterate. As compared with national data of central mountain sub region data, almost half (49.4% and 30.2%) of female and male were illiterate respectively (MOHP *et al.*, 2012a).

Table 4.3 Socio-demographic characteristics of study population.

Variables	Frequency	Percent
Types of family		
Nuclear	80	53.3
Joint	70	46.7
Family size		
< = 4	65	43.4
>4	85	56.6
Type of house		
Temporary	148	98.7
Permanent	2	1.3
No. of Under five-year child		
Only one	95	63.3
More than one	55	36.7
Under five year children death		
No	146	97.3
Yes	4	2.7
Father's education		
>5years	62	41.3
< 5years	50	33.3
None	38	25.4
Mother's education		
> 5years	46	30.7
< 5years	33	22
None	71	47.3

4.2 Child characteristics

Among the total children included in this study 42% (63) were males and 58% (87) were females. WHO recommended birth weight less than 2.5kg as Low Birth Weight (LBW), so 2.5 kg is considered to the standard birth weight (Kramer, 1987). Sindhupalchok district lies in central mountain sub region and its 21.1% and 78.9% of birth weight less than 2.5kg and more than 2.5 kg has been reported respectively (MOHP *et al.*, 2012a). Only less percentage of children weighted below normal (less than 2.5 kg), and more than half was above and

equals normal (≥ 2.5 kg) as shown in Table 4.4. Children belonging to age group of 6 – 24, 24 – 48 and 48 – 60 month were 34% (51), 34.7% (52) and 31.3% (47) respectively. During the study, it was found that 42.7% of children were eldest child, 26.6% were second child and 30.7% were above third child of the household.

Table 4.4 Child characteristics of study population (n = 150)

Variables	Frequency	Percent
Gender		
Male	63	42
Female	87	58
Child birth weight		
< 2.5 Kg	21	14.0
≥ 2.5 Kg	84	56.0
Don't Know	45	30.0
Age group (months)		
6 – 24	51	34
24 – 48	52	34.7
48 – 60	47	31.3
Birth order		
1	64	42.7
2	40	26.6
>3	46	30.7

4.3 Child caring practices

Out of total respondents, 98.7% of respondents revealed that breast feeding to their child was initiated from the day of birth. The children initiated for breastfeeding within the first hour after delivery was 76.7% and 1.3% did not breastfeed their child from the day of birth. Children continuing their breastmilk during the survey period was 33.3%, but 20.7% had stop their breastfeeding within 1 – 12 months, 39.3% stopped within 13 – 24 months and 6.7% stopped within 25 – 48 months. Among them, 79.3% were exclusively breastfed for six months and 20.7% were not fed exclusively. Feeding practices of colostrum to the neonate was 95.3% and very least percentage of 4.7 did not feed colostrum. Uniform

conclusion was notified, 90% of infants were fed colostrum in Melamchi (Ghimire *et al.*, 2010).

Maximum children were fed nothing before initiation of breast milk while 2% were fed with prelacteal feed as shown in Table 4.5(a and b). Those 2% responded mentioned about herbal paste to be the prelacteal feed. 52.7% of the respondent knew the preparation of *lito* and 47.3% did not know the preparation. But, findings from Melamchi concluded that 75.3% of mother had proper knowledge about the preparation of Super flour (Ghimire *et al.*, 2010). About half of the respondent know about ORS and 53.3% did not know about it. Less than a half percentage of the respondent didn't know about ORS so this might reflect the children are at high risk to slow recovery from diarrhea. Melamchi study revealed that among 79% of the respondent who had heard about *Jeevan Jal*, still 49% of them did not know about the method of preparation of ORS (Ghimire *et al.*, 2010).

Table 4.5 (a) Distribution of different child caring practices (n=150)

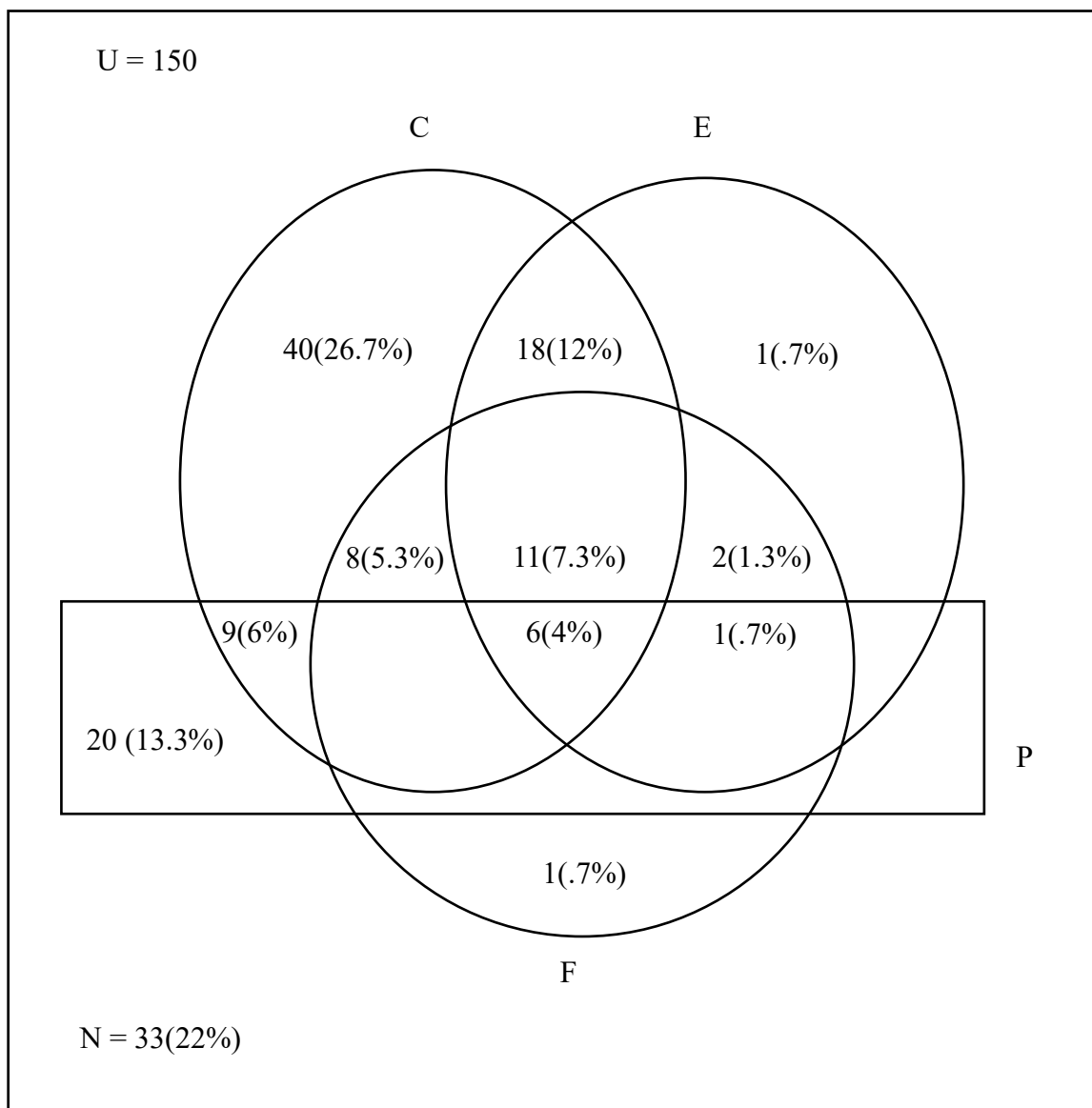
Variables	Frequency	Percent
Breastfeeding initiation		
Within 1 hours	115	76.7
Within 8 hours	32	21.3
Within 24 hours	1	0.7
None	2	1.3
Breastfeeding stopped		
1 - 12 month	31	20.7
13 – 24 month	59	39.3
25 – 48 month	10	6.7
Continue breast feeding	50	33.3
Exclusive Breastfeeding		
Yes	119	79.3
No	31	20.7
Colostrum feeding		
No	7	4.7
Yes	143	95.3

Table 4.5 (b) Distribution of different child caring practices (n=150)

Variables	Frequency	Percent
Prelactate feeding		
Yes	3	2.0
No	147	98.0
Lito preparation		
Yes	79	52.7
No	71	47.3
Oral Rehydration Solution (ORS)		
Yes	70	46.7
No	80	53.3

4.3.1 Knowledge about supplementary food

78% respondent had knowledge about the types of supplementary food and 33% didn't had knowledge about it. In majority, 26.7% fed only one food group like cereal products (*Jaulo*, *Dhiro*). While in minority, 0.7% fed three food groups (egg, meat, milk, fruits, vegetables, processed food like cerelac, *lito*, packet milk) and with the same percentage respondent fed only a group of food (fruits and vegetables) as shown in the Figure 4.1.



Note: C – Cereal product (Jaulo, Dhiro), E – Egg, meat, milk, F – Fruits and vegetables, P – Processed food (Cerelac, Litto, Packet milk), N – None, U – Total study population

Figure 4.1 Venn diagram on knowledge about types of supplementary food

4.4 Immunization and health description

Majority of children 97.3% have been vaccinated, taken Vitamin A and deworming tablets only 2.7% had not been vaccinated and dewormed. Melamchi study also showed that 90.2% children (0- 5 year) were supplemented by Vitamin A capsule while 88.64% with deworming tablets. It was also able to show that 81.53% of children (12- 23 month) were found to be immunized with 100% coverage of BCG, 95.3% of DPT, Hepatitis B and 83% coverage of measles (Ghimire *et al.*, 2010). The first born children have been fully immunized (91%)

