ASSESSMENT OF FACTORS AFFECTING THE NUTRITIONAL STATUS OF 6 - 59 MONTHS OF CHILDREN IN *MUSAHAR* COMMUNITY OF MADHELI VDC, SUNSARI

by

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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 *Assessment of Factors Affecting the Nutritional Status of 6 – 59 Months of Children in Musahar Community of Madheli VDC, Sunsari* presented by Sandeep Kumar Chaudhary has been accepted as the partial fulfillment of the requirements for the Bachelor of Science in Nutrition and Dietetics.

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Abstract

A cross- sectional study was conducted to assess nutritional status of 6 to 59 months aged children of *Musahar* community of rural Sunsari District, Nepal. Sixty children were selected applying census sampling technique for the assessment. A structured questionnaire was used to collect data from 60 children paired with their mothers or caretakers. Anthropometric measurements and basic associated factors were collected. SPSS version 20 and WHO Anthro 3.2.2 version were used for data analysis. Chi square technique was used to assess factors associated to nutritional status of children. Statistical association was declared.

Out of 60 *Musahar* children, 61.7%, 41.7% and 10% of them were stunted, underweight, and wasted respectively. All three types of undernutrition were prevalence among 5% of total children. The study found significant difference in stunting with weaning age (P=0.044) and age of mother at first pregnancy (P=0.049). The age of mother at first pregnancy (P=0.017) was also significantly associated with underweight whereas wasting was not found statistically significant with any factors. *Musahar* community had 66.7 % children who had at least one kind of under-nutrition. Out of them, nearly half children were in critical condition (below -3SD) and they need immediate intervention.

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Abbreviations

Abbreviations	Full form
FAO	Food and Agriculture Organization
FCHV	Female Community Health Volunteer
HAZ	Height for Age Z Score
IDA	Iron Deficiency Anemia
IDD	Iodine Deficiency Disorder
IDDS	Individual Dietary Diversity Score
MoHP	Ministry of Health and Population
MUAC	Mid – Upper Arm Circumference
NDHS	Nepal Demographic Health Survey
PEM	Protein Energy Malnutrition
RDA	Recommended Daily Allowance
SAM	Severe Acute Malnutrition
SMART	Standardized Monitoring and Assessment of Relief and Transitions
UNICEF	United Nations International Child Emergency Fund
VDC	Village Development Committee
WAZ	Weight for Age Z Score
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight for Height Z Score

Part I

Introduction

1.1 Background of study:

Proper nutrition is essential for proper growth and development of child as well as elderly people. The period of first two years is very much important for physical, mental and cognitive growth and development of children and also the vulnerable period marked for infestation by protein energy malnutrition and various micronutrient deficiencies. These problems alter the development and growth of children. So, special care is needed in this period of life in terms of good diet, giving adequate, proper nutrition and the health facilities, care practice etc. Malnutrition ultimately leads to poverty giving burden to national economy and development of any nation. So, malnutrition should be minimized as we couldn't totally eradicate it and to build our nation well. Majority of the ethnic population in Nepal are deprived and live in condition of extreme poverty and deprivation. Harsh living, poverty and poor socioeconomic condition and infrastructure have increased the health risk of people especially living in rural areas (Gartaulla, 1998).

Malnutrition is the pathological state resulting from relative lack or absolute deficiency or excess of one or more nutrients in the body which is detected chemically or can be tested by biochemical, anthropometric or clinical test (Gomez *et al.*, 1955). Protein energy malnutrition (PEM) has been a common health problem of the developing countries like Nepal. Stunting, underweight and wasting are common patterns of under-nutrition in children. In children, acute nutritional deficit and/or disease (such as diarrhea) produce wasting, characterized by a reduction in weight-for-height or arm circumference, or both (Acharya, 2013)Prolonged nutritional deficit and/or disease result in stunting, characterized by a reduction in height-for-age. Wasting and stunting are associated with functional consequences (SR, 1994).

Undernutrition among children is a key public health problem in developing countries including Nepal (Glewwe and Miguel, 2007). More than 26,000 under five children die around the world each day mostly conditions to the escapable causes. Nearly all of them live in developing countries or, more specifically in 60 developing countries (UNICEF, 2008). Every year 7.6 million under five children die such preventable malnutrition and its related causes. Similarly, next prevalent cause is low birth weight which leads to integration cycle of malnutrition especially in female (WHO, 2016). A child's life is

determined in huge measure by food given to the child during his/her first five years. Nutrition is one of the influencing factors as faster growth and development occurs in this period (MoHP, 2001).

NDHS 2011 shows that the percent prevalence for stunting, underweight and wasting children for under five years age are 41%, 29% and 11% respectively (MoHP, 2011).

Among diverse ethnic and cultural groups existing in our country, *Musahar* community is one of the rare ethnic groups in terrain region. Musahar population has been living in Morang, Sunsari, Saptari, Jhapa and many Terai districts. These people are one of the main ethnic groups in terrain and have been living here from time immemorial. The community, in Terai Nepal, is socially and economically one of the most marginalized communities in Nepal and they are the poorest amongst poor. The *Musahar* community falls under the category of Dalit. They are famous as named by "rat eaters". It is considered the worse of the Dalit group, the untouchables, which are the most segregated communities in Nepal. They are discriminated for their skin colour, religion, and traditions. They belongs the Hindu religion. Their main source of income is labors. They have been working as ploughman, housemaids, servants and as many more (Ojha, 2003; Shah *et al.*, 2016).

1.2 Statement of problem

It is seen that *Musahar* community is suffering from the extreme nutritional problem. Their nutrition status directly affects the health status of the country. The factors behind the poor nutritional status are needed to be identified to support the community to improve their nutritional status. Considering the low progress of health and socio economic indicators, this community was selected for the study. This study was focused to assess the nutritional status of under-five (6- 59) months children and to find out the associated factors with undernutrition (Shah *et al.*, 2016).

Musahar community is one of the oldest communities in Nepal. They are isolated from the other community and this is the reason why they are neglected from the most of the nutritional and health studies and facilities. Their economic condition is still poor so that there is lack of accessibility for foods consumption and health facilities. Most of them are illiterate and uneducated so, they are not much aware of food habits and the nutrition. Their hygiene and sanitation behaviors are still to be improved so their children are more susceptible to the various communicable diseases and prone to be malnourished (Ojha, 2003).

1.3 Significance

The nutritional status of children is important as it determines their health, physical growth and development and progress in life. All children have right to adequate nutrition, which is essential for attainment of the highest standard of health. This study will be helpful in designing better nutritional intervention for the malnutrition problem prevalent in the community and will be used as baseline data for other programs.

a) The study will provide information regarding the nutritional status of children between 6 – 59 months of age to the governmental and non-governmental organization which will be helpful to initiate corrective measures for the problem.
b) Make people aware about the current real situation of nutritional status in their surroundings.
c) Encourage people for the improvement of their present status by improving their feeding practices of their children and hygienic condition of their surroundings.
d) Act as tool to discover the problems related to nutrition and feeding practices of this community.

1.4 Objectives of study

1.4.1 General:

To find the factors affecting the nutritional status of 6-59 months of children in Musahar community of Madheli VDC, Sunsari.

1.4.2 Specific:

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

a) To assess the nutritional status of (6-59) months children of Musahar community.
b) To identify factors those are responsible for causing malnutrition.

1.5 Research questions

The purpose of this study is to determine the nutritional status and factors that influences the nutritional status of 6 to 59 months of children in *Musahar* community of Madheli VDC. This thesis addresses the following question.

a) Is there contributing factor to determine the nutritional status of children belonging *Musahar* community in Madheli VDC exist?

b) Is the undernutrition among under five year children of *Musahar* community of Madheli VDC regarding the weight-for-height, height-for-age, weight-for-age, MUAC measurement exist?

1.6 Limitations of the study

I. Actual information about family's income, food availability and consumption patterns, and their utilization may not be given correctly as the matter of prestige is important.
II. Language used by the Musahar community is different than that of national language so collected information may be slight different than the actual statement.
III. Current data about the population, nutritional status and the state of malnutrition of the village is not available so information through the communication may not be exact.
IV. Seasonal variation may be there as this is cross sectional study done for specific period of time.
V. The result may only represent the community and not whole district or region.

Part II

Literature review

2.1 Nutritional status

Nutritional status is the condition of health of the individual as influenced by the utilization and interaction of nutrients in body. It can be determined through a careful medical, dietary history, a thorough physical examination, and appropriate laboratory investigation (Robinson, 1972).

A report on the nutrition situation in the world shows that about 2 billion people are affected by malnutrition in one form and the other. Nepal is facing the vicious cycle of PEM i.e. Poverty, population explosion, and environmental degradation. However various types of governmental and nongovernmental health programs have been launched from time to time but they are still need improvement (MoHP, 2005).

The prevalence of poor nutritional status on developing countries is mainly due to the low income, low production of food, low productivity of crops and livestock, unequal distribution of food, low literacy, socio-culture and poor environmental sanitation (Naborro, 1984). The poor nutritional status has both direct and indirect effect on learning skills, mental performance as well as a working capacity, resistance to disease (Schmitt, 1979). Broadly speaking the development of nation depends on the nutritional status of its people (Katwal,1989).

2.2 Factor affecting the nutritional status

A number of factors affect acceptability and utilization of food such as availability, cultural practices, economic condition, familiarity, taste and knowledge about health (Bhatta *et al.*, 1998).

The factor affecting nutritional status are; mother's food security, types of food given to the young children, feeding frequency, poverty, illiteracy, ignorance to the child for care and feeding, status of woman and child nutrition and last but not the least who feed the child and how the child eats (UNICEF, 1996). Also factor influencing the nutritional status are food availability and its distribution system, consumption, income and purchasing power, price of commodities, illiteracy, family size, socio-culture and religious belief, environmental sanitation, health facility etc. (Bocabo, 1988).

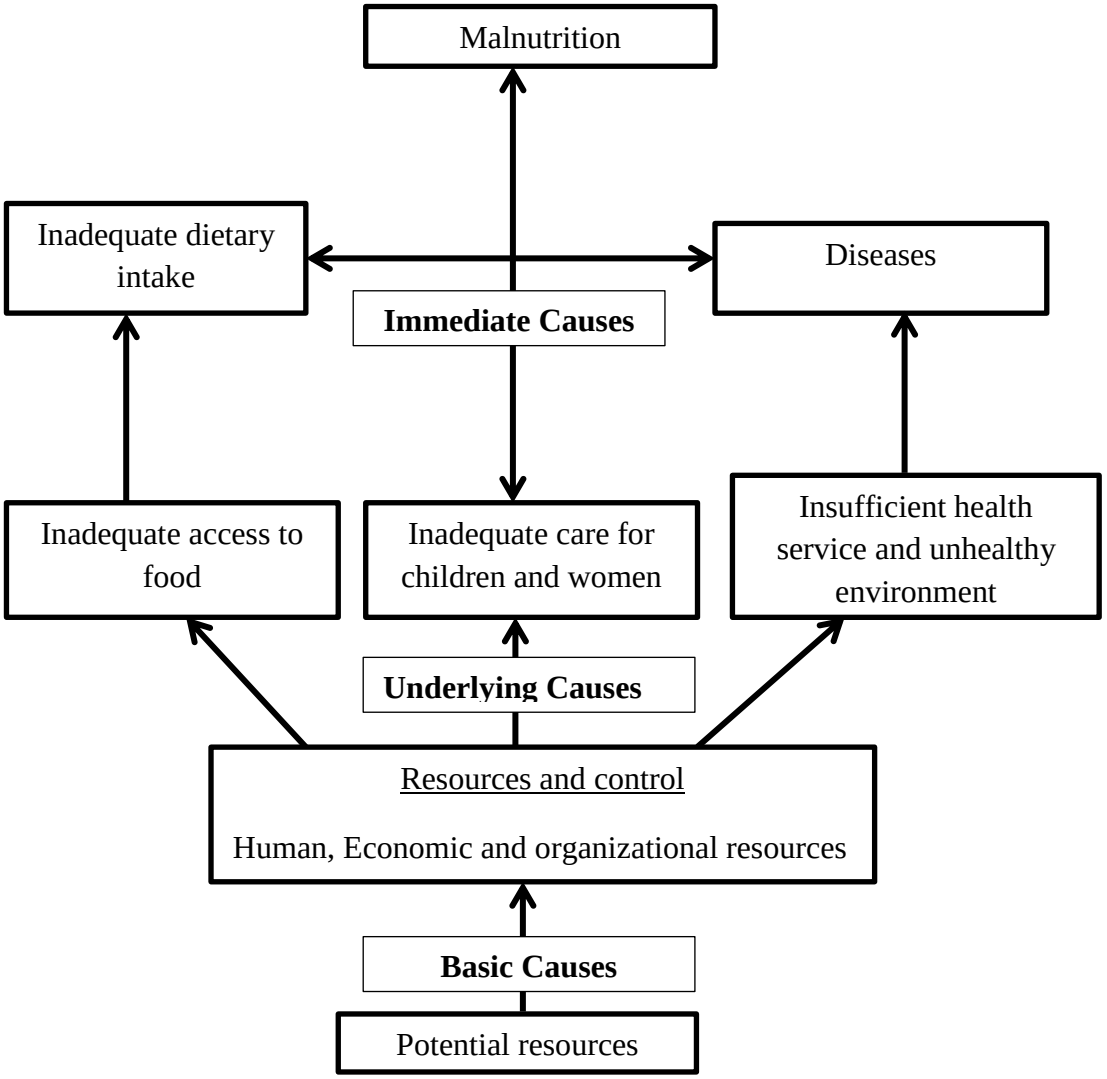

Fig. 2.1 Conceptual framework of Malnutrition (UNICEF, 2011)

2.2.1 Food availability and nutritional status

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

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

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

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

2.2.2 Nutritional requirement

Nutritional requirement refers to the amount of food energy and nutrient needed on an average per day by specific age and sex categories to meet the need of individuals for normal functioning of the body for work, growth and maintenance. The requirement varies with sex, age, activity, physiological state (pregnancy, lactation and old age) and environmental condition. The requirements have generally been stated in term of average, taking such variation into accounts (Burk, 1984).

