

**NUTRITIONAL ASSESSMENT OF 6-59 MONTHS CHILDREN
HAVING WORKING MOTHERS IN DHARAN SUB-
METROPOLITAN CITY**

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Nutritional assessment of 6-59 months children having working mothers in Dharan sub-metropolitan city

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Approval Letter

This *dissertation* entitled *Nutritional assessment of 6-59 months children having working mothers in Dharan sub-metropolitan city* presented by **Sahema Shakya** has been accepted as the partial fulfillment of the requirement for the **B.Sc. degree in Nutrition and Dietetics**.

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Sahema Shakya

Abstract

The research was conducted to assess the nutritional status of 6-59 months children having working mothers in Dharan sub-metropolitan city and the factors associated with the nutritional status of children. Anthropometric and clinical measurements and structured questionnaires were used. Anthropometric measurement was then used to determine the nutritional status of children based on WHO references. Statistical Package for Social Science (SPSS) 20 version and World Health Organization (WHO) Anthro 3.2.2 version were used for analyzing the data. Chi-Square test was used to identify the factors associated with the nutritional status of children.

Out of 216 children, 14.8% were stunted, 3.7% were wasted, 6.9% were underweight and 6.5% were overweight. Severe case of undernutrition was not observed in the studied area, also oedema was not present in the studied population. Based on gender, the prevalence of stunting was higher in males (20.2%) than that in females (9.8%). Likewise, wasting was higher in females (4.5%) than that of males (2.9%) and underweight was slightly higher in females (7.1%) than that of males (6.7%). On the basis of age group, wasting was found to be higher in 6-11 months children (14.8%). Similarly, stunting was higher in 48-59 months children (22.4%) and underweight was higher in 36-47 months children (12.3%). According to MUAC based on WHO classification wasting was found to be 0.5%. The prevalence of wasting was higher in children of mothers engaged in agriculture and manual work (8.3%). Likewise, the prevalence of stunting was higher in children of mothers engaged in domestic or household work (46.2%). Similarly, the prevalence of underweight was higher in children of mothers engaged in domestic or household work (23.1%). Higher prevalence of stunting, wasting and underweight among children of mothers who earned below 3000 per month i.e. 25%, 12.5% and 12.5% respectively. Higher percentage of children of illiterate mothers were stunted (27.3%). Similarly, the prevalence of wasting (9.1%) and underweight (27.3%) were also higher among the children of illiterate mothers. Maternal employment was found to be associated with stunting ($P = 0.006$) and underweight ($P = 0.017$). Mother's education was also found to be associated with underweight ($P = 0.033$).

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List of Abbreviations

Abbreviation	Full form
BMI	Body Mass Index
BW	Body Weight
CF	Complementary Feeding
HAZ	Height for Age Z-score
ICMR	Indian Council of Medical Research
IDD	Iodine Deficiency Disorder
LBW	Low Birth Weight
MDG	Millennium Development Goal
MoHP	Ministry of Health and Population
MUAC	Mid-Upper Arm Circumference
NDHS	Nepal Demographic and Health Survey
NGO	Non-Government Organization
NMICS	Nepal Multiple Indicator Cluster Survey
NMIS	Nepal Multiple Indicator Surveillance
RDA	Recommended Dietary Allowance
PEM	Protein Energy Malnutrition
SAM	Severe Acute Malnutrition
UMN	United Mission to Nepal
UNICEF	United Nations International Child Emergency Fund
USAID	United State Agency for International Development
VAD	Vitamin A Deficiency
VDC	Village Development Committee
WAZ	Weight for Age Z-score

WB	World Bank
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight for Height Z-score

PART I

Introduction

1.1 Background to the study

Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development. Economic growth and human development require well-nourished populations who can learn new skills, think critically and contribute to their communities (Onis *et al.*, 2012). Malnutrition is one of the most important health and welfare problems among infants and young children in the developing countries (M *et al.*, 2017). It is defined as an impairment of health resulting from a deficiency, excess or imbalance of nutrients. It includes both undernutrition and overnutrition (Joshi, 2015).