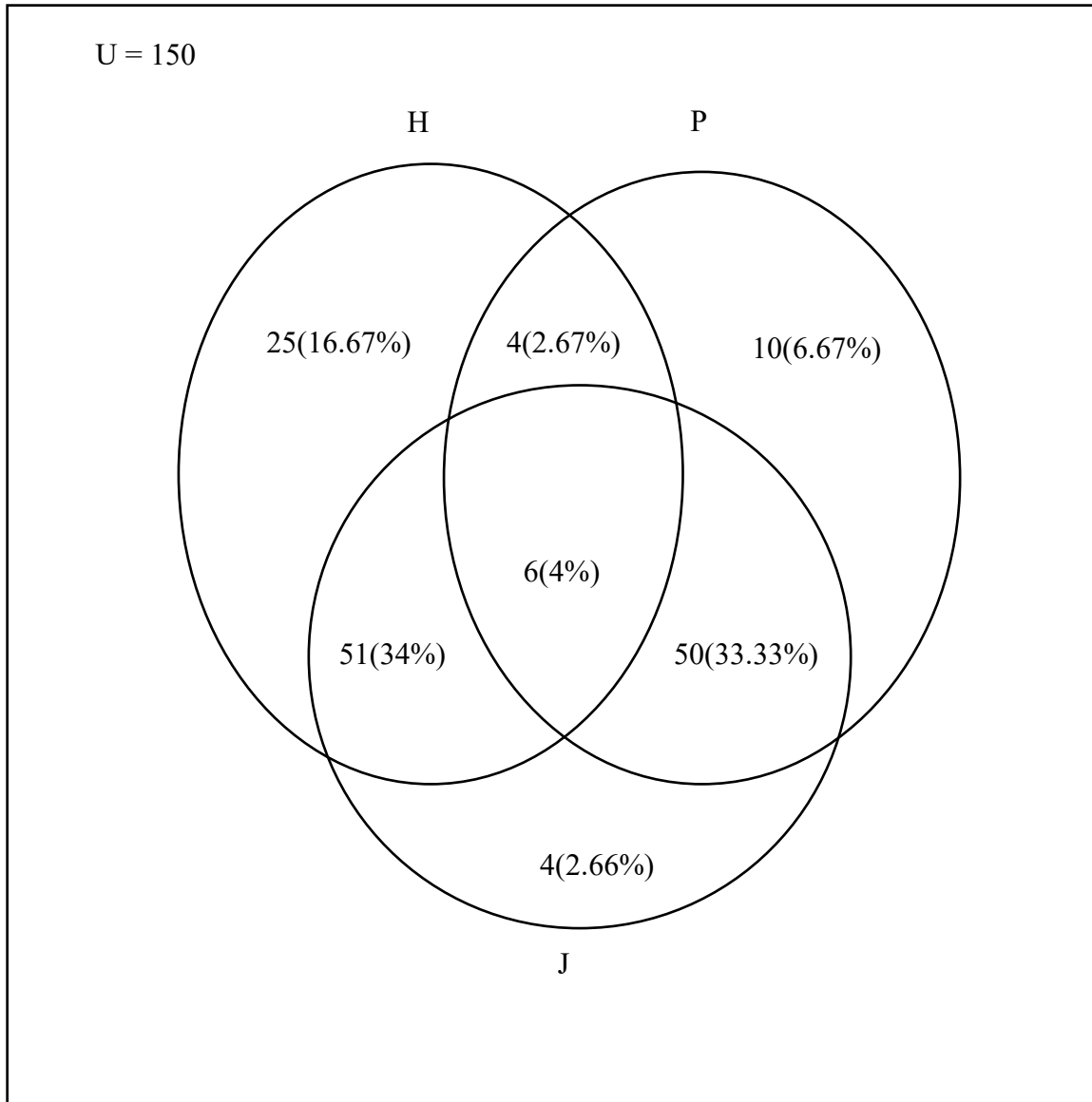
and in central mountain sub region of Nepal 95% of children aged (12 – 23) month have received BCG vaccination (MOHP *et al.*, 2012a). In majority, of 94.7% of mother have been vaccinated in the survey study. Whereas the Melamchi study, disclosed 60.27% mother were only under the T.T (tetanus toxoid) coverage (Ghimire *et al.*, 2010). The high percentage of distribution of immunization in both children and mother is revealed from the survey study.

Table 4.6 Distribution of different immunization and health practices

Variables	Frequency	Percent
Child Vaccination		
Yes	146	97.3
No	4	2.7
Vitamin A and deworming tablets consumption		
Yes	146	97.3
No	4	2.7
Mother Vaccinated		
Yes	142	94.7
No	8	5.3

4.4.1 Health seeking practices

In the study population, it was found that 34% respondent took their child to both hospital and *jhakri* and 33.33% took their child to both pharmacy and *jhakri*. People of this place still seems to believe in traditional healers though they take their child to health post and pharmacy. It is also shown that 30% of household preferred indigenous healers (*dhami/ jhakri*) in Melamchi as well (Ghimire *et al.*, 2010). From this result, percentage of seeking *jhakri* in Bhimtar and Melamchi, both seems quite similar. This may be due to the believe that *Jhakri* posses with force of spiritual or divine spirit and they examine, heals the person (Gewali and Awale, 2008)

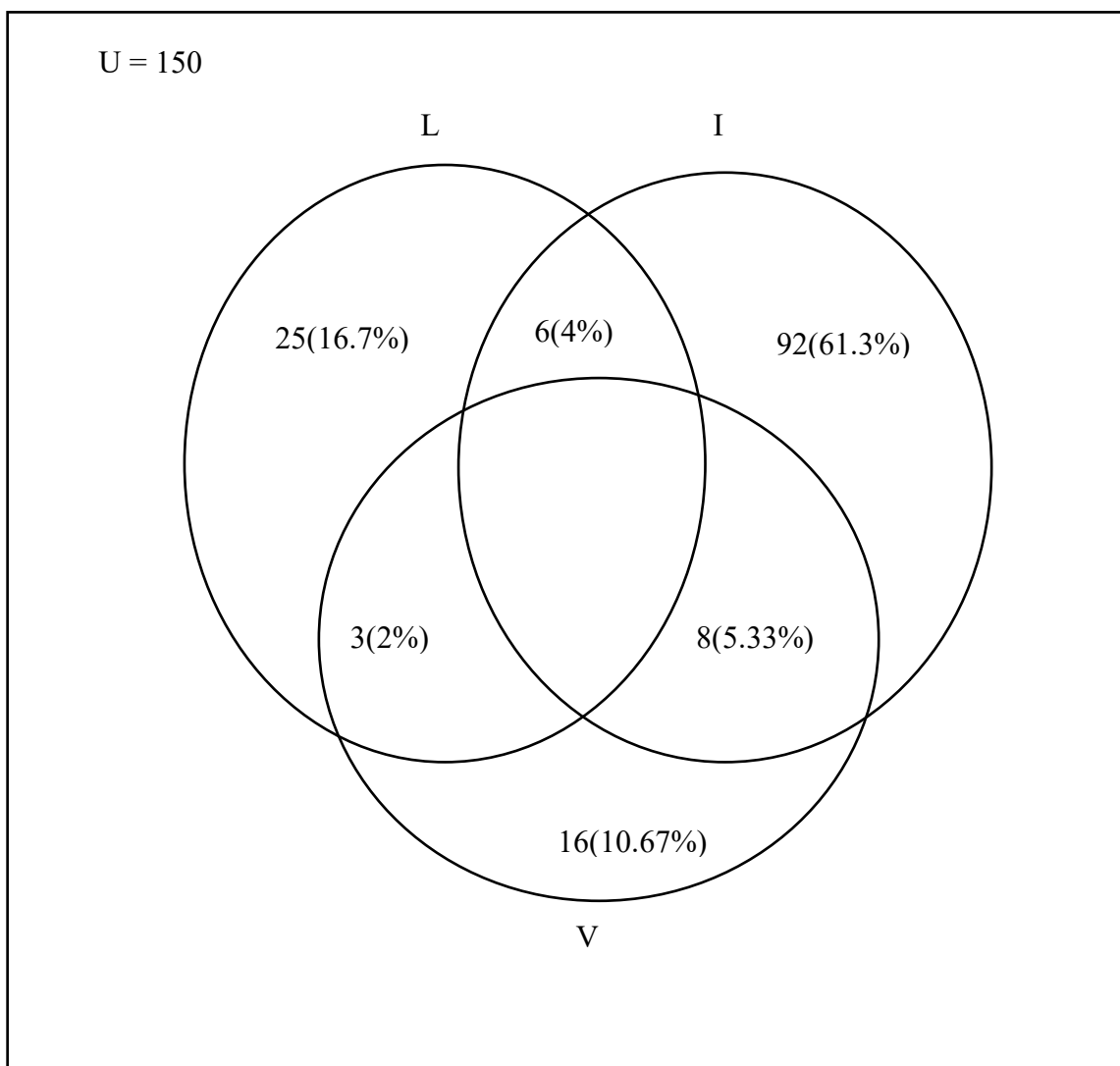


Note: H – Health center, P – Pharmacy, J – Jhakri, U – Total study population

Fig. 4.2 Venn diagram on health seeking practices

4.4.2 Detection of ill child

61.3% of respondent knew their children were falling sick when their body temperature rises only and 2% knew when the child vomits and felt lazy as shown in Figure 4.3.



Note: L– Laziness, I – Increase in body temperature, V – Vomiting and diarrhea, U – Total study population

Fig. 4.3 Venn diagram on Detection of ill child

4.5 Maternal description

The legal age of marriage in Nepal for both gender should be more than twenty years (NLC, 1971). But in study area still 77.3% of mothers found to be married before the age of 20 years and more than half (53.3%) had their first pregnancy as shown in Table 4.7(a and b). In many parts of the world parents encourage the marriage of their daughters with the hopes that the marriage will benefit them both financially and socially. But in actual it is a violation of human rights, comprises the development of girls and often result in early pregnancy and social isolation, with little education and poor vocational training reinforces the gendered nature poverty (UNICEF, 2005). Much as same, Melamchi study showed that 52.06% of

the women were pregnant at the age of less than 20 years(Ghimire *et al.*, 2010)(Ghimire *et al.*, 2010)(Ghimire *et al.*, 2010)(Ghimire *et al.*, 2010). Majority of 84.7% mothers had consume iron and folate tablet during pregnancy but in contrast Melamchi study reported only 39.7% of the pregnant women have taken iron tablets (Ghimire *et al.*, 2010).

75.3% mother did not know about malnutrition and among mothers who know the cause of marasmus, 5.3% mentioned lack of balance diet while 94.7% reported to be evil eye. Many Nepalese people, especially in rural areas believe that the complication is created by an evil eye and seek help from traditional healers (*Dhami/ Jhakri*) before seeking medical help (Suwal, 2008). This result is identical with Melamchi study and furthermore, 10.48% replied that malnutrition occurred if pregnant women touched the children, which was one of the major taboos that still exist in that district (Ghimire *et al.*, 2010). 32% respondents mentioned that they had more than usual food during pregnancy, 17.3% mentioned that had less food than usual and 50.7% had food as usual. Somehow same issue was seen in the Melamchi, where 34.25% of pregnant women had taken more nutritious food, 9.29% has less than before due to reasons such as loss of appetite, poverty etc. (Ghimire *et al.*, 2010). Almost all the study population of 98.7% used iodized salt for the consumption. The findings is similar to that of NDHS which revealed that more than 90% of households were using iodized salt (MOHP *et al.*, 2012).