The energy supplies are almost insufficient; it seems to occur in those developing countries where the stable commodities are either very low in protein content or the protein is of very low quality. Most of the people of the developing countries depend on the starchy food and derive their 80% of total calories from them. The people of the countries are able to obtain about 87% of calories intake and 79% of gross protein intake and they receive only 64% of their calories and 89% their protein from the consumption of meat, eggs, milk and milk fat combined (Schmitt, 1979).

2.2.3 Malnutrition

Malnutrition is a disease condition resulting from a relative or absolute deficiencies or excess of one or more nutrient. It may or may not manifest clinically. In the case of latter, the disease may be detected only from biochemical indices of nutritional status (Okoye, 1992). Malnutrition has been defined in different ways. Some believe that it is the result of an imbalance in the intake of nutrient; whereas other says that it is the result of nutrients interaction with body. There are still others who say it is depending on the type of nutrients responsible for the diseases. Nevertheless, both over-nutrition and under-nutrition are

considered malnutrition (Jelliffe, 1966). Since the diet consumed by large of low income groups of the population in most of the developing countries are inadequate both in quality and quantity. Malnutrition, particularly under-nutrition is widely prevalent among the vulnerable group of the people (Swaminathan and Bhagavan, 1976).

Malnutrition is a pathological condition of varying degree of security and disease clinical manifestation, resulting from the deficient assimilation of component of nutrient complex. The diseases affect the physiological patterns of tissue, reduce the defensive capabilities to withstand different environmental condition and lower both the efficiency and ability in work shortens life (Gomez *et al.*, 1955).

The classical theory of malnutrition holds that kwashiorkor results from a deficiency of protein with a relative adequate supply of calories whereas Marasmus is caused by overall deficiency of both protein and calories (Waterlow, 1972). On the other hand, Gopalan and his co-workers produced evidence that there is no difference in the diet of children as the clinical picture reflects not a difference in diet but difference in the capacity of the child to adopt (Gopalan, 2000).

Malnutrition has been defined as "a pathological state resulting from a relative or absolute deficiencies or excess of one or more essentials nutrients'', it comprises four forms of under nutrition, imbalance and the specific deficiency (Park, 2011).

1. Under-nutrition: - This is the condition which results when insufficient food is eaten over an extended period of time. In extreme cases, it is called starvation.
2. Over nutrition: - This is the pathological state resulting from the consumption of excessive quantity of food over an extended period of time. The high incidence of obesity, atheroma and diabetes in western societies is attributed to over nutrition.
3. Imbalance:-It is the pathological state resulting from a disproportion among essential nutrient with or without the absolute deficiency of any nutrient.
4. Specific deficiency:-It is the pathological state resulting from a relative or absolute lack of an individual nutrient.

The effect of malnutrition on the community is both direct and indirect. Direct effects are the occurrence of frank and subclinical nutrition deficiency diseases such as kwashiorkor, marasmus and vitamins & minerals deficiency disease. Indirect are, high morbidity and mortality among young children (nearly 50% of total death in the developing countries occur among children five years of age as compare to less than 5 percent in developed countries), retarded physical and mental growth and development

(which may be permanent), lowered vitality of the people leading to lowered productivity and reduced life expectancy (Amruth, 2012).

Malnutrition and infection are inter-related. Malnutrition encourages infection and infected children had poor nutritional intake as well as absorption ultimately lead towards Malnutrition. The morbidity arising was from as a result of complication from such infectious diseases such as tuberculosis and gastroenteritis are not considerable. The high rate of maternal mortality, stillbirth and low birth–weight are all associated with malnutrition (Park, 2011).

2.2.4 Malnutrition & infection cycle

The vicious cycle of malnutrition, impaired immune response, increased infection and diseased food intake is well recognized (Caballero and Maqboal, 2003) (fig. 2.3). Malnutrition (both macro and micronutrients) affect epithelial mucosal integrity, mucociliary clearance, immunoglobulin synthesis, lymphocyte differentiation and thus lead to impaired immunity which leads to recurrent infection (Chandra and Kumari, 1994).

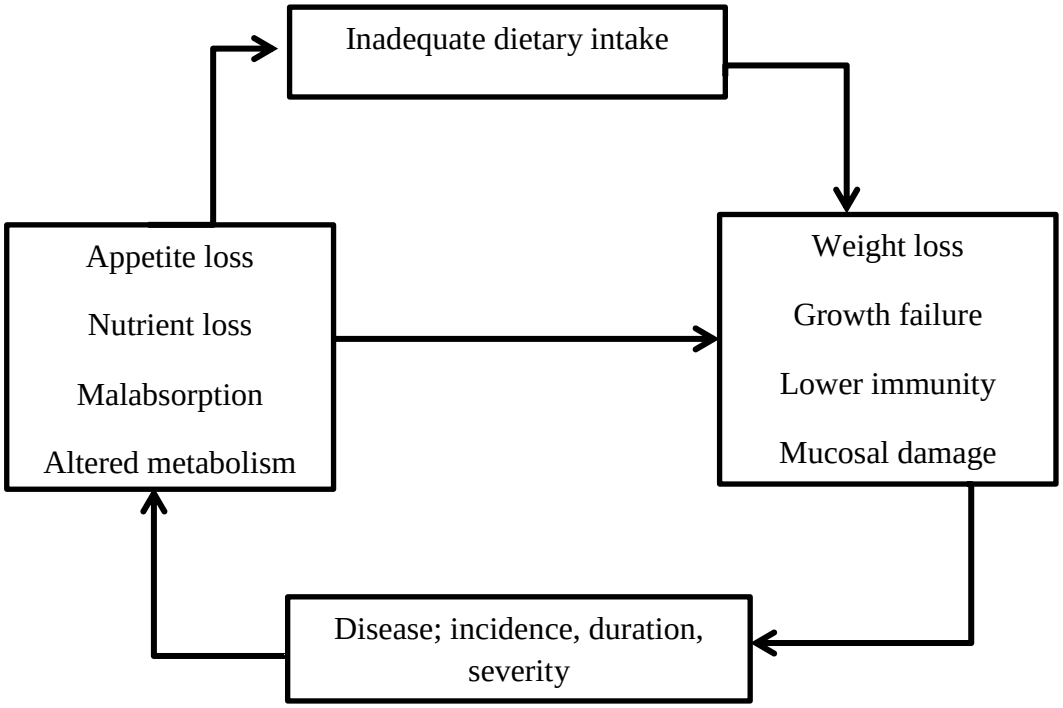

Fig. 2.2 The vicious cycle of malnutrition (Caballero, 2003)

Non-availability of food seems to be the major cause of malnutrition. Protein energy malnutrition (PEM) and micronutrient deficiencies are major contributors to higher

mortality rates from illness and diseases such as pneumonia, malaria, diarrhea and measles in the developing world (Caballero and Maqboal, 2003).

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

2.2.5 Types of malnutrition problem

Although there are different types of malnutrition problem, the major types in the developing countries like Nepal are protein energy malnutrition, vitamin A deficiency, and Anemia & Iodine deficiency disorder.

A. Protein energy malnutrition (PEM): - Protein energy malnutrition is classified as primary when an individual is not able to offer an adequate intake of energy and other nutrients. PEM is classified as secondary when the major cause is disease or abnormality (Viteri, 1992). Severe malnutrition may be manifested as Marasmus and Kwashiorkor or Marasmic Kwashiorkor. Protein energy malnutrition is a broad term that encompasses kwashiorkor and Marasmus together with milder stages of these social diseases. According to studies conducted, "Millions of infants and young children are the victims of these diseases in Asia, Africa, Central America, west Indies and South America". Many of the children who survive are unable to achieve their full physical growth and mental development (Margo *et al.*, 1996).

B. Kwashiorkor: -Kwashiorkor is a Ghanaian word, which means the illness that an older baby contracts when he is weaned as a result of the mother falling pregnant again (Williams, 1935). A pediatrician who observed this syndrome in infants, and pre-school children introduced this term. Children who were weaned and fed on a diet high in carbohydrates, but low in protein typical of a diet of staple food, such as maize, were usually the victims of kwashiorkor (Davidson, 1992). Growth is retarded and although the muscles are wasted and flabby, there is usually more subcutaneous fat than marasmic children. There is also edema, the child appears 'moon faced' and the hair often turns red brown or grey (Cameron and Hofvander, 1993). According to literature, "kwashiorkor is far more common among poor communities and the depressed social classes than among

privileged people. No one has recorded a contrary view" (Bengoa, 1998). Even those who have doubted whether kwashiorkor was a nutritional disease have not found cases in wealthy families, unless the feeding was exceptional poor.

C. Marasmus: - It is usually occurs in the children under 1 year of age when the quantity of mother's breast milk is insufficient to provide adequate amount of protein and calories for a growing child and when the supplementary feeding is inadequate (Cameron and Hofvander, 1993). A child suffering from marasmus is less than 60% of normal weight for its age (Shrestha, 1996). There is little or no subcutaneous fat, so the skin is loose and seems to be too big for the body. The infant looks an 'old man' or has a 'monkey face'. The muscles are markedly wasted. They are flabby; this can be easily felt on the thigh and buttocks where the muscles should be thick and strong. There is no edema and no change in hair colour (Cameron and Hofvander, 1993).

D. Marasmic-Kwashiorkor:-When the incidence of PEM is high, a large number of cases with some of the feature of both Marasmus and Kwashiorkor can be found (Passmore, 1986).

E. Runche: - Runche is the primary state of the malnutrition in Nepal. The restricted food intake of Marasmic child is sometime the result of maternally imposed restriction rather than result of poor appetite and the child is cry baby, crying all the time for food, but shows the symptoms such as diarrhoea caused by under nutrition, the mother is afraid to give the child enough food. In Nepal it is known as 'Runche lageko' (UMN, 1995).

F. Vitamin A deficiency: - Vitamin A deficiency is one of the most serious nutritional disorders among young children in developing countries. Vitamin A deficiency is prevalent among large segments of society in many countries. Knowledge of this fact is critical to the well-being of society, as a series of large intervention trials have shown that even mild to moderate Vitamin A deficiency is recognized as a critical factor in child health and survival (Edejer and Tan, 1993). The implication of such vitamin A deficiency, however, varies in the group at risk. In pre-school children, vitamin A deficiency can lead to increased risk of morbidity or mortality and to blindness in pregnant and lactating women. It can also lead to night blindness and appear to have implications for maternal mortality and morbidity, while the immediate health consequences for school children and adolescents are yet to be studied (Westcott and Statt, 1979). Deficiency of vitamin A leads to softening and ulceration of the cornea of the eye and sometimes to blindness. It usually affects young children and is often combined with kwashiorkor and marasmus. VAD is

related to the death of 14,000-20,000 Nepalese children annually. One percent of children aged 24-36 months and 0.5% of children aged 0-36 months had night blindness. The data is 2.1% for bitot's spot (NMIS, 1996).

G. Anaemia: - Anaemia in children results in lack of energy, fatigue and reduced power of concentration and although not confirmed by research in Nepal, lightly affects children's level of participation in school and recreational activity. It is possible that children with iron deficiency are most susceptible to infections, since impairment in the production of antibodies is observed when this deficiency is present (UNICEF, 1996). In Nepal, 78% women are anemic due to iron deficiency of which 50% of women are in childbearing age. In total 78% any anaemia, mild, moderate and severe are 34.7, 28.7%, 5.6% and 0.3% respectively. And in children anemic condition data shows 46.2%, 27.2%, 18.5 and 0.5% as any anaemia, mild, moderate and severe respectively (MoHP, 2011).

H. Iodine deficiency disorder: - Iodine deficiency disorder is a more precise term than "goiter" because the latter only refers to the size of the thyroid gland. The former on the other hand, also includes a condition associated with iodine deficiency. Among these, still births, abortions and congenital anomalies, endemic cretinism, are characterized most commonly by mental deficiency deaf mutism and spastic diplegia. For a lesser degree of neurological defects related to fetal iodine deficiency, and impaired mental function in children and adults with goiter and decreased circulating thyroxin. Correcting iodine deficiency in the mother before pregnancy prevents iodine deficiency disorders in infants and children (Westcott and Statt, 1979).

The iodine deficiency disease and goiter occur in those areas where iodine content is low that insufficient iodine is obtained through food and water. Iodized water can thus prevent goiter in districts where this disease is common.

I. Vitamin D deficiency: - Both inadequate and excessive vitamin D intakes are found in the United State and in Canada, even though the vitamin has been known for decades to be essential for growth. Worldwide, vitamin D deficiency leads to rickets, which still afflicts large number of children. The main symptoms of an inadequate intake of vitamin D are those of calcium deficiency. The bones fail to calcify normally and may be so weak that they become bent when they have to support the body's weight (Griesel, 1986).

