NUTRITIONAL ASSESSMENT AND ITS ASSOCIATED FACTORS AMONG 6-59 MONTHS CHILDREN IN *DALIT* COMMUNITY OF BAGCHAUR MUNICIPALITY, SALYAN

by

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Nutritional assessment and its associated factors among 6 to 59 months children in *Dalit* community of Bagchaur municipality, Salyan.

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Approval letter

This dissertation entitled Nutritional assessment and its associated factors among 6-59 months children in Dalit community of Bagchaur municipality, Salyan; presented by Kushma Gautam has been accepted as the partial fulfillment of the requirements for the Bachelor degree in Nutrition and Dietetics.

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Abstract

The study was conducted to assess the nutritional status of 6-59 months children of Bagchaur, municipality and to find out the factors associated with it. A community based cross sectional descriptive study was conducted on children aged 6-59 months for assessing the nutritional status and factors associated with it in Bagchaur municipality. A sample of 205 children were selected from the 4 wards of a municipality and 4 wards were selected using simple random sampling. Anthropometric measurements were then used to determine if children were underweight (weight-for-age), wasting (weight-for-height) and stunting (height-for-age) based on WHO reference. Statistical Package for the Social Sciences (SPSS) 20.0 version and World Health Organization (WHO) Anthro 3.2.2 version were used for analyzing the data. Chi-square test was used to identify the associated factors of malnutrition.

This study revealed that, 51.2%, 20.5% and 7.3% of children were stunted, underweight and wasted, respectively. The main associated factors of wasting were found to be caste ($p=0.017$) and immunization ($p=0.013$). Underweight was found associated with family occupation ($p=0.049$) and religion ($p=0.029$) was found associated with stunting. From the findings of this study, it is concluded that malnutrition is still an important problem among children aged 6-59 months. Therefore, special attention should be given on intervention of malnutrition.

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Abbreviations	Full Form
CBS	Central Bureau of Statistics
DWO	Dalit Welfare Organization
ILO	International Labor Organization
FAO	Food and Agriculture Organization
FANTA	Food and Nutrition Technical Assistance
HAZ	Height for Age Z Score
IDA	Iron Deficiency Anemia
IDD	Iodine Deficiency Disorder
IDDS	Individual Dietary Diversity Score
LBW	Low Birth Weight
MOHP	Ministry of Health and Population
MUAC	Mid Upper Arm circumference
NDC	Nepal Dalit Commission
NDHS	National Demographic and Health Survey
NLSS	Nepal Living Standards Survey
PEM	Protein Energy Malnutrition
RDA	Recommended Dietary Allowance
SAM	Severe Acute Malnutrition
UNICEF	United Nations International Child Emergency Fund
VAD	Vitamin A deficiency
WAZ	Weight for Age Z Score
WHO	World Health Organization
WHZ	Weight for Height Z Score

Part I

Introduction

1.1 Background of the study

Nepal is one of the least developed nation in the world, which was ranked 145 among 188 nations in the Human Development Index (Jahan and Jespersen, 2015). It has a total land area of 147, 181 Sq. Km with the total population 26,494,504. More than 83% of population resides in rural area. The infant and under five mortality rates are 64.2 and 91 per 1000 respectively. The population growth rate in 2011 is 1.41 % (MOHP, 2011).

Nepali society is multiethnic, multi-religious, multicultural and multilingual. Caste is hierarchical differentiation of ritual status. Caste groups of Nepal are belonging to the Indo-European cultural orientation and occupying both uppermost (Brahmins, Chhetris and certain Newar groups) and bottommost (*Dalit* groups) rung in the caste hierarchy. *Dalits* are the de facto 'untouchables' of contemporary Nepal who are religiously, culturally, socially, economically, educationally and historically oppressed and are deprived of human dignity and social justice (ILO, 2005b). *Dalits* comprise 13.2% of the total 26,494,504 population of Nepal (Central Bureau of Statistics-CBS, 2011). There are 26 castes under *Dalit* including 7 Hill *Dalit* castes and 19 Terai/ Madhesi *Dalit* castes. Hill *Dalit*s are Badi, Pariyar (*Damai, Dargee, Suchikar, Nagarchee, Dholee, Hudke*), Gandharva (*Gaine*), Bishwokarma (*Kami, Lohar, Sunar, Od, Chunanra, Parki, Tamata*), Mijar (*Sarki, Charmakar, Bhool*), Pode (*Deula, Pujari, Jalari*), Chyame (*Kuchikar, Chyamkhal*). Terai *Dalit*s are Bantar, Chamar (*Ram, Mochi, Harijan, Ravidas*), Chidimar, Dhobi (*Rajak*), Dom (*Marik*), Dusadh (*Hajara, Paswan*), Dhandi, Dhankar/Dharikar, Halkaihiya, Kakaihiya, Kalar, Khatwe (*Mandal, Khang*), Kori, Tatma (*Tanti, Das*), Mushar, Mestar, Natuwa, Pasi and, Sarbhang (*Sarbariya*) (NDC, 2014).

Salyan is a "hill" district some 320 km west of Kathmandu in Rapti Zone of Nepal's Mid-Western Region. It covers an area of 1,462 km² with a population of 241,716 and 46,524 total households (CBS, 2011).

The best global indicator of children's well-being is growth. Nutritional status of children is a proxy indicator for assessing the entire population health status and one of the

major predictors of child survival. Despite the various efforts, malnutrition among children is remaining as a major public health problem in Nepal.

Malnutrition is widely prevalent in many parts of the world. Malnutrition especially under nutrition is the most serious human health and social problems that affect the majority of the population of the developing country like Nepal. Malnutrition is associated with infection and its complex links with fertility, family size, physical and mental growth and development and immunity mechanism of the body is certainly new dimension (Gartoulla, 1998). Malnutrition is an important factor contributing to illness, diseases and death. Malnutrition during childhood can also affect growth potential and the risk of morbidity and mortality in three quarters are linked to mild and moderate forms. Globally 165 children (26%) under 5 age are stunted, 101 million (16%) are underweight, 52 million are wasted, 43 million (7%) are overweight and 20 million (15%) are low-birth weight (UNICEF, 2013a).

1.2 Statement and justification of a problem

Malnutrition is a complex condition that can involve multiple, overlapping deficiencies of protein, energy and micronutrient because they are nutrients needed by the body in only tiny amounts. A child becomes malnourished because of illness in combination with inadequate food intake. Insufficient access to food, poor health services, the lack of safe water and sanitation, and inadequate child and maternal care are the major causes (UNICEF, 2013).

In the present context of Nepal, malnutrition among the victimized and disadvantaged *Dalit* children is more common than any other caste groups. The socio-culturally-constructed caste structure has so much concretized that, today, it can independently lead entire groups of people into situations of lower opportunities and reduced life chances, and subsequently into poverty and deprivation (ILO, 2005a). The people belonging to the so-called *Dalit* groups tend to be poor because of their relative low access to opportunities and resources which independently lead entire group into reduced life chances and subsequently into deprivation and malnutrition as compared to those belonging to the so-called upper castes (DWO, 2010).

The literacy rate of *Dalits* is 52.4% compared to the national average of 65.9% and it is 34.5% for Terai /Madhesi *Dalit.* Only, 24.7% of Hill *Dalits* and 11.8% of Terai/Madhesi *Dalits* complete 8th grade which is far behind the national average 41.7%). *Dalits* comprise only 1.6% of those with a SLC and above; and only 0.8% of those with a Bachelors' degree. The low educational status has a multifaceted impact in the socio-economic status of *Dalits*. Women from Musahar and Dom community are at the bottom with literacy rates of 17.4% and17.9% (CBS, 2011a).

As of Nepal Living Standards Survey, *Dalits* comprise the poorest community in Nepal, in terms of all poverty measures – income, consumption and human development. A total of 42% of *Dalits* fall below the poverty line which is 17% higher than that of the national average (25.2%) 22. Among the *Dalits* of both Hill and Madhesi origin, every two in five persons are poor (CBS, 2011b). Also, *Dalits* land holdings are small; 36.7% Hill and 41.4% Madhesi *Dalits* are landless (Gurung *et al.*, 2012). 42.5% Terai/Madhesi *Dalits* earn their livelihood from elementary occupations(Das *et al.*, 2014). The food sufficiency for Hill *Dalits* and Terai/Madhesi *Dalits* is 56.0% and53.7% respectively. The lack of access to agricultural land and employment opportunities result in extreme poverty and put *Dalits* in the lowest food sufficiency status which violates their right to food and cannot feed their children. Due to the lack of education, the practice of child marriage and early pregnancy has worsened the health problems for *Dalit* women. The girls who get married before 15 years of age ranges up to 62% among *Dalit* groups and the child born from such mother will definitely have high rate of low nutritional status. Discrimination in access to health service is a major issue in enjoying the right to health. 14.6% of Hill *Dalits* experience discrimination when receiving medical treatment during the pregnancy period (Das *et al.*, 2014).

Lack of diversity in food is a particularly severe problem among poor populations and esp. among *Dalits* in Nepal, where diets are based predominantly on starchy staples and often include few or no animal products and only seasonal fruits and vegetables. Micronutrient malnutrition remains a problem of public health concern in Nepal, partly due to monotonous, cereal-based diets that lack diversity. For vulnerable infants and young children, the problem is particularly critical because they need energy- and nutrient-dense foods to grow and develop both physically and mentally and to live a healthy life. Due to

the low diversification in food groups, the child might not get sufficient nutrient for the growth, on the other hand they become malnourished (Arimond and Ruel, 2004b).

The study place, Bagchaur municipality lies in the hill mid-western region of Nepal. No study has been done to assess the nutritional status till now in this region. This *Dalit* community still remains untouchable, victimized, uneducated, unemployed, below the poverty line and lacking in all the resources. Thus there was a need to determine the current nutritional status and associated factors. Therefore the present study is designed to assess the nutritional status of children ages 6-59 months of Bagchaur municipality, Salyan and can be used as in priority setting and designing effective nutritional program for affected children.

1.3 Objectives of the study

The general objective of this study is to assess the nutritional status among 6-59 months *Dalit* children in Bagchaur municipality of Salyan district.

The specific objective of this study is to identify the associated factors that is directly or indirectly responsible for malnutrition among *Dalit* children.

1.4 Research questions

What are the underlying factors that are associated with malnutrition on the children of particular age group residing in these living areas and what parameters are responsible to induce low food availability in household level to cause malnutrition in child.

1.5 Significance of the study

The significance of the study are to:

a. To map out the magnitude and distribution of malnutrition in *Dalit* caste and to analyze the responsible factors.
b. To identify the individual or population group who are at the risk of being malnourished.
c. To identify the facts with accordance of religion, ethnicity, livelihood, culture, faulty food habits etc which contribute to the poor nutritional status of *Dalit* children.

d. Serve as a helpful guide to implement nutritional, health and food related programme on *Dalit* community.
e. Help local bodies (VDC's, health posts and child care agencies) by providing the information regarding the nutritional condition and corrective measures to initiate approaches on treating malnutrition.

1.6 Limitations of the study

a. Study was cross sectional so it may not represent seasonal variation of nutritional outcomes.
b. Quantity of food consumed was not taken in account while measuring IDDS (Individual Dietary Diversity Score).

1.7 Assumptions

It is assumed that the prevalence of malnutrition below 5 years aged in Bagchaur municipality is high. Low economic status, high illiteracy, low maintenance of hygiene & sanitation, untreated & infectious diseases, improper breast feeding, household food insecurity, Lack of women's control of resources and caring capacity, famine: are assumed to be the underlying causes of malnutrition.

Part II

Literature review

2.1 Nutritional status

Nutrition is the intake of food, considered in relation to the body's dietary needs. Good nutrition – an adequate, well balanced diet combined with regular physical activity – is a cornerstone of good health. Good nutrition is fundamental for children's current and future health as well as their development and learning. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity (WHO, 2016a).

Nutritional status is the condition of health of the individual as influenced by the utilization of nutrient. The spectrum of nutritional status spread from obesity to severe malnutrition. The 3 most widely used indicators to assess the nutritional status of children are stunting, wasting and underweight (WHO 1995). In combination, these 3 indicators indicates both current and past under nutrition or of current status of obesity. These indices alone do not provide insights into underlying causes – in particular, whether the risk of malnutrition originates from food or non-food factors or both. The nutritional status of children under age 5 is an important measure of children's health. The measurement of anthropometry and evaluation of nutritional status allows identification of subgroups of the child population that are at increased risk of faltered growth, disease, impaired mental development, and death.

2.1.1 Nutrition status of children in Nepal

Nepal Demographic and Health Survey (NDHS) reports 29 % children are under weight (less weight as per age), 41 % stunted(less height as per age) and 11 % wasted (less weight as per height) 12% of the child are born low birth weight (MOHP, 2011).

Among 41% stunted, 16 % are severely stunted. Stunting is highest (53 %) in children age 36-47 months and lowest (14%) in children age 9-11 months. Stunting is slightly higher in male children (41%) than in female children (40%). Children in rural areas are more likely to be stunted (42%) than those in urban areas (27 %). Among the development regions, stunting is highest among children in the Mid-western region (50%). Children in

households with food security (33%) are less likely to be stunted than children in households with mild food insecurity (41%), moderate food insecurity (46%), and severe food insecurity (49%) (MOHP, 2011).