Table 4.7 (a) Distribution of different maternal practices of the study population (n = 150)

Variables	Frequency	Percent
Married age		
<20 years	116	77.3
≥20 years	32	21.4
Not reveal	2	1.3
Age at first pregnancy		
<20 years	80	53.3
≥20 years	68	45.4
Not reveal	2	1.3
Iron/Folate supplementation		
Yes	127	84.7
No	23	15.3

Table 4.7(b): Distribution of different maternal practices of the study population (n = 150)

Variables	Frequency	Percent
Knowledge about malnutrition		
Yes	37	24.7
No	113	75.3
Causes of marasmus		
Yes	8	5.3
No	142	94.7
Consumption of food during pregnancy		
More than usual	48	32.0
Less than usual	26	17.3
Usual	76	50.7
Iodized salt usage		
Yes	148	98.7
No	2	1.3

4.6 Environmental characteristics

The main source of drinking water used by household was tap only (Table 4.8). Among those household, 90.7% used water without any treatment, 8% filtered and 1.3% boiled water before they drink. Study in Melamchi revealed that 83% of people used tap water as the major source of drinking water and most of the household (92.86%) didn't treat water before drinking (Ghimire *et al.*, 2010). 40.7% households under the survey did not have toilet facility and the rest 59.3% had a common toilet facility. Melamchi study also showed the similar result with not so satisfactory use of latrine, there was only about 59.8% of latrine coverage. The problem seemed more significant in ward no 4 and 9 and they reported the financial problem to be the most common cause (Ghimire *et al.*, 2010). In rural areas, who were poor, whose source of water was unprotected, and who did not have a toilet facility in their household, Infant mortality rate (IMR) were seen higher (R. Adhikari and Sawangdee, 2011). 80.7% people use to bury their wastages, 12.7% burnt and 6.6% use to practice both ways for disposal. Significant proportion of households (45.98% and 28%) used burning and burial method to dispose waste respectively in Melamchi (Ghimire *et al.*, 2010).

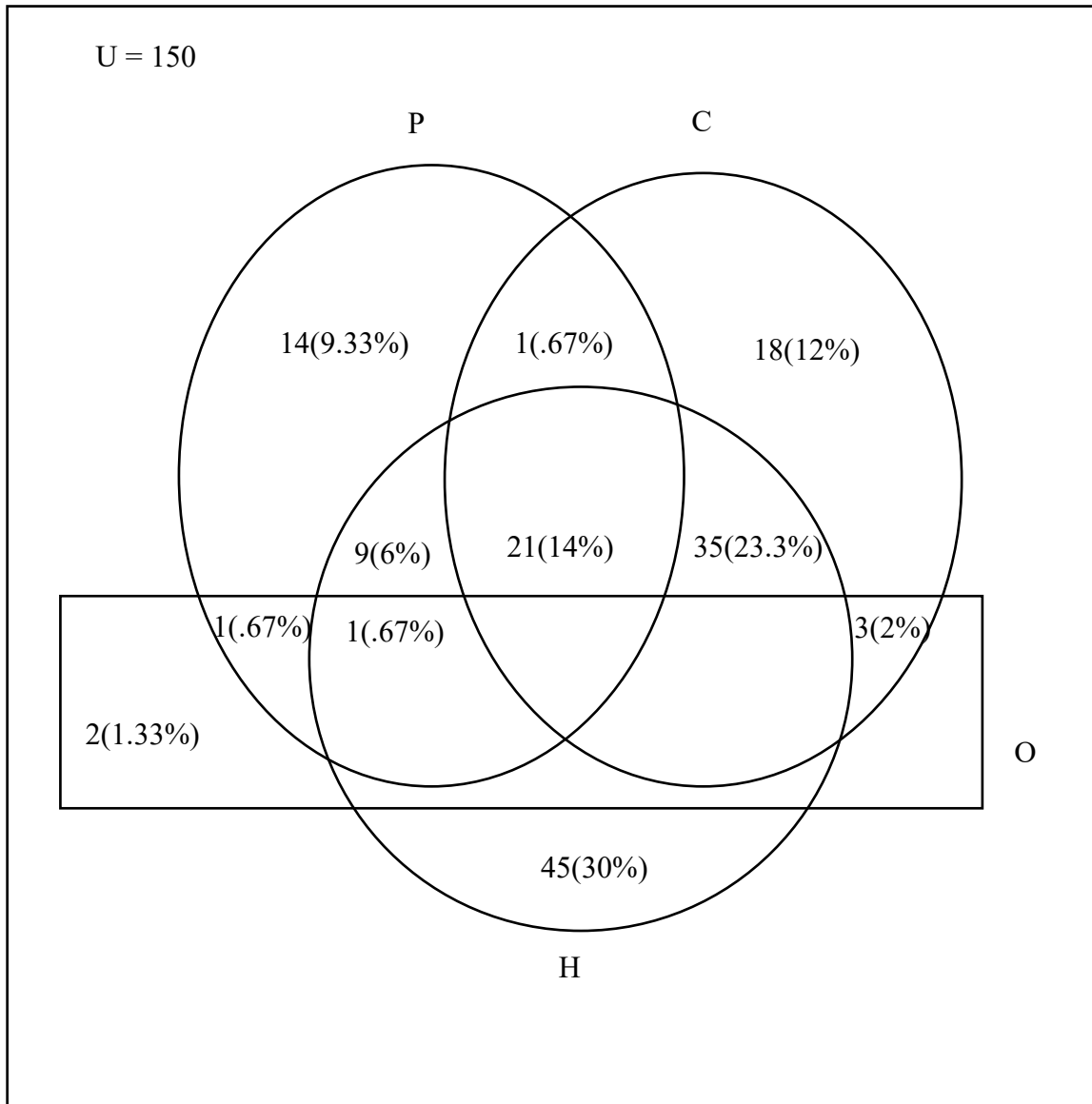
Table 4.8: Environmental characteristics of study population (n=150)

Variables	Frequency	Percent
Tap water		
Yes	150	100.0
No	0	0
Processing practice of drinking water		
Nothing	136	90.7
Filter	12	8.0
Boil	2	1.3
Toilet		
Yes	89	59.3
No	61	40.7
Disposal		
Burn	19	12.7
Bury	121	80.7
Both	10	6.6

4.7 Earthquake characteristics

4.7.1 Damages from earthquake

There was no respondent without any damages caused by earthquake where, 30% respondent's houses were only damaged, 14% had all loss like; people injury or death, cattle loss, house and other damages as shown in Figure 4.4.



Note: P– People injury or death, C – Cattle loss, H– House, O – Other, U – Total study population

Figure 4.4 Venn diagram on damages from earthquake

People frightened from earthquake were 92% and 8% said they were not frightened anymore in this study. Likewise the long-term psychological after-effects of Erzincan earthquake in 1992 was analyzed by Karanci and Rustemli (1995). The Agriculture Livelihood Impact Appraisal was conducted by Nepal Food Security cluster in six of the hardest hit districts (Sindhupalchok, Dolakha, Dhading, Gorkha, Nuwakot and Rasuwa) which were found to have significant drop in the consumption of animal products. Kitchen gardens were destroyed and created shortage of food. Though the government was distributing micronutrient powder and therapeutic food etc., most of the distributed and easily accessible food as relief were packaged junk food (Shrestha., 2015). In the same way, in Table 4.9, the

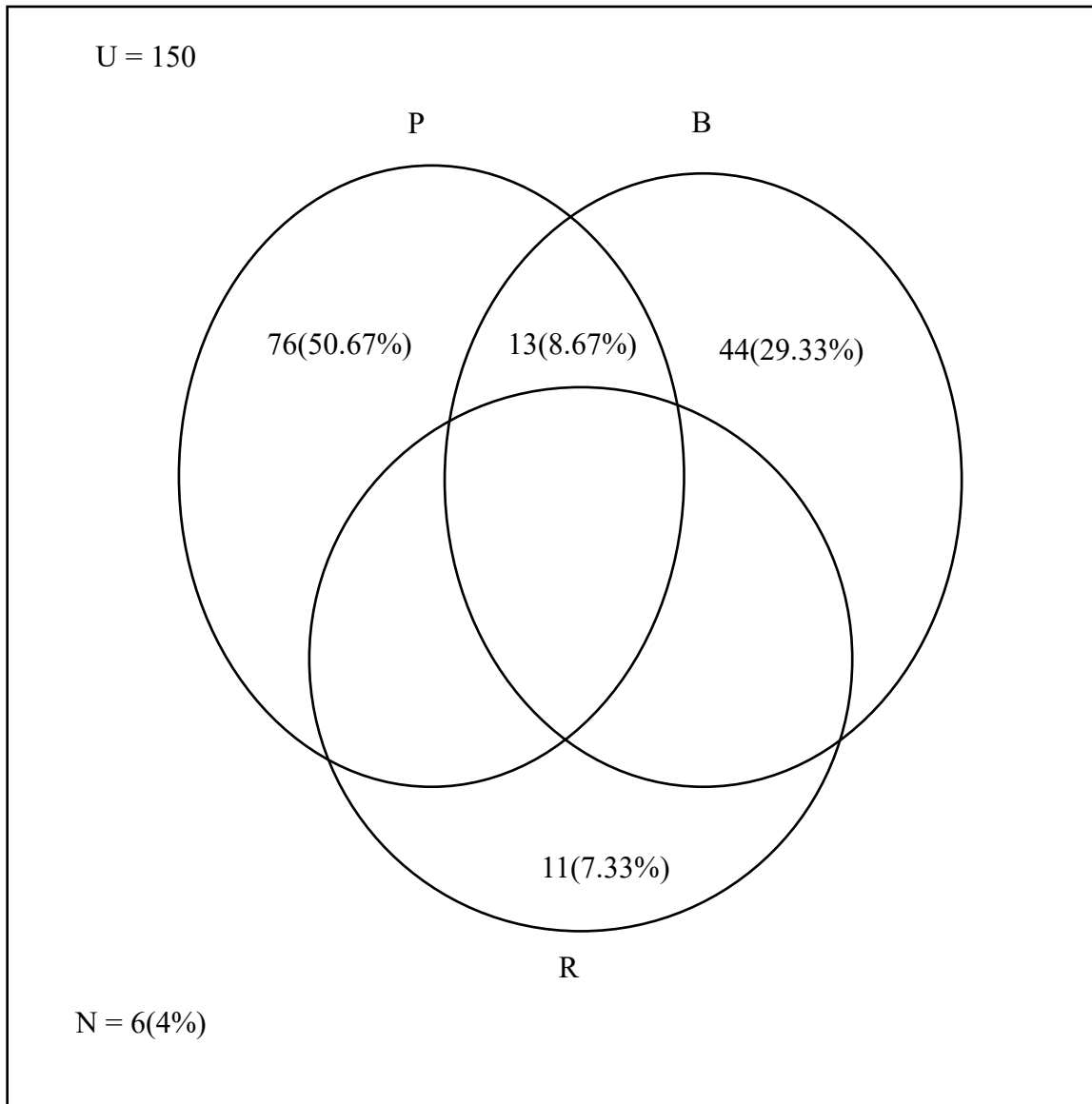
larger part of the (85.3%) respondent faced the changes in their daily food eating practices and almost half of the respondents (52%) said the affected days last more than 15 days. Furthermore, 80.7% said they had packet foods and 11.3% had nothing to eat during earthquake.