2.2.6 Malnutrition and poverty

Malnutrition is a part of vicious cycle that includes poverty and disease. These three factors are interlinked in such a way that each contributes to the presence and permanence of the others (WHO, 2016).

Socio economic and political changes that improve health and nutrition can break the cycle: as can specific nutrition and health interventions. At a micro-level, child malnutrition is related to poverty, but at the macro community level poverty does not appear to be strongly related to child malnutrition in many cases. Other factors are equally important. One of these is related to the intra-household use of resources such as the time management and knowledge of the main caregiver, who is usually the mother. For example, how much time is allocated to feeding, caring and ensuring a healthy environment for children?

2.2.7 Weaning and complementary feeding status

After six months, complementary food should be introduced and it is important to continue breastfeeding the children at least up to the age of two years (UNICEF, 2016). Overall, 74 percent of infants aged 6–8 months had received solid, semi-solid or soft foods at least once during the previous day. Boys were more likely than girls to receive solid, semisolid or soft foods. Of children aged 6–23 months, 74 percent had adequate meal frequency and 37 percent had adequate dietary diversity. Overall, 32 percent received a minimum acceptable diet (CBS, 2015).Undesirable cultural practices such as giving pre lacteal feeds, late initiation of breastfeeding after birth, delay in introduction of weaning foods and avoiding exclusive breastfeeding are still prevalent among the mothers. The maternal knowledge towards breast feeding was inadequate and there was a big gap between actual and desired practices (Chaudhary *et al.*, 2011).

2.3 Children's nutritional status in Nepal

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

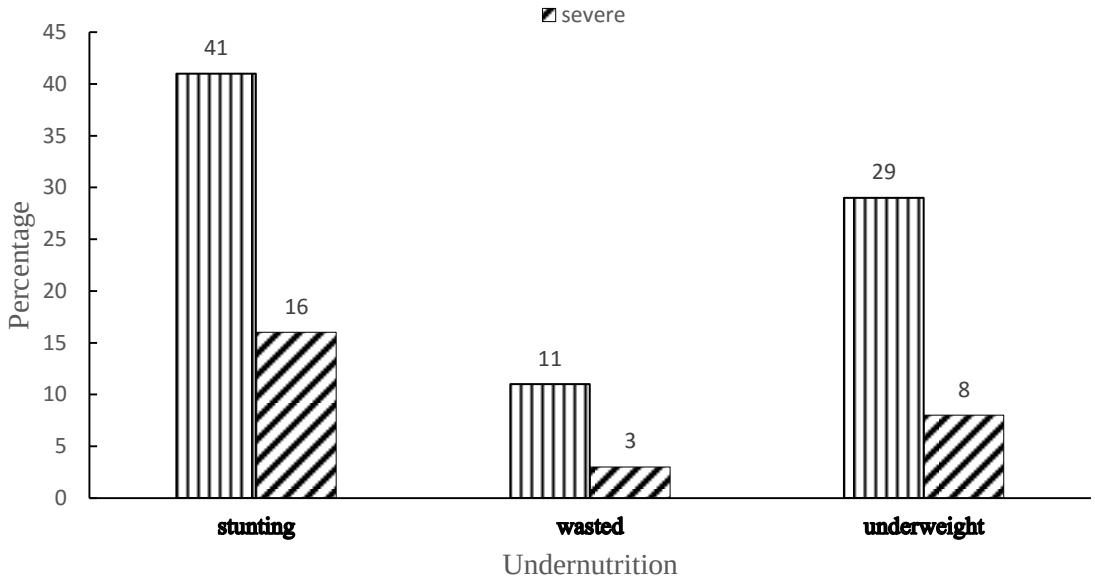

Fig. 2.3 Prevalence of different forms of malnutrition (MoHP, 2011)

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

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

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

Cross-sectional study conducted in Kapilvastu district reveals that better socio-economic status, mother's age 20 – 35 years, birth order up to second, gap more than two years between two pregnancies, recommended exclusive breast feeding, early recommended supplementary feeding, complete immunization and timely care seeking

had positive effect on children health which are also statistically significant (Bhandari, 2013).

A cross-sectional comparative study conducted in Belahara VDC of Dhankuta district in Nepal located in South Asia showed that the prevalence of underweight, stunting and wasting was 27%, 37% and 11% respectively (Sapkota and Gurung, 2009).

Study done on malnutrition among under-five children in Bangladesh revealed that, the high prevalence of stunting and underweight, for instance 42% and 40% of under-five children were stunted and underweighted, respectively (Siddiqi, 2011).

2.4 Nutritional status indicators

A variety of indicators, which can be used for the purpose of assessing nutritional status, are currently available. Among many possible indicators only few are suitable for the evaluation of field program. The only indicator of nutritional status that are applicable in a large scale and for which a suitable experience if available are those based on anthropometric indicators are best applicable in the evaluation of nutritional status (Keller, 1982).

WHO listed nutritional status lowering indicators based on body dimensions, birth weight, weight for height, height for age, weight for age, arm circumference, reported in 1976. 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. It is widely used for both the assessment of child population and the monitoring of individual development. The simplest of these indicators are weight–for age (Keller, 1982).

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 considerable error in to the classification of malnutrition by weight for age particularly in the categories of ‘mild’ and ‘moderate’ malnutrition. Therefore, a refinement that has long been used by anthropologist was introduced into the nutritional anthropometry of children (Scoane and Lathan, 1971). By relating the weight to the attained height, a distinction was made between chronic and acute malnutrition or between; ‘stunting’ (low-height-for-age), and ‘wasting’ (low-weight-for–height) (Waterlow, 1972).

Three indicators weight-for-age, height-for-age, and weight-for-height have since found wide acceptance and application and probably more known today about these indicators in

different population and different health situations than any of other indicators that have been prepared in the past (Keller, 1982).

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

2.5 Assessment of nutritional status

In making an assessment of nutritional status of an individual or a group, various indices give us some idea. These include body build, physical stature, general appearance, feeling of health and well-being, the level of activity etc. A well-built body, a bounce in the step, sparkling eyes, clear skin and ready smile generally associated with good health. The nutritional assessment may require encompassing nations, communities, and vulnerable segments of communities or individuals. It may be done as a part of an exercise to document current status as compared with post status or as specific attempt to evaluate the impact of an intervention programme (Ramchandran, 1987).

Assessment of nutritional status can be done using the following information (WHO, 1966):

I. Direct method: - Deals with the individual and measures objective criteria e.g. anthropometric, clinical examination, biochemical and bio- physical parameters.
II. 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.
III. Ecological factors: - e.g. Socio-economic status, housing and environmental hygiene, health and education services, conditioning infection.

Direct method of nutritional survey

The method is summarized as ABCD steps as:

- Anthropometric method

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

Indirect method of nutritional survey

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

2.5.1 Anthropometric measurement

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

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

Growth assessment is the single measurement that best defines the health and nutritional status of children because the disturbance in health and nutrition, regardless of their etiology, invariability, affect child growth. The most commonly use anthropometric

indexes for assessing child growth are, weight-for-age, height-for-age, weight-for-height, and mid-upper-arm-circumference (Onis and Habitch, 1997).

Advantages of anthropometry

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

Limitation of Anthropometry

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

Much of the world's literature on nutritional anthropometry is concerned with adult, especially in well-fed communities where obesity is a health problem. Similarly, investigations of children have been concerned mainly with the growth and development among children. The commonly used anthropometric measurements are briefly discussed below:

A. Weight-for-Age

Weight is the measurement of body mass. Underweight appears to be the best indicator of the prevalence of PEM in children of all age groups. Comparison of weight-for-age values with regional standard at corresponding ages will help to determine the degree of underweight in a community. It is important that the age of the subject is correctly known and the presence of pathological weight (e.g. Due to oedema) is ruled out (Gopaldas and Seshadari, 1987). Various methods have been suggested or used to express the classification of malnutrition. The Gomez system labels young children between 90% and 75% of the standard as first degree malnutrition, between 75% and 61% as second degree, 60% and below as third degree. This classification has been used quite widely and has proved extremely useful. However, the selection of levels below standard was based largely on clinical hospital experience in Mexico City (Jelliffe, 1966).

B. Height-for-Age

Height is a linear measurement made up of the sum of four components, leg, pelvis, spine and skull. The extent of lowered height in relation to age as compared to a regional standard may be regarded as a measure of the duration of malnutrition. Lowered in height may represent a short period of growth failure at any early age or a longer period of growth failure at a later age. Height/age gives a picture of past history (Gopaldas and Seshadari, 1987).

C. Weight-for-Height

A major problem with weight-for-height is unavailability of weight and height data for specific community of the specific age children. Weight for a given height is age dependent or nearly so. Age affect the extremes of the range in children who are very tall or very short for their age. Thus, standard weight-height ratio prepared from normal, balanced food supplied population with numerous researches is based on age. Weight-for-height is an index of existing nutritional status (Gopaldas and Seshadari, 1987; Scoane and Lathan, 1971).

D. Mid-upper-arm circumference

Muscle and fat constitute the soft tissues that vary with a deficiency of protein and calories. Measurement of the mid-upper-arm circumference is the most useful method for assessing muscle mass and is also useful for rapid screening of children for severe malnutrition, as this region is easily accessible and measurement requires only a flexible fiber glass tape (RAPA, 1988).

The WHO reference 2007 provides a smooth transition from the child growth standard for 0-5 years to the older age group. The data tables and charts cover the 1st to the 99th percentile and from -3 to +3 standard deviation (SD). The 2006 WHO growth standard should be used for the assessment of children 0-60 months. WHO anthro is software for use on desktop personal computer or laptops using Microsoft windows. It was developed to facilitate the application of the WHO reference 2006 for monitoring the growth of school-age children and adolescent. To show the continuity with the WHO child growth standard for 0-5 years, these are included in anthro for the three main indicators that apply, i.e., weight-for-age, height-for-age and weight-for-height.

2.5.2 Dietary assessment

Dietary assessment encompasses food supply and production at the national level, food

purchases at the household level, and food consumption at the individual level (Ferruzzi *et al.*, 2013). The choice of method in each case should be guided by the purpose of the monitoring, the need for data accuracy and the availability of resources. Dietary assessment methods should also be adapted to the target population and be culturally sensitive. Dietary intake data may be collected at the national, household or the individual level (FAO, 2009).

1. Household survey

The principle methods of assessment at the household level are: food accounts, inventories and household recall. Data generated by these methods are useful for comparing food availability among different communities, geographic areas and socioeconomic groups, and for tracking dietary changes in the total population and within population subgroups. However, these data do not provide information on the distribution of foods among individual members of the household (FAO, 2009).

A. Food account and inventory method

In food account method household members keep a detailed record of the quantities of food entering the household, including purchases, home produced food, gifts, and from other sources. No account of stock of foods is taken before or after the study period. Inventory method is similar to the food account method. The additional element is that an inventory of stored food is made at the beginning and end of the survey period. One main weakness of these methods is that data are restricted to food brought into the home and does not include food consumed outside home (FAO, 2009).

B. Household record method

In the household record method, the foods presented for consumption to household members are weighed or estimated in household measures. Preparation waste and waste after eating are deducted, as well as the food consumed by visitors should also be deducted. This method may be well suited to populations in which a substantial proportion of the diet is home produced rather than purchased (FAO, 2009).

2. Individual survey

Main methods for assessing present or recent diet as individual survey include food records, 24-hours (or 48-hours) recall, and food frequency questionnaires. In order to quantify the intake of foods, some estimate of the weight of consumed food is required. To convert food intake into nutrient intake, the availability of a food composition

database/food table is essential. By combining the information of dietary intake and food composition databases/tables one can determine whether the diet is nutritionally adequate or not (FAO, 2009).

A. Food record method

In the food record method food intake is measured at the time of eating. Food intake is quantified by weighing and using household measures. Household members themselves usually record their food intake, although a field worker might keep the record. The data collection and processing are time consuming and expensive. These methods require a high degree of cooperation from the subjects, which can lead to poor response rates. Also, the need to weigh and record food, or the act of being observed, may alter the intake (FAO, 2009).

B. 24-Hour dietary recall method

In the 24-hour dietary recall, 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 or by telephone, either computer assisted or using a paper-and-pencil form, although self-administered electronic administration has recently become available. Ideally, interviewers would be dietitians with education in foods and nutrition; however, non-nutritionists who have been trained in the use of a standardized instrument can be effective. All interviewers should be knowledgeable about foods available in the marketplace and about preparation practices, including prevalent regional or ethnic foods (Thompson and A., 2013). It is much used dietary assessment method because it is simple, quick and inexpensive, but it is prone to reporting errors, including biased or inaccurate recalls of food intake and portion sizes. It requires a good methodological knowledge in order to transform the interview data of the dietary intake to nutrients. Applied once, it yields no information on day-to-day variation on food or nutrient intake (FAO, 2009).

C. Food frequency method

For food frequency method, there are a set of questions, these questionnaires provide information about how often certain foods or foods from given food groups, were eaten during a time interval in the past, usually day, by either the household or an individual. The questionnaire can be self-administered or be administered through a short personal interview. The food list may range from a few questions to capture intake of selected foods and nutrients, to a comprehensive list to assess the total diet. The frequency responses can

be open-ended or multiple choice, ranging from several times per day to number of times per year, depending on the type of food (FAO, 2009). The appropriateness of the food list is crucial in the food frequency method. The entire breadth of an individual's diet, which includes many different foods, brands, and preparation practices, cannot be fully captured with a finite food list. Frequency instruments designed to assess total diet generally list more than 100 individual line items, many with additional portion size questions, requiring 30-60 minutes to complete (Thompson and A., 2013).

