

**INFLUENCE OF INFANT FEEDING PRACTICE ON THE
NUTRITIONAL STATUS OF 6-59 MONTHS CHILDREN OF
SUKUMBASHI BASTI, KANKAI MUNICIPALITY JHAPA**

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**Influence of Infant Feeding Practise on The Nutritional Status of 6-59
months Children of *Sukumbashi Basti*, Kankai Municipality, Jhapa**

*A dissertation submitted to the department of nutrition and dietetics, Central
Campus of Technology, Tribhuvan University, in the partial fulfillment of the
requirements for the bachelor degree in Nutrition and Dietetics*

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Approval Letter

The *dissertation* entitled “*Influence of Infant Feeding Practise on The Nutritional Status of 6-59 months Children of Sukumbashi Basti, Kankai Municipality, Jhapa*” presented by Devi Khadka has been accepted as the partial fulfillment of the requirement for the bachelor degree in Nutrition and Dietetics.

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Abstract

A nutritional survey was conducted among the 6–59 months of children residing in *Sukumbashi basti*, Kankai Municipality. Anthropometrics measurements along with household surveys were carried to find out the level of malnutrition and information about the feeding practice. Random sampling with 123 samples was taken for the study and the data collected were analyzed by using SPSS version 20 and WHO anthro 3.2.2 version.

The study show that 6.5% were found to be wasted out of which no were found to be severely wasted. Similarly, 26.8% were found to be stunted out of which 1.6% were found to severely stunted and 9.7% of the children were found to be underweight, out of which 0.8% were severely underweight. The factor significantly associated with stunting ($p \leq 0.05$) were exclusive breastfeeding, starting of complementary feeding, pulses intake with 3-5 times per week and source of drinking water from river. Similarly, the factor significantly associated with wasting ($p \leq 0.05$) were exclusive breastfeeding, duration of breast feeding, types of complementary jaulo, and source of drinking water from river and the factor significantly associated with underweight at ($p \leq 0.05$) were exclusive breastfeeding, types of complementary and pulses intake per week. This indicates that under nutrition is still an important problem among 6 to 59 months children of *Sukumbashi basti*, Kankai municipality, Jhapa.

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List of abbreviations

Abbreviations	Full form
ARI	Acute Respiratory Infection
BMI	Body Mass Index
EBF	Exclusive Breastfeeding
IgA	Immunoglobulin A
IYCF	Infant and Young Child Feeding
LBW	Low Birth Weight
MUAC	Mid Upper Arm Circumference
NDHS	Nepal Demographic Health Survey
ORS	Oral Rehydration Solution
PEM	Protein Energy Malnutrition
PSTI	Pancreatic Secretory Trypsin Inhibitor
UNICEF	United Nation International Children's Emergency Fund
VDC	Village Development Community
WFP	World Food Program
WHO	World Health Organization

Part I

Introduction

1.1 General introduction

Nutrition is the intake of food, considered in relation to the body's dietary needs. Good nutrition i.e an adequate well balanced diet combined with regular physical activity is a cornerstone of good health. Poor nutrition can leads to reduced immunity, increased susceptibility to diseases, impaired physical and mental development and reduced productivity (WHO, 2018a).

Malnutrition is any condition in which the body does not receive enough nutrients for proper function. Malnutrition may range from mild to severe and life-threatening. It can be a result of starvation, in which a person has an inadequate intake of calories, or it may be related to a deficiency of one particular nutrient (for example, vitamin C deficiency). Malnutrition can also occur because a person cannot properly digest or absorb nutrients from the food they consume, as may occur with certain medical conditions. Malnutrition remains a significant global problem, especially in developing countries. In the developing world, it is frequently a result of socioeconomic, political, or environmental factors. In contrast, protein energy malnutrition in the developed world usually occurs in the context of chronic disease. There remains much variation in the criteria used to define malnutrition, with each method having its own limitations. Early recognition, prompt management, and robust follow up are critical for best outcomes in preventing and treating PEM (Grover and Ee, 2009).

On recent study estimate that approximately 45% of childhood deaths in 2011 were caused by under-nutrition (Black. *et al.*, 2013). Asia leads to other world regions with the highest percentage of children under 5 who are underweight or wasted (21.9% and 11.2% respectively, as of 2011). Similarly, the population density across the region, it is also home to the greatest total number of children under 5 who are stunted, wasted, or underweight (103.5 million, 39.2 million, and 76.6 million respectively, as of 2011) (Black. *et al.*, 2013).

According to Nepal Demographic and Health Survey, 2016, the percent prevalence for underweight and wasted children of under five years of age are 27 and

10 percent. Around 36 percent of under five children were stunted. Children in rural areas are more likely to be stunted (53.9%) than in urban areas (43%). Similarly, NDHS 2016 also states that 36% of children below 5 years of age are stunted and 22% are severely stunted. The survey also showed that 3% of the children are severe wasted and 5% are severely underweight (MoHP, 2016).

Delaying initiation of breastfeeding and introducing other liquids prior to 6 months of age (including pre-lacteal feeds) increases the risk of disease and death: in one study from south India, delaying the initiation of breastfeeding past the first 24 hours increased the risk of death by 78% (Garcia, 2011).

1.2 Statement of problem and justification

Inadequate intake of protein (necessary to keep the body healthy and build muscle), calories (a measure of energy the body needs), iron (for proper blood cell function), and other nutrients make up different types of malnutrition. Poor nutrition occurs in developing countries, as well as in more prosperous areas of the world. As many as 800 million persons worldwide are affected by malnutrition. More than half the childhood deaths in developing countries are related to malnutrition (WFP, 2011b).

For the improvement of growth and development of infants and young children, proper feeding practice is needed. The proper feeding practice, communally recognized as IYCF practice, take in exclusive breastfeeding for 6 months with the continuation of breastfeeding up to 2 years or beyond. The initiation of breastfeeding immediately after birth, preferably within one hour; exclusive breastfeeding for the first six months; appropriate and adequate complementary feeding from six months of age while continuing breastfeeding; and continued breastfeeding up to the age of two years or beyond (Malik, 2013).

According to the NDHS 2016, 36% of children under 5 years of age are stunted (short for their age), 10% are wasted (thin for their height), 27% are underweight (thin for their age) where only 55% of children under age 2 are breastfed within 1 hour of birth, and 66% of children under age 6 months are exclusively breastfed. 47% of children age 6-23 months receives meals with minimum recommended diversity (at least four food groups), 71% receive meals at the minimum frequency, and 36% meet the criteria of minimum acceptable diet. 86% of children age 6-59 months received a Vitamin A capsule, 76% of children age 12-59 months received deworming

medication (MoHP, 2016). This shows that malnutrition can cause due to feeding practice as infant feeding practice influence on the nutritional status.

Hence, this study assessed the prevalence of malnutrition and influence of infant feeding practice on the nutritional status which can be used as a reference in priority setting and designing effective nutritional programs.

1.3 Objectives of the study

1.3.1 General objectives

- To study the influence of infant feeding practise on the nutritional status of 6-59 months children of *Sukumbashi basti*, Kankai municipality, Jhapa

1.3.3 Specific objectives

- To assess the nutritional status of children between 6–59 months of age in the community
- To carry out household survey to find out the socioeconomic status, condition of health facilities, care and feeding practices of mother and children with the help of questionnaire.
- To identify the factors that directly or indirectly responsible for malnutrition.

1.4 Research questions

- What is existing nutritional status of the under five year children in *Sukumbashi basti*, Kankai municipality, Jhapa?
- Is there any association between infant feeding practice and nutritional status of 6-59 months children?

1.5 Significance of study

The significance of the study was to provide information regarding the nutritional status of children between 6–59 month of age to the governmental and non-governmental organization which will be helpful to initiate corrective measures for the problem. The study also finds the influence of several infant feeding practice on the nutritional status of 6-59 months children. It also act for discovery of problems related to nutrition, care practices and feeding behavior of this community. The study helps to identify individual or group of people who are at risk of being malnourished and who need special care and attention.

1.6 Limitation of study

- i. The study was cross-sectional in design; it neither represents seasonal variation of nutritional outcomes particularly to wasting status nor establishes correct temporal causal relationship of predictors and the outcomes variables.
- ii. Biochemical examination was not done to assess the nutritional status.

1.7 Conceptual framework

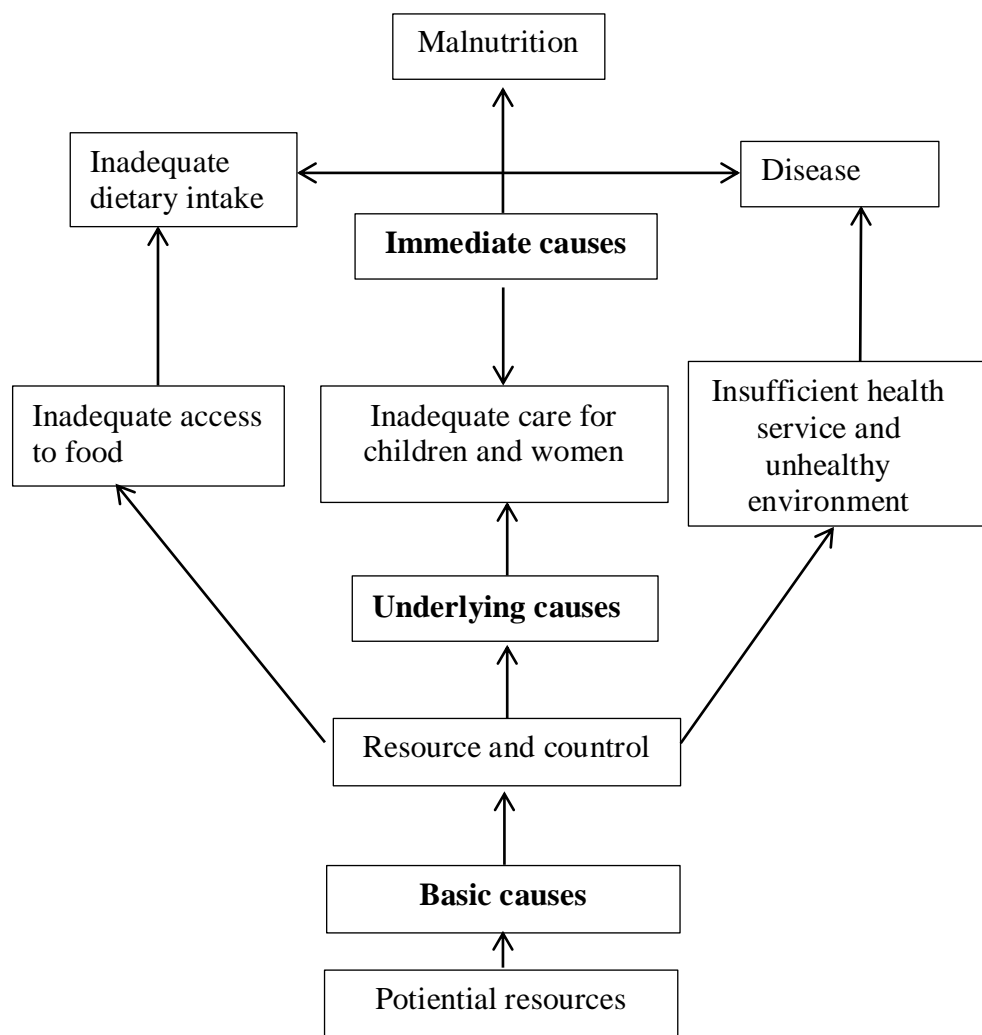


Fig 1.1: UNICEF conceptual framework (UNICEF, 2015)

Part II

Literature review

2.1 Background

Millions of children in Asia face a daily challenge in achieving optimal nutrition, often because of their families lacking sufficient knowledge, information and resources. More than half of these early child deaths are due to conditions that could be prevented or treated with access to simple, affordable interventions. Leading causes of death in children under-5 years are preterm birth complications, pneumonia, birth asphyxia, diarrhea and malaria. Nearly half of these deaths are in newborns, a figure that will rise as the mortality rate for older infants continues to fall. Globally in 2017, 151 million children under the age of five (22%) were stunted (too short for their age), with three quarters of such children living in the WHO South-East Asia Region or WHO African Region (WHO, 2018b).

In Maharashtra, it was found that 40.46% under five children were stunted, 38.15% were underweight, and 16% were wasted (Purohit *et al.*, 2017). In a study conducted on Kathmandu valley, there were 2.1% severely stunted, 8% stunted, 2.8% tall, and 1.7% very tall children. Similarly, 6.4% were severely wasted, 14.4% wasted, 4.7% severely underweight, and 12.3% under-weight (Chhetri *et al.*, 2017).

In 2017, 22.2 % or just under one in four children under five years had stunted growth worldwide. Between 2000 and 2017, stunting prevalence globally declined from 32.6 per cent to 22.2 per cent, and the number of children affected fell from 198 million to 151 million. In 2017, nearly two out of five stunted children lived in South Asia while more than one in three lived in sub-Saharan Africa. Similarly, 51 million children under five were wasted of which 16 million were severely wasted. This translates into a prevalence of 7.5 % and 2.4 %, respectively. At nearly 16 % children in South Asia's was under prevalence of wasting (UNICEF., 2018).