Among 11% wasting, 3 % are severely wasted. Wasting is highest (25 %) in children age 9-11 months and lowest (7%) in children age 36-47 months. Male children are more likely to be wasted (12%) than female children (10%)**.** Children born to mothers who are thin (BMI < 18.5) are 2.5 times more likely to be wasted than those born to mothers who are overweight/obese (BMI ≥ 25). Children residing in urban areas are less likely to be wasted (8%) than children in rural areas (11%). Wasting in children does not vary markedly by ecological zone or development region (MOHP, 2011).

Twenty nine % of children under age 5 are underweight (low weight-for-age), and 8 percent are severely underweight. The proportion of underweight children is highest (37%) among those age 18-23 months and lowest (18%) among those under 6 months. Male children are slightly more likely to be underweight (30%) than female children (28%). Rural children are more likely to be underweight (30%) than urban children (17%). Children living in the mountain zone are more likely to be underweight (36%) than those in the Terai (30%) and Hill zone (27%). The Mid-western region has the highest percentage of underweight children (37%), while the Western region has the lowest (23%). Children in the poorest households are four times as likely to be underweight (40 %) as children in the wealthiest households (10%) (MOHP, 2011).

Forty six percent of children in Nepal are anemic; 27 % are mildly anemic, 18 % are moderately anemic, and less than 1% are severely anemic. The prevalence of anemia among children under age 5 has declined by only 2 % points in the past five years. The proportion with anemia is higher among children age 6-17 months (72-78%) than among children in other age groups. Male children and children residing in urban areas are less likely to be anemic. Children in the Terai are more anemic (50%) than children in the Hill zone (41%). The prevalence of anaemia among children under 5 has declined by 2% in the past years (MOHP, 2011).

On increase in age, risk of stunting also increases. Socioeconomic status is most important factors associated with stunting, underweight and wasting. Meeting minimum

dietary diversity, minimum meal frequency and minimum acceptable diet were associated with better nutritional status of children (Ruwali, 2011).

2.1.2 Trends in children's nutritional status of Nepal

In general, the nutritional status of children in Nepal has improved over the past 10 years. There is a downward trend in stunting and underweight over time. The percentage of stunted children declined by 14% between 2001 and 2006 and declined by an additional 16 % between 2006 and 2011. A similar pattern is observed for the percentage of underweight children, which dropped by 9 % between 2001 and 2006 and by 26 % between 2006 and 2011. Similarly, wasting has declined by 15 % between 2006 and 2011 (MOHP, 2011).

Fig 2.1 Trends in children nutritional status of Nepal

2.1.3 Factors affecting nutritional status

Nutritional status of children is affected by the education level of mother. Almost half of the children born from illiterate mother have malnutrition. Mother's age (maternal age more than 35 years and below18 years pregnancy), parting, type of family and children's immunization status are also the key factors affecting the nutritional status (Acharya *et al.*, 2013).

Maternal use of time has direct relationship with a child's health and nutritional status. Participation of the principal caretakers (mothers) in economic activities outside the household and spending less time cooking and feeding their children during the peak labor seasons could have a negative effect on child nutrition, as child receives less intensive care (Ricci JA, 1996).

Unsatisfactory exclusive breastfeeding practices, lack of extra food intake during pregnancy & lactation, inappropriate supplementary & complementary feeding bottle feeding practices and mother's food security are also the responsible factors (Arimond and Ruel, 2004).

Besides these above, there are many other factors that influence the nutritional status some of which are food availability and its distribution system, consumption of food, income source and purchasing power, family size, sociocultural & religious belief, environmental sanitation & health facility, care practices, food habits, caste inequality and political situation of the country.

2.1.4 Food availability and nutritional status

Availability refers to the physical availability of food stocks in desired quantities in any location within a nation (Swaminathan and Bhavani, 2013). Dietary intake aggregates within families and individual behaviors are greatly influenced by characteristics within the family which strongly correlates the home availability of foods (Boutelle *et al.*, 2006).

The nutritional status of each member of the household depends on several conditions being met: the food available to the household must be shared according to individual needs; the food must be of sufficient variety, quality and safety; and each family member must have good health status in order to benefit from the food consumed (FAO, 2010).

Good health depends on an adequate food supply and this in turn on sound agricultural policy and a good system of food distribution. The food supply determines the status of health and the incidence of disease amongst a population. If the food supply is inadequate to the physiological needs, malnutrition and under nutrition could result (Gyawali, 2002).

2.2 Nutritional requirements

Nutritional requirement is defined as the lowest amount of intake of a nutrient that will maintain a defined level of nourishment for a specific indicator of adequacy. Requirements are different for each nutrient and also vary between individuals, environmental conditions and life stages, e.g. women of childbearing age and children need more nutrients (Jones and Varady, 2008).

The Recommended Daily Allowance (RDA) per day of nutrients for 1-5 years children is shown in table below:

Table 2.1 RDA per day for 6 months to 6 years children.

NUTRIENTS	**YEARS**		
	6-12 months	1-3 years	4-6 years
Calories (kcal)	80	1060	1350
Protein (gm)	1.69	16.7	20.1
Fat (gm)	19	27	25
Calcium (mg)	500	600	600
Iron (mg)	5	9	13
Vitamin A(µg)	350	400	400
Thiamine (mg)	0.3	0.5	0.7
Riboflavin (mg)	0.4	0.6	0.8
Nicotinic acid(mg)	650	8	11
Pyridoxine(mg)	0.4	0.9	0.9
Ascorbic acid(mg)	25	40	40
Folic acid (µg)	25	80	100
Vitamin B12 (µg)	0.2	0.2-1	0.2-1

Source: (ICMR, 2010)

Each nutrient has a particular series of functions in the body and some nutrients are needed in larger quantities than others. For example, protein is needed in gram (g) quantities. Vitamin C is needed in milligram (mg) quantities and vitamin B_{12} is needed in microgram (µg) quantities.

2.3 Malnutrition

For proper growth and development, every organism requires an adequate amount of nutrients in proper proportion in their diet. If a person takes excessive or deficient or if there is any imbalance in the body, it causes nutritional disorders. Malnutrition refers to the term under nutrition, over nutrition and imbalance but here we use the term to refer solely to a nutritional deficiency which may be both quantitative and qualitative. Although it is rarely the direct cause of death (except in extreme situations, such as famine), child malnutrition was associated with 50% of child deaths (Rajalakshmi, 1987).

Undernutrition is a state of nutrition where the weight for age, height for age and weight for height indices are below -2 Z-score of the NCHS reference. Malnutrition not only affects mortality and morbidity figures but also physical growth and intellectual development; school performance; effectiveness of education; productivity of labor; and virtually all aspects of social and human development. Nepal, one of the least developed countries, suffers from extensive malnutrition. It is ranked in the top 10 countries with the highest prevalence of stunting (less than -2 SD scores) and the top 20 countries by number of stunted children less than five years of age worldwide (UNICEF, 2009).

Undernutrition is defined as a pathological state resulting from a relative or absolute deficiencies or excess of one or more essentials nutrients. More recently malnutrition is defined as an unintentional weight loss of more than 10 percent, associated with a serum albumin below 3.2g/dl (Joshi, 2015)

A child is likely to suffer from malnutrition if, (Adhikari and Krantz, 2013a)

- The mother is not able to breast fed the child.
- The child is given complementary food late or too early.
- If the child is born with a low birth weight.
- The child was born as a twin or after multiple births.

- The family is very poor and has no access to adequate to food.
- The youngest child in a family with large number of children.
- The child suffers frequently from infections like acute respiratory infections which will cause fever, inability to feed and loss of appetiate.

2.3.1 Malnutrition and child growth

Infants and young children are the most vulnerable because of their high nutritional requirements for growth and development. Malnourished pregnant women when gives birth to a LBW baby, those babies are also prone to growth failure during infancy and early childhood, and be at increased risk of morbidity and early death.

Growth assessment is the single measurement that best defines the health and nutritional status of a child, because disturbances in health and nutrition, regardless of their etiology, invariably affect child growth. Children who suffer from growth retardation as a result of poor diets and/or recurrent infections tend to have more frequent episodes of severe diarrhoea and are more susceptible to several infectious diseases, such as malaria, meningitis, and pneumonia. In addition, there is strong evidence that impaired growth is associated with delayed mental development, poor school performance, and reduced intellectual capacity.

The evidence accumulated in the WHO Global Database on Child Growth and Malnutrition permits an accurate description of the magnitude and geographical distribution of childhood under- and over nutrition worldwide. Analyses based on the database's information confirm that child undernutrition remains a major public health problem in many countries, and continues to hamper children's physical growth and mental development. Indeed, it is a major threat to their very survival (Onis and Blossner, 2003).

2.3.2 Malnutrition and infection

Malnutrition can make a person more susceptible to infection, and infection also contributes to malnutrition, which causes a vicious cycle. An inadequate dietary intake leads to weight loss, lowered immunity, mucosal damage, invasion by pathogens, and impaired growth and development in children. A sick child's nutrition is further aggravated by diarrhea, malabsorption, loss of appetite, diversion of nutrients for the immune

response, and urinary nitrogen loss, all of which lead to nutrient losses and further damage to defense mechanisms. These, in turn, cause reduced dietary intake. In addition, fever increases both energy and micronutrient requirements. Five infectious diseases—pneumonia, diarrhea, malaria, measles, and AIDS— have high mortality rates proportionate to the degree of malnutrition in children aged <5 years.

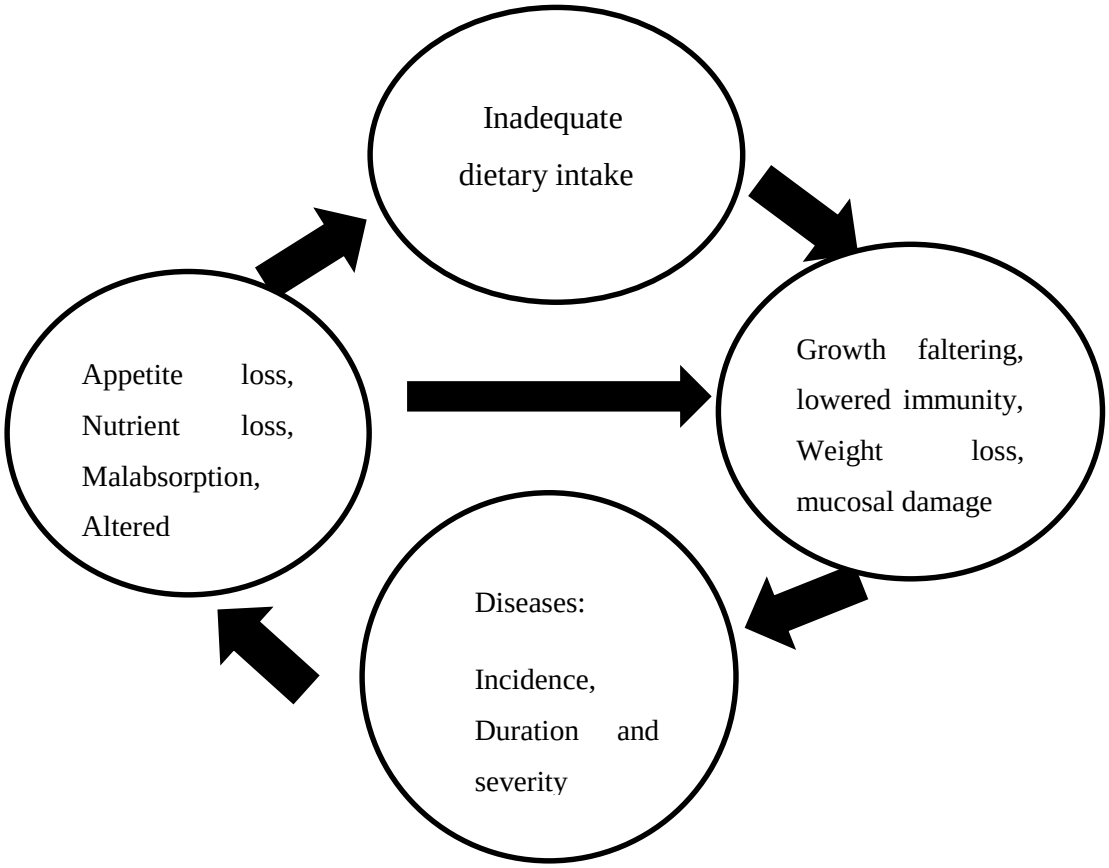

Fig 2.2 Vicious cycle of infection and malnutrition (Katona and Kotana, 2008).

2.3.3 Malnutrition and mental development

The effects of malnutrition on the brain encounter severe difficulties. When child is malnourished, there is deficit in total number of cells in the brain. There is much great cell deficit in physical structure of the fastest growing regions, predominantly in the cerebellum (Brainerd and Menon, 2015).

The vulnerability of the growing brain to periods of malnutrition is high. The period of growth of human brain corresponding to a vulnerable period would seem to extend from about mid-pregnancy to 2nd birthday, when large number of components are being formed

and assembled. Anatomic abnormalities that occur in malnutrition are neuropsychological deficit where there is shorter apical dendritic spine in the neurons as well as reduced number of dendrites (Ghosh *et al.*, 1979).