3. Dietary diversity

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

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

A more diversified diet is an important outcome in and of itself (Bilinsky and Swindle, 2006).

- A more diversified diet is associated with a number of improved outcomes in areas such as birth weight, child anthropometric status, and improved hemoglobin concentrations.
- A more diversified diet is highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high quality protein), and household income.
- Even in very poor households, increased food expenditure resulting from additional income is associated with increased quantity and quality of the diet.

- Questions on dietary diversity can be asked at the household or individual level, making it possible to examine food security at the household and intra- household levels.

Part III

Research design and methodology

3.1 Research designs

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

I. Anthropometric measurements of 6-59 months children. (As shown in appendix)
II. Household survey with the help of questionnaire that includes open/closed end questions. (As shown in appendix)

3.2 Study variables

The study variables are divided into two categories:

a) Dependent variable: Stunting, wasting and underweight.
b) Independent variable:

- Socioeconomic and demographic factor; head of household, ethnicity, family size, income, occupation, education.
- Maternal characteristics; age, number of children born.
- Children characteristics.
- Environmental and Hygienic Practice of the family.

3.3 Type of study

The type of study applied was cross sectional i. e. for short period of time

3.4 Study site and its justification

Musahar toll, Madheli VDC, Sunsari. Total population of the village is 7620 (CBS, 2011). Madheli VDC is situated 4 km. west from Koshi highway. This VDC is surrounded by Duhabi Bhaluwa municipality, Itahari Sub metropolitan city, Sonapur VDC, Chandbela VDC and Aurabani VDC.

3.5 Study population

Measurement is taken of (6- 59) months old children of *Musahar* community and interview was taken from caretakers (especially mother but in the absence of mother other will be interviewed).

Criteria for Sample Selection

Inclusion criteria: The children of age (6-59) month were selected for survey belonging Musahar community. The mothers or caregivers (in absence of mother) of selected children were also selected for the questionnaire.

Exclusion criteria: In absence of the study subject (child) at the time of household survey or being seriously ill.

3.6 Sampling methods

This research has adopted the census method. This method is used where samples are less or in nationwide studies such as population census. Because there are not many houses of Musahar community as compared to others and also the number of children between (6-59) months seems to be low, according to personal communication. So, every household in *Musahar* community of Musahar toll of Madheli village were studied.

3.7 Sample size

The sampling technique used in this case is census method. The sample size is equal to the total number of children who lies in between age group of 6 months to 59 months and belongs to *Musahar* community of Madheli VDC. According to personal communication the total population of 6-59 months of age children is 60. Thus the sample size for the study was 60.

3.8 Data collection technique and methods

A community based descriptive cross-sectional study was conducted in Madheli VDC of Sunsari district of Nepal. Musahar community of Madheli village was selected purposely for the study.

The data collection process consists 4 parts:

I. Household survey with the help of questionnaire: - A set of questionnaires that have directly or indirectly influence in the nutrition status were asked to the parents of the children who were to be studied. The questions asked to the respondent give the both qualitative and quantitative data.

II. Anthropometric measurements of 6-59 months age children: - The following indices were used

a) Weight-for-Age

b) Height-for-Age

c) Weight-for-Height

d) Arm circumference

III. Edema check for protein energy malnutrition (PEM).

IV. The dietary methods used were Dietary Diversity Score and Food Frequency Questionnaire. In this method, the respondent is asked to remember in detail the type and frequency of foods consumed during the previous week/Days/Months. The 12 groups of foods were taken as classification for this study. Based on 12 food groups frequency consumed was measured for 7 days and was calculated by adding the frequencies of consumption of all 12 food groups by the child. DD questionnaires are very simple in their conception and use. However, they need to be adapted to each context. In particular, the food groups list to be used in the questionnaire (which is not necessarily the one that will be used to compute the score and often range from 9 to 25 food items/groups) must be carefully designed and a list of examples of foods for each food group must be established (UNSCN, 2006).

There is currently no standard list of foods or food groups, and no cut-off point, upon which the international community agrees for a broad use in all contexts. However, a huge research work is currently ongoing and several propositions have already been made to standardize the indicators (UNSCN, 2006).

After the data collection was done by using questionnaire. The results were checked and stored for further analysis. The questionnaire was classified with 12 food groups and we categorized IDDS on the following basis (Palermo et al., 2013).

3.9 Data collection tools

Data collection tools and equipment require for the survey consist of:

a) Weighing machine: Weighing machine of capacity 100 kg and having the least count of 0.1 kg. (1 piece)
b) Height measuring scale (standiometer). (1 piece)
c) MUAC tape: For measuring mid upper arm circumference. (1 piece)
d) Questionnaire: A well designed and pretested questionnaire to collect household information.

3.10 Pre-testing the data collection tools

The prepared sets of questionnaire and anthropometric instruments were pre-tested among few of 6-59 months children and their parents/caretakers respectively. Pre-testing should be conducted in order to maintain accuracy and clarity of questionnaire, to check the consistency in interpretation of questions by respondents and to identify ambiguous item. After pre-testing, all the ambiguous, misleading and wrongly interpreted questions were omitted and questionnaire was revised in accordance with the findings of pre-testing.

3.11 Validity and reliability of study tools

To improve the validity and the reliability of the collected data following methods were applied.

- To increase the precision of the equipment especially weighing machine it will be monitored 3 times a day by using the standard 1 kg measurement.
- To increase the precision and validity and to minimize the error in the collection of the data, measurement was carried out by triplet method that is each measurement was measured three times and median was recorded in the file.
- I was regularly monitored by my guide teacher to complete this research.
- Problems during the study related to the data collection were minimized by the help of local leaders e.g. language Problems etc.

To ascertain the degree to which the data collection instruments will measure what they purposed to measure, the instruments were validated. The aspects tested in the questionnaire were also drawn from the available literature in nutrition about the preschool children. The questionnaire was pre-tested prior to data collection to ascertain content and face validity.

Reliability refers to quality control measure of data collected. Before data collection the research assistants were intensively trained on the objectives of the study and on data collection techniques. The process of data collection was involved the principal researcher and a research assistant. Questionnaire was checked daily for completeness, consistency and clarity. (Ethical approvals are given in Appendix A and B).

3.12 Data management and analysis

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

3.13 Ethical and logistical consideration

The ethical permission from National Health and Research Council was obtained before the survey was held.

Prior consent to conduct the research was obtained from the parents of respective children and research conducting households at the same time clearance from the office of *Madheli* VDC was obtained.

General discussion with respondents was held to take their consent as well as inform importance of the study to get their actual prevailing nutritional status. They were assured that the data collected will only be used for study purpose with the uttermost confidentiality. (Ethical clearances were given in Appendix).

Chapter IV

Results and discussion

Madheli VDC lies in Terai region and is nearly about 4km West from Koshi highway near Khanar. The main ethnic groups of the village are *Tharu, Musahar, Khatbe*. There are 80 households and 315 total populations. This study is mainly focused on the nutritional status of 6-59 months of age children in *Musahar* community of *Madheli* and some factors associated with it. Accurately 60, 6-59 months of age children were taken as sample for anthropometry and a semi structured questionnaire was set for interviewing the mothers or caretakers to obtain important information related to assess the nutritional status and other information related to it. Some of the important findings of the study are listed below.

4.1 Socio economic and demographic factors

The study shows that among the survey children, 60% had single family and rest (40%) had joint Family as shown in table 4.1. Almost all (98.3%) of respondents were laborers and 1.7% were engaged in some type of business in the community.

Table 4.1 Socio – demographic characteristics of survey population

Variable	Frequency	Percent
Family type		
Single	36	60.0
Joint	24	40.0
Family occupation		
Labor	59	98.3
Business	1	1.7
Annual family income		
Below one lakh 10 thousand	38	63.3
Above one lakh 10 thousand	22	36.7
Mother's education		
Illiterate	44	73.3
Primary level	15	25.0
Lower secondary level	1	1.7

Annual income of 63.3% families was below one lakh ten thousand and annual income of 36.7% families was above one lakh ten thousand. Among the mothers, 73.3 % were illiterate, 15 % had primary level education and 1.7% had the lower secondary level education.

The children belonging to single families were relatively less prone to be undernourished than those of joint of families. This may be due to their bonding relation, less members to be fed and care. So, greater and good caring ultimately leads to less vulnerable to malnutrition. Most of the elders (both male and female) in the community were engaged in labor activity for daily/weekly wages as they had low access to good education, political background. Different cultural beliefs, practices and traditions were also the factors for their current poor socioeconomic status.

4.2 Maternal characteristics

More than half (68.3%) of the mothers under the survey were housewife and 30% and 1.7% of mother's occupation was labor and service respectively.

Table 4.2 Maternal characteristics of survey population

Variable	Frequency	Percent
Mother's occupation		
Service	1	1.7
Labor	18	30.0
Housewife	41	68.3
Age at first pregnancy		
Under 20	51	85.0
20 or above	9	15.0
Age group of mother		
Below 20	9	15.0
20-30	46	76.7
30 above	5	8.3

Eighty-five percent mothers had their first pregnancy before 20 years and 15% had their first pregnancy at 20 or above. The mean age at first pregnancy of mothers in this survey was found to be 18.08±1.319 years.

The minimum age at first pregnancy of mothers included in this survey is 15 years and maximum age is 22 years. Unlike the Nepali proverb," *Bihebari bis barsa pari*", most of the marriage were before the age of 20 and so the pregnancy too as shown in table 4.2.

The mean age of mothers in this survey was found to be 24.02±3.65 years. Maximum age of mother was found to be 36 years and minimum age was found to be 18 years.

Mostly, mothers were housewife to care their child and engaged in household works. They work as seasonal labors or housemaids in crop harvesting period. They had been following their traditional practices. They worked on daily basis to feed their own and to support the household expenses.

They got married at their early ages and got pregnant risking their life under their tradition and practices. Despite this, the study result revealed that the early age pregnancy is protective factor for becoming undernourished. Greater and good caring for newly married bride and the newly born child in terms of workload, food access, health facilities, love and support compared to others may be the reasons behind this.

4.3 Child characteristics and care practices

All the major child characteristics and care practices under study are listed below in the table 4.3. Out of 60 respondents, 100% of children were given colostrum milk after the birth of the child. Among them 68.3% were breastfed within an hour after birth and 31.7% were breastfed within 8 hours after birth. 48.3% of the children were still under breast feeding during the survey.

Survey result showed that 11.7% of children were initiated complementary feeding before 6 months of age, 30% of children were initiated complementary feeding at the age of 6 months of age and remaining 58.3% were initiated after 6 months of age. Ninety five percent children had cesarean birth while 5% had natural birth.

The mean age of children under the survey was 34.75±15.7 months. Majority of children fall between 36-47 (31.66%) months age group followed by 12-23 (28.3%), 48-59 (25%), 24-35 (10%) and 6-11 (5%). Among the children who were selected in survey were 43.3% first child, 40% second child and 16.7% third child of their parents.

Ninety-five percent of children had equal and more than 2.5 Kg birth weight while 5% had birth weight less than 2.5 Kg. For the child feeding status IDDS of children and FF were calculated. The individual dietary diversity score showed 23 (38.3%) children had low IDDS, 36 (60%) children had medium IDDS and 1 (1.7%) had high IDDS.

Table 4.3 Characteristics of surveyed children

Variables	Frequency	Percent
Initiation of breast feeding		
Within an hour	41	68.3
Within 8 hours	19	31.7
Continuation of Breastfeeding		
No	31	51.7
Yes	29	48.3
weaning of children in group		
≤ 6 months	25	41.7
6-12 months	33	55.0
> 12 months	2	3.3
Type of child birth		
Natural	57	95.0
Cesarean	3	5.0
Age group of children		
6 to 11	3	5.0
12 to 23	17	28.3
24 to 35	6	10.0
36 to 47	19	31.7
48 to 59	15	25.0
Birth order of child		
1st	26	43.3
2nd	24	40.0
3rd	10	16.7
Birth weight of child		
Less than 2.5 kg	3	5.0
2.5 kg and above	57	95.0
Individual dietary diversity score		
Low diversity	23	38.3
Medium diversity	36	60.0
High diversity	1	1.7

Food frequency (FF)		
75 and Below	20	33.3
Above 75	40	66.7

Food frequency of child within 7 days was carried out. Among them, 20 (33.3%) children had food frequency score 75 or lower and 40 (66.7%) had food frequency score more than 75. The mean food frequency of child within 7 days was 75.72±11.91.

Positive attitude and practices toward the early initiation of breastfeeding was seen. Their knowledge regarding breastfeeding may be improved because of the community intervention of maternal, neonatal and child health program by the government through health system, FCHVs. These health and nutrition education based programs conducted by various governmental, non-governmental health institutions and projects were probably improved their maternal and child characteristics. This result in greater and good care practices for the children.

4.4 Environmental and hygienic practices

All the major environmental and hygienic practices under study are listed below in the table 4.4.