The impact of malnutrition usually falls mainly on children under five years of age. Malnutrition is estimated to contribute to more than half of deaths in children worldwide; child malnutrition was associated with 54% of deaths in children in developing countries in 2001 (Bain *et al.*, 2013). Globally, 21.3% children are stunted; 6.9% children are wasted and 5.6% children are overweight. About two-thirds of all stunted children i.e. 64% and three-quarters of all wasted children i.e. 75% and 37% of all overweight children live in lower-middle income countries (Krasevec *et al.*, 2020).

Traditionally, a woman's place has been her home and a generation ago, her employment outside her home was looked down by the society. This situation has now changed and women have started seeking employment outside their homes, these entering the work field have both positive and negative effects on the nutritional status of the children (M *et al.*, 2017). Maternal employment can positively influence the child's growth by increasing income, providing improvements in the acquisition of healthy foods, material goods, access to sanitation and health care services which are important factors for adequate child growth (Gea-Horta *et al.*, 2016). There are two principle ways in which mothers' involvement in work outside the house has a negative effect on their children's nutrition and health status. First, the work load can affect the woman's own nutrition and health and consequently decrease her capacity to attend to

other activities such as child care or to produce an optimum quantity of breast milk. Second, time constraints imposed by her involvement in work outside may prevent her from attending to the needs of her children (Abbi *et al.*, 1991).

1.2 Justification and problem statement

Dharan sub-metropolitan city is one of the developed city in Nepal. It is located at the northern part of the Sunsari district, in the foothill of the eastern Mahabharat range, Koshi zone of the eastern development region of Nepal. A dense forest which is a part of famous Charkoshe jhadi lies in the south. Out of total population, a total of 6,581 females are employed in Dharan sub-metropolitan city. The data regarding total population of working mothers in Dharan sub-metropolitan city wasn't available (Sub-metropolitan, 2075). As compared to olden days, women have earned more liberty in today's times with regard to employment before and after parenthood. With such diverse opportunities in different sectors, women can choose the most appropriate jobs for them.

As of many developing countries malnutrition is one of the most important health and welfare problems among infants and young children in Nepal. Inadequate and/or inappropriate dietary intake and infectious diseases are the immediate/direct causes which in turn are related to a number of socio-economic, demographic, child-care and environmental factors among these factors one is women's employment which has both positive and negative effects on the nutritional status of children (M *et al.*, 2017). On the one hand, it increases the family income and some aspects of diet quality related to income might be improved on the other hand, there is an inefficient time allocation of the working mothers towards their children (Das, 2014). In low and middle income countries, economic crisis exercises greater pressure toward the participation of women in the labor market as a source of supplemental family income. Additionally, low social investments and the lack of infrastructure for child care in these countries overburden women, who are responsible for domestic and economic activities of the family. Such a situation can result in harm to the child, such as less contact with the mother and impaired growth and development (Gea-Horta *et al.*, 2016).

Activities carried out by women such as breast feeding, preparing food, and seeking preventive and curative medical care are crucial for children's healthy development,

women also play an important roles as generators of family income, whether in household farms or businesses or as wage employees. This inevitable change, women entering the work field have an effect on the child care and development (M *et al.*, 2017). Most of the studies suggested that working mothers were unable to exclusively breastfed their children (Shuhaimi and Muniandy, 2012). The nutritional status of a child in his/her early years of life determines his/her health status in later life. Thus, it is important to assess the nutritional status of children (6-59) months having working mothers in Dharan sub-metropolitan city.

1.3 Objectives

1.3.1 General objectives

The main objective of the study is to assess the nutritional status of children (6-59 months) having working mothers in Dharan sub-metropolitan city.

1.3.2 Specific objectives

- a) To find the knowledge and behavior of working mothers regarding child feeding and caring practices.
- b) To assess the factors associated with the nutritional status of children having working mothers.

1.4 Research questions

- a) What is the nutritional status of children (6-59 months) having working mothers in Dharan?
- b) What is the knowledge and behavior of working mothers regarding child feeding and caring practices?
- c) What are the factors associated with the nutritional status of children having working mothers?