The stunting of brain growth condemns the victims of malnutrition to a lifetime of failure of learning, academic performances, professional achievements and psychological resilience. Similarly those children who have recovered from severe malnutrition proved much inferior to normal well-nourished of the same age group with respect to their mental development and learning capacity (Ghosh *et al.*, 1979).

2.3.4 Conceptual framework

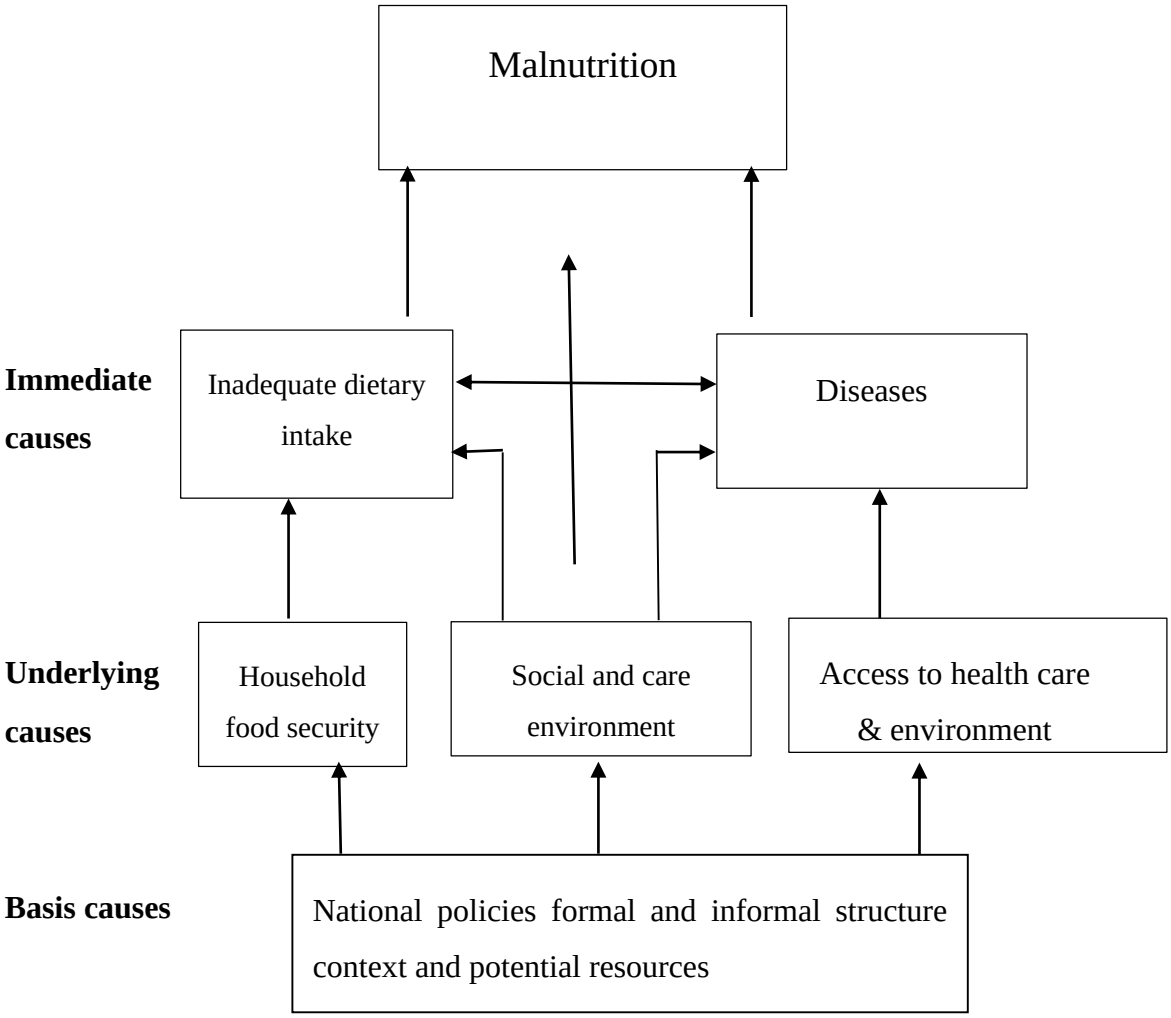

Fig 2.3 A conceptual frame work of malnutrition (UNICEF, 2015).

UNICEF identified the causes of malnourishment in three types/categories: immediate, underlying, and basic causes, as presented in Fig 2.3. UNICEF's framework attempts to capture several issues, ranging from household level factors—dietary intake, occurrences of diseases, access to food, child feeding and caring practices—to more macro-level factors such as insufficient health facilities and unhealthy environment. Similarly, the framework also touches upon political and economic structure, and their possible negative/positive implications through various macro and household-level factors.

a. Immediate causes

The most significant immediate causes of malnutrition - inadequate dietary intake and illness -- tends to create a vicious circle: A malnourished child, whose resistance to illness is compromised, falls ill, and malnourishment worsens. Children who enter this malnutrition-infection cycle can quickly fall into a potentially fatal spiral as one condition feeds off the other.

Malnutrition lowers the body's ability to resist infection by undermining the functioning of the main immune-response mechanisms. This leads to longer, more severe and more frequent episodes of illness. Similarly, Infections cause loss of appetite, malabsorption and metabolic and behavioral changes. These, in turn, increase the body's requirements for nutrients, which further affects young children (Annan, 1998).

b. Underlying causes

(Woodruff *et al.*, 2009) explained major underlying causes of malnutrition as follows:

- **Household food insecurity**: Non-availability of food in markets, difficult access to markets due to lack of transportation, and insufficient financial resources are all factors contributing to the food insecurity of the most vulnerable populations.
- **Poor social and care environment**: The poor infant feeding practices, poor home care for ill children and poor health care seeking behavior increase the risk of malnutrition.
- **Poor access to health care and unhealthy environment**: Diseases which are known to have substantial and rapid impact on nutritional status, such as dysentery

and pneumonia and many such diseases, also poor hygiene and sanitation can produce rapid weight loss in children and affect nutritional status.

c. Basic causes

The basic causes of malnutrition in a community originate at the regional and national level, where strategies and policies that affect the allocation of resources (human, economic, political and cultural) influence what happens at community level. Geographical isolation and lack of access to markets due to poor infrastructure can have a huge negative impact on food security (Gillespie and Haddad, 2003).

2.3.5 Forms of malnutrition

2.3.5.1 Undernutrition

Undernutrition is defined as the outcome of insufficient food intake or eating enough food for energy but choosing foods that lack certain nutrients and repeated infectious diseases. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition) (UNICEF, 2006).

2.3.5.2 Over nutrition

It is the pathological state resulting from consumption of too many nutrients and too much energy compared with DRI (Dietary Recommended Intake) levels over the extended period of time (Grodner *et al.*, 2012).

2.3.5.3 Imbalance

It is a state of nutritional deficiency or excess which occurs when nutrient intake does not match an individual's requirement for optimal health.

2.3.5.4 Specific deficiency

It is pathological state resulting from relative or absolute lack of an individual nutrient. Nutritional deficiency also occurs when the body cannot absorb necessary amount of nutrient. Some common nutrient deficiency diseases are iodine deficiency disorder, iron deficiency anaemia, vitamin A deficiency, calcium deficiency (Hambridge, 2000).

2.4 Nutritional disorders

2.4.1 Protein energy malnutrition (PEM)

Protein energy malnutrition (PEM) is a potentially fatal body-depletion disorder, characterized by dietary deficiency of proteins and total food calories. At any time, approximately 100 million children suffer from the moderate or severe forms of PEM which is currently the most widespread and serious health problem in the world. In Nepal 3.5% of the children are suffering from severe PEM and 80%-90% are suffering from mild to moderate PEM. PEM is one of the direct causes of death (Onyango *et al.*, 1998).

2.4.1.1 Classification of Protein energy malnutrition

a. Kwashiorkor

Kwashiorkor, also known as "edematous malnutrition" or "wetprotein-energy" malnutrition because of its association with edema (fluid retention), is a nutritional disorder primarily caused by a lack of protein in the diet. People suffering from kwashiorkor typically have an extremely emaciated appearance in all body parts except their ankles, feet, and belly, which swell with fluid. This condition usually appears at the age of about 1 to 3 years when the infant is weaned and breast milk is replaced with a diet low in protein (Anonymous, 2015).

The common features of kwashiorkor includes (Adhikari and Krantz, 2013b).

- Pigmentation, scaling and shredding of skin. Usually these changes are seen over the buttocks, perineum and upper thighs
- Cracking of lips, soreness at the corner of the mouth and smoothness of the tongue.
- Prominent gastrointestinal symptoms such as loss of appetiate, nausea, vomiting and diarrhoea.
- Mental changes and intermittent crying.
- Child may be anemic, have poor circulation and vitamin A deficiency.
- Muscles wasting and apathy.

b. Marasmus

Marasmus is the result of calorie deprivation and is more common between 9 months to 3 years of age. It is characterized by decreased anthropometric measurements and is usually well tolerated in the absence of stress, unless it is severe. Failure to gain weight due to the marked loss of subcutaneous fat may result in emaciation and loss of skin turgor. General body functions decrease as indicated by a subnormal temperature, decreased pulse and metabolic rate, and constipation. Starvation diarrhea (frequent small stools containing mucus) and respiratory illness may be present (Castiglia, 1996).

c. Marasmic kwashiorkor

The severely malnourished children shows mixed clinical features of marasmus and kwashiorkor. They are severely underweight (below 60% of the expected weight) but also have oedema. Children with marasmus may rapidly deteriorate, especially if they develop an infection, and present with oedema to become marasmic kwashiorkor (Adhikari and Krantz, 2013c).

2.4.2 Disorders due to specific nutrient deficiency

2.4.2.1 Vitamin A deficiency (VAD)

VAD is mainly caused due to the inadequate dietary intake of vitamin A or beta-carotene. VAD lowers the resistance against infection; anorexia; growth retardation; thick, teared, dry, lusterless skin; impaired embryo development; spontaneous abortion and changes in epithelial tissues.

Following are the ocular manifestations that may cause due to the VAD; (Bansal, 2010).

- Night blindness: This means inability to see in dim light, especially on entering a dark room from bright place.
- Conjuctival xerosis: Dryness of conjuctiiva with muddy and wrinkled appearance.
- Bitot's spot: A tiny triangular shiny gray, foamy spots on the bulbar conjunctiva on either side of the cornea.
- Corneal xerosis: Dull and dryness of cornea, not having a moist appearance.

- Keratomalacia: Liquefaction of the cornea. Whole or a part of the cornea become soft and burst may open, and then if eye collapses, vision is lost.

2.4.2.2 Iodine deficiency disorder (IDD)

Inadequate iodine intake and absorption leads to insufficient production of thyroxin and tri-iodothyronine hormones, which in turn negatively affects various organ and muscle functions, particularly the heart, liver, kidneys and most devastatingly, the developing brain. Insufficient iodine during the prenatal period and the first few years of life can result in irreversible brain damage, and is considered to be the major cause of preventable mental retardation iodine deficient children will be poorly equipped to fight disease and to learn, and will become adults who are unable to work effectively. The severity of iodine deficiency-related brain damage varies from mild intellectual blunting to frank cretinism, a condition that includes gross mental retardation, deaf-mutism, short stature, and various other physical and mental defects. The other most visible and well-known sign of iodine deficiency is goiter. Small goiters cannot be detected clearly without an examination of the front of the neck, whereas larger goiters are obvious and unsightly lumps that can be seen easily (UNICEF, 2002).

2.4.2.3 Iron deficiency anaemia (IDA)

In iron deficiency, ferrous iron, which is necessary in the formation of haem is insufficient. Due to the inadequate availability of haem, it cannot combine with globin to form haemoglobin. Hence, iron deficiency anaemia is characterized by a mark reduction (5-7g %) of haemoglobin from the normal levels of 11-13g %. Paleness of the skin, eye, nails; angular stomatitis; glositis; palpitation; breathlessness; koilenchia are the marked symptoms of IDA (Swaminathan, 2008a).

Although the cause of IDA among young children can be multifactorial, the consumption of foods with low bioavailable iron is likely the primary contributing factor. Before 24 months of age, rapid growth coincident with frequently inadequate intake of dietary iron places children at the highest risk of any age group for iodine deficiency. In full-term infants, the iron stores can meet the iron requirements until ages four to six months, and IDA generally does not occur until approximately nine months of age. Comparatively, preterm and low-birth-weight infants are born with lower iron stores and

grow faster during infancy. Consequently, their iron stores are often depleted by two to three months of age and they are at greater risk for iodine deficiency. After 24 months of age, the growth rate of children slows and the diet becomes more diversified, the risk for iodine deficiency drops. After 36 months of age, dietary iron and iron status are usually adequate; however, risks for iodine deficiency include limited access to food, a low-iron or other specialized diet, and medical conditions that affect iron status (e.g., malaria or parasitic infections) (Abdullah *et al.*, 2011).

2.4.2.4 Zinc deficiency

Zinc is a trace mineral essential to all forms of life because of its fundamental role in gene expression, cell development and replication. Zinc is an important micronutrient that affects both non-specific and specific immune function at a variety of levels and essential in many enzyme actions (Onyemaobi and Onimawo, 2011). Zinc deficiency is largely related to inadequate intake or absorption of zinc from the diet, although excess losses of zinc during diarrhoea may also contribute (Hambridge, 2000).