Table 4.4 Environmental and hygiene characteristics

Variable	Frequency	Percent
Drinking water		
Tube well	60	100.0
Toilet facility		
No	4	6.7
Yes	56	93.3
Waste disposal		
Burial	15	25.0
Incineration	29	48.3
Throw	10	16.7
River	6	10.0
Availability of kitchen garden		
Yes	12	20.0
No	48	80.0

Out of 60 respondents, 100% of household used tube well for drinking water. On the contrary, 93.3% households had toilet and 6.7% didn't have toilet. For the waste management 15 (25%) households use burial technique followed by 29 (48.3%) incineration, 10 (16.7%), throwing and 6 (10%) in river. This study indicated that larger percentage of households in *Musahar* community did not have kitchen gardening facility 80% and 20% had the facility.

They had good source of semi-improved drinking water source i.e. tube well with 100% coverage. This is the reliable and less expensive source having minimum risk of being ill by water borne disease as it is underground water source not directly open to environmental contamination. Greater coverage of toilet facility was seen as government focuses on toilet facility and knowledge regarding health and diseases lately. Officials of government priorities, those having toilet in their home, as first than not having ones for official works and many more added facilities. Waste disposal practices were also good. Less kitchen gardening practice was seen as they lacked their own land to cultivate such crops and vegetables. They were given land on the condition of giving half amount back to the owner of the land called "*Adhiya*" to cultivate and harvest crops, vegetables and fruits. So, the kitchen gardening practices seen was not enough but less.

4.5 Nutritional status of children

In among 60 children the overall magnitude of malnutrition in 6 – 59 months was found to be 61.7% stunted, 10% wasted and 41.7% underweight respectively. On the other hand, 0%, 23.4% and 3.3% were severely wasted, stunted and underweight respectively having z- scores less than <-3 as shown in figure below.

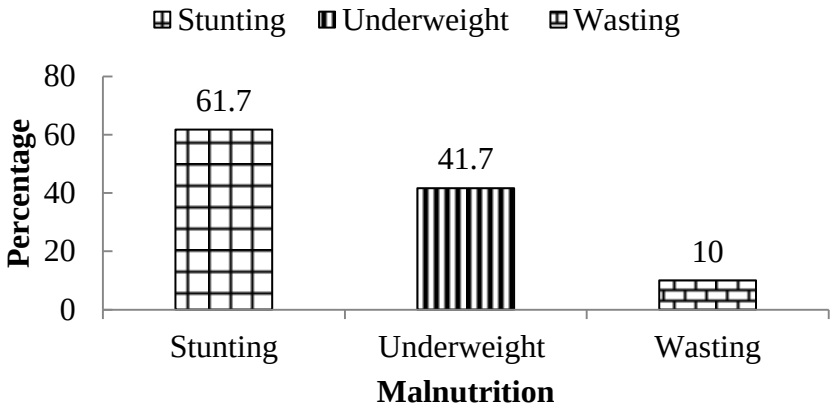

Fig 4.1 Nutritional status of children

The prevalence of stunting in *Musahar* community was found to be 61.7% which was found higher than (46.66%) the study conducted in *Musahar* community of Nursing VDC, Sunsari (Ojha, 2003). Similarly, underweight and wasting was found to be lower than (85.35% & 55.98%) the study conducted.

A study conducted in Sunsari district revealed that there was high prevalence of Stunting (36.6%), underweight (53.3%) and wasting (30.0%) among the children of rural terai region of eastern Nepal, Which was greater than the result finding of this study except for stunting (61.7%) (Gharti Chhetri, 2005).

A similar study of urban *Musahar* community in Sapatri district showed that the prevalence of stunting, underweight and wasting was 47%, 36% and 21% respectively (Shah *et al.*, 2016). Compared to above data, result of the current study is found to be higher except for stunting (10%).

4.6 Distribution of nutritional status of children according to height for age

A HAZ of < -2 defines the presence of chronic malnutrition (stunting). Among 60 children, the prevalence of stunting in *Musahar* community were found to be 61.7% where 38.3% moderately stunted and 23.4% severely stunted and normal was found to be 38.3% as shown in figure 4.2.

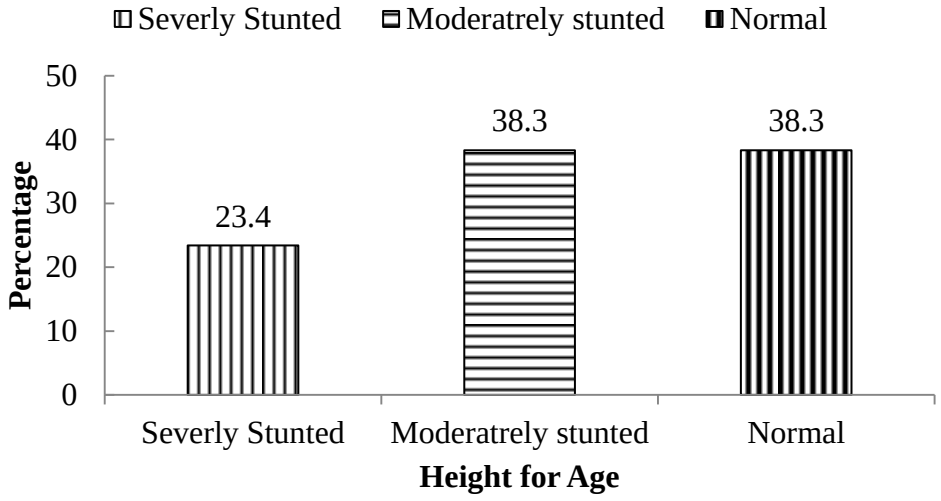

Fig 4.2 Distribution of nutrition status of children according to height for age

The prevalence of stunting in *Musahar* community was found to be 61.7% which was found higher than (47%) the study conducted by (shah, 2016) in *Musahar* community of

urban Saptari district. Stunting was found lower compared to a study conducted in Rupandehi district (65%) by (Acharya, 2013).

4.6.1 Distribution of height for age according to gender

Out of 60 children 25 were male children and 35 were female children. The study results showed that 28% boys and 20% girls were found to be severely stunted. Stunted were found to be 68% male and 57.1% female. The survey showed that stunting was higher in boys than girls as shown as below fig 4.3.

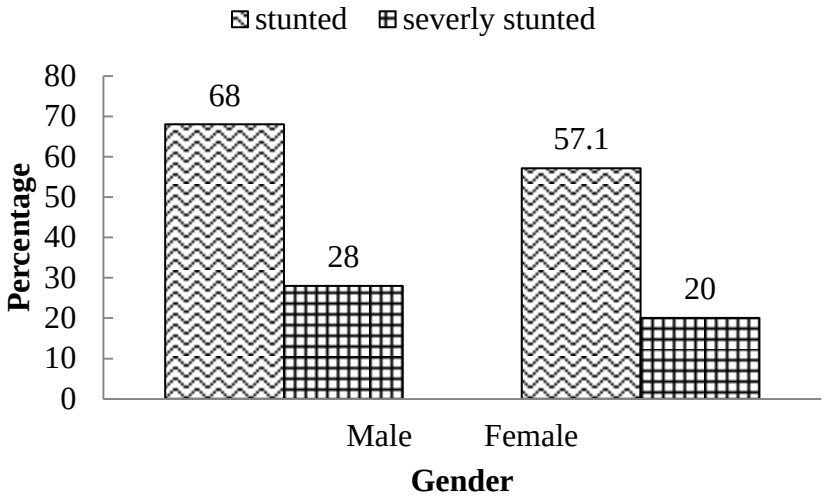

Fig 4.3 Distribution of stunting according to gender

The study showed that the male children were more prone to stunted than female children is similar to that of NDHS result.

4.6.2 Distribution of height for age according to age group

Among 60 children, study showed that highest percentage of stunting (100%) was found in the age group 24-35 month and children in the range of age 12-23 less stunted (52.9%) as shown in the table 4.5.

Table 4.5 Distribution of height for age according to age group

Age Group		HAZ (%)	
(months)	**N**	**<-3SD**	**<-2SD**
6-11	3	Nil	66.7
12-23	17	23.5	52.9
24-35	6	33.3	100
36-47	19	26.3	57.9
48-59	15	20	60
Total	**60**		

4.6.3 Height-for-age

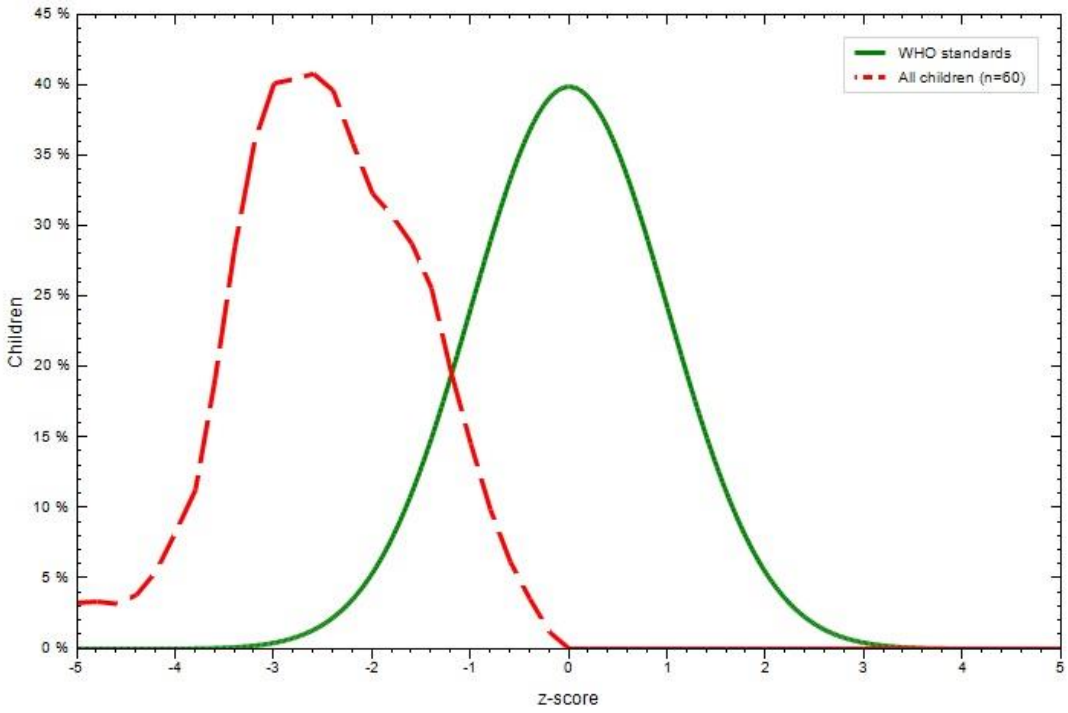

Fig. 4.4 Distribution of stunting among survey children based on WHO standard (n=60)

The median Height for Age z-score of survey children was found to be -2.51 which is less by 2.51 with the reference to WHO standard. This is why curve is slightly skewed to the left side of WHO standard curve showing the prevalence of stunting among study population as shown in figure 4.4.

4.7 Distribution of nutritional status of children according to weight for age

WAZ of <-2 is used for defining a child as underweight. WAZ of ≤-2 and ≥-3 is defined as moderately underweight and WAZ <-3 is defined as severely underweight. The result

showed that prevalence of underweight was found to be 41.7% where 38.4% moderately underweight, 3.3% severely underweight and 58.3% normal as shown figure 4.5.

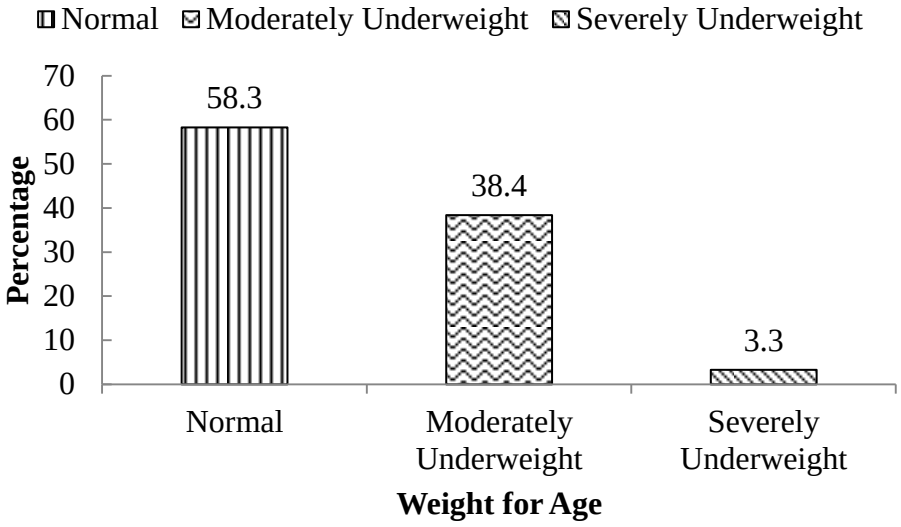

Fig. 4.5 Distribution of nutritional status of children according to weight for age

The study result regarding underweight 41.7% is found similar to that of SMART study conducted in Saptari (41.4%) (ACF, 2013).

4.7.1 Distribution of weight for age according to gender

The study result showed that 0% boy and 5.7% girls were found to be severely underweight and 44% boys and 40% girls were found to be underweight. The result showed that underweight was found to be higher in boys than girls but severe cases include only girl child as shown below in figure 4.6.