2.2 Nutrition status

The term malnutrition refer to the syndrome of inadequate intake of protein, energy, and micronutritents, combined with frequent infection which result in poor growth and body size. In recognition of the fact that the deficiency of nutrients other than protein and energy play a significant role in the causation of malnutrition (Adhikari,

2013). Nutritional status is the condition of health of the individual as influenced by the utilization of nutrient. It can be determine through a careful medical and dietary history, a thorough physical examination, and appropriate laboratory investigation (Robinson, 2000)

Nepal is facing the vicious cycle of PEM spiral i.e. poverty, population explosion, and environmental degradation. However various types of governmental and no governmental health programs have been launched from time to time but they are still need improvement (MoHP, 2011). Nutrition is the study of food in relation to health and the process by which living organism used food for the maintenance of life, growth, normal functioning of the organs and tissues, and productivity of energy or the study of various nutrients their functions, food resources and their utilization by human body and their effect on human well beings. Nutrition is about our food, what we need it, and how it allows us to live healthy lives (Adhikari, 2013).

The prevalence of poor nutrition status on developing country is mainly due to the low income, low production of food, low productivity of crops and livestock, unequal distribution of food, low literacy, socio-culture and poor environmental sanitation. The poor nutritional status has both direct and indirect effect on learning skills, mental performance as well as a working capacity resistance to disease. Broadly speaking the development of nation depends on the nutritional status of its people (Adhikari, 2013).

2.2.1 Factor affecting the nutritional status

A number of factors affect acceptability and utilization of food such as availability, cultural practices, economic condition, familiarity, taste and knowledge about health. The factor affecting nutritional status are mother's food security, types of food given to the young children, feeding frequency, poverty, illiteracy, ignorance to the child for care and feeding, status of woman and child nutrition and last but not the least who feed the child and how the child eat. Also factor influencing the nutritional status are food availability and its distribution system, consumption, income and purchasing power, price of commodities, illiteracy, family size, socio-culture and religious belief, environmental sanitation and health facility (Bacobo, 1988).

Good health depends on an adequate food supply and this in turn on a sound agricultural policy and a good system of food distribution. The social, economic and

agricultural factors that determine the food supply also determine the state of health and incidence of disease amongst the population. These are the basic etiological factors causing nutritional diseases and they are closely linked with the dangers, which arise from failure to control on excessive increase in the population. Even a good supply and preparation of food in the home, lack of education is responsible for much malnutrition, especially in poor rural areas and urban slums (Davidson. and Passimore., 1986).

Factors influencing the nutritional status are food availability, its distribution system, consumption, income and purchasing power, price of commodities, illiteracy, socio cultural and religious beliefs, environmental sanitation, health facilities etc. Among the above given factors the availability of food and its proper distribution and consumption, income and its proper distribution and purchasing power and proper environmental sanitation play a very important role in the nutritional status of the people in developing countries (Adhikari, 2013).

Some of them are explained below:

1. Inadequate dietary intake: A child's growth is the most important indicator of health, which is influenced and measured by adequate intakes of food and nutrients and a decreased susceptibility to disease. Height and weight measurements are used as determinants of normal child growth. The UNICEF Conceptual Framework for nutrition indicates that inadequate dietary intake results in growth failure (Ruel *et al.*, 2013).
2. Cooking practices: Draining away the rice water at the end of cooking, prolonged boiling in open pans, peeling of vegetable all influences the nutritive value widely from region to region and influence the nutritive value food (Amruth, 2012).
3. Child rearing practices: These vary widely from region to region and influence the nutritional status of infants and children. Examples of these situation are premature curtailment of breast feeding, the adoption of bottle feeding and adoption of commercially produced refined food, during eating time roaming around, inactive eating and watching television also effect the nutrition status of child (Amruth, 2012).
4. Health & Nutrition education: It is opined that by appropriate educational action, 50% of nutrition problem can be solved. Health education and nutrition education

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

2.3 Food availability and nutritional status

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

Increased production of food groups making the national diet balance is one of the most important measures of achieving, nutritional adequacy. Where the national diet are deficient in nutrient, adverse consequences manifest themselves, for example, there is high prevalence of anemia due to iron deficiency, blindness among children due to vitamin A deficiency etc. Thus, the real solution to overcome the deficiencies disease is to consume diet rich in these nutrients (Adhikari, 2013).

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

2.4 Malnutrition

Malnutrition continues to be a major public health problem in developing countries. Health and physical consequences of prolonged states of malnourishment among children are: delay in their physical growth and motor development; lower intellectual quotient (IQ), greater behavioral problems and deficient social skills; susceptibility to contracting diseases (Black. *et al.*, 2003). In ancent the most common form of malnutrition that is visible and thus easy to diagnose in children is protein energy malnutrition. (PEM) Protein energy malnutrition is a deficiency disease caused by inadequate intake of protein or calorie or both of them (Gomez *et al.*, 1995).

Malnutrition has been responsible, directly or indirectly, for 60% of the 10.9 million deaths annually among children under five. Well over two-thirds of these deaths, which often associated with inappropriate feeding practices, occur during the

first year of life. No more than 35% of infants worldwide are exclusively breastfed during the first four months of life; complementary feeding frequently begins too early or too late, and foods are often nutritionally inadequate and unsafe (Bohara, 2018). Malnutrition is the direct or indirect cause for 50% of the total deaths among children (Knight *et al.*, 2014). Worldwide over 10 million children under the age of five years die every year from preventable and treatable illness despite effective health interventions. At least half of these deaths are caused by malnutrition. Malnourished children have lowered resistance to infection; therefore, they are more likely to die from common childhood ailments such as diarrheal diseases and respiratory infections. In addition, malnourished children that survive are likely to suffer from frequent illness, which adversely affects their nutritional status and locks them into the vicious cycle of recurring sickness, faltering growth and diminished learning ability. In developing countries, malnutrition is a major health problem (Monaghan *et al.*, 2006).

2.5 Types of Malnutrition

According to WHO, there are four forms of malnutrition. They are as follows:

i) Under-nutrition: This is the condition which results when insufficient food is eaten over an extended period of time. In extreme cases, it is called starvation. Malnutrition is often used specifically to refer to undernutrition where there is not enough calories, protein or micronutrients. If undernutrition occurs during either pregnancy or before the age of two years of age it may result in permanent problems with physical and mental development. Extreme undernourishment, known as starvation, may have symptoms that include: a short height, thin body, very poor energy levels, and swollen legs and abdomen. People also often get infections and are frequently cold. The symptoms of micronutrient deficiencies depend on the micronutrient that is lacking (Young, 2012).

Undernourishment is most often due to not enough high quality food available to eat. This is often related to high food prices and poverty. A lack of breast feeding may contribute, as may a number of infectious diseases such as: gastroenteritis, pneumonia, malaria and measles which increase nutrient requirements (WHO, 2014).

ii) Over-nutrition: Alongside under nutrition, a "double burden" of malnutrition is emerging with rates of obesity and chronic diseases associated with urbanization, aging populations, technological development and globalization of food supply and industry (Galal and Harrison, 2010). Billions of dollars are spent annually by the food industry to promote the consumption of highly refined, high calorie foods with little or no nutritional value (Ebbeling *et al.*, 2002). A nutrition transition is thus taking place, where disease patterns are shifting away from infectious illness towards a higher rate of non-communicable diseases such as heart disease, diabetes, and some types of cancer (WHO, 2012).

A second dimension of malnutrition, associated with the rising prevalence of overweight and obesity and overnutrition-related diseases, is not an exclusive concern of high-income countries, and generates an additional health burden in many middle-income and even low income countries. The persistence of undernutrition and micronutrient deficiencies in areas where the prevalence of excess weight is also growing has been associated with economic transitions, growing income inequalities, and rapid changes in the structure of food systems (REU, 2012).

iii) Specific deficiency: It is the pathological state resulting from a relative or absolute lack of an individual nutrient. Micronutrients encompass vitamins and minerals which are essential for normal human development and functioning and are needed in minute quantities. Deficiency of those specific nutrients like iron, iodine leads to several diseases (Seshadri, 2001).

iv) Imbalance: This pathological state results from a disproportionate consumption of essential nutrients with or without the absolute deficiency of any nutrients as determined by the requirement of a balanced diet. The main types of malnutrition prevailing in human children are protein energy malnutrition (PEM) and micronutrient malnutrition; following are the brief descriptions of the types of malnutrition (Adhikari, 2013).

2.5.1 Most common malnutrition problems

Adequate nutrition is a fundamental right for every human being. If people fail to consume sufficient quality and quantity of nutrients, they will suffer from hunger or malnutrition. The common types of malnutrition in Nepal are: protein energy

malnutrition, iodine deficiency disorder, iron deficiency anemia and vitamin A deficiency (Joshi., 2012).

2.5.1.1 Protein energy malnutrition (PEM)

The term PEM was first introduced by Jelliffe in 1959 and is defined as a diet with insufficient amounts of all the major macronutrients: proteins, carbohydrates and fats. Protein energy malnutrition usually is seen during famines in Third-World countries and in eating disorders in Western societies. PEM is also known as starvation and a person becomes thin and weak and is in danger of death (Jelliffe, 1966).

Protein energy malnutrition, also known as starvation, is defined as a diet with insufficient amounts of all the major macronutrients: proteins, carbohydrates and fats. A starving person becomes skeletally thin and weak and is in danger of death. Protein energy malnutrition usually is seen during famines in Third-World countries and in eating disorders in Western societies (WFP, 2011a). Protein Energy Malnutrition usually manifests early, in children between 6 months and 2 years of age and is associated with early weaning, delayed introduction of complementary foods, a low-protein diet and severe or frequent infections (Müller and Krawinkel, 2005).

Types of Protein energy malnutrition (PEM)

i) Kwashiorkor

Threatening and debilitating form of malnutrition mostly seen in regions experiencing famine in low and lower middle income region. Because of its association with edema (fluid retention), kwashiorkor is also known as "edematous malnutrition". People suffering from kwashiorkor typically have an extremely emaciated appearance in all body parts except their ankles, feet, and belly, which swell with fluid. The term of kwashiorkor means the disease which the child gets when the next baby is born, i.e. sickness of deposed child. The disease is appertaining when the child is weaned onto traditional diet that may be low in protein. In many rural areas where kwashiorkor is endemic, the food supply become scarce each year before the harvest, at during this hungry season the incidence of kwashiorkor in other nutritional disease increases (Adhikari, 2013).

This disease can be easily treated with a change in diet and those who are treated early usually have a full recovery. Treatment includes introducing extra calories and

protein into the diet. Children who develop kwashiorkor may not grow or develop properly and may remain stunted for the rest of their lives. There can be serious complications when treatment is delayed, including coma, shock and permanent mental and physical disabilities. Kwashiorkor can cause major organ failure and eventually death and can also be life threatening if it's left untreated. Kwashiorkor can be identified with following symptoms: change in skin and hair color (to a rust color) and texture; fatigue; diarrhea; loss of muscle mass; failure to grow or gain weight; edema of ankles, feet and belly; damaged immune system; irritability; flaky rash, shock, moon face, apathy and peevishness, crazy pavement and fatty liver etc (Swaminathan, 2014).

ii) Marasmus

Nutritional marasmus also referred as wasting is considered as a severe form of malnutrition, principally due to consumption of diet markedly deficient in both protein and calories and is usually participated by diarrheal diseases. Characteristic symptom are growth failure and low body weight wasting , severe of muscles and of subcutaneous fat, and dry and atrophic skin (Swaminathan, 2014).

Underweight is the main symptom of marasmus. Children with marasmus have lost a lot of muscle mass and subcutaneous fat along with brittle hair, sunken eyes and dry skin; chronic diarrhea; respiratory infectious; intellectual disability and stunted growth, frequent dehydration, persistent dizziness, ribs and shoulder visible through skin along with frequent infections. Seriously malnourished children have little to no energy or enthusiasm for anything. Short temper and irritability is also seen in marasmic child but this is usually a more common symptom of kwashiorkor (Adhikari, 2013). It is estimated that 20 million children under five years of age have severe form of malnutrition like marasmus at some point in their lives and about 500000 to 2 million children die as a result of it (UNICEF, 2015). Improper feeding, Infection as syphilis or tuberculosis, congenital weakness of disease, such as congenital heart disease, very poor sanitary and hygienic condition that spread disease are considered to be additional cause of marasmus (UNICEF, 2015).

iii) Marasmic-Kwashiorkor

It can be indicated as a mixed form of malnutrition resulting from the deficiency of both calories and protein, primarily in children. The condition is characterized by

presence of both wasting and bilateral pitting edema along with dehydration lethargy and growth retardation. It is a very serious condition and classified as forms of severe acute malnutrition (Swaminathan, 2014) .

2.5.1.2 Iron deficiency Anemia

Iron deficiency is one of the most prevalent nutrient deficiencies in the world, affecting an estimated two billion people (Stoltzfus and Dreyfuss, 1998).

According to American society of Hematology, iron deficiency is the most common cause of anemia and it may be caused due to several reasons as inadequate iron intake, pregnancy or blood loss due to menstruation, internal bleeding, inability to absorb iron etc. It can occur in both men and women of any age and from any age group however some people may be at greater risk for IDA than others which include women of childbearing age, pregnant women, women with heavy menstrual periods, people with poor diets, people who donate blood frequently, people with major surgery or physical trauma, GIT disease, inflammatory bowel syndrome, peptic ulcer disease infants and children especially those born prematurely or experiencing a growth spurt, vegetarians who do not replace meat with other iron rich food, children who drink more than 16-24 ounces a day of cow's milk (as it not only contains little iron but calcium also decrease absorption and irritate the intestinal lining causing chronic blood loss) (Stanley and Auerbach, 2016).