Severe Zn deficiency in infancy and childhood are rare but mild deficiency in infancy and childhood is not uncommon. Growth failure is the most prominent clinical feature of mild Zn deficiency but impairments in body composition, loss of taste acuity, loss of appetite, weak immune function, and dark adaptation, lightened pigment in hair, white spot on fingernails and delays in secondary sexual maturation are important features of zinc deficiency. Growth failure is also a characteristic feature of childhood growth patterns attributed due to deficits in energy and/or protein (Gibson, 1994). Malnourished children with diarrhea esp. those with kwashiorkor and marasmus are often lacking in zinc (Adhikari and Krantz, 2013).

2.4.3 Child overweight and obesity

Childhood obesity is a serious medical condition that affects children and occurs when a child is well above the normal weight for his or her age and height. When weight-for-height is more than 2SD and 3SD above WHO Child Growth Standards median, child is categorized as overweight and obese respectively. The problem is global and is steadily affecting many low- and middle-income countries, particularly in urban settings. Globally, in 2014 the number of overweight children under the age of five is estimated to be over 41

million. Close to 31 million of these are living in developing countries and 48% lived in Asia. The fundamental cause of childhood obesity is an energy imbalance between calories consumed and calories expended (WHO, 2016b).

2.5 Assessing the nutritional status

2.5.1 Nutritional assessment

Nutritional assessment can be defined as "The interpretation of information from dietary, laboratory, anthropometric and clinical studies". The information thus obtained is used to determine the type, magnitude and distribution of malnutrition of individuals and population groups as influenced by the intake and utilization of nutrients. Presently, the nutritional assessment in low income countries (such as Nepal) emphasizes new simple, noninvasive approaches that can be used to measure the risk of both nutrient deficits and excesses, as well as to monitor and evaluate the effects of nutrition (Gibson, 1994).

2.5.2 Methods used to assess nutritional status

Nutritional status can be assessed by direct and indirect methods.

2.5.2.1 Direct methods

a. Anthropometric measurements

Anthropometric measurements are based on the measurements of body dimensions and proportions without giving any harm to the body. Although, it is used to evaluate both under and over nutrition, it doesn't differentiate between chronic and acute malnutrition. The most commonly used anthropometric measurements as defined by (Hartog *et al.*, 2006) are:

- Weight for height: Weight and Height of child is measured using standard Secadigital balance and stadiometer respectively and index is expressed in standard deviation units from the median of WHO child growth standards adopted in 2006. Children whose weight-for-height is below minus one standard deviations is considered mildly wasted similarly below minus 2 and 3 standard deviations are considered moderately and severely wasted respectively.

- Weight for age: Children whose weight-for-age is below minus two standard deviations from the median of the reference population are considered underweight. The measure reflects the effects of both acute and chronic under nutrition.

- Height for age: Children whose height-for-age is below minus two standard deviations from the median of the reference population are considered stunted or short for their age. Stunting is the outcome of failure to receive adequate nutrition over an extended period and is also affected by recurrent or chronic illness.

- Mid upper arm circumference (MUAC): When the measurement of height and weight is difficult, MUAC is used as an alternative index. Children whose mid upper arm circumference is below 12.5cm are considered malnourished. Hence it is significant during the diagnosis of protein energy malnutrition. Measurement should be taken by flexible, non-stretch tape made of fiber glass or steel.

- Oedema: Accumulation of fluid in interstitial cells is called as oedema it also reflects PEM.

- Head/chest circumference ratio: Measurement of head circumference is important in clinical settings as part of health screening for potential development or neurological disabilities in children. It is often used with other measurements to detect pathological conditions too.

The circumference of chest should be same to the head circumference at 1 year of age. After this skull grows slowly and the chest more rapidly. Between the ages of 1 year and 5 years, if head /chest circumference ratio is less than 1, it indicates the wasting of muscle and fat of chest wall. It can also be used as an indicator of PEM (Swaminathan, 2008b).

b. Biochemical methods

Variations in the intake of different nutrients present in the diet are reflected by changes in the concentration of the corresponding nutrients or metabolites influenced by the nutrients, in blood, tissues and in urine. Hence the biochemical assessment can reveal sub clinical states of deficiency of one or more nutrients due to lowered intake or absorption or impaired transport or abnormal utilization of nutrients. Some of the biochemical tests includes:

- Measurement of individual nutrient in body fluids such as serum retinol, serum iron, urinary iodine, vitamin etc.
- Analysis of hair, nails and skin for micronutrients.
- Stool examination for the presence of intestinal parasites.
- Detection of abnormal amount of metabolites in the urine (eg. Urinary creatinine/ hydroxyproline ratio) (Swaminathan, 2008c).

c. Clinical assessment

Anthropometry alone cannot assess accurate child's nutritional status. A child with normal weight and height may have different nutrient deficiency disorders. Therefore a documented process called clinical examination is used to evaluate and diagnose individuals overall well -being, whether mental, physical or both by observing certain signs and symptoms which are associated with various nutrient deficiencies. Some of the clinical sings of nutritional disorders are:

- Hair: thinness, sparseness, depigmentation and easily pluck ability: kwashiorkor and marasmus.
- Face: nasolabial dyssebacea(dryness and scaling in the area extending from nose to the corner of lips), moon face: kwashiorkor
- Eyes: Bitot spot, conjuctival xerosis, keratomalacia: vitamin A deficiency
- Lips: angular stomatitis, angular scars, cheilosis: riboflavin deficiency
- Tongue: magneta tongue: riboflavin deficiency. Scarlet and raw tongue: nicotinic acid deficiency
- Teeth: mottled enamel: fluorosis
- Gums: spongy bleeding gums: Ascorbic acid deficiency
- Skin: Xerosis, per follicular keratosis: vitamin A deficiency
    - Flaky paint dermatosis: kwashiorkor
    - Scrotal and vulval dermatosis
- Nails: koilonychias: iron deficiency
- Glands: Thyroid enlargement: iodine deficiency
    - Paratoid enlargement: starvation

Since, this method is based on observation of physical signs, it is relatively inexpensive and does not require any elaborate field equipment or even a laboratory but cannot detect the early cases (Adhikari and Krantz, 2013).

d. Biophysical methods

i. Radiographic examination

Though this method is not feasible in routine examination but is valuable to carry out if the physical signs and symptoms suggest that rickets, osteomalacia, fluorosis, or beriberi may be present, e.g rickets can be identified with widened concave, rarefied, frayed distal ends of long bones, usually the radius and ulna (Joshi, 2015a).

ii. Testes for physical function

These are devised to determine deviations in visual acuity, dark adaptation of the eyes, capillary fragility, nerve accommodation, physical performance (dynamometry, etc), and muscle coordination. The most widely used test is the dark adaptation since vitamin A deficiency is a very common one and this test cab be used objectively to evaluate the complaint of night blindness (Joshi, 2015b).

iii. Cytological test

This test assesses the buccal smears and shows the good correlation with malnourished children. Cornified and non cornified cells can be differentiated by the color reaction to Schorr's stain. The buccal smears from healthy children shows 60-70% non cornified cells while in PEM, this proportion drops to about 20% or less (Joshi, 2015c)

2.5.2.2 Indirect Methods.

a. Vital statistics

A variety of vital statistics such as maternal, infant and childhood mortality rates, fertility index, prevalence rates have been considered as indirect indicators of nutritional status of community.

b. Economic factors

Per capita income, population density and social habit have indirect effect in nutritional status.

c. Ecological Information

The nutritional status of an individual or community is affected by socioeconomic and ecological factors. Therefore these parameters are likely to serve useful indirect indicators (Rajalakshmi, 1987).

d. Dietary assessment

Dietary intake is assesses by following methods:

i. 24 hours dietary recall: It aims to ascertain the food intake of an individual during the immediately preceding 24 hours. This method estimates the food actually eaten, as recalled from memory. A structured questions with specific probes helps the respondent to remember all foods consumed throughout the day (Hartog *et al.,* 2006).

ii. Food dairy technique:

In this method all the foods eaten by an individual during a specified period is recorded at the time of consumption and listed by the subject. Often the ingredients and amounts used in the preparation of dishes are also measured and nutrient and calorie intake are calculated. Though this method can give a fairly exact picture of the actual food intake of an individual, sometimes not every individual is able to weigh and record the intake in household measures (Rodrigo *et al.,* 2015a).

iii. Food Frequency method (Questionnaires)

A Food Frequency Questionnaire (FFQ) is a limited checklist of foods and beverages with a frequency response section for subjects to report how often each item was consumed over a specified period of time. Food frequency method focus on the intake of specific nutrients, dietary exposures related to a certain disease, or comprehensively assess various nutrients (Coulston and Boushey, 2008).

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. A better representation of usual dietary patterns than only a few days of observation is its main advantage. Whereas, disadvantages include: comprehensive list of all foods eaten cannot be included and reported intake is limited to the foods contained in the food list and particularly complex for children and elderly people. A relatively high degree of literacy and numeracy skills are required if self-administered (Rodrigo *et al.*, 2015).

iv. Dietary diversity

Dietary diversity is defined as the number of different foods or food groups consumed over a given reference period. Dietary diversity is a qualitative measure of food consumption that reflects household access to the food variety/balance, and is also a proxy for nutrient adequacy of the diet of individuals. The dietary diversity questionnaire represents a rapid, user-friendly and easily administered low-cost assessment tool. The data collected through dietary diversity questionnaire can be analyzed to provide information on specific food groups (Kennedy *et al.*, 2013).

Nutrient rich foods from diverse diets are important elements in child feeding that supports dietary needs and adequate growth during their early years of life. Further, a diverse diet, with foods from all food groups, is necessary for population groups to meet their requirements for essential nutrients. Increasing dietary diversity is a specific recommendation for children 6 months to 2 years of age.

Dietary diversity has been linked to the pillars of food security: accessibility, availability and utilization. Nutrition status is seen as an outcome of biological processes that involve adequate nutrient intakes among groups while dietary diversity ensures adequate nutrient intakes in population. Dietary diversity is a better predictor of diet quality than that based on individual food items. Consuming a diet that consists of a wide range of food items has been shown to increase intake of energy and micronutrients in developing countries (Potts, 2014).

The two most important indicators that are used to construct the dietary diversity are:

- Household dietary diversity score: The household dietary diversity score (HDDS) reflects, the economic ability of a household to access a variety of foods in a snapshot form. An increase in household dietary diversity is associated with socio-economic status and household food security (Hoddinott and Yohannes, 2002).
- Individual dietary diversity score: Individual dietary diversity scores reflects nutrient adequacy. An increase in individual dietary diversity score is related with improved nutritional status, suggesting that diversity may indeed reflect higher dietary quality and greater likelihood of meeting daily energy and nutrient requirements (Arimond and Ruel, 2004c)

IDD scores target more specifically young children and women of childbearing age, because of the importance of micronutrient adequacy for growth, development and protection of the fetus and infant. Dietary diversity may be more important for nonbreast-fed children because they rely on complementary food to meet all of their energy and nutrient needs. While constructing IDDS, all foods eaten by the individual of interest, consumed inside or outside the home, irrespective of where they were prepared are also taken into account.

❖ **Limitations of the indicator**

Although, HDDS and IDDS indicators are used to assess the dietary diversity, there are few limitations and constraints to using the indicator. Such as:

- Establishing the food groups list to be used in the questionnaire requires a good knowledge of local diet and of the nutrient value of local foods.
- Seasonality is always an issue for dietary diversity assessment due to the seasonal availability of certain foods. For comparative purposes scores or indices must be collected at the same period of the year.
- These indicators can’t decide how several ingredients entering in the composition of mixed dishes should be accounted for.
- There may be urban/rural differentials in dietary diversity. Variety is often much greater in urban and peri-urban centers where food markets are vastly supplied and easily accessible (FAO, 2008).

2.6 Dietary diversity and nutritional status of a children

Nutritional status is considered an outcome of biological processes that involve food utilization while dietary diversity ensures adequate nutrient intakes (Steyn *et al.,* 2006).It has a direct relationship with favorable nutritional status since it is associated with a number of improved outcomes such as nutrient adequacy, anthropometric indices and improved hemoglobin concentration. In urban areas of Mali, lower food variety or dietary diversity scores were associated with twice the risk of being stunted or underweight (Thorne-Lyman *et al.*, 2010). In Kenya, diversity measured by the number of individual foods consumed in 24 hour was significant associated with five nutritional status indicators height-for-age z-scores (HAZ), weight-for-age z-scores (WAZ), weight-for-height z-scores (WHZ), triceps skinfold and mid-upper arm circumference among 12- 36 months children (Ogle *et al.*, 2001).

2.6.1 Dietary diversity and stunting

Stunting reflects a process of failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions. The lack of diversity is a strong predictor of stunting across all age groups of children under-five, regardless of breastfeeding status, morbidity, gender, and maternal and household characteristics. Using data from 10 multiple countries in Africa, Asia and Latin America, showed that improved dietary diversity was associated with a higher HAZ among children aged 6–23 months. Similarly, a positive relationship was between infant and child feeding index and HAZ in all age groups of children 6–35 months in rural Burkina Faso (Lumole, 2013).