Table 4.9: Earthquake characteristics of study population (n= 150)

Variables	Frequency	Percent
Still frightened		
Yes	138	92.0
No	12	8.0
Changes in daily food eating practices		
Yes	128	85.3
No	22	14.7
Food consumption during earthquake		
Packet food	121	80.7
Regular	12	8.0
Nothing	17	11.3

4.7.2 Food fed to child during earthquake

The respondents who fed their child with only packet food like noodles, biscuits etc were 50.67%. Least of the respondent 7.33% did feed their child with the regular food that they use to consume. 29.3% respondents feed their child with breastmilk and 8.67% fed both packaged food and breastmilk to their children Figure 4.5.



Note: P – Packet food, B – Breastmilk, R – Regular, N – Nothing, U – Total study population

Figure 4.5 Venn diagram food fed to child during earthquake

4.8 Prevalence of malnutrition

The magnitude of malnutrition as described by WHO z- score wasting, stunting, underweight studied in Bhimtar VDC were 22.7%, 64.7%, 41.3% respectively (Figure.4.6). Wasting, stunting and underweight levels across the central mountain sub-region ranges 8%, 45.5% and 34.7% (-2SD) respectively and NDHS 2011 shows 11%, 41% and 29% of wasting, stunting and underweight respectively (MOHP *et al.*, 2012a). While comparing the results with sub-region and NDHS 2011, the wasting was 0.35 times than that of central mountain sub-region and 0.48 times of NDHS 2011. The stunting was 0.7 times and 0.63 times of central sub-region and NDHS 2011 respectively. Similarly, the underweight was 0.84 times

and 0.7 times of central sub-region and NDHS 2011 respectively. These comparisons show that the data has changed after the impact of earthquake.

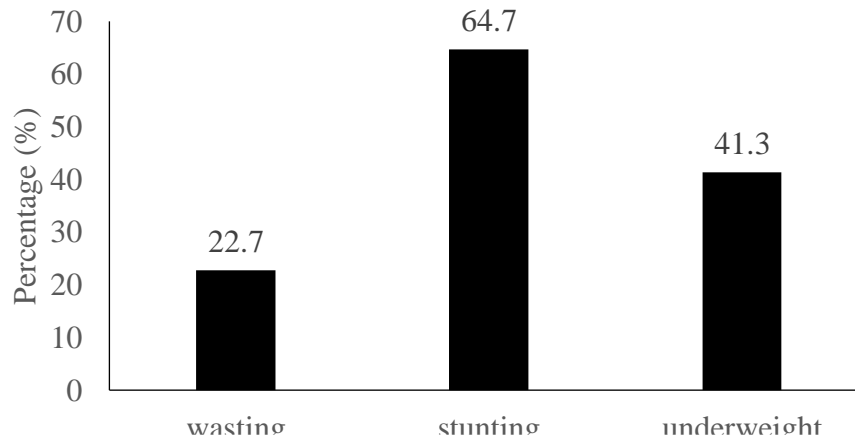


Fig. 4.6 Prevalence of Malnutrition in Bhimtar VDC (n= 150)

According to the WHO classification (Appendix E) for assessing severity of malnutrition by prevalence ranges among children under 5 years of age, wasting, stunting and underweight are in very high situation (Figure 4.6). Less severe wasting and underweight has been observed than severe stunting (< -3 SD) while it is still an issue. Likewise, moderate (< -2 SD to > -3 SD) stunting and underweight is more in comparison to wasting (Figure 4.7). Somehow similar result is shown from Melamchi study with 5% severe malnutrition according to Gomez classification (Ghimire *et al.*, 2010).

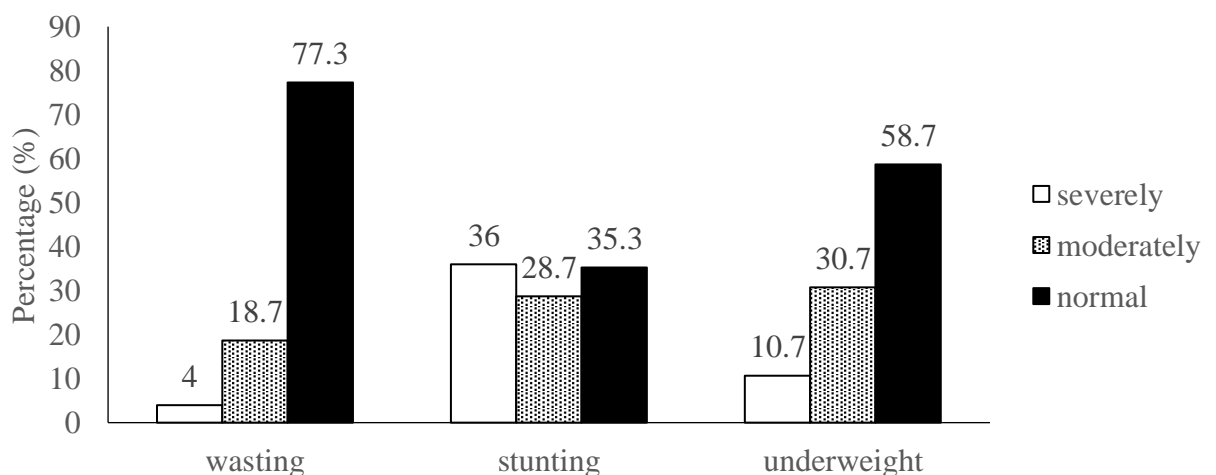


Fig. 4.7 Detail prevalence of malnutrition in Bhimtar VDC (n= 150)

Distribution of wasting, stunting and underweight of Bhimtar VDC comparing with general population based on WHO growth standard are shown in Figures 4.8, 4.9 and 4.10.

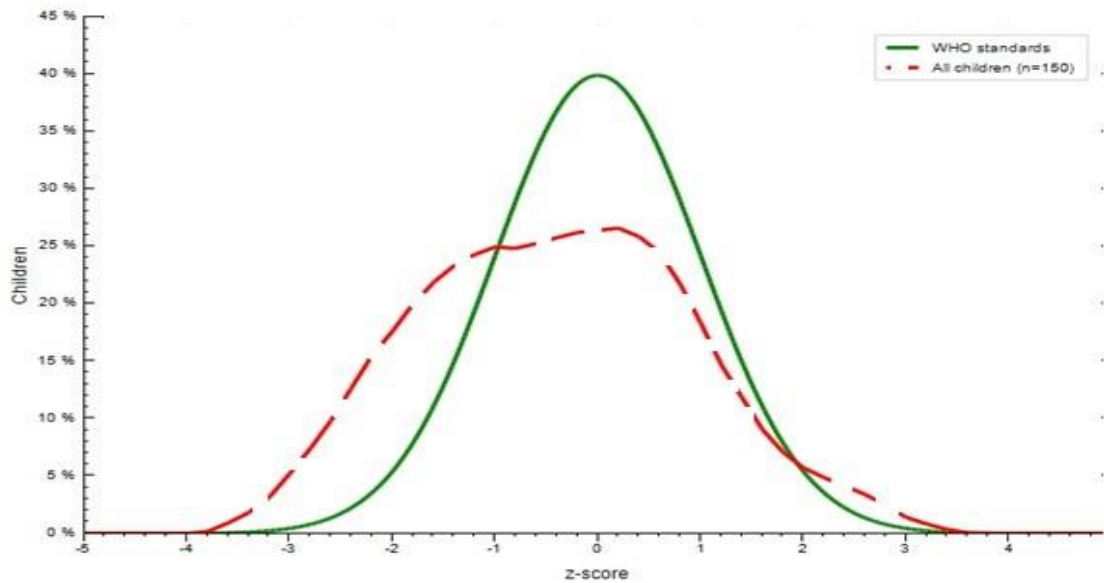


Fig. 4.8 Distribution of wasting among 6- 59months children of Bhimtar based on WHO standards (n = 150)

The median weight for height z – score of the survey children was found to be -0.42 which is less than 0.79 with the reference to WHO standard . This cause curve to slightly skewed to the left side of WHO standard curve showing the prevalence of wasting.