The symptoms of IDA can be mild at first and one may not even notice them. Common symptoms of anemia are paleness of lip, tongue, inside the eyelids and hands. The child with severe anemia becomes tired, dizzy, and restless and has a rapid pulse and short breath. Iron deficiency anemia has also been shown conclusively to delay psychomotor development and impair the cognitive performance of infants and pre-school children. There may also be strange craving to eat items that aren't food as dirt, ice or clay along with tingling or crawling feeling in the legs, swelling of tongue or soreness, cold hands and feet, brittle nails and headache (Kaushansky *et al.*, 2016). According to WHO, overall rates for iron deficiency anemia in developing countries are 26% for men, 42% for women, 46% for school-age children, and 51% for children four years of age or less. Iron deficiency anemia has long been associated with tiredness. Anemia is very rare in healthy breast-fed infants. Anemia may be a greater problem in the lower socio-economic families (De Onis *et al.*, 1998).

2.5.1.3 Iodine deficiency disorder

Iodine deficiency is the leading cause of preventable intellectual impairment and is associated with a spectrum of neurological and developmental pathology. It is a global health issue and WHO estimates over 2 billion people may be iodine deficient up to 50 million of them suffering from serious symptoms of iodine deficiency such as brain damage (Chestnov, 2005). Iodine deficiency disorders are of particular concern among women. The main manifestation of iodine deficiency are goiter, impaired mental function and increased rates of fetal wastage, still births, and infant deaths. Severe mental and neurological impairment known as cretinism occurs among infants born to mother who are seriously iodine deficient (Lisile *et al.*, 1997). The extent of iodine deficiency disorder is usually assessed by the prevalence of goiter in affected populations (Swaminathan, 2014).

Iodine deficiency symptoms manifest as a result of improper thyroid hormone production i.e. when the thyroid gland does not receive enough iodine, trouble appears. Signs and symptoms of Iodine deficiency may vary according to individuals but they usually include- thyroid enlargement known as goiter; mental imbalance such as depression and anxiety; mental retardation (in extreme case); fetal hypothyroidism leading to brain damage; autism (Eastman and Zimmermann, 2011).

2.5.1.4 Vitamin-A deficiency

Vitamin A deficiency (VAD) is a nutritional deficiency of high magnitude that can be caused by insufficient intake of vitamin A food sources or by vitamin absorption, transport or metabolism process. The importance of adequate vitamin A is indisputable, as it has very diverse physiological roles in the visual process, in the integrity of epithelial tissue and immune system, as well as in other metabolic function (Organization, 2009). In pregnant women, VAD causes night blindness and may increase the risk of maternal mortality. VAD is a public health problem in more than half of all countries, especially in Africa and South-East Asia, hitting hardest young children and pregnant women in low income countries. An estimated 250 million preschool children are vitamin A deficient and it is likely that in vitamin A deficient areas a substantial proportion of pregnant women is vitamin A deficient (WHO, 2012).

Xerophthalmia is sometimes used to cover all the clinic disorders of the eyes due to VAD. Xerophthalmia and keratomalacia are progressive disease of the eye due to VAD. The earliest symptoms are night blindness, dryness of conjunctiva and affected cornea (Swaminathan, 2014).

2.5.1.5 Zinc deficiency

Everyone, young and old, requires regular zinc intake to remain alive, which is why it is referred to as an -essential trace element. Even plants and animals need it to survive. Present in every cell, organ, bone, tissue, and fluid in our bodies zinc is especially prominent in the male prostate gland and semen. The mineral zinc is necessary for proper function of our immune system. Zinc also helps cells divide and grow and assists the body in healing wounds. Deficiency symptoms include frequent infections, hair loss, poor appetite, problems in tasting and smelling and long healing times for wounds. Zinc deficiency can be stopped or prevented by eating nuts, legumes, yeast and whole grains. Zinc is also found in beef, pork and lamb (WFP, 2011b).

Zinc deficiency, a significant problem for most countries in the world, the World Health Organization (WHO) reports that the global prevalence of zinc deficiency is 31%. ranked as the fifth leading risk factor in causing disease worldwide, underdeveloped nations regularly suffer from high mortality rates because of the connection that zinc deficiency has with childhood diarrhea and pneumonia. Zinc deficiency is such a serious global problem that 176,000 diarrhea deaths, 406,000 pneumonia deaths and 207,000 malaria deaths are caused by it; primarily in Africa, the Eastern Mediterranean and South-East Asia (WHO, 2012).

2.6 Causes of malnutrition

Causes of Malnutrition among young children in Asia were determined as follows:

2.6.1 Dietary intake

Both dietary quantity (total amount of energy consumed) and quality (dietary diversity and intake of specific nutrients) are of concern in Asia. Traditionally vegetarian diets in some countries, low intake of micronutrient-rich foods (particularly meat and animal source foods, but also certain vegetables and fruits), high intake of compounds that inhibit absorption of key nutrients such as iron and zinc, and monotonous diets based largely on staple grains such as rice are considered

prime contributors to micronutrient deficiencies and anemia in Asia. Micronutrient deficiencies of particular concern in Asia include iron, zinc, vitamin A, iodine, and calcium deficiencies (Chaparro *et al.*, 2014).

2.6.2 Low birth weight and maternal nutritional status

LBW in developing countries is primarily due to intrauterine growth restriction rather than premature birth and is both a cause and consequence of maternal and child malnutrition. Asia leads other world regions in both the percentage of children who are born with LBW (18% for Asia overall, ranging from 5.9% in East Asia to 27% in South and Central Asia (Black, 2008) as well as the total absolute number of live births suffering from this condition. The prevalence and total number of infants born “small for gestational age,” indicating some level of fetal growth restriction, is much higher (approximately 30%) in Asia overall, ranging from a low of 6.8% in East Asia to a high of 44.6% in South Asia (Black. *et al.*, 2013). Infants who are born with LBW are at greater risk of death during the neonatal period (particularly due to birth asphyxia and infections, including sepsis, pneumonia, and diarrhea) (Black, 2008). Compared to its other global regions, the World Health Organization’s (WHO’s) Southeast Asia and Western Pacific regions have the highest percentages (52% and 54%, respectively) of mortality for children under 5 years of age attributable to neonatal deaths (Liu, 2012).

Long-term consequences of LBW and intrauterine growth restriction are also apparent, including increased risk of underweight and stunting in childhood. Girls who do not grow adequately during childhood nor catch-up during adolescence, reach their child bearing years with short stature, which can contribute to the risk of LBW in their offspring, thus continuing the intergenerational transmission of malnutrition. Maternal short stature is also associated with increased risk of complications during delivery due to smaller pelvic size. If a girl becomes pregnant during adolescence, further height gain is prevented, and by 6 months postpartum, previously pregnant adolescents have lower BMI, fat mass, and mid-upper arm circumference as compared to their multigravida peers (Rah, 2008).

2.6.3 Breastfeeding practices

Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process with

important implications for the health of mothers. As a global public health recommendation, infants should be exclusively breastfed for 6 months of life to achieve optimal growth, development and health. There after, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond (Dewey, 2002). Delaying initiation of breastfeeding and introducing other liquids prior to 6 months of age (including pre-lacteal feeds) increases the risk of disease and death: in one study from south India, delaying the initiation of breastfeeding past the first 24 hours increased the risk of death by 78% (Garcia, 2011).

2.6.4 Complementary feeding practices

The complementary feeding period, when food and liquids other than breast milk are introduced to the infant's diet, constitutes a high-risk period for development of malnutrition and disease, particularly diarrhea. Inadequate complementary feeding practices have been identified as a major cause of malnutrition globally, particularly in Asia. Many aspects of complementary feeding are inadequate the timing of introduction of solid/semi-solid food, the frequency of feeding, the choice of foods, and the way in which they are prepared. Recent analyses of complementary feeding practices in Indonesia, showed that only a little over half of children under 2 years (53%) were receiving enough meals for their age per day, although dietary diversity was higher (68%) than that seen in other South Asian countries examined (Chaparro *et al.*, 2014).

2.6.5 Disease, sanitation, and hygiene and access to health care

Young children, particularly those between 6–23 months of age, have a particularly high incidence of acute respiratory infections (ARI) (which include both lower and upper respiratory infections), diarrhea, and fever (a potential indicator of malaria). Pneumonia, diarrhea, and malaria represent the three leading causes of mortality in children under 5 globally (Liu, 2012). Poor personal Hygiene and environmental sanitation: Increased susceptibility to infection and thereby illnesses (Brugues *et al.*, 2014).

2.6.6 Poverty and food security

Malnutrition has long been known to be a consequence of poverty. Poverty is a critical underlying determinant that influences a child's nutritional status through

several pathways: hindering food security and access to diverse and nutritious foods, reducing a child's ability to receive adequate care, and restricting access to health services and treatment (Black, 2008).

2.6.7 Gender inequality and women's status

The importance of the education and social status of women relative to men in improving nutritional and health status of children has been documented. The low status of women in South Asia in particular has been identified as a basic cause of poor maternal and child nutrition and health outcomes. A recent assessment of mental health and depression among women in both Vietnam and Bangladesh found that there was significantly correlated with greater incidence of ARIs and diarrhea, and with greater levels of stunting in Bangladesh and greater levels of wasting in Vietnam (Chaparro *et al.*, 2014).

2.7 Appropriate Infant and Young Child Feeding Practices

2.7.1 Breastfeeding

Breastfeeding, initiated within the first hour of birth, provided exclusively for six months, and continued up to two years or beyond with the provision of safe and appropriate complementary foods, is one of the most powerful practices for promoting child survival and wellbeing. Improving breastfeeding rates around the world could save the lives of more than 820,000 children under age 5 every year, the majority (87 %) under 6 months of age (Ashmika and Rajesh, 2014).

Transitional milk

Transitional milk is used to describe the postcolostral period (7 to 21 days postpartum) when the composition of the milk changes more slowly than in the first few days following parturition. The content of transitional milk includes high levels of fat, lactose, water-soluble vitamins, and contains more calories than colostrum but lower levels of immunoglobulin (Ashmika and Rajesh, 2014).

Mature milk

Mature milk (21 days post-partum) also varies but to a lesser extent than in early lactation. Mature milk looks thinner, paler and is more watery than colostrum. Additionally, it consists of 90% water which is required to maintain hydration of the infant and the remaining 10% consists of carbohydrates, proteins and fats which are

important for both growth and to meet energy needs of the baby. There are two types of mature milk: Foremilk and hind- milk (Ashmika and Rajesh, 2014).

Foremilk

Foremilk is the first milk available in large amount at the beginning of a feeding which is watery thus, providing all the water the baby needs from it. Therefore, no other drinks such as water or juice are required before 4-6 months, even in hot climate. Foremilk is rich in proteins, lactose and other essential nutrients but contains less fat (Ashmika and Rajesh, 2014).

Hind-milk

Hind- milk is the richer milk, containing more fat which occurs after the initial release of milk and is more opaque and creamy white in colour. This type of milk induces a feeling of satiety in the infant as well as making the latter feels sleepy (Ashmika and Rajesh, 2014). WHO categorize breastfeeding into three groups, and focused on the entire period since birth as described by (Labbok *et al.*, 1997).

a) Exclusive breastfeeding

Exclusive breastfeeding is defined by WHO and UNICEF is the practice whereby an infant receives only breast milk from the mother or a wet nurse or expressed breast milk. The WHO and UNICEF, both recommend that mothers should breastfeed their child exclusively for the first 6 months and continue breastfeeding up to 2 years or longer rather than stop EBF practice as from 4-6 months (Labbok *et al.*, 1997).

Although breastfeeding infant exclusively for the first 6 months of life carries numerous benefits, many studies are centered on the “weanling’s dilemma” in developing countries which involves choosing between the protective effects of exclusive breastfeeding against infectious diseases and the (theoretical) insufficient breast milk to meet the infants’ energy and micronutrient needs beyond four months of age (Fewtrell. *et al.*, 2007).

b) Dominant Breastfeeding

The infant’s predominant source of nourishment had been breast milk. However, the infant may also have received water and water-based drinks like tea and local herbal drops (Heise and Garcia-Moreno, 2002).

c) Partial Breastfeeding

When infant's feeding included non-breast milk foods such as animal / powdered / condensed milk and / solid / semi-solid food (i.e. cereals, vegetables, fruits, lentils or meat). Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process with important implications for the health of mothers. As a global public health recommendation, infants should be exclusively breastfed for 6 months of life to achieve optimal growth, development and health. Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond (Heise and Garcia-Moreno, 2002).

2.7.1.1 Nutritional benefits of breast milk

Millions of children in Asia face a daily challenge in achieving optimal nutrition, often because of their families lacking sufficient knowledge, information and resources. The best solution for providing optimal infant and young child nutrition include protecting and promoting exclusive breast-feeding for the first six months of child life. In addition to improving child survival and protecting against life-threatening and chronic illnesses, breastfeeding promotes healthy growth and boosts early child development. Breastfeeding supports healthy brain development, and is associated with higher performance in intelligence tests among children and adolescents across all income levels. However, breastfeeding is not just good for babies; it is good for mothers as well. Indeed, breastfeeding has been shown to protect against post-partum hemorrhage, postpartum depression, ovarian and breast cancer, heart disease and type II diabetes (Ashmika and Rajesh, 2014).

It is estimated that improving breastfeeding rates could prevent an additional 20,000 maternal deaths from breast cancer. In short, breastfeeding is among the most effective ways to protect maternal and child health and promote healthy growth and optimal development in early childhood. Empowering and enabling women to breastfeed should be at the heart of countries' efforts to keep every child alive and to build healthy, smart and productive societies (UNICEF, 2017).