2.6.2 Dietary diversity, underweight and wasting

Underweight represents depleted body fat and/or lean tissue stores; relative to chronological age and is a leading contributor to the disease burden in low income countries (Ezzati *et al.*, 2005). The most common cause of underweight is malnutrition caused by the unavailability of adequate food. Poor nutritional status afflicts a significant proportion of children below five years in developing countries.

Underweight is linked to growth faltering and is associated with increased morbidity and mortality among children (Savy and Martin-Prevel, 2005). On the other hand Wasting

indicates a recent and severe process of weight loss, which is often associated with acute starvation and/or severe result also from failure to gain weight. Other studies have shown that dietary diversity is significantly associated with nutritional status indicators especially among preschool children (Onyango *et al.*, 1998). However, the study in Democratic Republic of Congo and Burundi revealed poor relationship between dietary diversity and wasting (Lumole, 2013).

Part III

Materials and methodology

3.1 Research design

Nutrition survey of *Dalit* children between 6-59 months age group in Bagchaur municipality, Salyan at household level consists of following:

a) Anthropometric measurement of 6-59 months children at household level.
b) Household survey by the application of questionnaire to the parents of children under study to find out the situation of households.

3.2 Area of study

Area nutritional survey was conducted in *Dalit* community of Bagchaur municipality, Salyan district. Bagchaur municipality consists of 5,782 households with 33,000 total populations. The total population of under five year age children comprises 3,962 including 648 *Dalit* children. (Source: Bagchaur municipality office).

3.3 Target population

Target population of the study were 6-59 months children living in the Bagchaur municipality.

3.4 Inclusion and exclusion criteria

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

Exclusion criteria: - The study participants who are not available at household during the time of survey were not included in the study

3.5 Sampling techniques

from the total 11 wards, four wards were selected by simple random method. Households were selected on the basis of proportionate allocation and from each selected household target population unit were studied.

3.6 Sample size

The sample size was determined by using a formula, Sample size (n_o) = $Z^2 \times p\ (1-p)/d^2$

Assuming the prevalence rate of malnutrition to be 50% in the survey area, 95% confidence interval (CI), 6% margin of error (d) and 5% non-response rate was added to the total calculated sample size.

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

P= estimated prevalence of malnutrition (50%)

d= margin of error (6%)

Now $n_o = 1.96^2 \times 0.5 \times (1-0.5)/ (0.6)^2 = 266.78 = 267$

According to Bagchaur municipality, the total population of children aged 6 – 59 months was 648. Thus, by applying finite population sample formula new sample size was obtained to conduct survey in this particular VDC.

The sample size was adjusted for finite population.

New SS=n_o/ [1+ {(n_o-1)/POP}]

Where,

New SS = New sample size for finite population

n_o = Sample size in infinite population

POP = Total number of population (Total of 6-59 months age *Dalit* children in this municipality).

New sample size obtain as

=267/ [1+ {(267-1)/648}] =189.36

i.e., 189

Thus calculated sample size was adjusted for non-response. Considering non response rate as 5%, the adjusted sample size was calculated to be 199.

Though the calculated sample size was 199, altogether 205 children were studied.

3.7 Description of respondents

The respondents were one of the victimized disadvantaged communities who have been compelled to lag at the bottom of the social structure and excluded from national development mainstream due to the caste system. They are living in abduct poverty and are compelled to stay away from Brahmins and Chhetris house. They work for others and

depend upon the low fare and grains given to them as reward to run lifestyles. They have the lowest annual per capita income, expenditure, savings and investment.

The *Dalit* respondents still practice their traditional occupations such as blacksmith work, tailoring, leatherwork, goldsmith work, copper/bronze work, earth-digging, sweeping and cleaning, ploughing, musical instrument playing, human waste disposal and carcass disposal. These occupations were performed on an ad hoc basis and do not contribute much to the household's livelihood. They possess the least amount of land. As a result, their consumption and thereby health and productive power are quite low.

Though they are illiterate and poor they are polite and hard-working people. They are living their lives on day to day earned wages and majorities in Bagchaur municipality are indeed spending a miserable life.

3.8 Survey equipments

a. Child weighing machine

Properly graduated seca scale (Brand: Microlife) having capacity 100kg and least count of 0.1 kg was used.

b. Height measuring instrument

A wooden board with attached measuring tape, a UNICEF stadiometer was used.

c. Mid upper arm circumference tape

Flexible, non-stretchable MUAC tape made of fiber glass which measures nearest to the 0.01cm was used for measuring the circumference of arm.

d. Questionnaire

A well designed, properly prepared and planned questionnaires were used to collect information about family size, income; literacy rate; food consumption; health facilities; household characteristics; child birth order; hygiene & sanitation; food availability, dietary diversity and so on.

3.9 Pre-testing

In a selected area, pre-testing was done among the children under 5 age year by using sampling procedure. The instruments were pre-tested to establish the accuracy of questionnaire and to check for consistency in the interpretation of questions and to identify ambiguous items. After review of instruments all suggested changes were made before being administered in the actual study.

3.10 Validity and reliability

The instruments used were validated before they were taken to the field. The instruments were so validated to ascertain the degree to which the data collection instruments will measure what they purposed to measure. The expected testes in the questionnaire were drawn according to the available literature in nutrition education for young children. Prior to data collection the questionnaire were also pre-tested to establish content and face validity.

Reliability refers to a way of assessing the quality of the measurement procedure used to collect data. Questionnaires were checked daily for leading, completeness, consistency, relevancy, clarity and its direct bearing with objectives. In addition, the supervisor had also visited the research site periodically to monitor the process of data collection during the data entry and analysis.

3.11 Data collection techniques

From the every selected household, required data were collected by using the validated instruments and obtained data are compiled. Anthropometric and questionnaires method were used for collecting data. Data from the anthropometry was obtained by measuring the body dimensions and proportions. Similarly, data from the questionnaire methods were collected with the help of structured questionnaire form in which answers of every question were coded with unique identity number for each child.

3.11.1 Data collection for anthropometric measurements

For measuring the height, Child was kept on a stadiometer without shoes on a horizontal platform with both heels together without raising the shoulders, with arms and hands

relaxed and the feet flat on the ground. The movable board was then moved up and down and measurement was taken.

For measuring the weight, child was asked to be clothed in a light undergarment and kept in a balance. Thus, measurement shown by the balance was read and noted.

For measuring the MUAC, left arm was bended, marked with a pen between the olecranon process and acromion. With the arm hanging straight down, MUAC tape was wrapped around the arm at the midpoint mark and nearest to 1mm was measured

3.11.2 Data collection for IDDS

Dietary recalls of 7 days were conducted with mothers or caregivers of each child by visiting the home of participants. The respondent was asked about all foods and drinks child has consumed, inside and outside the home. For this, food were categorized into 12 groups: cereals and cereal products, roots and tubers, green leafy vegetables and other vegetables, pulses and legumes, fruits, meat and poultry, fish, eggs, fats and oils, milk and milk products, sugar& honey , miscellaneous(Tea& coffee) (Palermo *et al.*, 2013).

Response options were scored and 1 point was given for each food group consumed.0 point was given for food item not consumed. Consumption of <5 food groups was considered as low diversity, while ≥5 to ≤8 was considered medium dietary diversity and ≥9 was considered high dietary diversity. Similar categorization and scoring of IDDS was done among HIV infected individuals in Uganda by Palermo (Palermo *et al.*, 2013).

3.12 Data analysis

The collected data was checked for completeness and consistency. The data was organized, entered and coded into WHO Anthro version 3.2.2 then into Microsoft excel 2014 and into Statistical software for social sciences (SPSS) version 20.0. The collected data was analyzed by using both descriptive and inferential statistics. Descriptive analysis was used to describe the percentages and number distributions of the respondents and data was presented in the table.

The collected anthropometric indices were interpreted as weight/age, height/age, weight/height, MUAC and compared with reference standards of WHO. The chi-square test was applied to test the association between the nutrition status and its associate factors.

The children were then categorized according to the classification and children suffering from various degrees of malnutrition according to the different systems were interpreted respectively.

3.13 Logical and ethical consideration

Verbal consent from parents/care taker was obtained prior to study. Respondents were informed that the data collected were for the purpose of the study and will be treated with the uttermost confidentiality. Respondents were assured about compensation for any temporary and permanent impairment or disability and the right to compensation may not be waived.

Part IV

Results and Discussions

Nutritional status among 6-59 months *Dalit* children in Bagchaur municipality was assessed and factors that are responsible for malnutrition were identified. The results and findings of the study are expressed into several following headings.

4.1 Socio-economic and demographic characteristics

Out of 205 respondents, 23.9% were Pariyar (*Damai*), 71.7 % were Bishwakarma (*Kami*), 2.4% were *Bitalu* and 2% were Nepali (*Badi*).

Table 4.1 a Socio-economic and demographic characteristics of Bagchaur, municipality.

Variables	Frequency	Percent
Caste		
Pariyar	49	23.9
Bishwakarma	147	71.7
Bitalu	5	2.4
Nepali	4	2
Religion		
Christian	16	7.8
Hindu	189	92.2
Family size		
Less than 5	74	36.1
5 and greater than 5	131	63.9
Family type		
Joint	84.0	41
Nuclear	121	59
Annual family income		
Less than 1 lakh	110	53.7
1lakh to 3lakh	77	37.6
More than 3 lakh	18	8.8
Occupation of a family		
Agriculture	65	31.7
Foreign employment	86	42
Formal jobs	8	3.9
Informal jobs	46	22.4

Table 4.1 b Cross tabulation between caste and religion

▼Caste/Religion▶	Hindu	Christian
Pariyar	46(93.9%)	3(6.1%)
Bishwakarma	134(91.2%)	13(8.8%)
Nepali	4(100.0%)	0(0.0%)
Bitalu	5(100.0%)	0(0.0%)

Table 4.1 b shows that, out of the total 49 *Pariyar* children 93.9% followed Hindu religion, where 6.1% followed Christian. 91.2% of 134 Bishwakarma children were Hindu and 8.8% were Christian. All *Nepalis* and *Bitalus* were Hindu and none of them were Christian.

Survey shows that, 63.9 % of household had family members 5 or more than 5 and remaining 36.1% of household had family members less than 5. Similarly, 41% of the children lived in a shared accommodation whereas 59% children were living separately only with their parents.

The typical occupation of the population of this municipality was foreign employment. i.e 42%. After that another income source was agriculture 31.7%. Population engaged in formal jobs were 3.9% such as teaching, office and 22.4% were employed in informal jobs (tailoring, shop keeping, small business, handcrafter, casual labor).

The study questionnaire examined the estimated household income earned per year. The result shows that, majority (53.7%) of the family earned less than 1 lakh. 77% of the family earned 1 to 3 lakh and only 8.8% earned more than 3 lakhs annually.

4.2 Mother characteristics

Table 4.2 shows that most of the participant mothers were educated i.e 72.2%.where, 4.9% and 7.8% had completed higher secondary and secondary education respectively. Only 18.5% had primary education where 41% were qualified with lower secondary education and 27.8% mother were illiterate.

Table 4.2 Mother characteristics of survey population of Bagchaur, municipality

Variables	Frequency	Percent
Age of first pregnancy		
Less than 20 year	162	79
20-25 year	40	19.5
More than 25 year	3	1.5
Education of mother		
Illiterate	57	27.8
Primary	38	18.5
lower secondary	84	41
Secondary	16	7.8
Higher secondary	10	4.9
Fe/folate consumption during pregnancy		
Yes	159	77.6
No	46	22.4

Among the participants, maximum women became pregnant at the age of less than 20 year with 79%, followed by age group 20-25 with 19.5% and least at age group 25-30 with 1.5%. Maximum 77.9% of the women had taken folate and iron tablet during pregnancy and all women had taken vitamin A capsule within 45 days after delivery.

4.3 Child characteristics

Out of 205 children, 6.8% of the children were born with low birth weight i.e less than 2.5kg, 62.4% children were born normal with the birth weight above 2.5 and 2.5 kg and 30.7% of the children's birth weight was unknown.

Table 4.3 Child characteristics of 6-59 months children of Bagchaur, municipality

Variables	frequency	percent
Birth weight		
Less than 2.5	14	6.8
Normal	128	62.4
Unknown	63	30.7
Time of initiation of breastfeeding		
Within 1 hour	169	82.4
Within 8 hour	12	5.9
After24 hours	24	11.7
Complete immunization		
Yes	190	92.7
No	15	7.3
Colostrum feeding		
Yes	169	82.4
No	36	17.6
Exclusive feeding		
Yes	137	66.8
No	68	33.2
First treatment place		
Health post	81	39.5
Pharmacy	64	31.2
Hospital	57	27.8
Dhami jhakri	2	1
Nowhere	1	0.5
Birth order		
1st	65	31.7
2nd and more than 2nd	140	68.3
Individual dietary diversity score		
Low dietary diversity score	23	11.2
Medium diversity score	120	58.5
High diversity score	62	30.2

As indicated in table 4.3, 31.7% of the child were first children of their parents whereas 68.3% of the child had birth order of 2nd and more than 2nd. Maximum children i.e.82.4% were breastfed within first hour of delivery, 5.9% were fed within 8 hours while 11.7% of the children were fed after the first 24 hours. Among them 82.4% were fed with colostrum and 17.6% were not fed. 92.7% children were fully immunized and 7.3% were not immunized completely.