1.5 Significance of study

The findings of the study will be helpful to

- a) Provide information regarding the nutritional status of children between 6-59 months of age having working mothers to the governmental and non-governmental organization which will be helpful to initiate corrective measures for the problem.
- b) Make people aware about the current real situation of nutritional status in their surroundings.
- c) Encourage people for the improvement of their present status by improving their feeding practices of their children and hygienic condition of their surroundings.
- d) Act as a guide for the development of proper nutritional program in this area by undertaking the discovered facts.
- e) Act as a tool to discover the problems related to nutrition and feeding practices of this area.
- f) The findings can become a guideline for better research in pediatrics nutrition in future and more effective intervention can be developed by corresponding organization to optimize child nutrition status.

1.6 Limitations of study

- a) The study has included only the food consumption pattern of the children in the studied area and it doesn't include the dietary adequacy of the children.
- b) This study was conducted with limited resources due to which it was impossible to include many other clinical and biochemical assessments.
- c) Time allocation of mothers and its impact on the nutritional status of children was not included in this study.

1.7 Conceptual framework

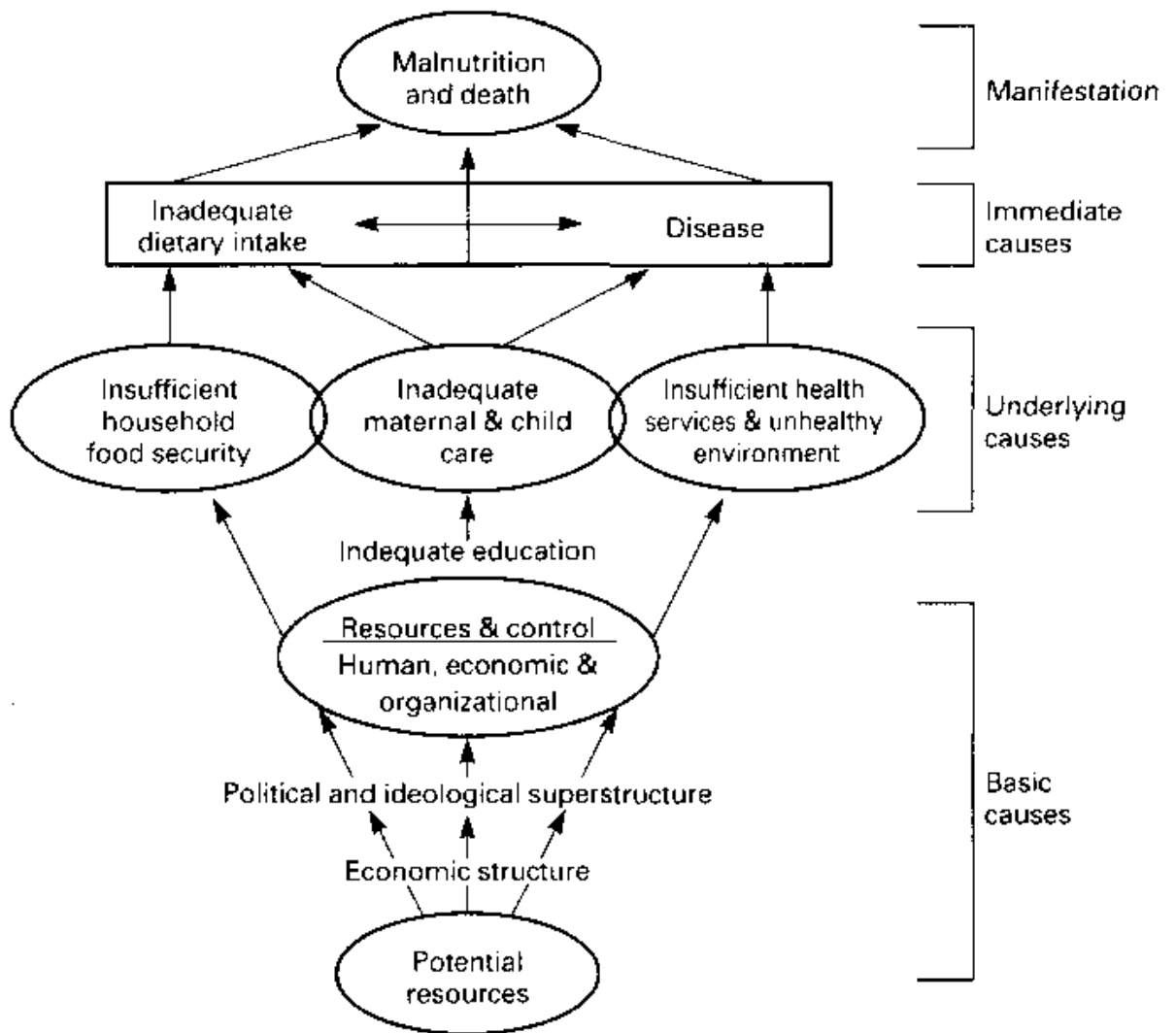


Fig 1.1 UNICEF Conceptual framework on the causes of malnutrition

PART II

Literature review

2.1 Nutritional status

Nutritional status is the condition of health of the individual as influenced by the utilization of the nutrients. It can be determined only by the correlation of information obtained through a careful medical and dietary history, taking physical measurements of the body, clinical examination and appropriate laboratory investigation (Srilakshmi, 2016). It is the state of balance between nutrient supply (intake) and demand (requirement). An imbalance between intake and requirement can result in over nutrition or under nutrition (Freeland-Graves and Nitzke, 2002).

Optimal nutritional status is the body condition which is achieved when sufficient nutrients are consumed to support day to day body needs and any increased metabolic demands due to growth, pregnancy or illness. The person having optimal nutritional status is more active, have fewer illness and have longer lifespan. Malnutrition usually refers to a number of diseases, each with a specific cause related to one or more nutrients. In the present context, malnutrition is synonymous with protein-energy malnutrition, which signifies an imbalance between the supply of protein and energy and the body's demand for them to ensure optimal growth and function. This imbalance includes both inadequate and excessive energy intake; the former leading to malnutrition in the form of wasting, stunting and underweight, and the latter resulting in overweight and obesity (Onis and Blössner, 1997).