Breast milk is ultimately the best source of nutrition for a new baby. Many components in breast milk help protect your baby against infection and disease. The

proteins in breast milk are more easily digested than in formula or cow's milk. The calcium and iron in breast milk are also more easily absorbed (Srilakshmi., 2014).

2.7.2 Colostrum

Colostrum, 'First milk' is secreted for first 2–3 days after delivery, which should be fed to the newborn baby. For a mother giving nourishment to her child is the best gift she can ever give; for it not only provides all the required nutrients in the right proportions, but also promotes emotional bonding with mother. Breast milk is the complete food for the child in the first 6 months; nothing, not even water is required externally during this period. The colostrum gradually changes to mature milk during the first two weeks after birth. During this transition, the concentrations of the antibodies in milk decrease, but milk volume greatly increases. The disease-fighting properties of human milk do not disappear with the colostrum. In fact, as long as baby receives your milk, he will receive immunological protection against many different viruses and bacteria (League., 2017).

2.7.2.1 Importance of colostrum

Colostrum encourages the growth of good bacteria because of its PH level. It contains antioxidant and an anti-inflammatory property is provided in small amounts. A newborn baby has a tiny stomach, which can only take small amounts, and colostrum (Ashmika and Rajesh, 2014). Colostrum has an especially important role in protecting baby's gastrointestinal tract. A newborn's intestines are very permeable (leaky). Colostrum seals the holes by painting the gastrointestinal tract with a barrier which prevents most foreign proteins (from food the mother has eaten or from formula) from penetrating the gut and possibly sensitizing your baby to an allergy (Abenoza *et al.*, 2013).

Colostrum is rich in immunologic components such as secretory IgA, lactoferrin, leukocytes, as well as developmental factors such as epidermal growth factor. Colostrum also contains relatively low concentrations of lactose, indicating its primary functions to be immunologic and trophic rather than nutritional. Levels of sodium, chloride and magnesium are higher and levels of potassium and calcium are lower in colostrum than later milk (Tatsanavivat *et al.*, 1998). The proteins present in help in proper growth of baby's eyes and brain. Every drop of Colostrum is precious and considered liquid gold nutrition for the newborn baby. Colostrum is the first

immunization provided by nature for the newborn. It prepares your newborn for life outside the womb. However, make sure that your baby receives it through nursing, hand expression, or pumping. Your body itself provides the natural immunization for the baby it has formed (Babu Narayan *et al.*, 2014).

2.7.3 Complementary Feeding

Complementary feeding is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk. The transition from exclusive breastfeeding to family foods is referred to as complementary feeding which typically covers the period from 6–24 months of age, even though breastfeeding may continue to two years of age and beyond. This is a critical period of growth during which nutrient deficiencies and illnesses contribute globally to higher rates of under nutrition among children under five years of age (Godhia and Patel, 2013)

2.7.3.1 Importance of complementary feeding

Complementary feeding should be timely (start receiving from 6 months onward) and adequate (in amounts, frequency, consistency, and using a variety of foods). The foods should be prepared and given in a safe manner and be given in a way that is appropriate (foods are of appropriate texture for the age of the child) and applying responsive feeding following principles for psychosocial care (PMC., 2016).

Children fed only on their mother's milk after the six months period face the prospects of a nutritional gap and lowered immunity against preventable illnesses such as diarrhea and pneumonia (Iversen *et al.*, 2001)

From the age of 6 months a baby needs more energy and nutrients than can be provided by breast milk alone. At this age a baby's digestive system is mature enough to digest a range of foods. Complementary feeding is needed to provide energy and essential nutrients required for continued growth and development. The nutrients in recommended complementary foods complement those in breast milk, hence the name "complement" means they go well together, each have a role to play (Villar *et al.*, 2011).

2.8 Assessment of Nutritional Status

Assessment of nutritional status of community is one of the first steps in the formulation of any public health strategy to combat malnutrition. The principal aim of such an assessment is to determine the type, magnitude and distribution of malnutrition in different geographic areas to identify at risk groups and to determine the contributory factors. In addition, fractional evidence of the exact magnitude of malnutrition is essential to sensitize administrators and politicians to obtain allocation of materials and human resources and to plan appropriately (Srilakshmi, 1993). The assessment of nutritional status can be done by using following information (WHO, 1996).

2.8.1 Direct method

Deals with the individual and measures objective criteria. e.g. anthropometric, clinical examination, biochemical and bio-physical parameters.

2.8.2 Indirect method

Use community indices that reflect the community nutritional status or need. e.g. dietary intake, morbidity and mortality rates, as specific mortality and vital statistics.

2.8.3 Ecological factors

Ecological factors e.g. Socioeconomic status, housing and environmental hygiene, health and education services, conditioning infection are ecological factors.

2.9 Anthropometric measurement

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. The word “anthropometry” is derived from the Greek word “anthropo” meaning “human” and the Greek word “metron” meaning “measure” (Ulijaszek, 1994). The field of anthropometry encompasses a variety of human body measurements. Weight, stature (standing height), recumbent length, skinfold thickness, circumferences (head, waist, limb, etc.), limb lengths, and breadths (shoulder, wrist, etc.) are the examples of anthropometric measure (UNICEF., 2009).

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

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

2.9.1 Height for age

Stunting refers to a child who is too short for his or her age. These children can suffer severe irreversible physical and cognitive damage that accompanies stunted growth. The devastating effects of stunting can last a lifetime and even affect the next generation (UNICEF., 2018).

The height for age index provides an indicator of linear growth retardation and cumulative growth deficits in children. Children whose height for age z-score is below minus two standard deviation (-2 SD) from the median of WHO reference population are considered short for age (stunted) or chronically malnourished. Children below minus three standard (-3 SD) deviation are considered severely stunted (WHO, 1996).

2.9.2 Weight for height

Wasting refers to a child who is too thin for his or her height. Wasting is the result of recent rapid weight loss or the failure to gain weight. A child who is moderately or severely wasted has an increased risk of death, but treatment is possible (UNICEF., 2018).

The weight for height index measures body mass in relation to body height or length and describes current nutritional status. Children with z-score below minus two standard deviation (-2SD) are considered thin (wasted) or acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of inadequate food intake or recent episode of illness causing loss of weight and the onset of malnutrition. Children with a weight for height index below minus three standard deviation (-3 SD) are considered severely wasted. The weight for height index also provides data on overweight and obesity. Children more than two standard deviations (+2 SD) above the median weight for height are considered overweight or obese (UNICEF., 2018).

2.9.3 Weight for age

Weight is the anthropometric measurement most in use. Its potential value, especially for children, is appreciated not only by health personnel, but often by less educated

parents, for whom it is useful as a source of health education. Weight for age is a composite index of height for age and weight for height. It takes into account both chronic and acute malnutrition. Children whose weight for age is below minus two standard deviations (-2 SD) are classified as underweight. Children whose weight for age is below minus three standard deviations (-3 SD) are considered severely underweight (WHO, 1996).

2.9.4 MUAC (Mid Upper Arm Circumference)

Recent estimates indicate that 8.5 million infants less than 6 months of age throughout the world are wasted by World Health Organization (WHO) growth standards, which define wasting. The risk of undernutrition in infancy is increased in preterm and low-birth-weight infants and in infants born to young, rural, poorly nourished mothers of lower socioeconomic or educational status. Additionally, in poor regions, low rates of exclusive breastfeeding and mixed feeding as early as 2 months of age expose infants to contamination and to foods with low nutrient density (Mwangome and Fegan, 2012).

Muscle and fat constitute the soft tissues that vary with a deficiency of protein and calories. Measurement of the mid-upper-arm circumference is the most useful method for assessing muscle mass and is also useful for rapid screening of children for severe malnutrition (Organization, 2006).

Part III

Materials and Methods

3.1 Research instrument

Equipment used during the survey was:

3.1.1 Weighing machine

For measuring the weight of the children digital weighing machine with the capacity of 100 kg and having the least count of 0.1 kg, manufactured by Micro-life Pvt. Ltd was used. The following paragraph describes the technique used for measuring weight of children. The subject was without shoes and minimal clothing. The subject was standing on the center of the scale platform with his/her weight equally distributed to both legs. In case for young infant's weight was taken carrying the child by mother/caretaker and later on subtract to calculate the weight of the child.

3.1.2 Height measuring scale

For measuring the height of children, height-measuring standiometer was taken. It was prepared under the supervision of Central Campus of Technology, Department of Nutrition and Dietetics. The technique used for measuring height of the child was as follow: For children above two years, they were asked to stand on vertical bar, removing their shoes and heels together, head position such that the line of vision was perpendicular to the body, arms hanging freely by the side and back of the head, buttocks and heels were in contact with the wall. Height was recorded to the nearest 0.1 cm (Joshi., 2003).

For the children below two years, they were laid on the ruled board of the infantometer (length measuring scale for children below two years). The board has attached fixed piece of wood at one end and moveable piece at the other. The child was stretched out on the board and moveable end flat is pressed against the bottom of the child foot and the measurements were taken (Joshi., 2003).

3.1.3 Mid Upper Arm Circumference (MUAC)

The subject was asked to bend his arms 90° with his/her palm facing upward MUAC was taken on the left hand midway between the elbow and shoulder joint so that the hand was simply relaxed and hanging by the side.

3.1.4 Set of questionnaire

A well designed set of questionnaire was used to collect information on household characteristics, food consumption, feeding practice, health status and health facility.

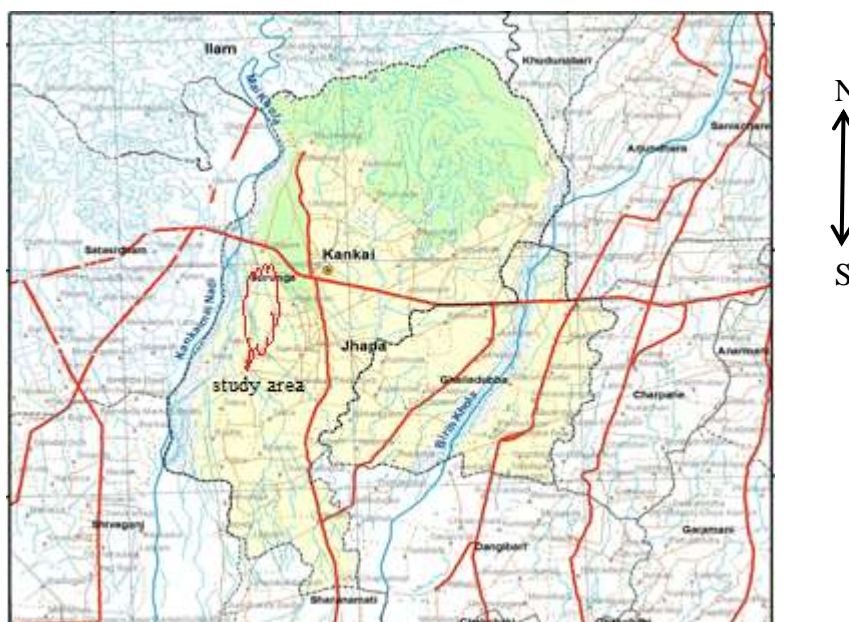
3.2 Research design

An area survey of under five year children of *Sukumbashi basti*, Kankai Municipality, Jhapa consists of two parts that were likely to be important in field based nutritional survey of designed research.

- A. Anthropometric measurement of under-five children
- B. Household survey with the help of questionnaire

3.3 Study area

Study area was *Sukumbashi basti*, Kankai municipality, Jhapa located in the eastern development region. Squatters' community is 4 km south from Surunga Chowk. Generally, people of low economic status along with poor hygienic environment reside in *Sukumbashi basti*, Kankai municipality, Jhapa. The longitude and latitude of Kankai municipality is 26.6518°N and 87.97041°E respectively.



3.4 Study variable

The study variables were divided into two categories:

a. Dependent variables

- i.** Stunting (height for age): Height for age below -2SD from the National center for Health Statistics/WHO reference median value
- ii.** Wasting (weight for height): Weight for Height below -2SD from the WHO reference median value
- iii.** Underweight (weight for age): Weight for age below -2SD from WHO reference median value

b. Independent variables

- i.** Socio-economic and demographic factors: family size, family type, income occupation, education
- ii.** Child Characteristics: gender, birth order, child birth weight, age groups
- iii.** Child caring practice: initiation of breast feeding, colostrum feeding, pre-lacteals feeds, exclusive breastfeeding, etc.
- iv.** Maternal characteristics: marriage age, age at pregnancy, iron folate supplementation, etc
- v.** Environmental and sanitation characteristics

3.5 Target population

Children aged 6-59 months were included as target population of the study.

Inclusion and exclusion criteria.

3.5.1 Inclusion criteria

Children aged 6-59 months who lived in Kankai municipality were included in the study.

3.5.2 Exclusion criteria

The study participants who were seriously ill or who were not available at house during the time of survey were not included in the study.

3.6 Sampling techniques

Random sampling was used for the study work. The basic criterion for the selection of household samples was that the household with at least one child of 6-59 months of age.