When the children became ill, 39.5% were treated in health post, 31.2% were treated in pharmacy, 27.8% were fed in hospital, 1% were taken to *dhami/ jhakri* and 0.5% were taken nowhere.

The result in this study shows that more than half (58.8%) children had dietary diversity score of 5-7.99 i.e medium dietary diversity score, 30.2% had high diversity score and 11.2% had low diversity score with score less than 5.

None of the parents had fed prelacteal feed to their child. None of the child has consumed bottle milk neither they had eaten sarbottam pitho *(lito*).

4.4 Hygiene and sanitation

The main source of water used by the household was tap water. The maximum distance of house and tap water source was ½ an hour. All of the household members use tap water for cooking purposes. For the drinking purposes 100% of the household use direct tap water without boiling and filtering. During the diseased condition half of the household boiled water to feed their child.

Every household had toilet facilities at their home. There was no any proper garbage management system at any household.

4.5 Nutritional status of children

Nutritional status of children is a proxy indicator for assessing the entire population health status and one of the major predictors of child survival. Despite the various efforts, malnutrition among children is remaining as a major public health problem in Nepal.

4.5.1 Prevalence of malnutrition

A proportion of 53.2% of the study children were boys and the rest 46.8% were girls. The mean age of the sampled children was 30 months, with the oldest being 59 months old and the youngest 6 months old.

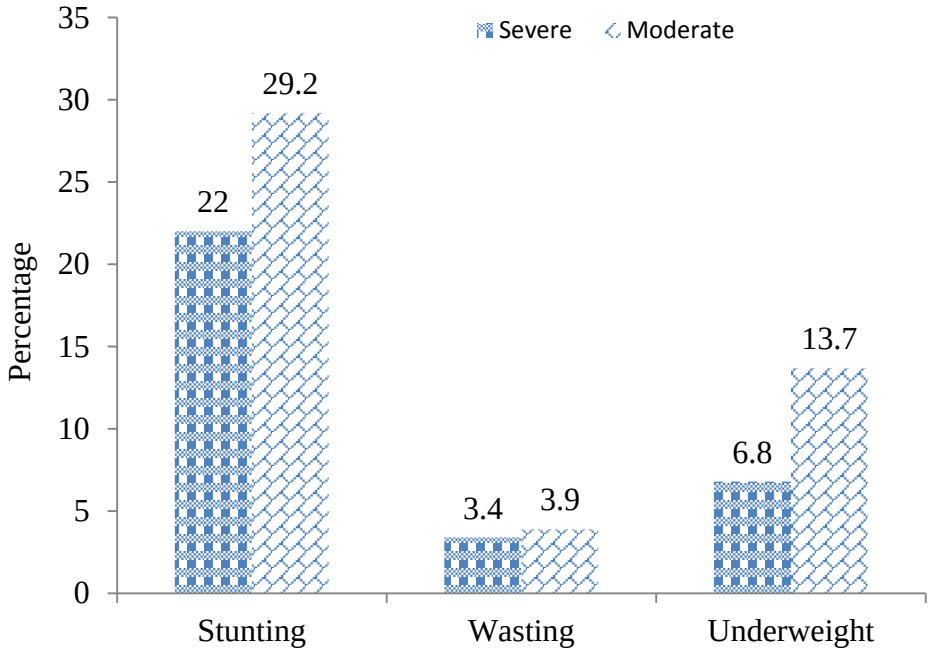

Fig.4.1 Prevalence of malnutrition of *Dalit* children in Bagchaur municipality

The prevalence of stunting among the children was 51.2%. About 22% of these were severely stunted; while the rest 29.2% were moderately stunted. Up to 92.7% of the children were found to have the normal weight for their height. Wasting prevalence was 7.3% where 3.4% were severely wasted, while 3.9% were moderately wasted. Similarly, prevalence of underweight was 20.5%; about 6.8% were severely underweight and 13.7% were moderately underweight. The national data on stunting, wasting and underweight is 41%, 29% and 11% respectively according to NDHS report 2011(MOHP, 2011).The prevalence of wasting & underweight were found quite better but stunting was highly prevalent than country's nutritional status.

As of the NDHS 2011, nutritional status of mid western hill is 51.7% stunting, 8% wasting and 37.1% undeweight (MOHP, 2011). On comparing the NDHS data with the

present study, stunting prevalence rate is similar, wasting rate is quite lower and underweight percentage is somewhat half than the NDHS data.

Children from Brahmin/Chhetri, Janajati, and Muslim ethnic groups are less likely to be severely stunted than those from *Dalit* and others. In Nepal, *Dalits* are poorer than most of the other social groups and are regarded as an "untouchable" class with high discrimination. A study done in the Terai region of eastern Nepal has shown that children from *Dalit* families had significantly higher malnutrition than those from the other ethnic groups. Owing to high discrimination and disparity among *Dalits* and other lower caste groups, they might have been deprived from nutrition, education, health care, and so on, which results in poor nutritional status among children in these ethnic groups. It seems that social exclusion of *Dalits* leads to poverty and poverty then causes stunting (Gaire *et al.*, 2016).

4.5.2 Sexwise categorization of malnutrition

The table below shows the sexwise categorization of malnutrition among male and female.

Table 4.4 Sexwise categorization of malnutrition

	Severe	Moderate	Normal
Stunting			
Male	24(25%)	24(25%)	48(50%)
Female	21(19.3%)	36(33%)	52(47.7%)
Wasting			
Male	3(3.1%)	1(1.1%)	92(95.8%)
Female	4(3.7%)	7(6.4%)	98(89.9%)
Underweight			
Male	7(7.3%)	8(8.3%)	81(84.4%)
Female	7(6.4%)	20(18.4%)	82(75.2%)

A total of 51.2% of the child were stunted, among which 52.3% female were slightly more stunted than males (50%). This distribution of stunting prevalence was found just opposite to the NDHS 2011 report. Of total 7.3% wasted children, 4.2% were male and 10.1% were female. The distribution of wasting based on gender showed similar pattern with that of NDHS 2011 findings and of 20.5% underweight child, 15.6% were male and 24.8% were female. This is opposite as compared to the national figures in NDHS 2011.

Other study done in western Nepal shows boys are more underweight than the girls (MOHP, 2011).

4.5.3 Nutritional status of children according to age

Table 4.5 shows that prevalence of wasting, stunting and underweight according to their gender.

Table 4.5 Age wise categorization of malnutrition

age group		**Wasting %**		**Stunting %**		**Underweight %**	
(months)	N	<-3	<-2	<-3	<-2	<-3	<-2
(6-11)	22	4.4	9.1	0	22.7	4.5	9.1
(12-23)	54	7.4	13	29.6	51.6	9.3	24.1
(24-35)	52	Nil	3.8	25	50	58	17.3
(36-47)	49	2	4.2	20.4	61.2	6.1	26.5
(48-59)	28	3.6	7.1	21.4	57.1	7.1	17.9

Wasting prevalence was found high in children age group 12-23 months and found low in age group 24-35 months. A study by conducted in Dang also reported the same result as present study (Bhattarai, 2016). The obtained result might be due to the late initiation of supplementary feeding at proper age with inadequate number of frequencies as well as not giving emphasis on maternal care during pregnancy and lactating period (Shah *et al.*, 2016)

Result shows that high stunting percentage was seen in 36-47 months age children and low in 6-11 months children, similar finding was reported in Duruwa VDC, Dang (Bhattarai, 2016). None of the child of 6-11 months was found to be severely stunted. Most children at this age group (36-47 months) have a habit of eating junk food, which could be the reason contributing to chronic under nutrition in the form of stunting. Children in the youngest age group were less stunted than children in older age group. It is likely that the adequate maternal care during early life is protective and stunting and becomes more likely as the child grows and becomes dependent on extra food intake for growth (Shrestha, 2014).

There was high prevalence of underweight in children of age group 36-47 months and there was low prevalence of underweight in children age group 6-11 months, which is similar to the study conducted by Sapkota and Gurung, 2009. Due to the low

socioeconomic status of the family and low availability of cultivable land and food availability, parents could not be able to provide sufficient food to their children which shows its effect in long run as children brought up in poor socioeconomic family were found prone to be underweight (Sapkota and Gurung, 2009).

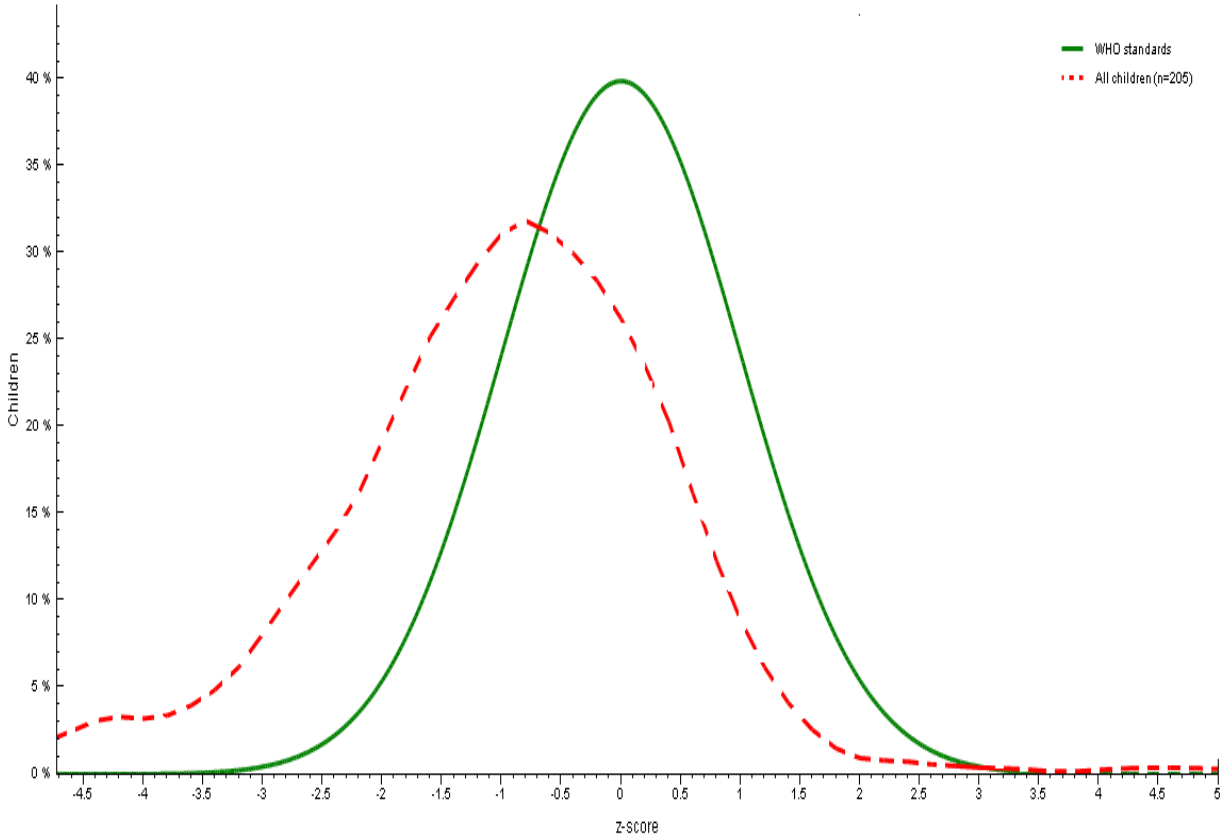

Fig 4.2 Distribution of weight for age (underweight)

Regarding weight for age, 13.7% were below -2SD (z-score) and 6.8% were below -3SD (z-score).The median weight for age z-score of survey children was found to be -0.92 which is less by 0.92 with the WHO standard reference. This curve is skewed to the left side of WHO standard curve showing the prevalence of underweight among study population. The underweight rate(20.2%) was also found less in under 5 children in western Nepal (Shrestha, 2014). The causes of underweight may be poor levels of hygiene, intestinal parasites, eating junk snacks, intake mini meals, not taking nutrient dense food and despite normal eating habits (UNICEF, 2013b).