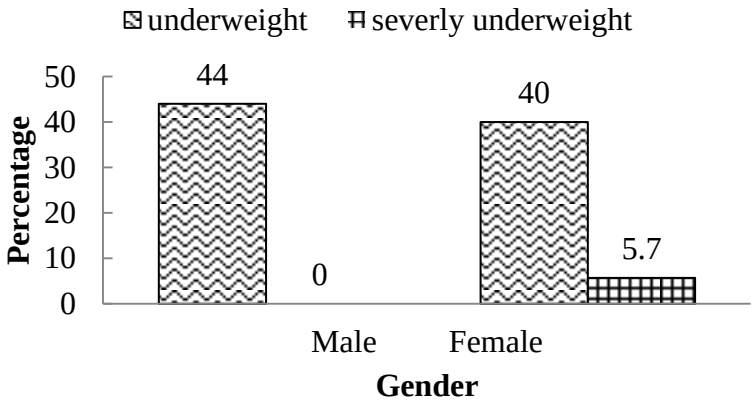

Fig. 4.6 Distribution of weight for age according to gender

4.7.2 Distribution of weight for age according to age group

Result showed that highest percent of underweight (66.7%) was found in the age groups 24-35 months and children in the range of age (48-59 months) less underweight as shown as below table 4.6.Whereas, NDHS shows highest prevalence of underweight in the age group 18- 23 months with 37%.

Table 4.6 Distribution of weight for age according to age group

Age Group		**WAZ (%)**	
(months)	**N**	**<-3SD**	**<-2SD**
6-11	3	nil	33.3
12-23	17	5.9	41.2
24-35	6	16.7	66.7
36-47	19	nil	42.1
48-59	15	nil	33.3
Total	**60**		

4.7.3 Weight-for-age

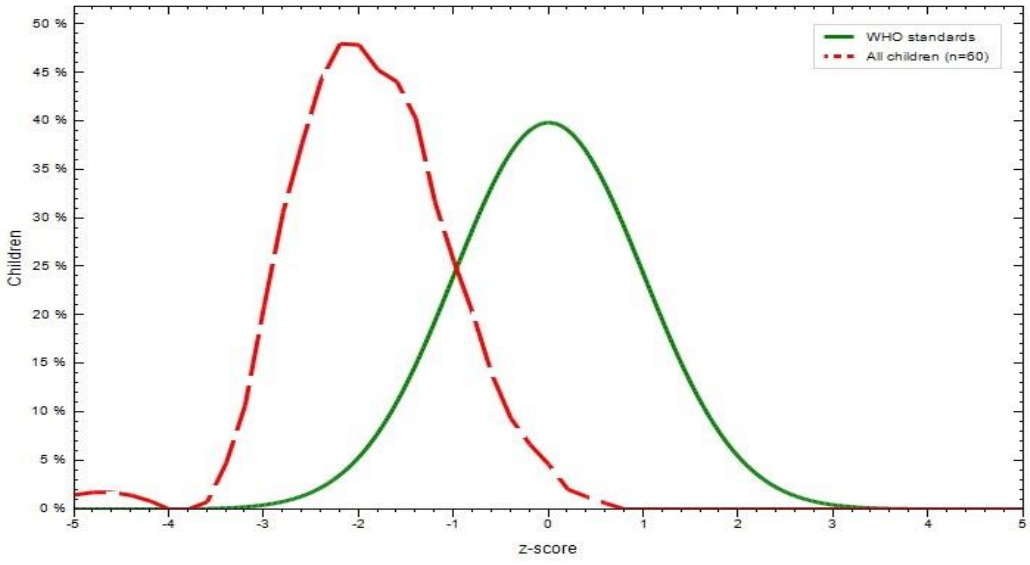

Fig. 4.7 Distribution of underweight among survey children based on WHO standard (n=60)

The median Weight for Age z-score of survey children was found to be -1.89 which is less by 1.89 with the reference to WHO standard.

This cause the curve slightly skewed to the left side of WHO standard curve showing the prevalence of underweight among study population as shown in figure 4.7.

4.8 Distribution of nutritional status of children according to weight for height

A WHZ of < -2 defines the presence of acute malnutrition (wasting). Similarly, WHZ <-3 severely wasted and WHZ ≤-3 and ≥-2 moderately wasted. The result showed that wasting was found to be 10% where moderate wasted was found to be 10% and no severe cases. Normal children were found to be 90% as shown in fig 4.8.

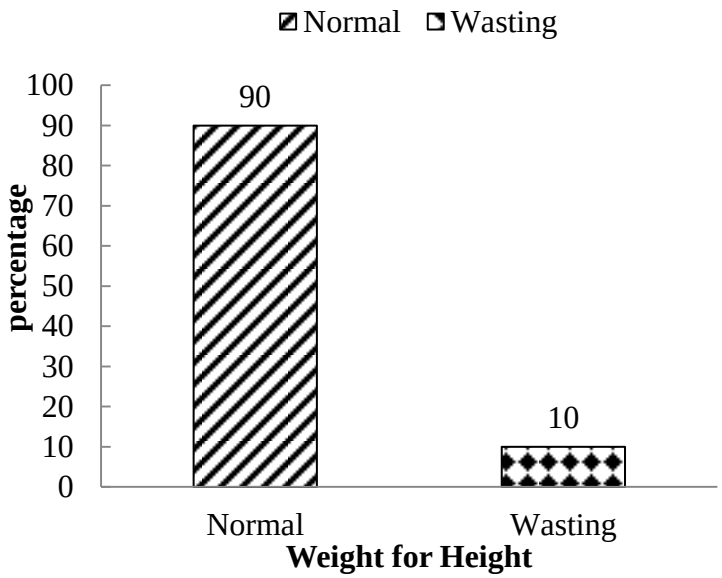

Fig. 4.8 Distribution of nutritional status of children according to weight for height.

The found result resembles that of NDHS 2011 in term of wasting i. e. prevalence of wasting in eastern terai region was 10.3% (MoHP, 2011).

4.8.1 Distribution of weight for height according to gender

The study result showed 12% boys and 8.6% girls were found to be wasted and no case of severe wasting was found. Survey data revealed that distribution of wasting based on sex was similar to NDHS findings. The study also showed that wasting was found to be higher in girls than boys as shown in fig 4.9.

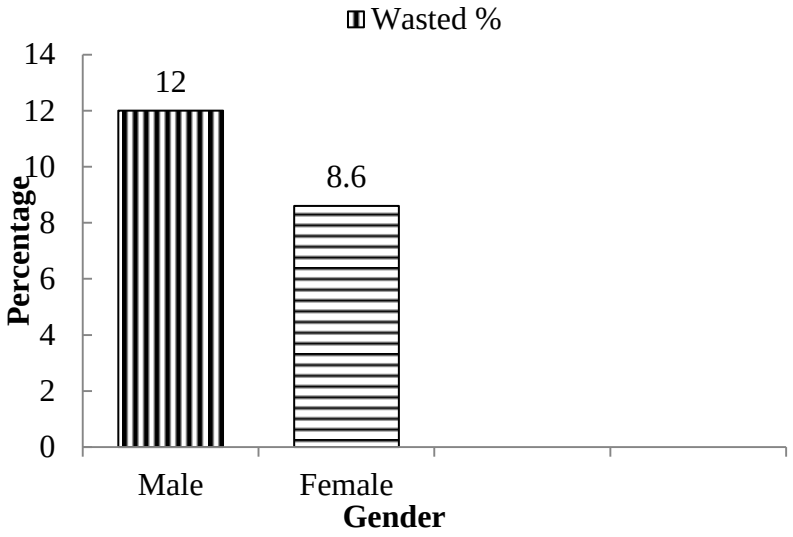

Fig 4.9 Distribution of weight for height according to gender

4.8.2 Distribution of weight for height according to age group

The study result showed that wasting (16.7%) was found highest in the age group (24-35) month and no wasting in the age groups (6-11) months and (48-59) months. as shown as table 4.7, but NDHS shows highest percent of wasting (25%) in the age group (9- 11) months.

Table 4.7 Distribution of weight for height according to age group

Age Group		**WHZ (%)**	
(months)	**N**	**<-3SD**	**<-2SD**
6-11	3	Nil	Nil
12-23	17	Nil	11.8
24-35	6	Nil	16.7
36-47	19	Nil	15.8
48-59	15	Nil	Nil
Total	**60**		

4.8.3 Weight-for-height

The median Height for Age z-score of survey children was found to be -0.66 which is less by 0.66 with the reference to WHO standard. This cause the curve slightly skewed to the left side of WHO standard curve showing the prevalence of wasting among study population as shown in figure 4.10.

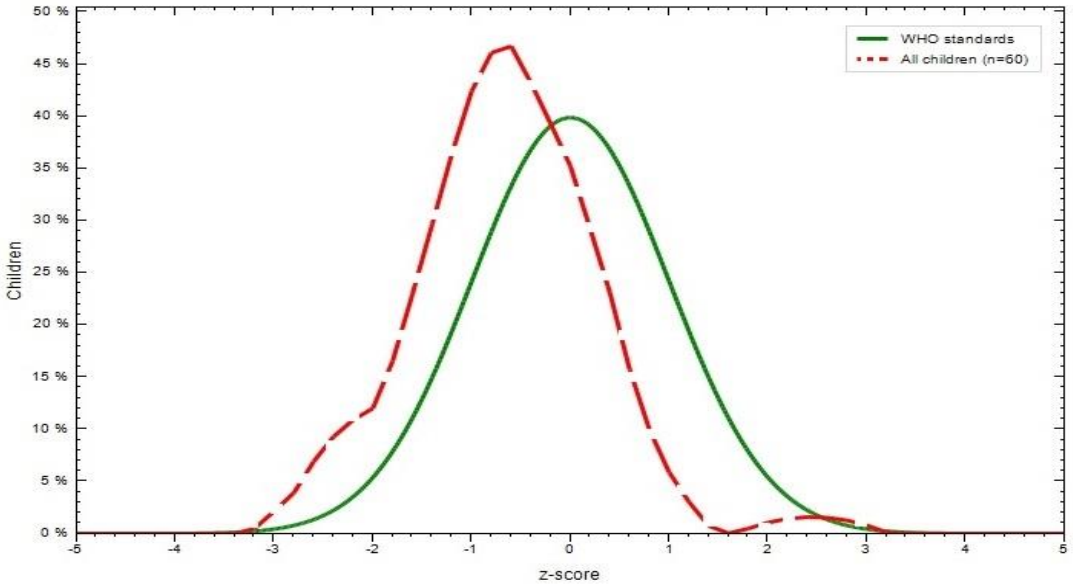

Fig. 4.10 Distribution of wasting among survey children based on WHO standard (n=60)

4.9 Distribution of malnutrition according to MUAC measurement

Table 4.8 Distribution of malnutrition according to MUAC measurement

MUAC range	Frequency	Percent
11.5-12.5	1	1.7
12.5-13.5	7	11.6
>13.5	52	86.7

The children having MUAC (>12.5cm&<13.5cm) are regarded as mildly malnourished, MUAC (>11.5cm &<12.5cm) below the normal and regarded as moderately malnourished (wasted) and normal (>13.5cm) On the basis of Mid-Upper Arm Circumference (MUAC) 11.6% children were found to be mild malnourished, 1.7% children were found to be moderately malnourished and 86.7% children were found to be normal as shown in table 4.8.

4.9.1 Distribution of MUAC on the basis of age group

MUAC on the basis of age group the moderate acute malnutrition was found to be 5.88% in 12 to 23 months age group only as shown as table 4.9.

Table 4.9 Distribution of MUAC on the basis of age group

Age Group in months	MUAC Class		
	(11.5 – 12.5) cm	(12.5 – 13.5) cm	> 13.5 cm
6-11	Nil	Nil	100.00%
12-23	5.88%	5.88%	88.24%
24-35	Nil	Nil	100.00%
36-47	Nil	21.05%	78.95%
48-59	Nil	13.33%	86.67%

4.10 Conclusive nutritional status

The overall analysis of indicators such as weight for height, Height for age and Weight for age showed that 66.7% children suffered with at least one kind of undernutrition and 5% had all three of them as shown in table 4.10.

Table 4.10 Combined indicator analysis

Indicators	**Frequency**	**Percent**
All three	3	5.0
Any one of three	40	66.7

4.11 Factor affecting wasting

The factors such as child age, age at first pregnancy, weaning, food frequency and IDDs had no significant association with wasting as shown in table 4.11. This may be due to low prevalence of wasting among the children of the community and seasonal variation may be other cause as the season when this study was conducted was after crops harvesting. Starting of winter may result in greater care for the children from cold and other morbidities. The other causes for no significance association were may be the low sample size i.e. sixty subjects only for the study and greater coverage of health facilities regarding private and governmental health institutions in the study area.

Table 4.11 Factors affecting wasting

Factors		Weight for Height status		Chi Square value	P-Value
		Normal	Wasted		
Child Age group	Below 24 months	17 (85.0%)	3(15.0%)	0.79	0.37
	Above 24 months	37 (92.5%)	3 (7.5%)		
Age at first pregnancy	Below 20 years	45 (88.2%)	6 (11.8%)	2.06	0.15
	20 years and above	9 (100.0%)	0 (0.0%)		
Weaning Age	Before 6 month	21 (84.0%)	4 (16.0%)		
	6-12 month	31 (93.9%)	2 (6.1%)	1.93	0.38
	After 12 month	2 (100.0%)	0 (0.0%)		
Food frequency	75 and less	19 (95.0%)	1 (5.0%)	0.92	0.33
	More than 75	35 (87.5%)	5 (12.5%)		
IDD	Low	20 (87.0%)	3 (13.0%)	0.37	0.54
	Moderate and High	34 (91.9%)	3 (8.1%)		

* Significant at 5% level of significance

4.12 Factor affecting underweight

The result showed that, there is no significant association between underweight and child age, weaning, food frequency and IDD. For underweight, age at first pregnancy is significantly associated (P= 0.01) as shown in table 4.12.