3.7 Sample size

Altogether 123 children were selected as sample during the survey as 95% confidence level, 7% desired precision, there may be absence of some children so, 5% non-response rate was added to total sample z-value 1.96 was used with 50% prevalence.

$$\begin{aligned} N &= Z^2 [P(1 - P)/d^2] \\ &= (1.96)^2 [0.5 * 0.5 / 0.07^2] \\ &= 3.8416 * 0.25 / 0.0049 \\ &= 196 \end{aligned}$$

Total population of children from 0-59 months were 255. Therefore,

$$\begin{aligned} \text{New, SS} &= N_o / [1 + (N_o - 1 / \text{POP})] \\ &= 196 / [1 + (196 - 1 / 255)] \\ &= 111.36 \sim 112 \end{aligned}$$

Thus, 5% non-response rate was considered due to unavailability of children. So the sample was 117. Again considering 5% household may refuse. So the final sample size was found to be 123.

3.8 Pre testing

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

3.9 Validity and reliability

To ascertain the degree to which the data collection instruments will measure what they purported to measure, the instruments was validated by a group of professionals from Central Campus of Technology, Central Department of Nutrition and Dietetics. The aspects tested in the questionnaire were also drawn from the available literature in nutrition education for young children. The questionnaire was also pre-tested prior to data collection to ascertain content and face validity. Reliability refers to quality control measure of data collected. Questionnaire was checked daily for completeness, consistency and clarity as mentioned earlier. In addition, the academic supervisor had

checked the collected questionnaires during the process of data entry and analysis.

3.10 Data collection technique

Data obtained from the respondents was collected on a structured form of questionnaire in which each questionnaire was given a unique identity number for each child. Interview was conducted with parents/care takers of the children to fill the questionnaire. Data collection was carried out on standardized procedures for obtaining informed consent, conducting interviews and performing anthropometry from guide teacher. We also learnt how to tackle the local problem that may arise in the field while conducting survey. These training were given to us during our field study on nutritional survey. All standardization and field work was conducted under the direction and supervision of my guide teacher.

3.11 Data analysis

Quantitative data was firstly cleaned, coded and was entered in Statistical software. Similarly, qualitative data were transcribed and coded by assigning labels to various categories. The verified test parameters were used to establish the relationships between the variables and nutritional status of students. SPSS 20 and WHO anthro 3.2.2 version were used to analyze the data and chi square test was used to find the associated factors for malnutrition.

3.12 Logistical and ethical consideration

Ethical clearance was obtained from Central Campus of Technology, Department of Nutrition and Dietetics and office of the Kankai Municipality, Surunga Jhapa. Also clearance to conduct the research will be obtained from the parents of respective children who will be selected for conducting the research. The study participants will be provided with oral consent prior to the study. Respondents will be assured that the data collected will be for the purpose of the study and will be treated with the confidentiality.

Part IV

Results and Discussion

Survey was conducted to find the prevalence and the factors associated with it in *Sukumbashi Basti*. The result of the survey was presented in the following headings.

4.1 Socio-economic and demographic characteristics

A total of 123 under-five children were included in the study with a response rate of 100%. The religion distribution shows mixed composition with higher percentage of Hindu 88.6%, followed by Muslim 10.6% and Christians 0.8% respectively. The participants were from a family who had an average of 5.34 ± 1.77 family members. Survey shows that 64.2% were living in nuclear family, followed by joint family 35.8%.

Table 4.1: Distribution of the surveyed population according to demographic characteristics (n=123)

Parameters	Frequency	Percent (%)
Religions		
Hindu	109	88.6
Muslim	13	10.6
Christian	1	0.8
Family type		
Single	79	64.2
Joint	44	35.8

Table 4.2: Distribution of the surveyed population according to socio-economic characteristics (n=123)

Parameters	Frequency	Percent (%)
Father occupation		
Farmer	27	22
Officer	2	1.6
Businessman	8	6.5
Abroad	28	22.8
Carpenter	17	13.8
Driver	15	12.2
Others	26	21.1
Mother occupation		
Housewife	113	91.9
Agriculture	9	7.3
Office worker	1	0.8
Mother literacy		
Illiterate	9	7.3
Primary	66	53.7
Secondary	33	26.8
Higher Sec. and above	15	12.2
Family income		
Less than 1 lakh	14	11.4
1lakh-3 lakhs	30	24.4
More than 3 lakhs	79	64.2

Survey shows 22.8% of the family head were in abroad, followed by 22% agriculture and 21.1% others where 91.9% mother were housewife, 7.3% were involved in farming and only 0.8% was office worker. Annual income of the family showed that 64.2% (79) household had the income above 3 lakhs, 24.4% had 1lakh-3lakhs and 11.4% had less than 1 lakhs. 7.3% of the mothers were illiterate, 53.7% were having primary level, 26.8% secondary and 12.2% higher secondary and above which shows higher literacy than census 2011 i.e 65.9% literacy rate (MoHP, 2011).

The major occupation of family was foreign employment followed by farming. A study conducted in Panchgachhi VDC found that the major occupation were labour and foreign employment (33%) followed by agriculture (14.4%), business (11.3%) and service (8.2%) which was similar as the present were majority of father were foreign employe. Similarly, annual income between NRs one hundred thousand to three hundred thousand had the highest percentage (49.5%) and the household that earn below one hundred thousand and above three hundred thousand annually were 34% and 15.5% respectively (Dhakal, 2015) whereas present study showed majority of peoples had annual income above 300000.

4.2 Child characteristics

Majority of the children were females 71 (57.7%) and males 52 (42.3%) and had mean age of 33.93 ± 14.87 months. The children of age 6-59 months were categorized according to WHO standard in 5 groups and shows that age group 12-23 and 48-59 month had the highest 23.6% of each age group followed by 36-47 months 21.1%, 24-35 month 20.3% and the least was 6-11 month 11.4%. A study carried in Panchgachhi VDC, 52.6% were males and 47.4% were females. The mean age of children was 28.2 months with SD of 14.7 months majority of them were in 12-23 months (35.1%) age group followed by 24-35 (23.7%), 36-47 (16.5%), 48-59 (13.4%) and 6-11(11.3%) (Dhakal, 2015) whereas present study shows majority of respondents were female and 12-23 months children. The study found that all families under study had only one child below 5 years of age.

Table 4.3: Distribution of the surveyed population according to child characteristics(n=123)

Parameters	Frequency	Percent (%)
Gender		
Male	52	42.3
Female	71	57.7
Age group		
(6-11) month	14	11.4
(12-23) month	29	23.6
(24-35) month	25	20.3
(36-47) month	26	21.1
(48-59) month	29	23.6
Birth weight		
<2.5 kg	8	6.5
>2.5 kg	115	93.5
Other child death		
Yes	6	4.9
No	117	95.1
Delivery type		
Cesarean	55	44.7
Normal	68	55.3

WHO recommended birth weight less than 2.5 kg as Low Birth Weight (LBW), so 2.5 kg is considered to the standard birth weight (Zewdu, 2012). In the study, 6.5% children had birth weight less than 2.5kg and 93.5% children were more than 2.5 kg has been reported respectively. In a study, NDHS 2016 shows 16.4% of children in Eastern Terai were born less than 2.5 kg. Birth weight less than 2.5 kg is considered as low birth weight (MoHP, 2016). It might be due to under nutrition in women before and during pregnancy (Koirala, 2019). 55.3% of children were born by natural birth whereas 44.7% babies were delivered by caesarean birth. In a study, 78.2% of children were born by natural birth whereas 21.8% babies were delivered by caesarean birth (Bista, 2018) where, caesarean cases was less than that of present study. Similarly, all children were monitored with growth chart.

4.3 Maternal characteristics

Majority of mothers had taken iron and folate tablet during their pregnancy and only 1.6% mother were found to have illness during pregnancy. It can be noted that the percentage of pregnant women receiving the recommended dose of iron tablets during their pregnancy was 42% in 2016 (MoHP, 2016).

Table 4.4: Distribution of the surveyed population according to maternal characteristics(n=123)

Parameters	Frequency	Percent (%)
Knowledge of jaulo		
Yes	65	52.8
No	58	47.2
Iron/folate intake		
Yes	121	98.4
No	2	1.6
Illness during pregnancy		
Yes	2	1.6
No	121	98.4
Knowledge of ORS preparation		
Yes	62	50.4
No	61	49.6
Smoking		
Yes	15	12.2
No	108	87.8
Consume alcohol		
Yes	31	25.2
No	92	74.8

In the study, 100% mothers consume food 3-4 times during their pregnancy. 52.8% mothers were well known about posilo jaulo where 47.2% did not know. Similarly, 50.4% mother had knowledge of ORS preparation. The study found that 12.2% mother smoke where 25.2% mother drink alcohol. In a study, 69.1% mothers had

knowledge about the importance of ORS while 30.9% had no knowledge about ORS (Khadka, 2017) which was higher than that of the present study.

4.4 Child feeding and care practices

Table 4.5: Distribution of the surveyed population according to child feeding (n=123)

Parameters	Frequency	Percent (%)
Colostrum feeding		
Yes	65	52.8
No	58	47.2
Prelacteal feeding		
Yes	121	98.4
No	2	1.6
Initiation of breastfeeding with in 1h		
Within 1h	40	32.5
Within 2h	75	61
Within 24h	5	4.1
Don't know	3	2.4
Duration of breastfeeding		
Upto 6month	23	18.7
Upto1year	43	35
Upto 2year	36	29.3
Above 2 year	15	14.6
No breast fed	3	2.4

Respondents who fed colostrum to their baby were found to be 52.8% while 47.2% did not feed colostrum. Pre-lacteal feeding to the neonate was practiced among 98.4% while 1.6% were not feed. In a study, 94.8% of the mothers in survey fed colostrum to their children while 5.2% of mothers didn't feed colostrum milk to their children and 86.4% of children were fed nothing before initiation of breast milk which was higher than that of present study.

Similarly, 18.7% children were breast fed for 6 month of age only where 35% children were breast fed for 2 year. In the study, it was found that 32.5% were initiated for breastfeeding during the first hour of birth while others where breastfed

after 1 hour. In a survey by Bista (2018) showed that 57.2 % of mother breastfed their child within 1 hour of the delivery which was lower than that of present study. NDHS 2016 found that 55% of last born children in the 2 years preceding the survey were breastfed within 1 hour of birth (MoHP, 2016).

Table 4.6: Distribution of the surveyed population according to child caring practice(n=123)

Parameters	Frequency	Percent (%)
Vaccination		
Yes	118	95.9
Escape Due to work	4	3.3
Forgotten	1	0.8
Balvita intake		
Yes	30	24.4
No	93	75.6
Start of complementary feeding		
4 months	2	1.6
5 months	3	2.4
6 months and above	118	95.9
Types of complementary food		
Home-made litto	40	32.5
Market available litto	40	32.5
Jaulo	22	17.9
Normal food	21	17.1
Feeding materials		
Spoon	18	14.6
Bottle	13	10.6
Hand	92	74.8

All the children were given vitaminA and worn capsule during the last vit. A capsule campaign whereas only 24.4% provided balvitta to their children. Regarding Vitamin A supplementation, all children were given Vitamin A capsule and deworming tablet

during the last Vitamin A campaign. Similarly, the effectiveness of National Vitamin A supplementation program was similar to that of the country as the national data on Vitamin A supplementation showed nine in ten children aged 6-59 months received vitamin A supplement (MoHP, 2016). 95.9% children were vaccinated where 3.3% children escape their vaccination due to work load and 0.8% forget either they vaccinated their children or not.

The age at which complementary diet was introduced to the child at 4 months was 5.7%, at 5 months was 2.4% and at 6 months in 91.9%. In a survey, Eighty-three percent of children age 6-8 months receive timely complementary foods, and only 10% of children age 18-23 months have been weaned (MoHP, 2016) which was lower than the present study. The type of complementary food given to children was same as other family members in 32.5% (40), followed by home-made lito 32.5% (40), jaulo 17.9% (22) and market available litto 17.1% (121). 74.8% used hand for feeding where 10.6% use bottle for feeding and 14.6% used spoon for feeding. As per frequency of food given to children i.e meat/fish, pulses and vegetable were mentioned below in table 4.6. In a study, 57.9% child initiated complementary feeding at the age of 6 months which is less than that of present study. Majority of children were provided with complementary food same as other family members in followed by *lito*, *jaulo* and other foodstuff (Bista, 2018) which is similar to the present study.

Table 4.7: Food frequency distribution (n=123)

Parameters	Frequency	Percent (%)
Meat/Fish/ week		
1 times	108	87.8
2 times	10	8.1
2-4 times	2	1.6
Not given	3	2.4
Pulses/ week		
3-5 times	14	11.4
5-8times	78	63.4
8-10 times	30	24.4
10-12 times	1	0.8
Vegetables /week		
3-5 times	1	0.8
5-8times	41	33.33
8-10 times	78	63.4
10-12 times	3	2.4

Food was classified into seven groups (grains, roots and tubers; legumes and nuts, vit. A rich fruits and vegetables, other fruits and vegetables, dairy product, egg and flesh foods) (Crum *et al.*, 2013) and scoring was done where majority of children eat meat/fish once a week whereas majority of children consume pulses at frequency of 5-8 times in a week and vegetables consumption was 8-10 times in a week .

4.5 Personal hygiene and environment sanitation

Survey shows that almost all people use water tap as source of drinking water. Out of total respondents 24.4% use water tap for drinking and remaining 74.8% use tube well as source of drinking water and 0.8% use river water due to low family income for tap and tubewell. It also shows that 48.8% purify water before drinking and remaining 51.2% do not purify before drinking. 91.9% people use toilet in the survey area and all use soap water for washing hand after toilet. All the major environmental and hygienic characteristics under study are shown in table 4.8.