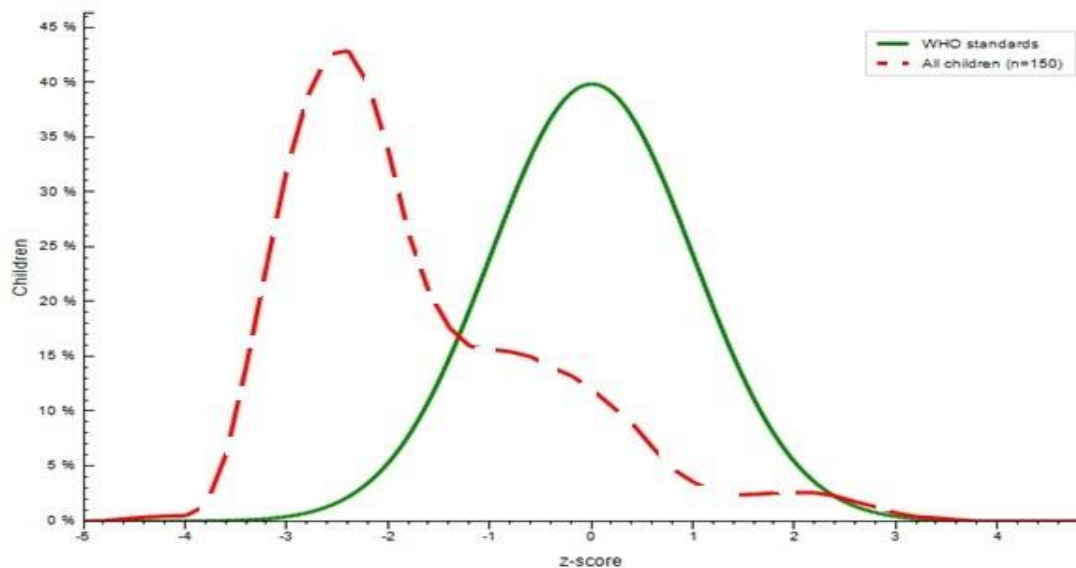


Fig. 4.9 Distribution of stunting among 6- 59months children of Bhimtar based on WHO standards (n = 150)

The median height for age z- score of survey children was found to be -2.26 which is less than 1.33 with the reference to WHO standard. This cause curve to skewed to left side of WHO standard curve.

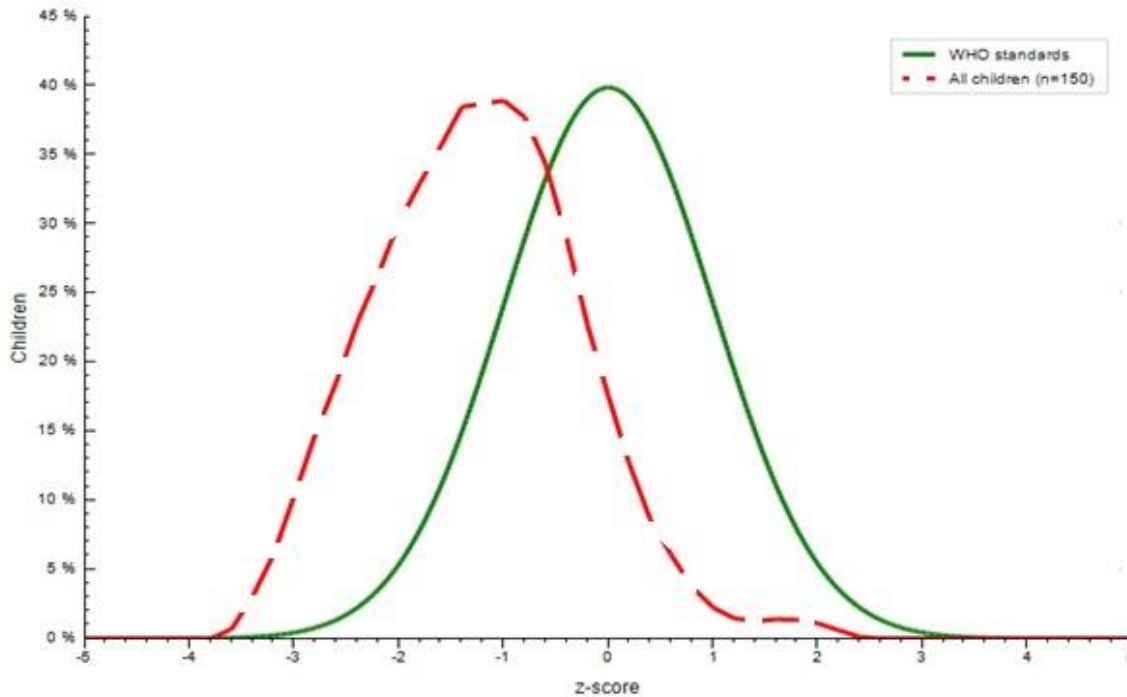


Fig. 4.10 Distribution of underweight among 6- 59months children of Bhimtar based on WHO standards (n = 150)

The median weight for age z – score of survey children was found to be -1.22 which is less than 1.33 with the reference to WHO standard. This cause curve to skew slightly to left side of WHO standard curve.

4.9 Nutrient intake according to the age group

Most of the nutrient intake are inadequate as compared to the RDA ICMR (2010) as shown in Figure 4.11. Energy is inadequate among 12 to 59 month children and so protein. Inadequate intakes of dietary energy and protein are the well-known causes of growth retardation (Habicht *et al.*, 1995). Growth retardation is highly prevalent in developing countries (Onis, 2000) and is associated with several adverse outcomes throughout life (Martorell, 1995). Likewise thiamine and carotene are also inadequate; these micronutrient deficiencies might also be the reason for malnutrition that affects physical growth and development (Bhan *et al.*, 2001). As a result, this can be concluded that natural disaster like

earthquake is also responsible for inadequate nutrition that may pose the development of malnutrition (Sonaliya *et al.*, 2015).

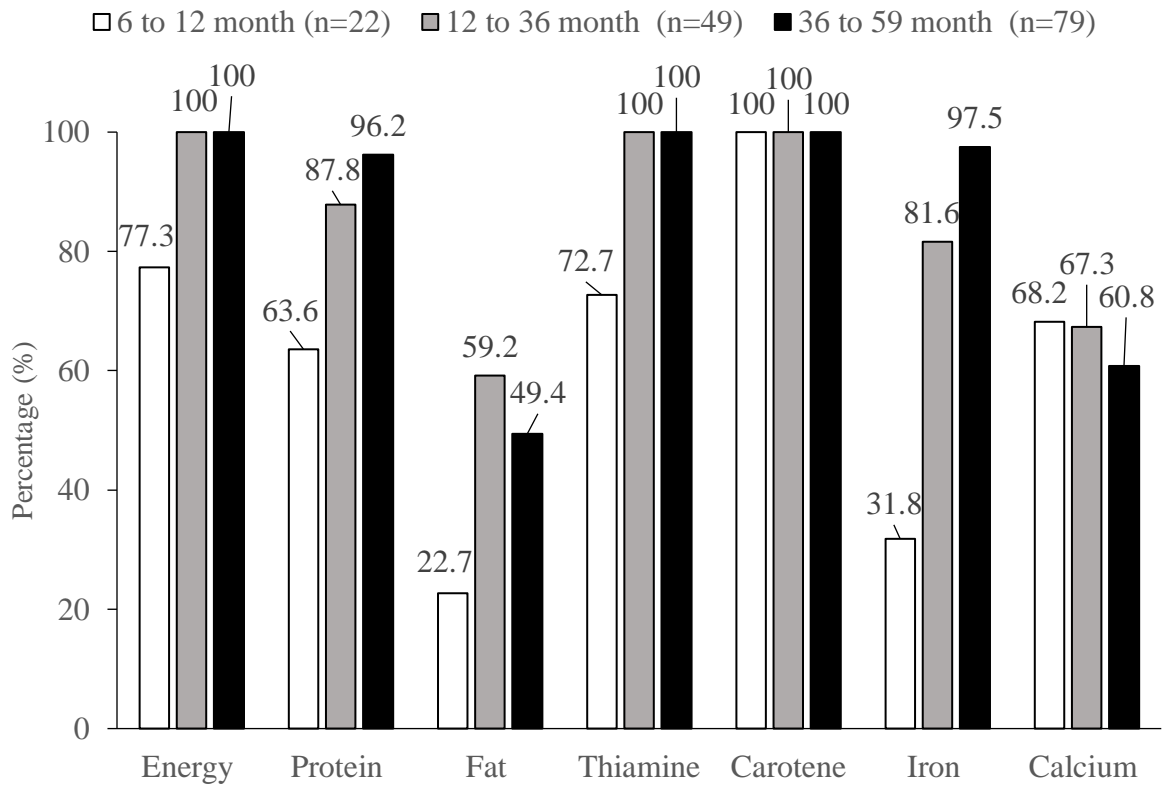


Fig. 4.11 Nutrient inadequacy of the study population according to age group.

RDA for 6 month children require 80 Cal energy which is assumed as 8 frequency and single frequency provides 100 ml human milk (Srilakshmi, 2014). For 6 to 12 month, the average protein intake of the children under five year was 12.58 gm which was quite near to RDA (14.2gm). The average visible fat intake was seen more (24.63 gm), whereas the average energy intake was 574.78Kcal was lower. Calcium average intake was found to be 470.09 mg and the RDA was 500 mg. The average iron intake was also slight more (6.45 mg) than the RDA (5mg). The average carotene intake was very less (470.09 μ g) whereas, the RDA was 2800 μ g. The average intake of the thiamine was 0.22mg though the RDA was 0.3mg.

The average protein intake of the children for 12 to 36 month, was 11.19gm lower to RDA (16.7gm). The average visible fat intake was 24.64gm and the RDA was 27gm. In the same way, the average energy intake was 559.48KCal, whereas the RDA was 1060KCal. Calcium average intake was 502.85mg since the RDA was 600mg. The average iron intake

was 5.05mg though the RDA was 9mg. The average carotene intake was 502.85µg very lower when in fact, the RDA was 3200µg. The average intake of thiamine was 0.20 mg.

The average protein intake for 23 to 59 month, of the children under five year was 11.65gm whereas RDA was 20.1gm. The average visible fat intake was more 26.14gm than RDA (25gm). The average energy intake was 605.34 Kcal, where the RDA was 1350 gm. Calcium average intake was 519.89 mg since the RDA was 600 mg. The average iron intake was 5.55mg though the RDA was 13mg. The average carotene intake was 519.89µg when in fact, the RDA was 3200 µg. The average intake of thiamine was 0.24mg though the RDA was 0.7 mg. Almost all vital nutrient average intake is seen inadequate in this age group.

4.10 Factors associated with under nutrition of children

Under nutrition was assessed by stunting, wasting and underweight. Fisher exact test and chi-square test was used to identify the characteristics that were related to nutritional status of children in Table 10 (a and b).

4.10.1 Factors associated with wasting

It is revealed that the ethnicity, Danuwar and Majhi was found to be significant with wasting ($P < 0.05$), as compared to the normal, less percentage of (18.5%) Danuwar and (38.7%) Majhi are seen wasted. Danuwar and Majhi (Hill / Mountain Janjati) falls under the main caste/ ethnic group termed as Janjati and likewise, less percentage (9.1%) of hill janjati kids aged 6 – 59 months are wasted in Nepal (Pandey *et al.*, 2013).