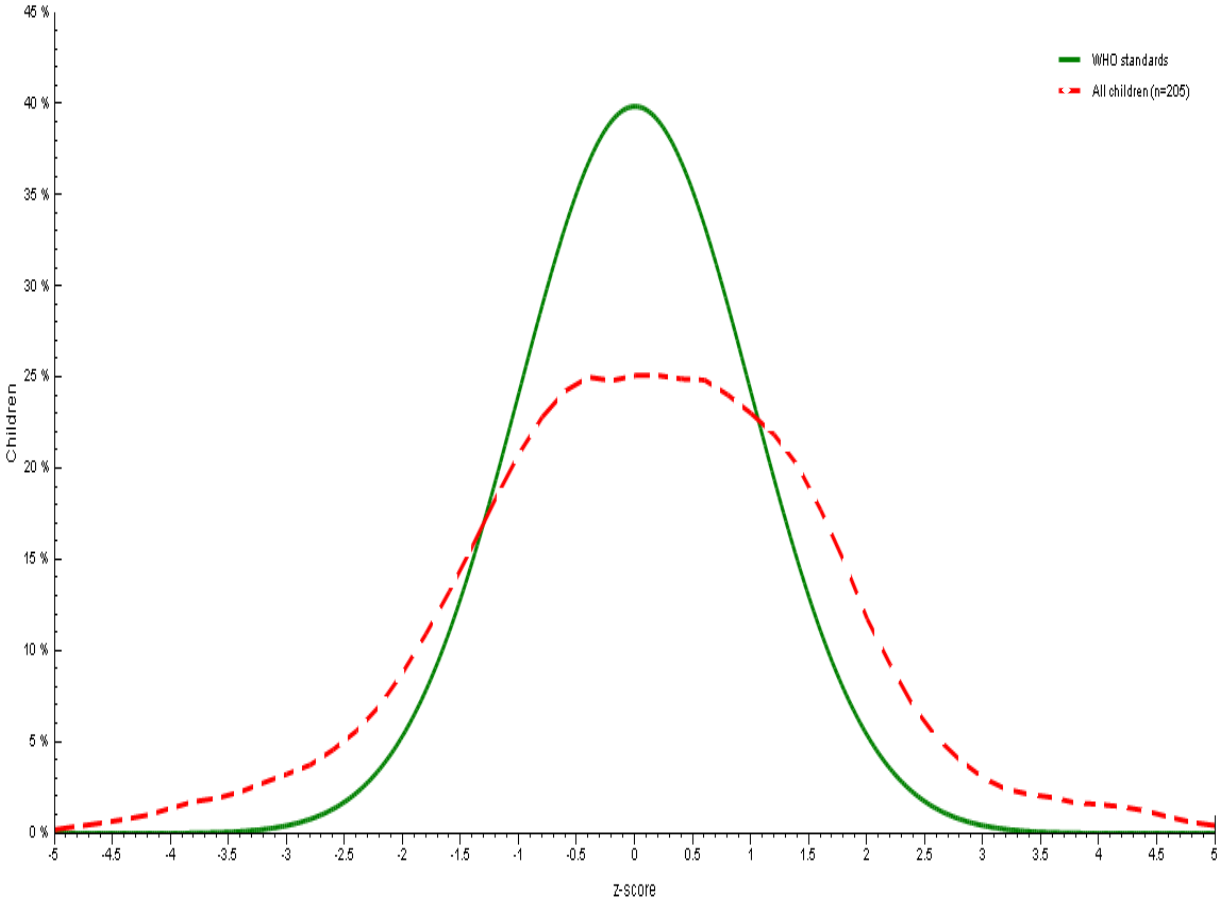

Fig 4.3 Distribution of weight for height (wasting)

Regarding weight for height, 3.4% were below -2SD (Z-score) and 3.9 % were below -2SD (Z-score). The median weight for age z-score of survey children was found to be 0.7 which is more by 0.7 with the WHO standard reference. This curve is skewed to the right side of WHO standard curve showing the prevalence of wasting among study population. There could be several reasons for this; for example, deficiency in food crop productions, deterioration in feeding practices, poor hygiene and sanitation, sudden outbursts of communicable diseases, and even the timing of the survey (Bishwakarma, 2011). The prevalence of wasting was similar to the nutritional status of under 5 children in rural Nepal (Dolakha and Kavre) where 7% were wasted (Chataut and Khanal, 2016).

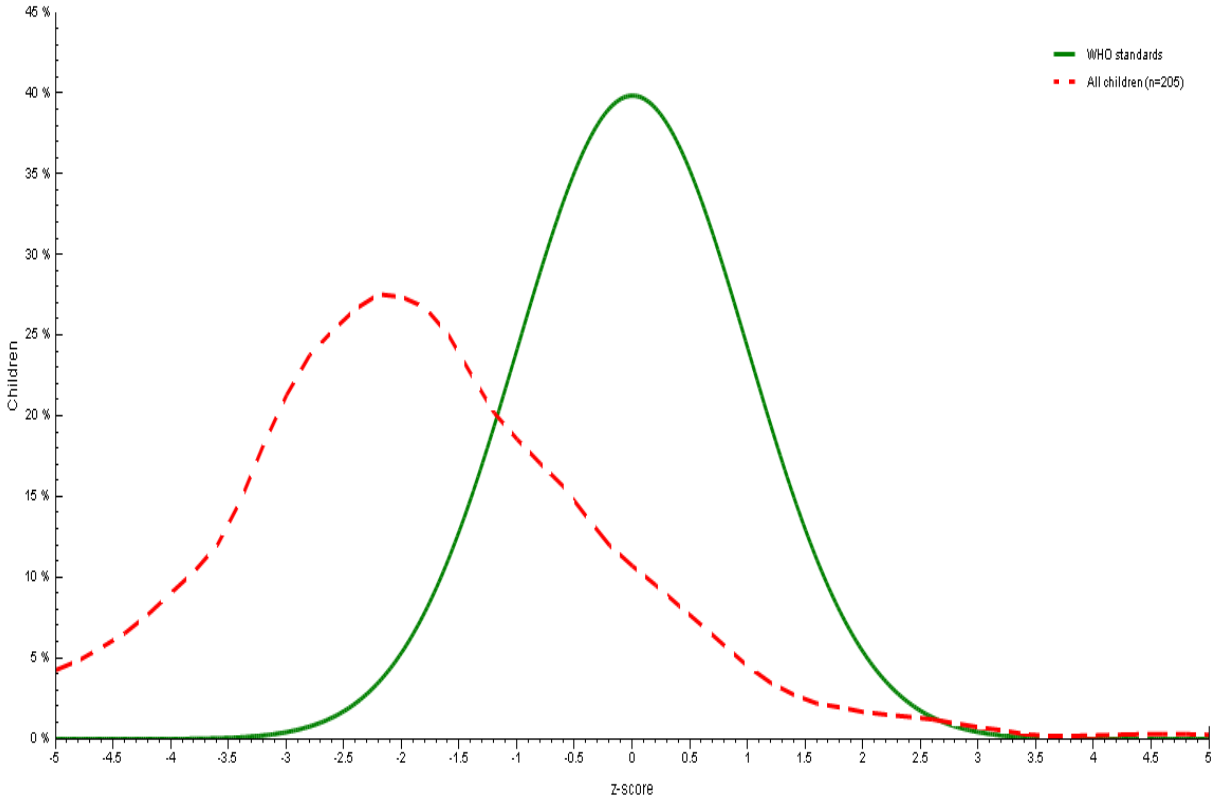

Fig 4.4 Distribution of height for age (stunting)

Regarding Height for age, 29.2% were below -2SD (z-score) and 22% were below -3SD (z-score). The median weight for age z-score of survey children was found to be -2.03 which is less by 2.03 with the WHO standard reference. This curve is skewed to the left side of WHO standard curve showing the prevalence of underweight among study population From the study done in Musahar (*Dalit*) community of Siraha district, the stunted child percentage was 47% (Shah *et al.*, 2016). On comparing the stunting prevalence of present study area with Musahar community of Siraha district, present study area was found to be in greater risk of chronic malnutrition. Similar stunting prevalence rate (51%) was also found in study done by Abhishek and the team (Singh *et al.*, 2014). Contributing factors include poor maternal health and nutrition before, during and after pregnancy, as well as inadequate infant feeding practices especially during the first 1,000 days of a child's life, lower age of mother at first birth & a higher number of pregnancies and children, Frequency & severity of infections, and loss in economic productivity of a family (Buckley, 2016).

4.6 Factors associated with undernutrition of children

Stunting, wasting and underweight indicators are most widely used for assessing the undernutrition of a child. Accordingly, chi-square test was used to find out the factors that are associated with above mentioned indicators.

4.6.1 Factors associated with wasting

The Chi- square test revealed that there is significant association for wasting with caste (p=0.017) and immunization (p=0.013).

Table 4.7 Factors associated with wasting

Predictors		**Weight for height**			
		wasted	**normal**	**χ^2 value**	**P-value**
Age of a child	<24 months	9(11.8%)	67(88.2%)	3.647	0.056
	>24 months	6(4.7%)	123(95.3%)		
Caste	Pariyar	6(12.2%)	43(87.8%)	10.204	0.017*
	Bishwakarma	6(4.1%)	141(95.5%)		
	Nepali	2(50%)	2(50%)		
	Bitalu	1(20%)	4(80%)		
Immunization	Complete	11(5.8%)	179(94.2%)	6.122	0.013*
	Incomplete	4(26.7%)	11(73.3%)		
Main occupation	Agriculture	3(4.6%)	62(95.4%)	5.391	0.145
	Foreign employment	4(4.7%)	82(95.3%)		
	Formal sectors	1(12.5%)	7(87.5%)		
	Informal sectors	7(15.2%)	39(84.8%)		
IDDS	Low diversity score	2(8.7%)	21(91.3%)	1.19	0.909
	Med diversity score	8(6.7%)	112(93.3%)		
	High diversity score	5(8.1%)	57(91.9%)		

*Significantly associated (p<0.05)

The culturally constructed dominant and sub-subservient class relationship based on caste/ethnic stratification is considered to be one of the main reasons of Nepal underdevelopment and high level of social inequality (Bishwakarma, 2011).

Likewise, the child that are not/incompletely immunized are highly wasted in comparison to fully immunized child. A study done in Metro Cebu, Philippines also shows the strong significant association (p=0.000) of wasting with immunization (Ricci and

Becker, 1996). Those child who are unimmunized are most vulnerable to diseases and infection. The diseases/infections predisposes to malnutrition esp. wasting through reduced intake and absorption and diversion of nutrients away from growth (Prendergast, 2015).

There was no significant association of wasting with child's age, main occupation of a family and IDDS.

4.6.2 Factors associated with stunting

From the table 4.8 it can be concluded that the association between stunting and religion was found (p=0.029).

Table 4.8 Factors associated with stunting

Predictors		**Height for age**			
		Stunting	**Normal**	**χ^2 value**	**P-value**
Age of a child	<24 months	33(43.4%)	43(56.6%)	2.94	0.086
	>24 months	72(55.8%)	57(44.2%)		
Religion	Hindu	101(53.4%)	88(46.6)	4.775	0.029*
	Christian	4(25%)	12(75%)		
Birth order	1st	29(44.6%)	36(55.4%)	1.661	0.197
	2nd&more than 2nd	76(54.3%)	64(45.7%)		
Food sufficiency	Yes	58(50.9%)	56(49.1%)	0.12	0.913
	No	47(51.6%)	44(48.6%)		
Birth weight	Low	10(71.4%)	4(28.6%)	2.625	0.269
	Normal	65(50.8%)	63(49.2%)		
	Don't know	30(47.6%)	33(52.4%)		
Main occupation	Agriculture	40(61.5%)	25(38.5%)	6.253	0.1
	Foreign employment	36(41.9%)	50(58.1%)		
	Formal sectors	5(62.5%)	3(37.5%)		
	Informal sectors	24(52.2%)	22(47.8%)		
IDDS	Low diversity score	12(52.2%)	11(47.8%)	0.91	0.99
	Med. diversity score	61(50.8%)	59(49.2%)		
	High diversity score	32(51.6%)	30 (48.4%)		

*Significantly associated (p<0.05)

Stunting prevalence was highly seen in Hindu children. Religion plays an important role in Nepal. As Nepal is a Hindu majority country, the religious affiliation of a child´s family provides information on the likely dietary restrictions encountered by a child in his or her early growing years. The women's autonomy and control over household resources

arising from differences in son preference across religions may also be the important contributing factor of stunting among children (Brainerd and Menon, 2015). Since one is born into one's religious identity and marriage is often restricted to one's caste and faith in our Nepalese community, the inequality is high, the child are likely to be even more vulnerable.

Age of a child, occupation of a family, birth order of Children, birth weight and Individual Dietary Diversity Score (IDDS) were not found significant with stunting in the survey area (Bagchaur municipality).

4.6.3 Factors associated with underweight

Table 4.9 shows that, there is a significant association between underweight and main occupation of a family (p=0.049).

Table 4.9 Factors associated with underweight

Predictors		**Weight for age**			
		underweight	**normal**	**χ^2 value**	**P-value**
Age of a child	<24 months	16(21.1%)	60(78.9%)	0	0.983
	>24 months	27(20.9%)	102(79.1%)		
Gender	Male	15(15.3%)	83(84.7%)	3.641	0.056
	Female	28(26.2%)	79(73.8%)		
Religion	Hindu	41(21.7%)	148(78.3%)	0.3	0.386
	Christian	2(12.5%)	14(87.5%)		
Birth weight	Low	5(35.7%)	9(64.3%)	2.305	0.316
	Normal	27(21.15)	101(78.9%)		
	Don't know	11(17.5%)	52(82.5%)		
Main occupation	Agriculture	18(27.7%)	47(72.3%)	7.854	0.049*
	Foreign employment	10(11.6%)	76(88.4%)		
	Formal sectors	2(25%)	6(75)		
	Informal sectors	13(28.3%)	33(71.7%)		
Annual income	Less than 1 lakh	22(20%)	88(80%)	0.533	0.766
	1lakh to 3lakh	18(23.4%)	59(76.6%)		
	More than 3 lakh	3(16.7%)	15(83.3%)		
IDDS	Low diversity score	3(13%)	20(87%)	1.374	0.503
	Med. diversity score	28(23.3%)	92(76.7%)		
	High diversity score	12(19.4%)	50(80.6%)		

*Significantly associated (p<0.05)

Family occupation indicates father occupation here, as none of the mother were involved in any type of occupation. Those children whose parents were involved in informal sectors job were highly low in weight for age. Similar result was found in the research done in Oman, after huge economic and improvements in health services, where the occupation of the father was marginally associated with underweight (Alasfoor *et al.*, 2007). Also, similar type of study done in Bangladesh shows father occupation was one of the main contributing factor for under 5 children malnutrition (Alam *et al.*, 2012).