Table 4.8: Distrubution of samples based on personal hygine and environmental sanitation (n=123)

Parameters	Frequency	Percent(%)
Source of Drinking water		
Tap	30	24.4
Tube well	92	74.8
River	1	0.8
Water Purification		
Yes	60	48.8
No	63	51.2
Use toilet		
Yes	103	91.9
No	20	8.1
Waste management		
Yes	79	64.2
No	44	35.8
Iodized salt		
Yes	123	100
No	0	0

For the waste management, 64.2% family used to manage waste properly where 35.8% households don't manage. All the survey households use packaged iodized salt. This finding is similar to that of National Demographic and Health Survey 2016 which revealed that more than 95% of households were using iodized salt (MoHP, 2016).

4.6 Prevalence of malnutrition

Anthropometric indices are the major tool for the assessment of nutritional status of children. Deviation of anthropometric indices from the reference standard of those indices is the evidence of malnutrition. Generally, underweight, stunting and wasting are widely used indicators of malnutrition (Shrestha, 2014).

The overall magnitude of malnutrition among 6–59 months children in were 26.8%, 9.7% and 6.5% for stunting, underweight and wasting respectively as shown in Figure 4.1. NDHS 2016 showed the prevalence of stunting, underweight and wasting to be 36%, 27% and 10% respectively. The prevalence of stunting in the study area was found to be lower than the national data. However the result of this study revealed that the prevalence of wasting were lower compared with NDHS (2016) result of Eastern Terai i.e 10.3% (MoHP, 2016).

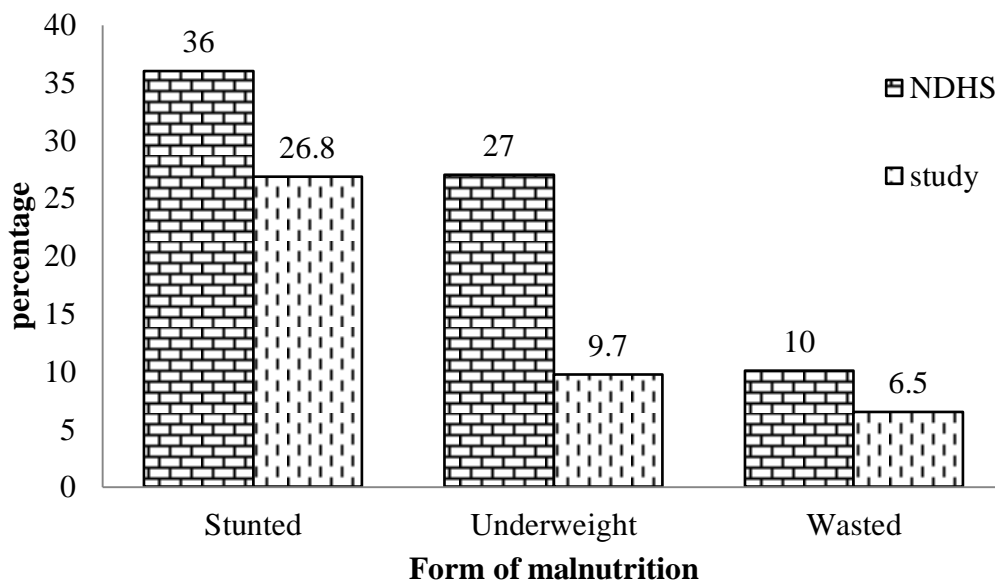


Fig 4.1: Prevalence of under nutrition in the study area in comparison to NDHS 2016,

A similar study conducted in Prakashpur VDC of Sunsari district showed that there was high prevalence of stunting (53.7%), underweight (26.1%) and wasting (11.5%), which was greater than the finding of the present study (Khadka, 2017).

Similarly underweight which is indication of both chronic and acute malnutrition has been found 8.5% which was lower than prevalence was seen in cross sectional study conducted in Belahara VDC of Dhankuta district in Nepal where the prevalence of underweight i.e 27% (Sapkota and Gurung, 2012).

4.6.1 Distribution of malnutrition based on gender

Moreover, severe and moderate stunting was found to be 1.6% and 25.14% respectively. Severe and moderate underweight was found to be 0.8% and 8.9% respectively and on the other hand prevalence of moderate wasting was found to be 6.5% among which 3.25% were female and 3.25% was male and there was no prevalence of severe wasting as shown in Table 4.9

Table 4.9: Gender wise distribution of wasting, stunting and underweight (n=123)

	Characteristic	Male%	Female%	All%
WHZ	Severely wasted	0	0	0
	Moderately wasted	3.25	3.25	6.50
	Normal	39.02	54.47	93.49
HAZ	Severely stunted	0.80	0.80	1.60
	Moderately stunted	9.75	15.44	25.19
	Normal	31.70	41.46	73.16
WAZ	Severely underweight	0	0.80	0.80
	Moderately underweight	4.10	4.90	8.90
	Normal	38.20	52.00	90.20

Prevalence of moderate stunting was 25.19% among which 15.44% were female and 9.75% were male. Prevalence of severe stunting was 1.60% among which 0.80% was male and 0.80% was female. Similarly, moderate underweight prevalence was 8.90% among which 4.10% were male and 4.90% were female. Prevalence of severe underweight was 0.80% among which 0.80% were female and no male.

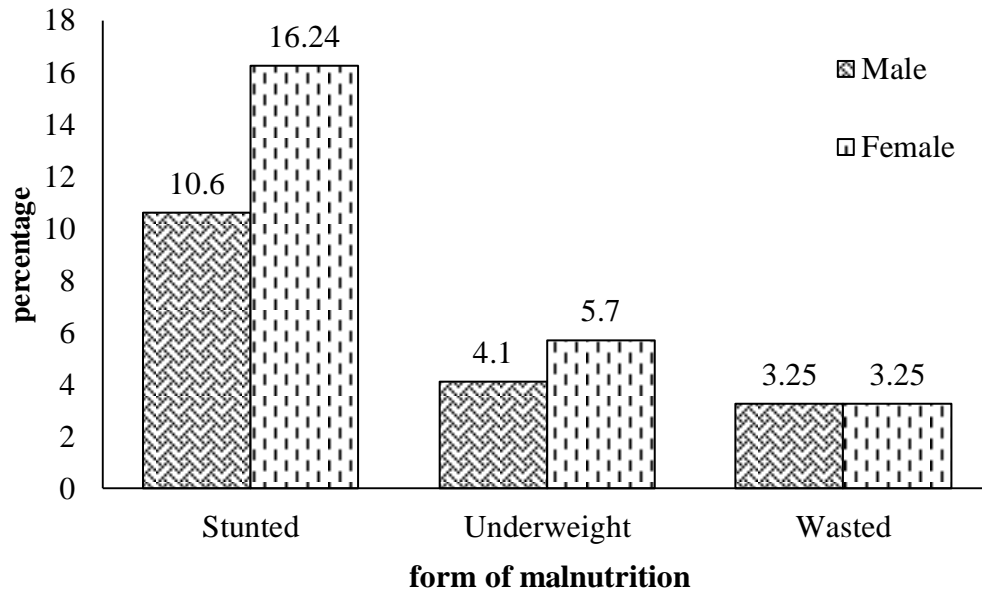


Fig 4.2:Gender wise distribution of stunting, wasting and underweight

4.6.2 Distribution of malnutrition based on MUAC

The prevalence of wasting based on MUAC measurement is shown in table 4.10. Out of 123 children, 8.9% of the children falls into moderate acute malnutrition criteria (MUAC: 115mm-125mm) where 1.6% were severely malnourished. The remaining 89.4% fall in the normal criteria (MUAC: >125mm). A similar study conducted at Ramdhuni-Bhasi Municipality, Sunsari showed that 7.3% of the children were malnourished based on MUAC reading (Bista, 2018).

Table 4.10: Distribution of malnutrition based on MUAC (n=123)

Class	MUAC	Frequency	Percentage (%)
Sever acute malnutrition	<115	2	1.6%
Moderate acute malnutrition	115-125	11	8.9%
Normal	>125	110	89.4%

4.6.3 Nutrition status comparison with WHO standard

Distribution of stunting, underweight and wasting among under five children of *Sukumbashi basti* surunga based on WHO standard are shown in the Figure 4.3, 4.4, 4.5, 4.6 and 4.7 respectively.

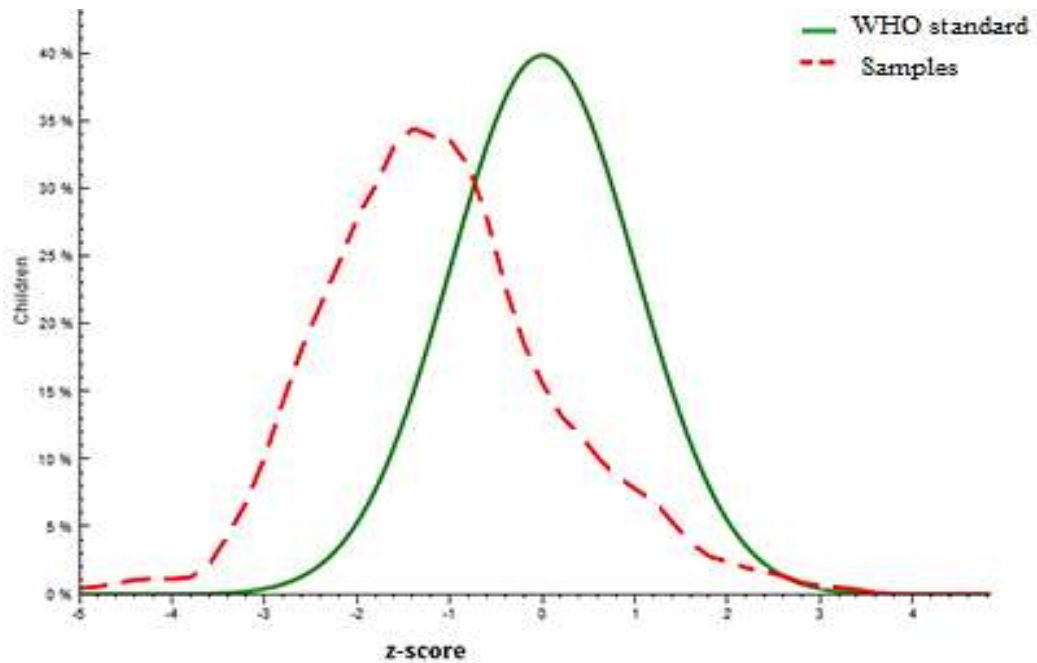


Fig 4.3: Distribution of stunting among 6 to 59 months children of *Sukumbashi basti* based on WHO standard (n=123)

Fig 4.3 shows that the median Height for Age z-score of survey children to be -1.4 which is less than the reference to WHO standard. This curve is skewed to the left side of WHO standard curve showing high prevalence of stunting among study population.

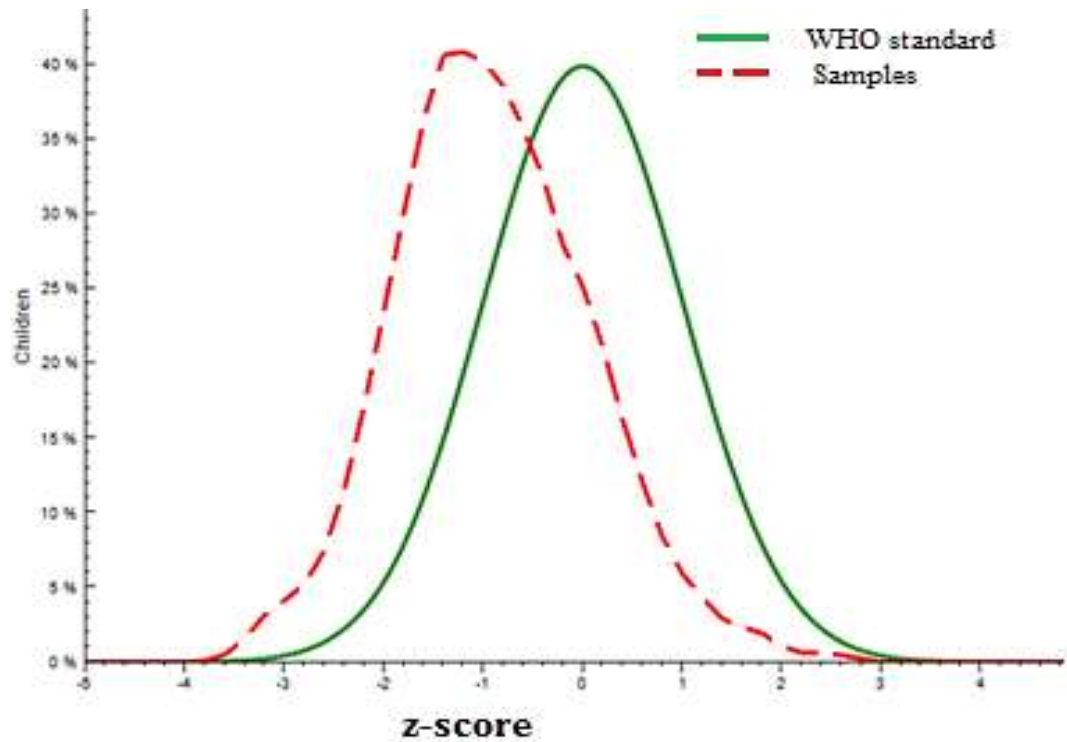


Fig 4.4: Distribution of underweight among 6 to 59 months children of *Sukumbashi basti* based on WHO standard (n=123)

The WAZ distribution curve obtained from the children is different than that of WHO standard curve. The median value of children is slightly shifted to the left indicating that most of the children in the population. The median value of WAZ was -1.3.