The prevalence of wasting in first child, second child and more than third child are 14.1%, 22.5%, and 34.8% respectively. The analysis of the survey revealed the significant relation between birth order and wasting ($P < 0.05$). Birth order has potential to impact the mother's intrahousehold allocation of time, resources, and care among siblings, and higher birth order can have negative impact on long – run nutrition outcomes (Horton, 1988). In average 2.66 children (24- 59 month) were wasted in respect to birth order numbers in Nepal (Shively *et al.*, 2015). Similarly, the proportion of undernutrition in higher birth order (> 3) was more at risk than those with first birth order was concluded by the study conducted in the rural areas of Allahabad district (Harishankar *et al.*, 2004).

The evaluation of the respondent's knowledge about supplementary food was done by cross questioning. This revealed 30.3% children were wasted of the respondents who didn't

know about the different types of supplementary food that they should be feeding to their children. Lesser (14.9%) children were wasted whose respondents had the basic knowledge about it. This shows the significant associations between wasting and the knowledge of supplementary food ($P < 0.05$). Nearly two – thirds of children were found malnourished in Kapilvastu district of Nepal, birth order has effect on nutritional status and were also found statistically significant (Bhandari and Chhetri, 2013). Supplementary feeding of children in populations showed up preventing the onset of wasting in a large proportion of children in Guatemala (Rivera and Habicht, 2002).

Table 10 (a) Factors associated with wasting in under five year of age children in Bhimtar VDC (n=150)

Factors		Weight for Height Category		Chi square value	P-value
		Wasted (>-2)	Normal (<-1)		
Ethnicity	Danuwar	22(18.5%)	97(81.5%)		.028* ^o
	Majhi	12(38.7%)	19(61.3%)		
Age group	6 to 24	12(23.5%)	39(76.5%)	.078	.962
	24 to 48	12(23.1%)	40(76.9%)		
	48 to 59	10(21.3%)	37(78.7%)		
Family size	≤ 4	14(21.5%)	51(78.5%)		.845*
	> 4	20(23.5%)	65(76.5%)		
Types of family	Nuclear	22(27.5%)	58(72.5%)		.171*
	Joint	12(17.1%)	58(82.9%)		
Mother's occupation	Agriculture	29(23.6%)	94(76.4%)		.625*
	Others	5(18.5%)	22(81.5%)		
Father's occupation	Agriculture	13(27.1%)	35(72.9%)		.407*
	Others	21(20.6%)	81(79.4%)		
Father's education	None	10(26.3%)	28(73.7%)	1.905	.386
	< 5 year	16(25.8%)	46(74.2%)		
	>5 year	8(16%)	42(84%)		
Mother's education	None	16(22.5%)	55(77.5%)	.081	.960
	< 5 year	11(23.9%)	35(76.1%)		
	>5 year	7(21.2%)	26(78.8%)		

Table 10 (b) Factors associated with wasting in under five year of age children in Bhimtar

VDC (n=150)

Factors	Weight for Height Category		Chi square value	P-value	
	Wasted (>-2)	Normal (<-1)			
Birth order	1	9(14.1%)	55(85.9%)	6.556	.038°
	2	9(22.5%)	31(77.5%)		
	> 3	16(34.8%)	30(65.2%)		
Birth weight	< 2.5kg	3(14.3%)	18(85.7%)		.557*
	≥2.5kg	18(21.4%)	66(78.6%)		
Breastfeeding	Continue	9(18%)	41(82%)		.410*
	Stopped	25(25%)	75(75%)		
Exclusive breastfeeding	No	9(29%)	22(71%)		.344*
	Yes	25(21%)	94(79%)		
Know	No	23(30.3%)	53(69.7%)		.032*°
Supplementary food	Yes	11(14.9%)	63(85.2%)		
Lito preparation	No	14(19.7%)	57(80.3%)		.441*
	Yes	20(25.3%)	59(74.7%)		
Knowledge about ORS	No	22(27.5%)	58(72.5%)		.171*
	Yes	12(17.1%)	58(82.9%)		
Food consumption during pregnancy	More than usual	9(18.8%)	39(81.2%)	1.173	.556
	Less than usual	5(19.2%)	21(80.8%)		
	Usual	20(26.3%)	56(73.7%)		
Damage by earthquake	No	1(16.7%)	5(83.3%)		1*
	Yes	33(22.9%)	111(77.1%)		
Still frightened	No	2(16.7%)	10(83.3%)		1*
	Yes	32(23.2%)	106(76.8%)		
Changes in daily food eating pattern	No	2(9.1%)	20(90.9%)		.165*
	Yes	32(25%)	96(75%)		

*Fisher exact value, °Statistically significant (P < 0.05)

4.10.2 Factors associated with stunting

Significant association ($P < 0.05$) between stunting and birthweight is observed, where stunting prevalence of the birth weight is higher in those having less than 2.5 kg (85.7%) in comparison to those children having ≥ 2.5 kg (57.1%) as shown in Table no.4.11(a and b). The study among Filipino children revealed stunting was significantly increased by low birth weight (Adair and Guilkey, 1997).

Table 4.11(a) Factors associated with stunting in under five year of age children in Bhimtar VDC (n=150)

Factors		Height for Age Category		Chi square Value	P-value
		Stunted (>-2)	Normal (<-1)		
Ethnicity	Danuwar	81(68.1%)	38(31.9%)	5.53	.096*
	Majhi	16 (51.6%)	15 (48.4%)		
Age group	6 to 24	27(52.9%)	24(47.1%)	5.53	.063
	24 to 48	39(75%)	13(25%)		
	48 to 59	31(66%)	16(34%)		
Family size	≤ 4	46(70.8%)	19(29.2%)	5.53	.228*
	> 4	51(60%)	34(40%)		
Types of family	Nuclear	50(62.5%)	30(37.5%)	5.53	.609*
	Joint	47(67.1%)	23(32.9%)		
Mother's occupation	Agriculture	79(64.2%)	44(35.8%)	5.53	.829*
	Others	18(66.7%)	9(33.3%)		
Father's occupation	Agriculture	29(60.4%)	19(39.6%)	5.53	.469*
	Others	68(66.7%)	34(33.3%)		
Father's education	None	22(57.9%)	16(42.1%)	1.064	.585
	< 5 year	41(66.1%)	21(33.9%)		
	>5 year	34(66.1%)	16(32%)		
Mother's education	None	45(63.4%)	26(36.6%)	.773	.680
	< 5 year	32(69.6%)	14(30.4%)		
	>5 year	20(60.6%)	13(39.4%)		

Table 4.11 (b) Factors associated with stunting in under five year of age children in Bhimtar VDC (n=150)

Factors	Height for Age Category		Chi square Value	P-value	
	Stunted (>-2)	Normal (<-1)			
Birth order	1	47(73.4%)	17(26.6%)	3.872	.144
	2	24(60%)	16(40%)		
	> 3	26(56.5%)	20(43.5%)		
Birth weight	< 2.5kg	18(85.7%)	3(14.3%)		.02* ^o
	≥2.5kg	48(57.1%)	36(42.9%)		
Breastfeeding	Continue	30(60%)	20(40%)		.469*
	Stopped	67(67%)	33(33%)		
Exclusive breastfeeding	No	21(67.7%)	10(32.3%)		.833*
	Yes	76(63.9%)	43(36.1%)		
Know supplementary food	No	49(64.5%)	27(35.5%)		1*
	Yes	48(64.9%)	26(35.1%)		
Lito preparation	No	48(67.6%)	23(32.4%)		.498*
	Yes	49(62%)	30(38%)		
Knowledge about ORS	No	50(62.5%)	30(37.5%)		.609*
	Yes	47(67.1%)	23(32.9%)		
Food consumption during pregnancy	More than usual	30(62.5%)	18(37.5%)	.979	.613
	Less than usual	19(73.1%)	7(26.9%)		
	Usual	48(63.2%)	28(36.8%)		
Damage by earthquake	No	4(66.7%)	2(33.3%)		1*
	Yes	93(64.6%)	51(35.4%)		
Still frightened	No	7(58.3%)	5(41.7%)		.755*
	Yes	90(65.2%)	48(34.8%)		
Changes in daily food	No	10(45.5%)	12(54.5%)		.054*
	Yes	87(97%)	41(32%)		

*Fisher exact test, ^oStatistically significant (P < 0.05)

4.10.3 Factors affecting underweight

In Table 4.12(a and b) reveals the statistically association between underweight and number of children under five years old at household ($P < 0.05$). Comparatively, less underweight are seen in household having only a child (33.7%), and higher about 54.5% for those household having more than a child. This study is similar with study conducted in an urban slum of Ludhiana showed that, the prevalence of underweight was found to be significantly higher in those with more siblings. Those with no siblings, had the lowest proportion of underweight children (12.8%), higher in those with 1 – 2 siblings (30.6%) and highest (51.7%) in those with more than three siblings (Sengupta *et al.*, 2010). Similarly, study at Hidabu Abote District, North Shewa, Oromia Regional State revealed children from those family who had more under five children were about 4.5 times more likely affected by underweight as compared to those from family had only one child. The prevalence of underweight found to be increasing as the number of sibling increases because of having more children below five years of age might be more difficulty in caring for children (Mengistu *et al.*, 2013).

In this study, the respondent showed significant association with the preparation of ORS ($P < 0.05$), 51.2% children were found to be underweight who didn't know the preparation of ORS and comparatively less (30%) children were underweight of those respondents who knew the preparation of ORS. This may reflect that those who knew the preparation of ORS are able to feed ORS to child than those who don't have any idea about ORS. Home management of diarrhea is the hallmark of control of diarrheal diseases. Study in Nepal, concluded that among 97.6% of the mothers, 50% only could make ORS properly. Thus the correct preparation and ideal use of ORS have not reached in proper way to the mothers of Sunsari district (Jha *et al.*, 2006). Though, diarrhoea and other infections can cause malnutrition through decreased nutrient absorption or decrease intake of nutrient.