Age of a child, gender, religion, birth order, birth weight of a child, annual income and IDDS were not found significant with underweight.

Part V

Conclusion and Recommendations

5.1 Conclusion

1. Malnutrition in young children is still the major problem as it may increase the mortality and morbidity of children and impair the intellectual and physical development.
2. The overall magnitude of malnutrition among 6-59 months children in Bagchaur municipality, Salyan were 51.2% stunting, 7.3% wasting and 20.5% underweight.
3. Factors like caste and immunization were associated with wasting. Religion showed significant association with stunting. Family occupation was associated with underweight.

5.2 Recommendations

Based on the result from thesis the following are the recommended points to increase the nutritional status of children of *Dalit* community of Bagchaur municipality, Salyan.

1. Policy planning and implications in Bagchaur municipality still need more focus on research that addresses child nutrition, as there is no research done in this area.
2. Discrimination in society should not be practiced. Equity in resource, employment, education, health care services should be maintained in all parts to reduce prevalence of malnutrition.
3. Close monitoring of the gap between poorest, middle, and richest households and ethnicity can help in the reduction of the gap in nutritional status of children.
4. Potential income generating programs among *Dalit*s should be conducted to decrease the risk of malnutrition due to poverty.
5. Further study should be done to see other unexplored factors that were not included in the present study.

Part VI

Summary

Anthropometry evaluates long term nutritional history with rapid, accurate, reliable and quantitative means of nutritional assessment, which is useful in monitoring normal growth and nutritional health in well-nourished individuals.

A cross sectional study was conducted among 6-59 months *Dalit* children in Bagchaur municipality of Salyan district, Nepal. The objective of this study was to determine the effects of various factors on nutrition. For this, 4 wards of a municipality were randomly selected and children were studied as per the requirement of the sample size. All the available children during the study time were taken and total 205 were studied. Anthropometric measurements (such as height, weight, MUAC) were taken to assess the nutritional status and pre-coded questionnaire was used to collect the information about socio-demographic characteristics, mother's characteristics, child characteristics, hygiene and sanitation. The made questionnaire was asked to caretaker of a studied child. This study also analyzed the factors, significantly associated with nutritional status among children of under five years of age and their mothers. This study also tried to prepare growth curve of children of under five years of age and compare with WHO z-score standard. WHO Anthro version 3.3.2 and SPSS version 20.0 were used to analyze data. Chi-square test was used to analyze the factors associated with nutritional status of a child.

This was the observational study done in all *Dalit* population. Pariyar, Bishwakarma, Nepali and Bitalu were the studied caste of the *Dalit* community. Out of the 205 children, highest was the bishwakarma group (71.7%), 23.9% were Pariyar, 2.4% were Bitalu and 2% were Nepali. Majority of the household were Hindu. Maximum parents esp. father were engaged in foreign employment i.e 42%. Majority (53.7%) of the family earned less than 1 lakh.

Maximum children were of the age 12-23 months (54) where, 31.7% children were 1st child and the rest 68.3% were other than 1st. 6.8% child were born with LBW and 62.4% were born with normal weight. 82.4% child were fed with mother's milk within 1 hour of birth. Hence, they were obviously fed with colostrum. 5.9% child were fed after 1 hour but

before 8 hour and remaining 11.7% were not fed within 24 hour. Only 17.1% child were not fed with colostrum.

More than half (58.8%) children had dietary diversity score of 5-7.99 i.e medium dietary diversity score. 30.2% had high diversity score and 11.2% had low diversity score with score less than 5.

The percent of children with stunting, underweight and wasting was found as 51.2%, 20.5% and 7.3% respectively as per study. There was high prevalence of stunting in this area than wasting and underweight. Stunting prevalence was observed 2.4 times more than underweight and 7.8 times more than wasting. Female children showed more likelihood to fall in under nutrition (wasting, stunting and underweight) than male children.

Chi-square test findings showed that there was significant association of wasting with caste (0.017) and immunization (0.013). Religion was significantly associated with stunting (0.029) and family occupation was found associated with underweight (0.049).

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Appendices

Appendix - A

Questionnaire

Code no: Date:

Name of a child:

Date of birth: Sex:

Address: Municipality: Ward no:

Section A: General description

1. Description of a family:
2. Type of Family:
   Nuclear/Joint
3. Family size: Male: Female:
4. Number of child: Male: Female:
5. Religion:
6. Main occupation:
7. Education level
   Father's Education: Mother's Education:
8. Annual income of a family:
9. Do you have sufficient food to eat: Yes/No
10. Husbandry:
    Animal: How many:
    Poultry: How many:
11. Types of crop cultivated
12. House type: Permanent/Temporary

Section B: General information of children

13. What is the present child birth order? 1/ 2/ 3/ 4/ 5/ 6/ 7
14. Birth weight:
15. Death of any child below 5 years of old? Yes/No
16. If yes, what is the cause? .....

Section C: Description about child nutrition and immunization

17. Did you breast fed your child soon after the birth? Yes/No
18. If Yes then when did you initiate breast feeding?
    within 1 hour of birth/ Within 8 hours of birth/ Within 24 hour of birth/ After 1 day / Cannot remember/ Other
19. Did you feed colostrum to your baby? Yes/No
20. Are you breast feeding your child? Yes/No
21. If yes, then how many times do you breast feed your child? …… times/a day
22. If no, then at what age you stop feeding? .....
23. What did you feed to your baby before feeding colostrum milk?
    Honey/ Ghee/ Cow‘s milk/ Alcohol/ Others/ Nothing
24. Do you know about complementary feeding? Yes/No
25. If yes, what types of complementary food should be fed to the child?
26. At which age do you start weaning food to your children?
    4 months/ 5 months/ 6 months/ 7 months/ More than 7 months
27. Do you know about Sarbottam pitho (lito)? Yes/No
28. Do you know how to make lito? If yes, explain…….
29. Do you know about balanced diet? Yes/No
30. Do you know what malnutrition is?
31. Did you vaccinate/immunized your child? Yes/No
32. Did you give Vit.A capsule and De-worming tablet to your baby?
    Yes/No
33. What are the common infection diseases from which your child can suffer
34. Where do you take your child for treatment, after getting ill?
    Healthpost/ Pharmacy/ Clinic/ Hospital/ Dhami-Jhakri/ Nowhere
35. How do you know that your child is getting sick?
    Body temperature increases/ Body temperature decreases/ Diarrhoea/ Vomiting/ Crying/ Other specify……..
36. What do you feed your child during Illness?
    Jaulo/ Lito/ Normal food/ Daal water/ other specify

Section D: Description about mother

37. What was your age of 1st pregnancy?
38. Did you take iron and folate tablet during pregnancy? Yes/ No
39. Did you take vitamin A after within 45 days of delivery? Yes/No
40. Did you get vaccination during your pregnancy period? Yes/No
41. Amount of food you take when baby is in your womb:
    Same as before/ less than before/ more than before
42. Do you takes cigaratte, tobacco, alcoholic drinks? Yes/No

Section E: Description about environmental sanitation and hygiene practices

43. Do you have toilet at hour home? Yes/ No
44. What are the sources of nearby water?

Tap/ Hand pump/ Well/ River/ Pond /other

45. What is your source of drinking water?

Tap/ River/ Pond/ other

46. What is the source of water for cooking purpose?

Tap/ River/ Pond/ Other

47. How do you purify water for drinking purpose?

Filtering/ Boiling/ Nothing

48. How do you manage garbage coming out from your house?

Composting/ Burning/ municipality management/ otherSection

F: Question about feeding of child

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

S.N	Food	frequency
1	Cereals(Rice/bread/maize/khichidi/pudding/biscuit/noodles etc)	
2	Root and tubers (potato/sweet potato/ yam/ githa/ pidalu)	
3	Green leafy vegetables (Rayo/ spinach/ simi saag/ barela/	

	cauliflower/ cabbage/pumpkin/iskus etc)	
4	Fruits (apple/ orange/ guava/ pomegranate/ banana)	
5	Meat (chicken/ goat/ buffalo/ pig etc)	
6	Egg (hen/ duck)	
7	Fish	
8	Legumes and pulses (chana/ bhatmas/ matar/ masuri/ rahar/ bosi/ simi etc)	
9	Milk and milk products (curd/ buttermilk/ paneer/ etc)	
10	Fats and oils/ ghee	
11	Sugar/honey	
12	Miscellaneous (tea/ coffee)	

Section G.

Anthropometric measurement

HEIGHT	WEIGHT	MUAC	ODEMA(yes/no)

Appendix– B

Consent form

Namaste!

I Ms. Kushma Gautam, graduate student in Department of Nutrition and Dietetics conducting a dissertation work for award of bachelor's degree in Nutrition and Dietetics.

The topic for the study is "*Nutritional assessment and its associated factors among 6-59 months children in Dalit community of Bagchaur, municipality"*.

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 witness: _____

Date: Date:

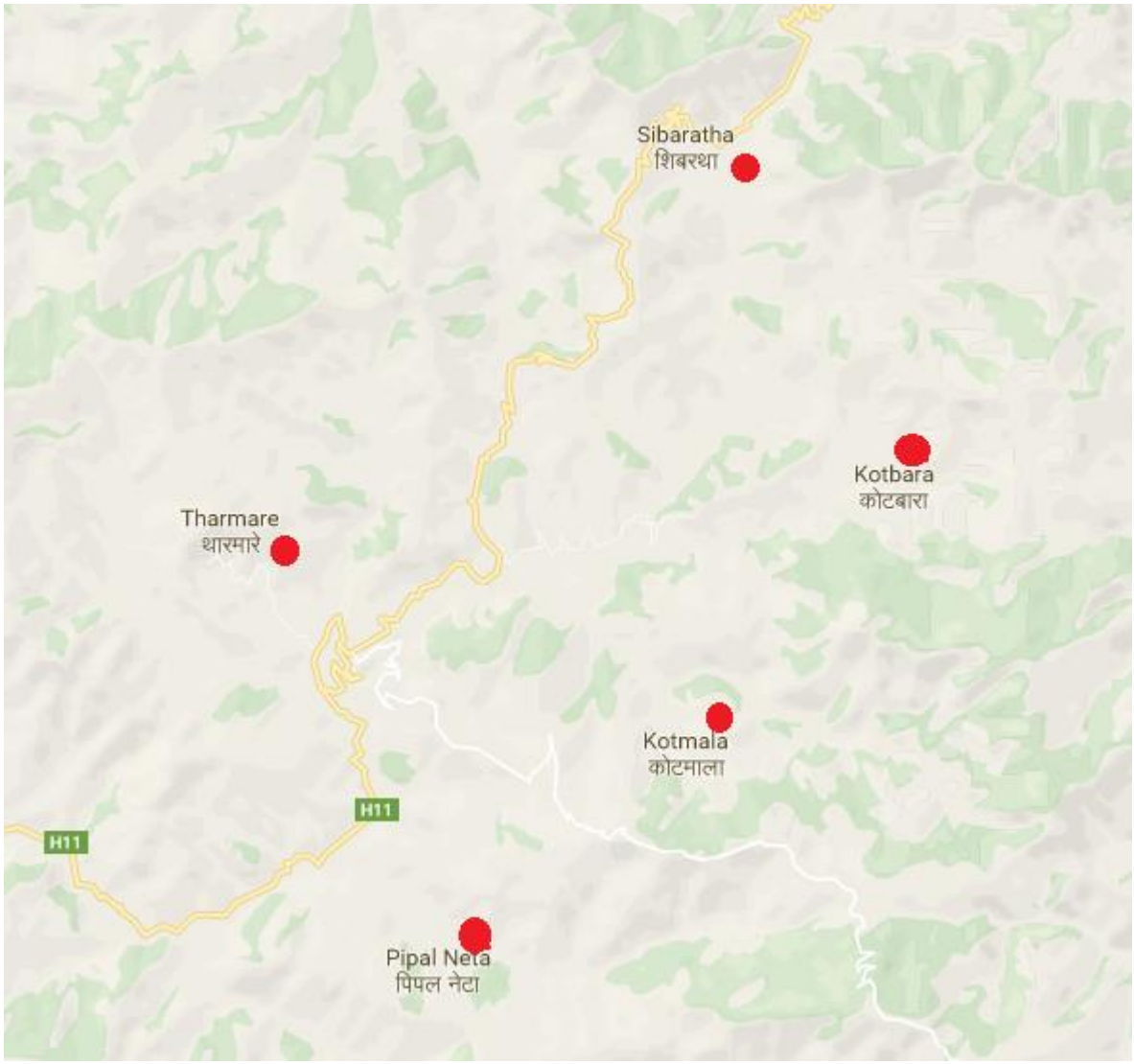
Place: Place:

I hereby state the study procedures were explained in the detail and all questions were fully and clearly answered to the above mentioned participant /his/her relative.

Investigator's sign:

Date:

Survey area


Sibaratha
शिबरथा
Kotbara
कोटबारा
Tharmare
थारमारे
Kotmala
कोटमाला
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पिपल नेटा