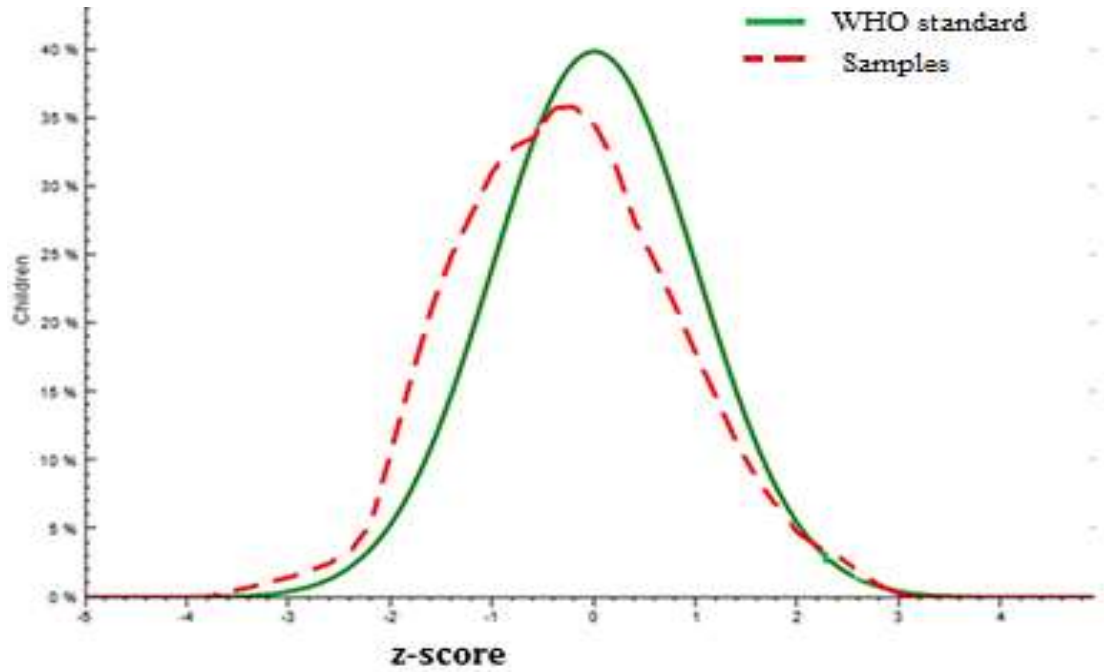


Fig 4.5: Distribution of wasting among 6 to 59 months children of *Sukumbashi basti* based on WHO standard (n=123)

Fig 4.5 shows that the median Weight for Height z-score of survey children was found to be -0.5 which is slightly less than the reference to WHO standard. This curve resembles the standard curve but is slightly skewed to left showing prevalence of underweight among study population.

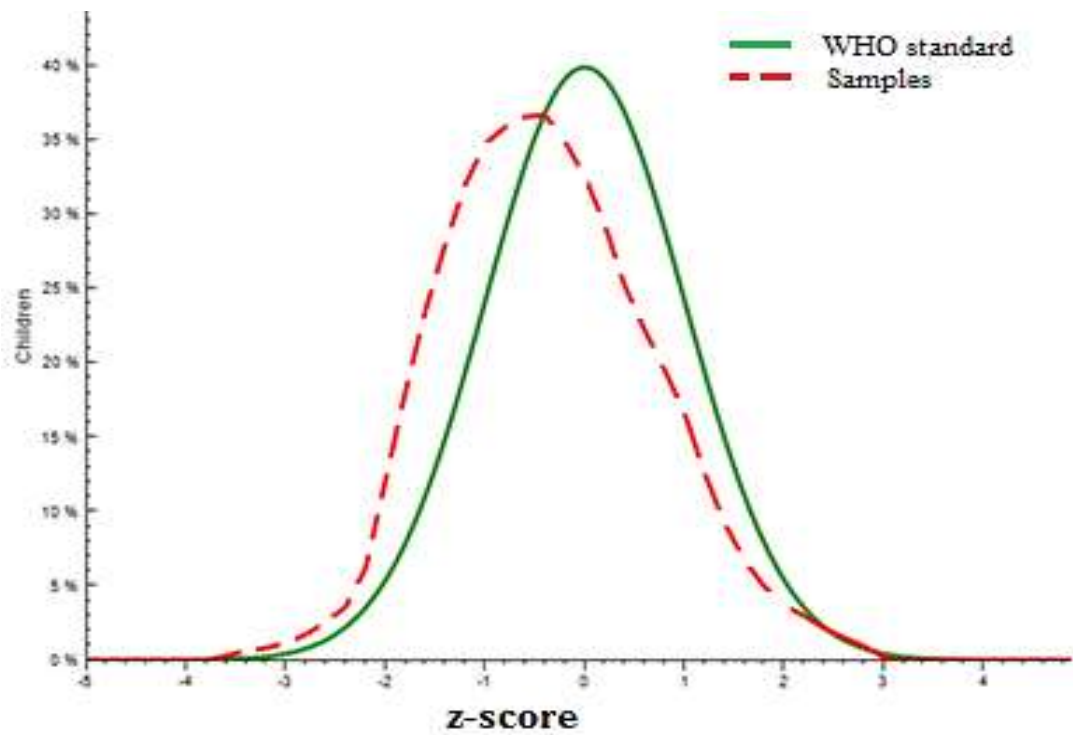


Fig 4.6: Distribution of BMI for Age among 6 to 59 months children of *Sukumbashi basti* based on WHO standard (n=123)

Figure 4.6 show that the median BMI for Age z-score of survey children was found to be -0.20 which is slightly less than the reference to WHO standard. This curve resembles the standard curve but is slightly skewed to left.

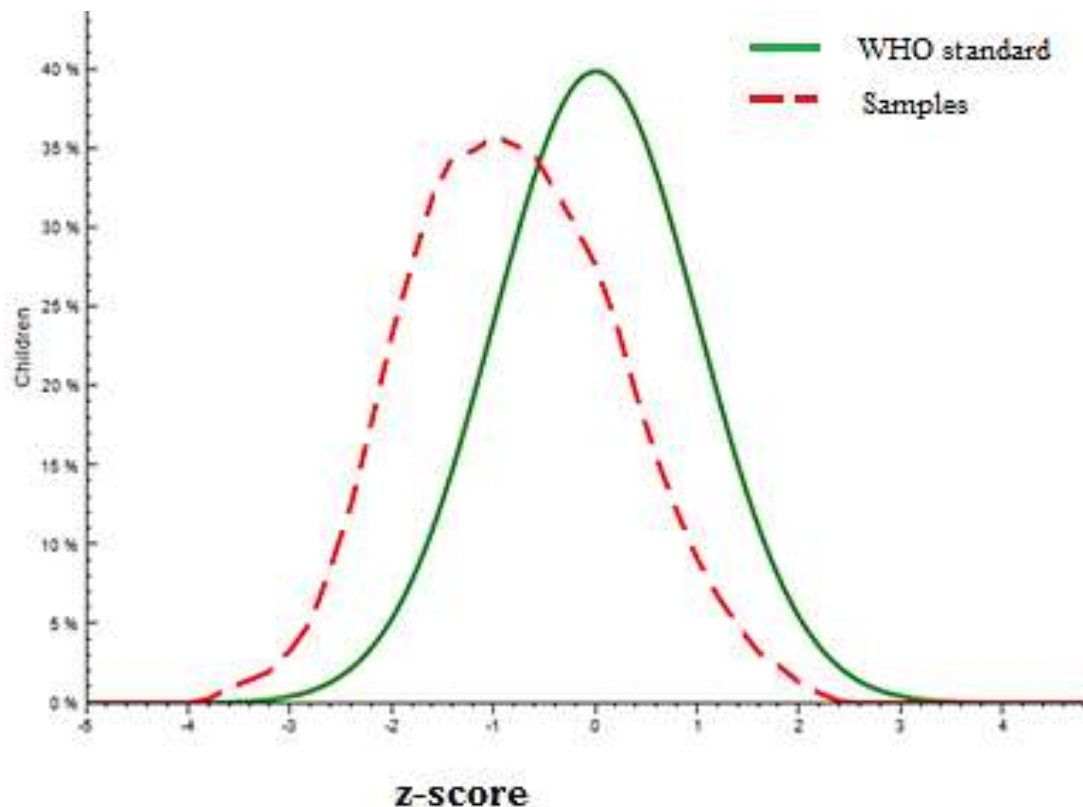


Fig 4.7: Distribution of malnutrition based on MUAC among 6 to 59 months' children of *Sukumbashi basti* based on WHO standard (n=123)

Fig 4.7 shows that the median MUAC z-score of survey children to be -1 which is slightly less than the reference to WHO standard. This curve is skewed to the left side of WHO standard curve showing slight prevalence of malnutrition based on MUAC among study population.

4.6.4 Edema

No cases with nutritional edema were found.

4.7 Factors associated with under nutrition

4.7.1 Factors associated with stunting

There was significant association of stunting with exclusive breastfeeding, starting of complementary, pulses intake per week and source of drinking water ($p \leq 0.05$). Initiation of breastfeeding, duration of breast-feeding, feeding before colostrum, types of complementary and meat/fish per week were found insignificant with stunting in the survey area.

Exclusive breastfeeding was significantly associated with stunting. In a similar study carried in Pakistan, it was found that stunting was common among 48-59 month children and exclusive breastfeeding was associated with stunting among under five year children (Terati. *et al.*, 2018). As the fact exclusively breast fed children are provided with adequate protein and essential fats which help them for proper growth and development.

Sources of drinking water from was found significantly associated with stunting and the finding of the study concluded that the children who consumed purified drinking water had lesser chance of getting stunted than the children who didn't consume purified drinking water. This result is consistent with the study conducted in Western region of Nepal (Joshi *et al.*, 2014). This could be partially explained in that, as children don't consume purified water, they may suffer from water-borne infections frequently.

Table 4.11: Factors associated with stunting in under five children of *Sukumbashi basti*, Kankai Municipality (n=123)

Variables	Stunting n (%)	Normal n (%)	χ^2 -square	p-value
Initiation of breastfeeding				
within 1 hours	8 (6.5)	32 (26)	3.835	0.278
within 2 hours	20 (6.3)	55 (44.7)		
within 8 hours	0	0		
within 24 hours	3 (2.4)	2 (1.6)		
After 24 hours	1 (0.8)	2 (1.6)		
Exclusive breast feed				
Yes	29 (23.6)	89 (72.4)	4.127	0.05*
No	3 (2.4)	2 (1.6)		
Duration of breastfeeding				
No	1 (0.8)	2 (1.6)	2.047	0.727
Upto 6 month	8 (6.5)	15 (12.2)		
Upto 1 year	10 (8.1)	33 (26.8)		
Upto 2 year	10 (8.1)	26 (21.1)		
>2 year	3 (2.4)	15 (12.2)		
Feed before colostrum				
yes	24 (19.5)	66 (53.7)	0.74	0.786
No	8 (6.5)	25 (20.3)		
Starting of complementary feed				
from 4 month	2 (1.6)	0	6.764	0.0034
from 5 month	0	3 (2.4)		
6 and above	30 (24.4)	88 (71.5)		

Types of complementary feed				
Jaulo	6 (4.9)	4 (3.3)	11.11	0.085
Homemade litto	9 (7.3)	35 (28.5)		
Market litto	8 (6.5)	18 (14.6)		
Daal, rice,veg	10 (8.1)	33 (26.8)		
Meat/Fish per week				
1-2 times	8 (6.50)	110 (89.4)	1.188	0.756
2-4 times	0	2 (1.6)		
Not given	0	3 (2.4)		
Pulses per week				
3-5 times	10 (8.1)	5 (4.1)	24.107	0.000*
5-8 times	17 (13.8)	56 (45.5)		
8-10 times	6 (4.9)	28 (22.8)		
10-12 times	0	1 (0.8)		
Source of drinking water				
River	1 (0.8)	0	61.274	0.000*
Tube well	25 (20.3)	67 (54.5)		
Tap	7 (5.7)	23 (18.7)		

4.7.2 Factors associated with wasting

There was significant association of wasting with exclusive breastfeeding, duration of breast feeding, types of complementary, and source of drinking water ($p \leq 0.05$). whereas initiation of breast feeding, feeding before colostrum, starting of complementary, meat/fish per week and pulses intake per week were not associated with wasting in the survey area as shown in table 4.12.

Children who were not exclusively breastfed for months were found to be more wasted compared to those who were exclusively breastfed 6 months or above. Similar result is found in study conducted by Abhishek kumor and V.K Singh in 2015 in

Empowered States Group (Kumor and Singh, 2015) and also in a study conducted at Morogoro municipality, Tanzania in 2013 (Safari *et al.*, 2013). Duration of exclusive breastfeeding have a significant relation with wasting was said in a study conducted in South-west region of Bangladesh in 2013 (Islam *et al.*, 2013) and the study showed similar result to the study. According to a study conducted in public Hospitals, Oromia region, West Ethiopia, exclusively breast fed child were less prone to acute malnutrition which is similar to the study (Ayana *et al.*, 2015).

Duration of breast-feeding and children fed with Jaulo and homemade litto was found to be significantly associated with wasting. This can be partially explained that, frequent feeding with breast milk provides satiety to child so they show lesser interest to take complementary food. The inadequate amount of complementary food results in calorie and protein deficit in child, which might be the cause of wasting in children who are under breast milk. Similarly Home made litto and jaulo may lack variety leading to lower nutritional adequacy.