When maternal age at pregnancy was less than 20 years, it was found protective factor for underweight and negatively associated with underweight (P=0.017)(Sapkota and Gurung, 2009). The findings were similar to the study conducted by Sapkota and Gurung. The children whose mothers were pregnant at age 20 years and above were more likely to be underweight compared to the children whose mother were first pregnant at age lower than 20 years. This may be due to having good care by family members regarding health facility, less working load, nutritious food stuffs etc. who were getting pregnant firstly before 20 years of age.

Table 4.12 Factors affecting underweight

Factors		Weight for Age status		Chi Square value	P-Value
		Normal	Underweight		
Child Age group	Below 24 months	13 (65.0%)	7 (35.0%)	0.55	0.45
	Above 24 months	22 (55.0%)	18 (45.0%)		
Age at first pregnancy	Below 20 years	33 (64.7%)	18 (35.3%)	5.74	0.01*
	20 years and above	2 (22.2%)	7 (77.8%)		
Weaning Age	Before 6 Month	16 (64.0%)	9 (36.0%)		
	6-12 months	17 (51.5%)	16 (48.5%)	3.11	0.21
	After 12 months	2 (100.0%)	0 (0.0%)		
Food frequency	75 and less	15 (75.0%)	5 (25.0%)	3.55	0.59
	More than 75	20 (50.0%)	20 (50.0%)		
IDD	Low	13 (30.4%)	10 (43.5%)	0.98	0.32
	Moderate and High	22 (59.5%)	15 (40.5%)		

* Significant at 5% level of significance

4.13 Factor affecting stunting

After analyzing the result, it was found that there was no association between Child age group, food frequency and IDD with stunting as shown in table 4.13. The result stated that there was significant association between weaning of baby and stunting (P= 0.044) and mother's age at first pregnancy and stunting (P= 0.049).

The children whose weaning was done in appropriate age i.e. within 6 months were more likely to be nutritionally fit compared to children who untimely initiated weaning i.e. after 6 months. The prevalence of stunting in Musahar community was statistically significant with the weaning age. A study done by (Goto *et al.,* 2002) supports the finding of this survey, the weaning stage was significantly associated with growth i. e. height for age (P= 0.024). The late weaning/initiation of supplementary feeding (after 6 months) and early cessation of breastfeeding (before 24 months) had negative impact on growth. This may be due to reason that late weaning promotes nutrient inadequacy in quantity resulting slow rate of proper growth and development in children ultimately leading to chronic

malnutrition i.e. stunting. So, this study finding suggests that the weaning age is important in preventing stunting.

Table 4.13 Factors affecting stunting

Factors		Height for Age status		Chi Square value	P-Value
		Normal	Stunted		
Child Age group	Below 24 months	9 (45.0%)	11 (55.0%)	0.56	0.57
	Above 24 months	14 (35.0%)	26 (65%)		
Age at first pregnancy	Below 20 years	22 (43.1%)	29 (56.9%)	3.86	0.049*
	20 years and above	1 (11.1%)	8 (88.9%)		
Weaning Age	Before 6 Month	14 (56.0%)	11 (44.0%)		
	6-12 month	8 (24.2%)	25 (75.8%)	6.25	0.044*
	After 12 month	1 (50.0%)	1 (50.0%)		
Food frequency	75 and less	6 (30.0%)	14 (70.0%)	0.88	0.34
	More than 75	17 (42.5%)	23 (57.5%)		
IDD	Low	7 (30.4%)	16 (69.6%)	0.98	0.32
	Mod. and High	16 (43.2%)	21 (56.8%)		

* Significant at 5% level of significance

The children whose mothers were pregnant at age 20 years and above were more likely to be stunted compared to the children whose mother were first pregnant at age below 20 years. This may be due to extra care given for younger (age less than 20) mothers and her child unlike the same for mothers who crossed their twenties regarding working load, nutritious foods, proper health checkups prior to pregnancy and delivery etc.

Part V

Conclusion and recommendations

5.1 Conclusion

The study was conducted to assess the causing factors of malnutrition and prevalence of malnutrition among children of 6 to 59 months in Musahar community of Madheli VDC, Sunsari.

1. The nutritional status of Musahar children in Madheli VDC is comparatively worse than the country's nutritional status. This study revealed that undernutrition continues to be a serious problem in the Musahar community of Sunsari district.
2. The overall magnitude of malnutrition among those children in Madheli VDC was 61.7%, 10% and 41.7% for stunting, wasting and underweight respectively. Among, severe stunted, severe wasted and severe underweight were found to be 23.4%, 0% and 3.3% respectively.
3. The highest percentage of stunting, wasting and underweight was found to be in the same age group i.e. 24-35 months were 100%, 16.7% and 66.7% respectively.
4. Male children were more affected by the undernutrition than female children.
5. According to MUAC based on WHO classification wasting was found to be 1.7%. MUAC on the basis of age group, the highest percentage of wasting was found to be 5.88% in 12 to 23months.
6. Age at first pregnancy was the factor for stunting and underweight. Weaning age was also the factor for stunting. There was no any factor with which wasting was significantly associated.
7. The results of the present study will be useful for policy makers and local institution in their various developmental and health care programs. Nutritional interventions are also necessary to improve the nutritional status of the children.

5.2 Recommendations

Based on the results from the thesis the following are the recommended points to improve the nutritional status of children of Musahar community of Madheli VDC, Sunsari.

1) Nutrition education by health workers and mobilization of FCHVs should be done to improve the feeding practice of parents on appropriate child feeding and care practices.

2) Weaning should be done within the six months of age.
3) Households should treat drinking water which obtained from unimproved or semi improved sources by boiling or with filter or sodis (treating by sunlight).
4) Dietary pattern should be changed to overcome undernutrition and proper growth and development.
5) Potential income generating programs should be conducted to decrease the risk of malnutrition due to poverty.
6) Further detailed study should be done to find out other unexplored factors and those which were not significantly associated with malnutrition according to present study but considered as important ones.

Part VI

Summary

Sixty children of *Musahar* community were taken. Anthropometric measurement of 60 children was taken to assess the nutritional status of *Musahar* community. The data collected was analyzed by using SPSS version 20 and WHO anthro 3.2.2 version and chi-square test was used to identify the associated factors of malnutrition.

Based on WHO classification out of 60 children, 41.7% were under weight, 61.7% were stunted and 10% were wasted respectively. Of which, nobody was severely wasted, 23.4% were severely stunted and 3.3% were severely underweight. The survey shows that wasting, stunting and underweight were higher among the boys. On the basis of WHO growth curve 12% and 68%, 44% and 8.6%, 57.1% and 40% were wasted, stunted and underweight for boys and girls respectively. Among 60 children, 25 were boys and 35 were girls. 60% of families under the study were single families while 40% were joint families respectively. Almost all (98.3%) of respondents were laborers and 1.7% were engaged in some type of business. Annual income of 63.3% families was below one lakh ten thousand, annual income of 36.7% families was above one lakh ten thousand. Among the mothers, 73.3 % were illiterate, 15 % had primary level education and 1.7% had the lower secondary level education.

More than half (68.3%) of the mothers under the survey were housewife and 30% and 1.7% of mother's occupation was labor and service respectively. The mean age of mothers found to be 24.02 years with standard deviation of 3.65 years. Maximum age of mother was found to be 36 years and minimum age was found to be 18 years. Eighty-five percent mothers had their first pregnancy before 20 years and 15% had their first pregnancy at 20 and above.

Out of 60 respondents, 100% of children were given colostrum milk after the birth of the child. Among them 68.3% were breastfed within an hour after birth and 31.7% were breastfed within 8 hours after birth. 48.3% of the children were still under breastfeeding during the survey.

Survey result showed that 41.7% of children were initiated complementary feeding before 6 months of age, 55% of children were initiated complementary feeding at the age

of 6-12 months of age and remaining 3.3% were initiated after 12 months of age. The mean age of children under the survey was 28.53months. Among the children who were selected in survey were 43.3% first child, 40% second child and 16.7% third child of their parents. Ninety-five percent of children had equal and greater than 2.5 Kg birth weight while 5% had birth weight lesser than 2.5 Kg. The individual dietary diversity score showed that 38.3 % children had low dietary diversity, 60 % children had medium dietary diversity and 1.7 % had high dietary diversity score. Likewise, 33.3 % children had food frequency score 75 and lower and 66.7 % had food frequency score more than 75.

Out of 60 respondents, 100% of household used tube well for drinking water. On the contrary, 93.3% households had toilet facility and 6.7% didn't have toilet facility. This study indicated that larger percentage of households in *Musahar* community did not have kitchen gardening facility 80% and 20% had the facility.

Chi–square test analysis of the determinants of nutritional status indicated that, there was significant association of stunting with weaning age (P=0.044) and age of mother at first pregnancy (P=0.049). Underweight was significantly associated with mother's age at first pregnancy (P=0.017). Unlike those mentioned above, wasting had no association at all.

The result obtained from my dissertation can be used by the government as well as other organizations for eradicating the malnutrition problem and motivate the people residing there to try to improve their existing poor nutritional status which can be done by improving dietary pattern of the under five children, pregnant and lactating women. This result can also create awareness of the people about the real situation of that population responsible for the prevalence of malnutrition.

References

ACF. (2013). SMART survey [Report]. MoHP.

Acharya, D., & et al. (2013). Factors Asssociated with Nutritional Status of Under Five Years Children in Rupandehi District of Nepal. Pokhara University,

Amruth, M. (2012). A study on nutritional status and risk factors for malnutrition among primary school children in sullia, Karnataka. M. D. Rajiv Gandhi University of Health Science,

Bengoa, J. (1998). The Problem of Chronic Malnutrtition.

Bhandari, T., & Chhetri, M. (2013). Nutritional status of under five children and factors associated in Kapilvastu District, Nepal. **1** (1), 5.

Bhatta, K., Mishra, S. and Gurung, G. (1998). Nutritional Status of Bishanku Narayan Village. **37**, 614-619.

Bilinsky, P. and Swindle, A. (2006). Indicator Guide [Report]. Vol. 2. FANTA. Washington DC,

Bocabo, D. (1988). Nutrition in Development In D. Dissertation, A., 1995 (Ed.), *prepared for NNC Seminar, Philippines*.

Bondal, M. (1996). A Comparison of the nutritional indices in healthy Africa, Asia and Europe children.

Burk, M. (1984). Brief introduction for food economics to nutrition *Integration Nutrition into Agriculture and Rural Development*: FAO.

Caballero, B. and Maqboal, A. (2003). International Nutrition. In W. Walker, Watkins, J.& Duggan, C. (Ed.), *Nutrition in Pediatrics* (pp. 195-204). London: BC Decker Inc.

Cameron, M. and Hofvander, Y. (1993). Manual in Feeding Infants.

CBS. (2011). National population and housing census [Report]. Central bureau of statistics. Kathmandu, Nepal,

CBS. (2015). Nepal Muliple Indicator Cluster Survey 2014 [Report]. UNICEF. Kathgmandu, Nepal,

Chandra, R. and Kumari, S. (1994). Nutrition and Immunity: An Overview. **124** (18), 1433-1435.

Chapagain, R., Adhikari, A., Dahal, R., Subedi, J., Blengro, J. and Williams, B. (2005). A study on nutritional status of under five Jirel children of eastern Nepal. **3** (2), 39-43.

Chaudhary, R., Shah, T. and Raja, S. (2011). Knowledge and Practice of Mothers regarding Breastfeeding: A Hospital Based Study. **9** (3), 7.

Chilton, M., Chyatte, M. and Breaux, J. (2007). The negative effects of poverty and food insecurity on child development. **126**, 262-272.

Davidson, C. (1992). "A Text book for Doctors and Students" (16th ed.).

Dhungana, G. (2013). Nutritional status under five children and associated factor of Kuncha Village Development Committee.

Edejer, T. and Tan, T. (1993). Cost Effectiveness Analysis of Strategies for Child Health in Developing Countries'. **331** (2005), 1177-1182.

FAO. (2009). Methods to Monitor the Human Right to Adequate Food [Report]. Vol. 2. FAO. Geneva,

Ferruzzi, M., Couloston A. and C., B. (2013). "Nutrition in the Prevention and Treatment of Disease" (2nd ed.).London.

Gartaulla, R. (1998). Improving Nutrition Education, Messages and Strategies in Nepal. Khoj-bin. 2(1).

Gharti Chhetri, P. (2005). Factors Associated with Malnutrition Among Children in Rural Terai Eastern Nepal. Master's Sree Chitra Tirunal Institute for Medical Sciences and Technology,

Glewwe, P. and Miguel, E. (2007). "Hand book of Development Economics". Oxford. UK.

Gomez, F., Galvan, R., Cuaiaton, J. and Frank, E. (1955). "Advance in Pediatrics". Vol. 7.New York.

Gopalan, S. (2000). Malnutrition: causes, consequences and solutions. **16** (7-8), 556-558.

Gopaldas, T. and Seshadari, S. (1987). "Nutrition Monitoring & Assessment". Oxford University Press.

Goto, R., Panter-Brick, C., Northrop-Clewes, C., Manandhar, R. and Tuladhar, R. (2002). Poor intestinal permeability in mildly stunted Nepali children : associations with weaning practices and Giardia lamblia infection. **88** (2), 141-149.