Table 4.12 (a) Factors associated with underweight in under five year of age children in Bhimtar VDC (n=150)

Factors		Weight for Age Category		Chi square value	P value
		Underweight (>-2)	Normal (<-1)		
Ethnicity	Danuwar	48(40.3%)	71(59.7%)	1.50	.684*
	Majhi	14(45.2%)	17(54.8%)		
Age group	6 to 24	19(37.3%)	32(62.7%)	1.50	.47
	24 to 48	25(48.1%)	27(51.9%)		
	48 to 59	18(38.3%)	29(61.7%)		
Number of under five-year child	Only one	32(33.7%)	63(66.3%)	4.779	.016* ^o
	>1	30(54.5%)	25(45.5%)		
Family size	≤ 4	28(43.1%)	37(56.9%)	4.779	.740*
	> 4	34(40%)	51(60%)		
Types of family	Nuclear	36(45%)	44(55%)	4.779	.406*
	Joint	26(37.1%)	44(62.9%)		
Mother's occupation	Agriculture	52(42.3%)	71(57.7%)	4.779	.671*
	Other	10(37%)	17(63%)		
Father's occupation	Agriculture	18(37.5%)	30(62.5%)	4.779	.595*
	Other	44(43.1%)	58(56.9%)		
Father's education	None	12(31.6%)	26(68.4%)	4.779	.092
	<5 year	32(51.6%)	30(48.4%)		
	>5 year	18(36%)	32(64%)		
Mother's education	None	28(39.4%)	43(60.6%)	1.241	.538
	<5 year	22(47.8%)	24(52.2%)		
	>5 year	12(36.4%)	21(63.6%)		
Birth order	1	29(45.3%)	35(54.7%)	3.872	.667
	2	16(40%)	24(60%)		
	> 3	17(37%)	29(63%)		
Birth weight	< 2.5kg	12(57.1%)	9(42.9%)	3.872	.136*
	≥ 2.5kg	31(36.9%)	53(63.1%)		
Breastfeeding	Continue	19(38%)	31(62%)	3.872	.601*
	Stopped	43(43%)	57(57%)		

Table 4.12 (b) Factors associated with underweight in under five year of age children in Bhimtar VDC (n=150)

Factors		Weight for Age Category		Chi square value	P value
		Underweight (>-2)	Normal (<-1)		
Exclusive breastfeeding	No	17(54.8%)	14(45.2%)		.103*
	Yes	45(37.8%)	74(62.2%)		.139*
Know Supplementary food	No	36(47.4%)	40(52.6%)		
	Yes	26(35.1%)	48(64.9%)		
Lito preparation	No	26(36.6%)	45(63.4%)		.320*
	Yes	36(45.6%)	43(54.4%)		
Knowledge about ORS	No	41(51.2%)	39(48.8%)		.012* ^o
	Yes	21(30%)	49(70%)		
Know Malnutrition	No	47(41.6%)	66(58.4%)		1*
	Yes	15(40.5%)	22(59.5%)		
Food consumption during pregnancy	More than usual	17(35.4%)	31(64.6%)	1.079	.583
	Less than usual	12(46.2%)	14(53.8%)		
	Usual	33(43.4%)	43(56.6%)		
Damage by earthquake	No	3(50%)	3(50%)		.692*
	Yes	59(41%)	85(59%)		
Still frightened	No	3(25%)	9(75%)		
	Yes	59(42.8%)	79(57.2%)		
Changes in daily food	No	6(27.3%)	16(72.7%)		.167*
	Yes	56(43.8%)	72(56.2%)		

*Fisher exact test, ^oStatistically significant (P < 0.05)

Part V

Conclusions and recommendations

5.1 Conclusions

Conclusively, this study has assessed the nutritional status of earthquake victimized children in Bhimtar VDC which was not explored before and findings are important to understand prevalence and determinants of under-nutrition among 6-59 months children in Bhimtar VDC. The results of this study indicate that under nutrition is a major problem among under-five children in Bhimtar VDC, Sindhupalchok. Following points can be concluded from the study.

- a) Prevalence of malnutrition among 6-59 months earthquake victimized children in Bhimtar VDC were 22.7%, 64.7% and 41.3% for wasting, stunting, and underweight respectively.
- b) Nutrient inadequacy such as energy, protein, carotene in all age group was seen.
- c) Annual income, birth order, knowledge about supplementary food, birth weight, number of under five-year child in a household and ORS preparation was the risk factors that were associated with malnutrition in children.

5.2 Recommendations

Based on the results of this study following recommendations could be made in order to improve the nutritional status of children under five years in the survey area. There is the need for intervening nutritional and health education as educated mother is most likely to provide better care in terms of good nutrition and better hygiene which in turn improve the nutritional status.

- a) There is urgent need for more attention on feeding and hygienic practices, so that problem of malnutrition can be reduced.
- b) Survey of this nature should be carried out at regular intervals so that it will assist the stakeholder to formulate plan and policies for the betterment of nutritional status and during emergency.

- c) Appropriate supplementary feeding programs to the vulnerable group to maintain the nutritional status during emergency.
- d) Further survey (especially biochemical test) can be conducted to determine the other nutritional status.
- e) Emergency nutrition and health strategies should be developed for outreaching remote places as relief programs.
- f) Need of making an integrated plan and VDC level disaster rapid response plan for addressing the problem of malnutrition in long term and focusing during emergency.

Part VI

Summary

Nutritional condition of children does not only serve as a health indicator, but it is also vital for the children susceptibility of many other diseases. The study was conducted to assess the factors associated with the nutritional status of earthquake victimized children aged 6-59 months in Bhimtar VDC, Sindhupalchok.

The study included 150 children selected randomly from 4 wards of Bhimtar VDC. Cross-sectional descriptive survey using a semi structured questionnaire was administered to the mother or care taker of children to determine the associated factors while anthropometric measurement was used to determine the prevalence of malnutrition among survey children based on WHO reference. Data collected was analyzed using WHO Anthro version 3.2.2 and SPSS version 20. Fisher exact test and Chi square test was used to analyze the factors associated with nutritional status.

Out of 150 children, 87 were female and 63 were male. The community belonged to Majhi and Danuwar. 41.3% of father had receive education for more than 5 year and 47.3% of the mother were illiterate. 84.7% of mothers have taken iron and folate tablet during pregnancy. 85.3% had face the changes in daily food eating patterns due to earthquake. 64.7% of children were stunted, 22.7% were wasted, 41.3% were underweight. The prevalence of stunting was found similar in both gender, but wasting and underweight was found higher in females 26.4% and 46% respectively than in males. Nutrient inadequacy among almost all age group of children disclosed the nutrient crisis in the study area.

Ethnicity, birth order, caretaker's knowledge about supplementary food, had significant association with wasting ($P < 0.05$). Significant association ($P < 0.05$) between stunting and birthweight and significant association ($P < 0.05$) of underweight with availability of children under five years old, preparation of ORS. The study confirmed these are the risk factors are associated with malnutrition in Bhimtar.

Results of this study indicate that malnutrition among 6-59 months earthquake victimized children is an important problem in Bhimtar VDC, Sindhupalchok. Earthquake has worsened the nutritional status even more as compared with the national and sub regional data of Nepal. These findings are of great importance to the stake holders as they identify potential

actions that can be used to improve the existing nutritional status of children. Thus, to reduce the existing prevalence of malnutrition, appropriate interventional program should be implemented.

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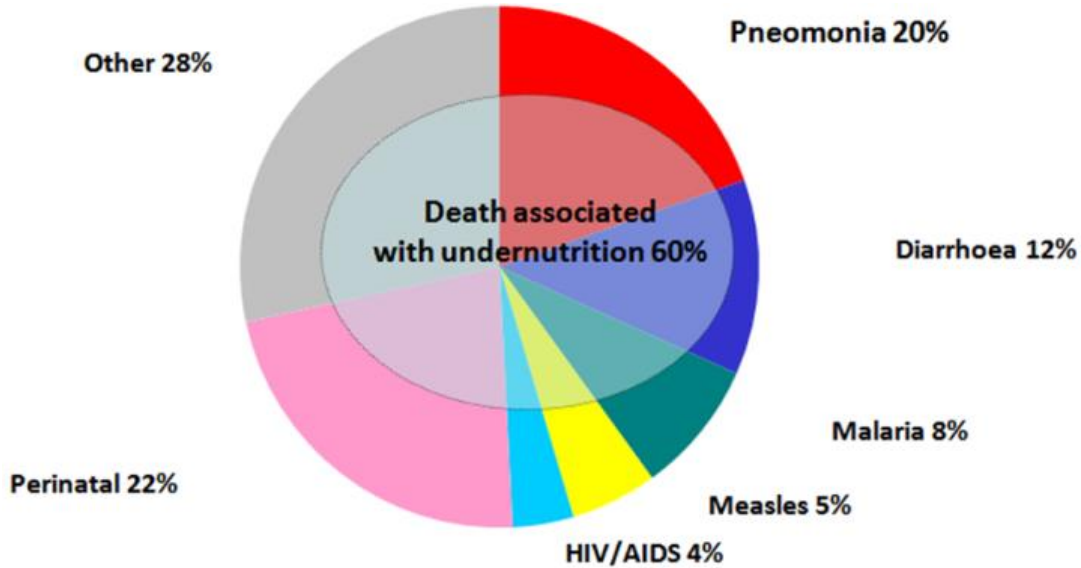
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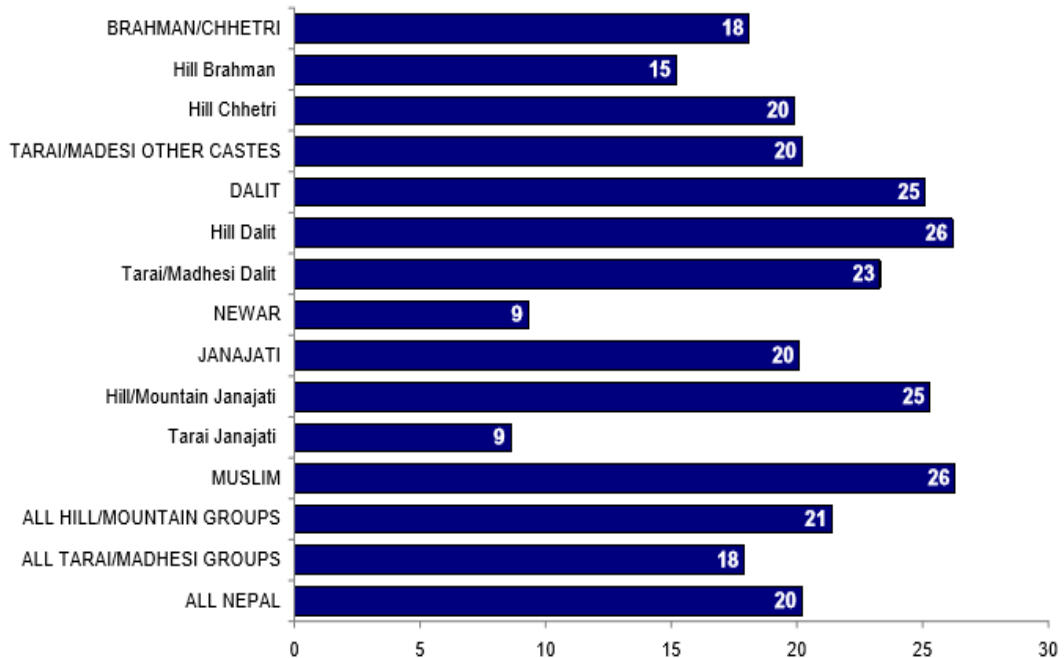
Appendices