2.2 Factors affecting the nutritional status

The factors 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 (NMIS, 1996). Also factor influencing the nutritional status are food availability and its distribution system, consumption, income and purchasing power, price of commodities, illiteracy, family size, socio-culture and religious belief. Malnutrition is not a simple problem with a single and simple solution.

Multiple and hierarchically interrelated determinants are involved in causing malnutrition. The most immediate determinants are inadequate dietary intake and disease which are themselves caused by a set of underlying factors; household food insecurity, poor maternal/child caring practices, and lack of access to basic health services including lack of safe water supply and unhealthy living environment such as open defecation. In turn, these underlying causes themselves are influenced by economic, political, and sociocultural conditions; national and global contexts; capacity, resources, environmental conditions, and governance (Gebre *et al.*, 2019).

2.2.1 Maternal employment

In this study, maternal employment is categorized as professional or formal, sales and services, agriculture and manual work and domestic or household work (Nankinga *et al.*, 2019). Professional or formal workers included teachers, bankers, nurse. Likewise, sales and services included mothers engaged in business. Agriculture and manual work included food growing, poultry, and mothers engaged in cottage industry and other manual works. Similarly, domestic or household work included drivers and labourers in construction sites. In Nepal, 61.3% mothers are engaged in agriculture and 15% mothers are working in paid work. Likewise, 43.3% mothers are illiterate, followed by primary education (20%), secondary education (30%) and higher education (6.7%) (Khanal *et al.*, 2014). More than two-thirds of the mothers (68%) are themselves heads of their households (Adhikari and Podhisita, 2010).

Maternal employment is one of the factor affecting child's nutritional status. It has a bearing on both child and maternal health. Some of the principal pathways through which maternal employment affects child nutrition include level of income and child care practices. Income generated and controlled by a woman plays a key role in contributing to child and household food as well as health budget. On the other hand, employment that entails absence of the mother usually implies partial weaning or cessation of breast feeding and inability to monitor child feeding and care (Nankinga *et al.*, 2019). The study conducted in poor areas of Pokhara showed that unavailability of adult childcare support was associated with increased risk of malnutrition in children of working mothers (Nakahara *et al.*, 2006). A cross-sectional anthropometrics survey carried out in low-income community of Surabaya, Indonesia showed that maternal employment was associated with undernutrition in children (Toyama *et al.*, 2001).