Sources of drinking water was found significantly associated with wasting and the finding of the study concluded that the children who consumed purified drinking water had lesser chance of getting wasted than the children who consume tubewell or river water. Similar result was found in a study conducted at Hibadu Abote District, North Shewa, Oromia Regional State which reported that treatment of water at household level which did not treat household by any means were 2.4 times more likely wasted as compared to children who were from those families who treat drinking water (Mengistu. This could be partially explained in that, as children don't consume purified water, they may suffer from water-borne diseases like diarrhea, cholera etc.

Table 4.12: Factors associated with wasting in under five children of *Sukumbashi basti*, Kankai Municipality (n=123)

variables	Wasting n (%)	Normal n (%)	χ^2 -square	p-value
Initiation of breastfeeding				
within 1 hours	1(1.6)	38 (30.9)	25.408	0.256
within 2 hours	5 (4.1)	70 (56.9)		
within 8 hours	0	0		
within 24 hours	0	5 (4.1)		
after 24 hours	1 (0.8)	2 (1.6)		
Exclusive breast feed				
Yes	3 (2.4)	115 (93.5)	74.921	0.000*
No	5 (4.1)	0		
Duration of breastfeeding				
No	3 (2.4)	0	48.051	0.000*
Upto 6 months	3 (2.4)	20 (16.3)		
Upto 1 year	1 (0.8)	42 (34.1)		
Upto 2 year	1 (0.8)	35 (28.5)		
Above 2 year	0	18 (14.6)		
Feed before colostrum				
yes	6 (4.9)	84 (68.3)	0.015	0.904
No	2 (1.6)	31 (25.2)		
Starting of complementary feed				
from 4 month	0	2 (1.6)	0.363	0.834
from 5 month	0	3 (2.4)		
from 6 month and above	8 (6.5)	110 (89.4)		
Types of complementary feed				
Jaulo	7 (5.7)	3 (2.4)	72.396	0.000*
Homemade litto	1 (0.8)	43 (35)		

Market available litto	0	26 (21.1)		
Daal, rice,veg.	0	43 (35)		
Meat/Fish per week				
1-2 times	8 (6.5)	110 (89.4)	1.188	0.756
2-4 times	0	2 (1.6)		
Not given	0	3 (2.4)		
Pulses per week				
3-5 times	4 (3.3)	11 (8.9)	11.49	0.009*
5-8 times	3 (2.4)	70 (56.9)		
8-10 times	1 (0.8)	33 (26.8)		
10-12 times	0	1 (0.8)		
Source of drinking water				
River	1 (0.8)	0	10.743	0.03*
Tube well	8 (6.5)	84 (68.3)		
Tap	3 (2.4)	27 (22)		

4.7.3 Factors associated with underweight

There was significant association of underweight with exclusive breastfeeding, types of complementary and pulses intake per week ($p \leq 0.05$) whereas initiation of breastfeeding, duration of breast feeding, feeding before colostrum, starting of complementary, meat/fish per week and source of drinking water were found insignificant with stunting in the survey area.

Exclusive breastfeeding was significantly associated with underweight. In a similar study carried in Bangladesh, it was found that underweight was common among children who terminated EBF at age of 0-4 months and exclusive breastfeeding was associated with stunting among under five year children (Terati. *et al.*, 2018). A similar study conducted in rural area of Jammu and Kashmir, India significant association ($p= 0.0048$) was found between exclusive breastfeeding with under nutrition (Suri and Kumar, 2015). Children who were not exclusively breastfeed are deprived of nutritional benefits, anti-infective factors (immunoglobulin, white blood cells, lactoferrin and vitamin B12, lactobacillus bifidus factor, lysozyme, oligosaccharides) and bio-active factors (bile-salt stimulated lipase, epidermal growth

factor, other growth factors which includes development and maturation of nerves and retina) which results in under nutrition.

This result might be due to inappropriate initiation of complementary food, poor and low quality complementary food, lack of proper care and timely feeding to the child when they need it the most, frequent illness, etc. Poor quality complementary foods may result into a deficit tissue and fat mass compared particularly after illness. Therefore, adequate breast-feeding, combined with timely and proper complementary feeding are important in ensuring child health and normal growth (Kirsten *et al.*, 2001).

Table 4.13: Factors associated with underweight in under five children of *Sukumbashi basti*, Kankai Municipality (n=123)

variables	Underweight n (%)	Normal (%)	χ^2-square	p-value
Initiation of breastfeeding				
Within 1 hours	4 (3.3)	36 (29.3)	2.755	0.431
Within 2hours	6 (4.9)	69 (56.1)		
Within 8hours	0	0		
Within 24hours	1 (0.8)	4 (3.3)		
After 24 hours	1 (0.8)	2 (1.6)		
Exclusive breast feed				
Yes	9 (7.3)	109 (88.6)	14.944	0.000*
No	3 (2.4)	2 (1.6)		
Duration of breastfeeding				
No	1 (0.8)	2 (1.6)	4.208	0.379
Upto 6 months	3 (2.4)	20 (16.3)		
Upto 1 year	4 (3.3)	39 (31.7)		
Upto 2 year	4(3.3)	32 (26)		
Above 2 year	0	18 (14.6)		
Feed before colostrum				
yes	7 (5.7)	83 (67.5)	1.491	0.222

No	5 (4.1)	28 (22.8)		
Starting of complementary feed				
from 4 month	0	(1.6)	0.563	0.754
from 5 month	0	(2.4)		
from 6 months and above	(9.8)	(86.2)		
Types of complementary feed				
Homemade litto	3 (2.4)	41 (33.3)		
Jaulo	5 (4.1)	5 (4.1)	20.235	0.000*
Market available litto	1 (0.8)	25 (20.3)		
Daal, rice, veg.	3 (2.4)	40 (32.5)		
Meat/Fish per week				
1-2 times	11 (9)	107 (87)	2.141	0.544
2-4 times	0	2 (1.6)		
Not given	1 (0.8)	2 (1.6)		
Pulses per week				
3-5 times	12 (9.8)	3 (2.4)	95.741	0.000*
5-8 times	0	73 (59.3)		
8-10 times	0	34 (27.6)		
10-12 times	0	1 (0.8)		
Source of drinking water				
River	1 (0.8)	0	9.37	0.009*
Tube well	8 (6.5)	84 (68.3)		
Tap	3 (2.4)	27 (22)		

Part-V

Conclusion and Recommendation

5.1 Conclusion

- i. The nutritional status among the children under five years in *Sukumbashi basti*, Kankai Municipality was 26.8% stunted, 9.7% underweight and 6.5% wasted which was found comparatively lower than the national demographic health survey.
- ii. There was significant association of exclusive breastfeeding, starting of complementary feeding, pulses intake per week and source of drinking water with stunting at $p \leq 0.05$.
- iii. Similarly, exclusive breastfeeding, duration of breast feeding, types of complementary, and source of drinking water with wasting at $p \leq 0.05$.
- iv. This study point out the need of making a comprehensive, integrated and multi-sectorial plan for addressing the problem of malnutrition in long term.

5.2 Recommendation

- i. Improvement of complementary feeding through strategies such as counseling about nutrition for food-secure populations and nutrition counseling, food supplements, conditional cash transfers, or a combination of these, in food-insecure populations Should be improved to reduce stunting and related burden of disease.
- ii. Similar cross-sectional descriptive or longitudinal survey can be conducted to determine the magnitude and distribution of malnutrition and other probable causes of malnutrition.
- iii. Invention targeted to community management regarding to acute malnutrition might be appropriate to manage wasting and underweight , which is an indication of acute malnutrition in study community.

Part VI

Summary

Malnutrition is not a simple syndrome. The poorly nourished individual, as a rule, suffer from a complexity of deficiencies. The great diversity of body function that may be ill-affected by inadequate nutrition complicates the process of assessing nutritional status (Wilson *et al.*, 1971). Nutritional survey was conducted among the 6–59 months of children residing in *Sukumbashi basti*, Kankai Municipality. Anthropometrics measurements along with structured questionnaire were carried to find out the level of malnutrition and various kinds of information about the feeding practice. Random sampling with 123 sample was taken for the study work. The data collected were analyzed by using SPSS version 20 and WHO anthro 3.2.2 version.

The malnutrition rate among the children under five years in *Sukumbashi basti*, Kankai Municipality was 26.8%, 9.7% and 6.5% for stunting, underweight and wasting respectively which was found comparatively lower than the national demographic health survey. The prevalence of moderate wasting was found to be 6.5%, moderate stunting was 25.2% and moderate underweight was 8.9%. Similarly, Prevalence of severe stunting was 1.6% and severe underweight was 0.8%. There was significant association of stunting with exclusive breastfeeding, starting of complementary feeding, pulses intake per week and source of drinking water ($P \leq 0.05$). Similarly, exclusive Breastfeeding, duration of Breast feeding, types of complementary, and source of drinking water was significantly association with wasting ($P \leq 0.05$). Similarly, there was significant association of underweight with exclusive breastfeeding, types of complementary and pulses intake per week ($P \leq 0.05$). Result of this study indicates that under nutrition is still an important problem among 6 to 59 months children of *Sukumbashi basti*, Kankai municipality, Jhapa. To get better nutritional status of children, greater emphasis should be given to under five year children with feeding based awareness programs to mother.

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Appendix A

Informed Consent

Namaste!

I am Miss Devi Khadka, 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 "*Influence of Infant Feeding Practise on The Nutritional Status of 6-59 months Children of Sukumbashi Basti, Kankai Municipality, Jhapa*"

Any information that you and your children give during this interview will be kept confidential and not disclosed to any outside the survey team. Your name and identity will not appear anywhere.

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: _____

Date:

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:

Appendix B

Questionnaire

General information

- 1) Name of child-----
- 2) Date of birth/Sex-----
- 3) Father's name-----
- 4) Mother's name-----
- 5) Religion-----
- 6) Address-----

Height	Weight	MUAC	BMI

Family description

- 7) No of total family member
 - i) Female member-----
 - ii) Male member-----
- 8) who is the head of family?
 - i) Father
 - ii) Mother
 - iii) Others
- 9) Family types
 - i) Joint
 - ii) Nuclear
- 10) Occupation of family
- 11) Education
 - i) Mother-----
- 12) No of child below 5 years-----
- 13) What is main income source of family-----

Child's information

- 14) Is there death of any child in your household?
 - i) yes
 - ii) no.....
- 15) if yes reason for death?-----
- 16) Which child is this? First/second/third

17) How was the baby born?

i) operation ii) normal

18) what is the age of the previous child when this child was born?-----

19) Do you have growth chart?

i)yes ii) no

20) Weight at the time of birth? (birth card)

i) less than 2.5kg ii) more than 2.5kg iii) Don't know

d) Child care information

21) Did you breastfed your child?

i) yes ii) no

22) If yes then when did you initiate breast feeding?

i) within 1 hour of birth ii) within 24hr of birth

iii) within 2hours of birth iv) cannot remember

23) If not what is the reason? -----

24) Do you know about colostrums?

i) yes ii) no

25) Did you exclusively breast fed your baby for first six months?

i) yes ii) no

26) Did you feed any food before 6 months beside breastmilk?

i) yes ii) no

27) What other foods did you provide?

28) How long did you breast fed your child?

i) less than 1year ii) 1year

iii) 2 years iv) more than 2year

29) Which feeding materials do you use?

i) spoon ii) Bottle

30) What others foods did you provide expect colostrums?

i) honey/ghee ii) cow milk iii) others iv) not given

31) How many times do you breast feed your child in a day?

32) When did you start giving complementary food to your child?

i) 4 months ii) 5 months iii) 6 months iv) after 6months

33) What complementary food did you give to your baby?

i) jaulo ii) locally made lito iii) market available

iv) pulses/rice/vegetables v) others

34) How many times do you give meat/fish in a week to your baby?

35) How many times do you give pulses in a week to your baby?

36) How many times do you give vegetables in a week to your baby?

37) Do you know about poshilo jaulo?

i) Yes ii) no

Health and immunization

38) Have you vaccinate your child according to schedule?

i) yes ii) no

39) If no why did you miss it?

40) if no which one did you miss?

i) polio ii) BCG iii) DPT iv) PCV V) OPV vi) IPV vii) JE

41) Did you receive vitamin A capsule/worm infestation tablets to your baby?

i) yes ii) no

42) Did you took iron folate tablet during pregnancy?

i) yes ii) no

43) Do you know to prepare ORS at home?

i) yes ii) no

44) where do you took your baby during pregnancy?

i) dhama ii) health post iii) both

45) Do you have health problems?

i) yes ii) no

46) Do your baby have health problems?

i) yes ii) no

Personal and environment information

48) What is the main source of your drinking water?

i) river ii) pond iii) tubewell iv) tap v) others

47) Did you treat water before feeding?

i) yes ii) no

48) Which source do you use to cook food?

i) Gas ii) firewood iii) both iv) others

49) Do you hav toilet in your house?

i) yes ii) no

50) Did you manage household waste?

i) yes ii) no

51) What type of salt do you use in your house?

i) iodized salt ii) non iodized salt

52) Mothers age during first pregnancy?

53) Do mother take smoking?

i) yes ii) no

54) Do mother take alcoholic drinks?

i) yes ii) no

Appendix C

Photo Gallery



Measuring MUAC



Measuring MUAC

Appendix D

MAP