Griesel, R. (1986). Malnutrition in Southern Africa. University of South Africa (UNISA),

Jelliffe, D. (1966). "The assessment of the Nutritional Status of the community". World Health Organization. Geneva, Switzerland.

Katwal, H. (1992). An Area Nutritional Survey. Central Campus of Technology, Tribhuvan University,

Katwal, S. (1989). Livestock Production and its Impacts on the Nutritional Status of the People in Developing Countries.

Keller, W. (1982). Choices of Indicator of Nutritional Status

Kennedy, L. (2009). Evaluation of Dietary Diversity Scores for Assessment of Micronutrient Intake and Food Security in Developing Countries. Phd Wageningen University,

Margo, G., Brain, Y., Brindley, M., Green, R. and Metz, J. (1996). Protein Energy Malnutrition in Coloured Children in Western Township, Johannesburg Part. The Ecological Background. **50**, 1205-1209.

MoHP. (2001). Neapal Demographic and Health Survey [Report]. New ERA, Ministry of Health and Population. Kathmandu, Nepal,

MoHP. (2005). "National School Health and Nutrition Strategy in Nepal". Ministry of Health and Population

MoHP. (2011). Nepal Demographic and Health Survey [Report]. Ministry of Health and Population, New ERA, Nepal and ICF International Calverton Maryland, USA. Kathmandu, Nepal,

Naborro, D. (1984). Social Economics, Health and Environmental Determinants of Nutritonal Status. **6**.

NMIS. (1996). Nepal Multiple Indicator Surveillance, Health and Nutrition, Cycle 1 [Report]. UNICEF.

Ojha, K. (2003). An area nutrition survey of pre school children of musahar community in Narsing VDC, sunsari. Central Campus of Technology, Tribhuvan University,

Okoye, Z. (1992). "Biochemical Aspects of Nutrition" (1st ed.). Prentice Hall of India Plot. New Delhi.

Onis, M. and Habitch, J. (1997). Anthropometric reference data for international use: Recommended from a WHO Expert Committee (pp. 181).

Palermo, T., Rawat, R., Weiser, S. and Kadiyala, S. (2013). Food Access and Diet Quality Are Associated with Quality of Life Outcomes among HIV-Infected Individuals in Uganda. **8** (4).

Park, K. (2011). "Park's Text Book of Preventive and Social Medicine" (16th ed.).

Passmore, R. (1986). "Human Nutrition and Dietetics".Churchil, Livingstone.

Ramchandran, P. (1987). "In Nutrition:Monitoring and Assessment". Oxford University Press. India.

RAPA, P. (1988). Indicators for identification of nutrtition at risk communities and geographical area [Report]. RAPA, FAO. Bangkok,

Robinson, C. (1972). "Normal and Therapeutic Nutrition" (14th ed.). Willy Eastern P. Ltd. New Delhi.

Sapkota, V. and Gurung, C. (2009). Prevalence and predictors of underweight, stunting and wasting in under five children. **7** (15), 120-126.

Schmitt, B. (1979). "Nutrition Source and Their Relative Importance in Economics of Developing Countries". West View Press. London.

Scoane, N. and Lathan, N. (1971). Nutritional Anthropometry in identification of Malnutrition in Childhood.

Shah, S., Shetty, S., Singh, D., Mathias, J., Upadhaya, A. and Pandit, R. (2016). Prevalence of Undernutrition among Musahar Children Aged Between 12 To 59 Months in Urban Siraha District, Nepal. **4** (5).

Shrestha, R. (1996). A Study on Socioeconomic Status on Malnutrtition in Bungamati Village. M.A. (Sociology)

Siddiqi, E. (2011). Malnutrition of under five children. **2**, 113-118.

SR, W. (1994). "Essential of nutrition and diet therapy" (7th ed.).St. Louis, Baltimore, London.

Swaminathan, M. and Bhagavan, R. (1976). "Our Food" (3rd ed.). Ganesh and Co. Madras, India.

Thompson, P. and A., S. (2013). "Dietary Assessment Methodology" (3rd ed.). Academic Press of Imprint of Elsevier. USA.

UMN. (1995). Nutrition Program Director [Report].

UNICEF. (1996). Nepal Multiple Indicator Surveillance, Health and Nutrition, Cycle 1 [Report].

UNICEF. (2008). The State of World Children. [Report]. United Nations Children's Emergency Fund. New York, USA,

UNICEF. (2016). Breastfeeding Week Promotes Better Nutrtition and Child Health in Nepal.

UNSCN. (2006). Fact sheets on Food and Nutrition Security Indicato rs/Measures Dietary Diversity (DD) [Report]. Vol. 1. UNITED NATIONS SYSTEM STANDING COMMITTEE ON NUTRITION.

Viteri, F. (1992). Iron: Global Perspective. In Ending Hidden Hunger. Presented at A policy conference on micronutrient malnutrition. Atlanta, Georgia.

Waterlow, J. (1972). Classification and Definition of Protein Calorie Malnutrition. 566-599.

Waterlow, J. and Ruthishause, I. (1974). "Malnutrition in man -in choice of indicator of nutrtitional status". Vol. 3. Hans Huber Publisher. Vienna.

Westcott, G. and Statt, R. (1979). The extent and causes of malnutrition in children in the Golo district Transkei. **52**, 963-968.

WHO. (2016). Global Health Observatory (GHO) data. Geneva, Switzerland: World Health Organization.

Wilson, E. D., Fisher, K. H and Fungua, M. E. (1971). "Principle of nutrition" (2nd ed.). Willy eastern Pvt. Ltd. New Delhi.

Yadav, D. (1994). Nutrition Survey of Bhutneese refugee camp Beldangi ext-2, Damak Municipality, Jhapa. Central Campus of Technology, Tribhuvan University.

Appendices

Appendix-A

Consent letter

Namaste!

I, Mr. Sandeep Kumar Chaudhary, graduate student in Department of Nutrition and Dietetics conducting a dissertation work for award of bachelor's degree in Nutrition and Dietetics.

The topic for the study is "ASSESSMENT OF FACTORS AFFECTING THE NUTRITIONAL STATUS OF 6-59 MONTHS CHILDREN IN MUSAHAR COMMUNITY OF MADHELI VDC, SUNSARI".

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

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

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

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

Appendix- B

Questionnaires

Form No. | | | | | Date.....

Interviewer.....

1. Introduction

Head of household..... Tole..... Ward No.....

Respondents details Mother Father Others

Mother's name Age.....

Child's name

2. Anthropometric Measurements

Age	Sex	Weight	Height	MUAC	OEDEMA

3. Family Background

Q. No 1. Family Types

a) Single b) Joint

Q. No 2. Total family number .....

Male..... Female..... No. of under 5 years.....

Q. No 3. Mother's education level …… Class.

Q. No 4. Father s education level ……. Class.

Q. No 5. Main occupation

a) Agriculture b) Service c) Labour d) Bussiness

Q. No 6. Source of family Income

a) Agriculture b) Service c) Labour d) Business

Q. No 7. Annual Income of Family

a) Less than Rs.110,000 b) More than Rs.110,000

Q. No 8.Mother's occupation

a) Housewife b) Service c) Labour d) Business

Q. No 9. Food source

a) Self production b) From market c) other (specify)

Q. No 10. Marital status of parents

a) Together b) Separate c) No Father d) No Mother

4. Environmental and Hygiene Information

Q. No 1. Source of water for drinking

a) Tube well b) Springs c) Well d) Tap water

Q. No 2. Do you treat water before drinking?

a) Yes b) No

Q. No 3.Do you had Latrine facility?

a) Yes b) No

Q. No 4. Do you wash your hands after defecation?

a) Yes b) No

Q. How do you manage/dispose wastes?

a) Bury b) Burn c) Throwing d) In River

5. Questionnaire regarding Nutrition and Breastfeeding

Q. No 1. Do you feed colostrum to your child?

a) Yes b) No c) Not Known

Q. No 2. If yes, then when do you breastfed your children for first time after birth?

a) Within 1 hour b) Within 8 hour c) within 24 hours d) not in mind

Q. No 3. Do you feed your milk to the child?

a) No b) Yes

Q. No 4. Are you still breastfeeding your children?

a) No b) Yes

Q. No 5. If yes, how often you breastfed your child ?

……times a day.

Q. No 6. If no, How long do you breastfeed your children? .....month

Q. No 7. At what age did you wean solid and semi-solid food to your child)..... month

Q. No 8. What type of foods you feed your child? ……

Q. No 9. Do you give vitamin A and Deworming tablet supplementation to your child?

a) No b) Yes

Q. No 10. Which type salt do you use for cooking?

a) Crystal salt b) Open salt c) Iodized salt

Q. No 11. How often you feed your child any meals other than breast milk?

……..times a day.

6. Maternal and infant care information

Q. No 1. Number of pregnancies .....times

Q. No 2. Age at first pregnancy ……year old.

Q. No 3. Did you get Iron and Folic acid tablet during pregnancy?

a) Yes b) No c) Not Known

Q. No 4. Birth type of child?

a) Natural b) Surgical

Q. No 5. Serial no of child at current study……. (1st, 2nd, 3rd….)

Q. No 6. Weight of child during birth

a) Less than 2.5 kg b) More than 2.5 kg c) Not known

Q. No 7. What is the age of former child when this child born?

……..year.

Q. No 8. Who will care the child on your absence?

a) Mother/Father b) Husband c) Sister/brother d) Neighbors

e) Leave at home

Q. No 9. Did you immunize your child yet?

a) No b) Yes

Q. No 10. Does your child have any health issues?

a) No b) Yes

Q. No 11. If yes what kind of?

a) Diarrhea b) Malnutrition c) Chronic diseases like HD/Cancer/Respiratory

d) Others……..

Q. No 12. Did your child is affect by any disease during last 2 weeks?

a) No problems b) Dysentery c) Diarrhea d) ARI

e) Fever

Q. No 13. Where you look for treatment during disease state?

a) Women Health volunteers b) Dhamijhakri c) Clinics

d) Health post e) Nowhere

7. Diet related Questions:

Q. No 1. Do you face any kind of food scarcity at any time of year?

a) No b) Yes

If yes then during which month/season ……..

Q. No 2. When do you wash vegetables?

a) After cutting b) Before cutting

Q. No 3. What do you do with the water used to boil or soak rice?

a) Used in cooking b) Discard

Q. No 4. Food fads in community if any ……

Q. No 5. Do you have kitchen garden?

a) No b) Yes

Within 7 days how many times did you feed your child? ……..

Food Frequency Table

S.N	Food	Frequency	SN	Food	Frequency
1	Cereals (Rice/bread/maize/lito/ khichadi/ pudding/ biscuit/noodles etc)		7	Fish and crab	
2	Root and tubers (potato/ sweet potato/ yam/ githa/ Pidalu etc.)		8	Legumes and pulses (Bhatmas, chana/ moong/ lentil/ pea/ rahar etc.)	

3	Green leafy vegetables and other vegetables (Rayosaag,/ Spinaich/ Kholesaag/ cauliflower/ cabbage/ bottle guard/ash guard/ pumpkin/ bodietc)		9	Milk and milk products(Milk/curd/yoghurt /paneer/mohi etc.)	
4	Fruits (Papaya/ banana/ pomogranate/ grapes/ gauva/ orange/ bhogate etc.)		10	Oil, Ghee, fat etc.	
5	Meat (chicken/ goat/ buffalo/ pig/ duck/ pigeon etc.		11	Sugar/honey etc.	
6	Egg		12	Others (Tea/ coffee/ beverages)	

For calculation of IDDS

……..

Thanks for giving interview.

Supervisor Signature

.....

Appendix- C

Consent from NHRC

Government of Nepal

Nepal Health Research Council (NHRC)

Estd. 1991

Ref. No.: 1393.

04 March 2016

Mr. Sandeep Kumar Chaudary
Principal Investigator
Central Campus of Technology
Dharan

Ref: **Approval of Research Proposal** entitled **Assessment of factors affecting the nutritional status of 6 to 59 months of children in Musahar Community of Madheli VDC,Sunsari**

Dear Mr. Chaudary,

It is my pleasure to inform you that the above-mentioned proposal submitted on 26 January 2016(**Reg. no. 21/2016** please use this Reg. No. during further correspondence) has been approved by Nepal Health Research Council (NHRC) National Ethical Guidelines for Health Research in Nepal, Standard Operating Procedures Section 'C' point no. 6.3 through Expedited Review Procedures.

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol.

If the researchers require the transfer of bio-samples to other countries, they should apply to the NHRC for permission. The researchers will not be allowed to ship any raw/crude human biomaterial outside the country; only extracted and amplified samples can be taken to labs outside of Nepal for further study, as per the protocol submitted and approved by the NHRC. The remaining samples of the lab should be destroyed as per standard operating procedure, the process documented, and the NHRC informed.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and submit progress report and full or summary report upon completion.

As per your research proposal, the total research amount is **Self-funded** and accordingly the processing fee amounts to **NRs-1,000.00**. It is acknowledged that the above-mentioned processing fee has been received at NHRC.

If you have any questions, please contact the Ethical Review M & E Section at NHRC.

Thanking you,

Dr. Khem Bahadur Karki
Member- Secretary

Appendix- D

Maps of Madheli VDC

Appendix- E

Photo Gallery

1

2

3

4

Index

1. Weight measurement

2. Asking questions

3. Height measurement

4. MUAC measurement