Likewise, a study done in Adama Town, Central Ethiopia also showed that maternal employment was associated with undernutrition in children (M *et al.*, 2017). Also, the study done in Uganda showed that maternal employment was associated with undernutrition in children (Nankinga *et al.*, 2019).

2.3 Nutritional requirements

Nutritional requirements refers to the amount of food, energy and nutrient needed on an average per day by specific group and sex categories to meet the needs of healthy individuals for normal functioning of the body for work and growth (Burk, 1984). The establishment of human nutrient requirement is the common foundation for all countries to develop food-based dietary guidelines for their populations. Nutritional requirements can be defined as the minimum amount of the absorbed nutrient that is necessary for maintaining the normal physiological functions of the body (Srilakshmi, 2014). The amount of the nutrients needed by individuals vary with different ages, activities and sex (Joshi, 2008). The recommended daily allowance (RDA) of nutrients for infants and pre-school children (1-6) years as recommended by ICMR is shown in Table 2.1 and 2.2 respectively:

Table 2.1 RDA for infants

Nutrients	Age (in months)	
	(0-6)	(6-12)
Body weight kg	5.4	8.4
Energy kcal/kg	92	80
Protein g/kg	1.16	1.69
Visible fat g	-	19
Calcium mg	500	500
Iron mg	46 µg/kg	5
Vitamin A		
Retinol µg	-	350
B-carotene µg	-	2800
Thiamine mg	0.2	0.3
Riboflavin mg	0.3	0.4
Niacin equivalent µg/kg	710	650
Pyridoxine mg	0.1	0.4
Ascorbic acid mg	25	25
Dietary folate µg	25	25
Vitamin B12 µg	0.2	0.2
Magnesium mg	30	45
Zinc mg	-	-

Source: (Srilakshmi, 2014)

Table 2.2 RDA for pre-school children

Nutrients	Age (in years)	
	(1-3)	(4-6)
Body weight kg	12.9	18.0
Energy kcal	1060	1350
Protein g	16.7	20.1
Visible fat g	27	25
Calcium mg	600	600
Iron mg	9	13
Vitamin A		
Retinol µg	400	400
B-carotene µg	3200	3200
Thiamine mg	0.5	0.7
Riboflavin mg	0.6	0.8
Niacin equivalent mg	8	11
Pyridoxine mg	0.9	0.9
Ascorbic acid mg	40	40
Dietary folate µg	80	100
Vitamin B12 µg	0.2-1.0	0.2-1.0
Magnesium mg	50	70
Zinc mg	5	7

Source: (Srilakshmi, 2014)

2.4 Malnutrition

Malnutrition has been defined as a pathological state resulting from a relative or absolute deficiency or excess of one or more of the essential nutrients in the diet (Jelliffe, 1966). The World Food Programme (WFP) defines malnutrition as “a state in which the physical function of an individual is impaired to the point where he or she can no longer maintain adequate bodily performance process such as growth, pregnancy, lactation, physical work and resisting and recovering from disease.” It literally means “bad nutrition” and technically includes both over and under nutrition (Bain *et al.*, 2013).

Malnutrition remains one of the most common causes of morbidity and mortality among children under five throughout the world. 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 a vicious cycle of recurring sickness,

faltering growth and diminished learning ability (Mengistu *et al.*, 2013). Many studies reported the health and physical consequences of child malnutrition which include delaying their physical growth and motor development, lower intellectual quotient (IQ), greater behavioral problems, deficient social skills, and susceptibility to contracting diseases. It may also lead to higher levels of chronic illnesses in adult life which may have intergenerational effects, as malnourished females are more likely to give birth to low-weight babies (Gebre *et al.*, 2019).

2.4.1 Forms of malnutrition

a) Under nutrition

The pathological state resulting from the consumption of an inadequate quantity of food over an extended period of time (Jelliffe, 1966).

b) Over nutrition

It is the pathological state resulting from the consumption of an excessive quantity of food, and hence a caloric excess, over an extended period of time (Jelliffe, 1966).

c) Specific deficiency

It is the pathological state resulting from a relative or absolute lack of an individual nutrient (Jelliffe, 1966).

d) Imbalance

This pathological state results from a disproportionate consumption of essential nutrient with or without the absolute deficiency of any nutrients as determined by the requirement of a balanced diet (Jelliffe, 1966).