Appendix A



Appendix B

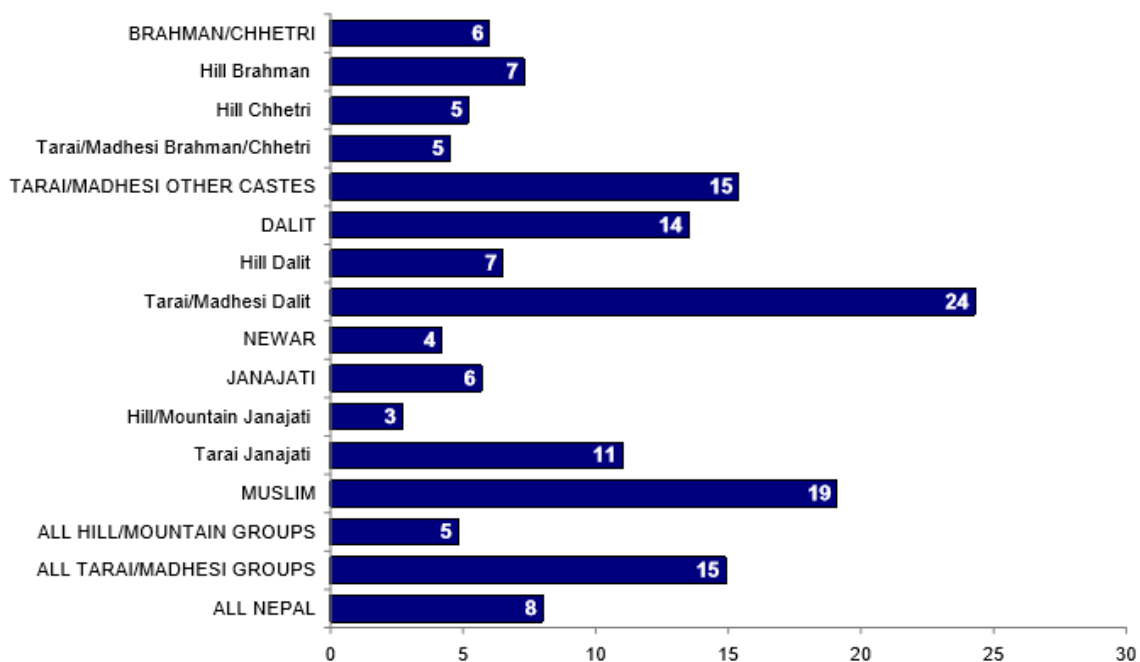
Figure 4.10 Percentage of Children Under 5 Who Are -3 Standard Deviations Below Normal Height-for-Age (Stunting)



Note: Tarai/Madhesi Brahman/Chhetri group not shown because it is based on fewer than 50 cases

Appendix C

Figure 4.11 Percentage of Women Who Are Considered Moderately or Severely Thin



Appendix D

	Date		Quantity
	B.S.	A. D.	
Pretest	15/09/72	30/12/16	6
	16	31	4
Total			10
Survey	17	1	16
	18	2	16
	19	3	2 and 14
	20	4	18
	21	5	16
	22	6	18
	23	7	16
	24	8	18
	25	9	16
Total			150

Appendix: E

Classification for assessing severity of malnutrition by prevalence ranges among children under 5 years of age

Indicator	Severity of malnutrition by prevalence ranges (%)			
	Low	Medium	High	Very high
Stunting	<20	20-29	30-39	≥40
Underweight	<10	10-19	20-29	≥30
Wasting	<5	5-9	10-14	≥15

Appendix: F



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:		
Adress		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: _____

Ethnicity: _____

Type of family? Nuclear/ Joint

What's your occupation? (Akin *et al.*) 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: _____

Birthweight: _____

Under 5 year child death? Yes / No

If yes, how many? _____

Reasons: _____

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)

24-hour dietary recall

Children:

Timing	description of food or drink	brand name	Serving	Amount
Breakfast (6:00 to 9:00 AM)				
Lunch (9:00 - 11:00 AM)				
Snacks (11:00 AM -5:00 PM)				
Dinner (6:00- 11:00 PM)				

Lactating Mother:

Timing	description of food or drink	Brand name	Serving	Amount
Breakfast (6:00 to 9:00 AM)				
Lunch (9:00 - 11:00 AM)				
Snacks (11:00 AM -5:00 PM)				
Dinner (6:00- 11:00 PM)				

...Thankyou ...

Verbal consent form

Date:

(Read in front of mother)

Title of the study: Nutritional assessment of earthquake victimized children age (6-59) months in Bhimtar, Sindhupalchowk

Principal Investigator: Anushka Thapa

I would like to request you to participate in this study and now I would like to tell you regarding this study.

Who is doing this study?

Me Anushka Thapa studying at Central Campus of Technology, Hattisar, Dharan. I am going to study about the nutritional status of earthquake victimized children under five-year-old in this VDC. I have also received approval letter from campus and NHRC for this study.

Objective: Main objective of this study is to find out the nutritional status of earthquake victimized under five year children

Participant: Earthquake victimized under five year children at Bhimtar VDC of Sindhupalchok district

What will I do?

I am going to ask you few questions. I will check weight, height, Arm circumference of children and bilateral edema on legs. I am going to collect the information about what types of foods are eating under five children and lactating mothers within 24 hours.

Time: 3 minutes for Verbal consent, Mother of 6- 59 month children will be interviewed with the survey questionnaire within 15 minute and anthropometric measurements of the child will also be carried out within 10 minute.

Confidentiality of information: Whatever information taken from you will be kept highly confidential.

Discomfort: If you feel any discomfort during this study or confused, I will make you clear. To make you comfortable in this study, I will try my best to answer your queries.

Facility / benefit: You are not getting money for this study

You can be happy and enjoy this study which is done by a student

Suggestions from this study might be helpful to improve nutritional status of under five children of this VDC in coming future

For community: This study will be help to determine the nutritional status of earthquake victimized children 6-59 months at Bhimtar, Sindhupalchok

Volunteer participation in the research: You are always free to decide whether to participate in my study or not. If you want to participate in this study, then you can or if not you can withdraw from the study at any time without giving reason and without any fear. If you like to ask additional information or question regarding this study you can contact my teacher in the following address.

Dambar Bahadur Khadka

Central Campus of Technology,

Hattisar, Dharan, Nepal

Contact no: 9841363554

Permission to start: May I get your permission to start my research?

Principal Investigator

Interviewee:

Appendix: G

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
height	Between Groups	.008	1	.008	.000	.995
	Within Groups	3595.210	18	199.734		
	Total	3595.218	19			
weight	Between Groups	.012	1	.012	.001	.973
	Within Groups	189.193	18	10.511		
	Total	189.206	19			

Appendix: H

Map of Survey Site (Bhimtar VDC)

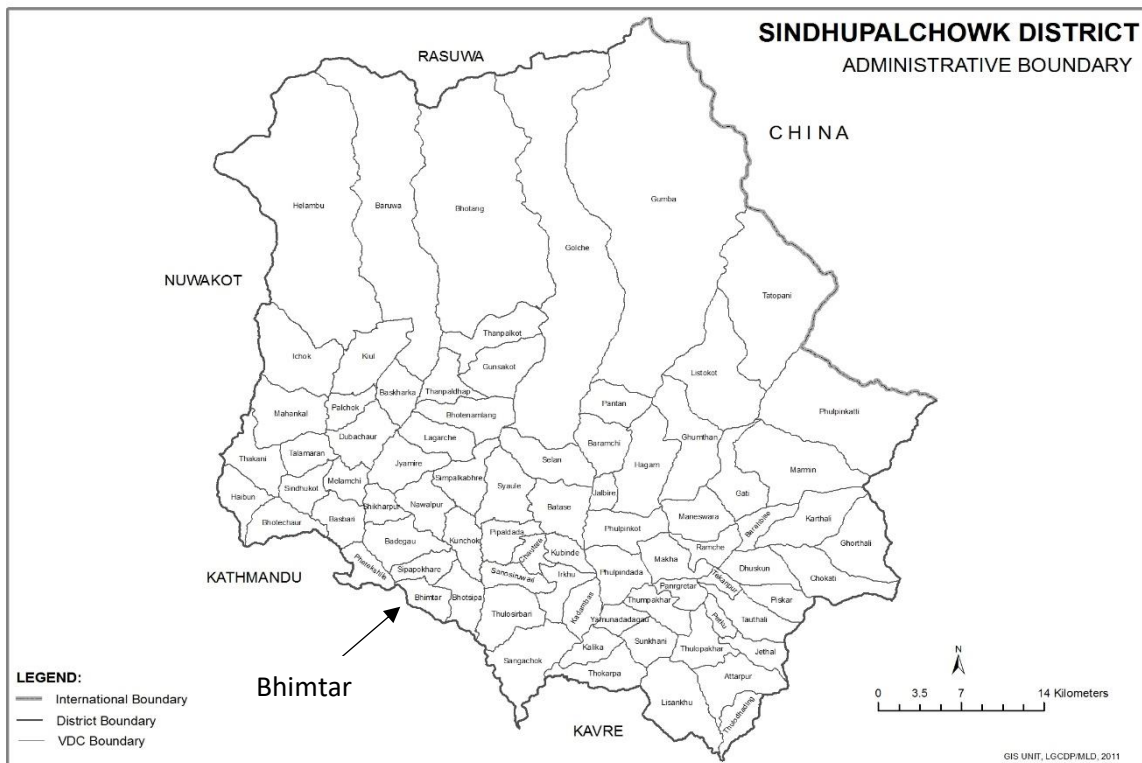


Photo gallery