2.4.2 Most common malnutrition problems

There are a number of types of malnutrition. The most common types of malnutrition problems in the developing countries like Nepal are PEM (protein energy malnutrition), vitamin A deficiency, iron deficiency anemia and iodine deficiency disorders (NDHS, 2016).

2.4.2.1 Protein energy malnutrition

Protein energy malnutrition occurs when inadequate protein and/or calories are ingested to meet an individual's nutritional requirements. PEM may be primary, as a result of inadequate food intake or secondary as a result of illness. The term protein energy malnutrition covers a wide spectrum of clinical stages ranging from the severe forms like kwashiorkor and marasmus to the milder forms in which the main detectable manifestation is growth retardation. Protein energy malnutrition is due to 'food gap' between the intake and requirement (Srilakshmi, 2016).

2.4.2.1.1 Kwashiorkor

Kwashiorkor is a word comes from an African (Ghana) that means illness of the displaced child that refers to the illness of the older infant who is denied breast milk when the new baby is born. Kwashiorkor is a severe form of protein-energy malnutrition characterized by oedema, usually starting in the feet and legs, changes in hair colour. The condition occurs most often in children aged from one to three years. It is also called wet protein-energy malnutrition. It is due to a protein deficiency which occurs after protein rich foods are discontinued or child is given food low in proteins and calories. The diet may be sufficient to assuage hunger, but is usually grossly deficient in protein and also in energy. The diet is therefore mainly carbohydrate, and too small in quantity to cater for the child's needs. The condition is often associated with an infectious disease especially measles (Bharati and Mehta, 2018).

2.4.2.1.2 Marasmus

Marasmus is principally due to the consumption of diets markedly deficient in both proteins and calories (Swaminathan, 1985). It is characterized by gross wasting of muscle and subcutaneous tissues resulting in emaciation, marked stunting and no edema. Because of insufficient energy intake to match the body's requirements, the body draws on its own stores. It can occur at any age, but is common among children of 9-36 months of age. The weight for age is always less than 60% of the expected weight (Bharati and Mehta, 2018).

2.4.2.1.3 Marasmic kwashiorkor

Marasmic kwashiorkor is the most severe form of protein energy malnutrition. In such forms, the child has features of both marasmus and kwashiorkor. The child weighs less than 60% of expected weight and has oedema (Bharati and Mehta, 2018). This is due to the varying nature of the dietary deficiency and the social factors responsible for the disease and presence or absence of infections (Srilakshmi, 2016).

2.4.2.2 Iron deficiency anemia

Iron deficiency is the most widespread disorder in developing countries and contributes significantly to reduced work and productivity and economic output as well as to morbidity and mortality. This is the most common form of anemia throughout the world affecting mainly women in their reproductive years, infants and children. In both rural and urban areas in the tropics, this type of anemia is extremely common (Srilakshmi, 2014). Common indicators of anemia are paleness of lip, tongue, inside the eyelids and hands. The child with severe anemia becomes tired and restless and has a rapid pulse. Iron deficiency anemia has also been shown conclusively to delay psychomotor development and impair the cognitive performance of infants and pre-school children. According to WHO, overall rates for iron deficiency anemia in developing countries are 26% for men, 42% for school-age children and 51% for children less than or equal to four years of age. Anemia is very rare in healthy breast-fed infants. Anemia may be a greater problem in the lower socio-economic families (Scrimshaw, 1997).

2.4.3.3 Iodine deficiency disorder

Iodine is a mineral that is also a part of the hormones produced by thyroid gland located in the front of the neck. When iodine intake falls below recommended levels, the thyroid may no longer be able to synthesize sufficient amounts of thyroid hormones in the blood is responsible for the damage done to the developing brain and the other harmful effects known collectively as the iodine deficiency disorders (WFP, 2005). 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. The extent of iodine deficiency disorder is usually assessed by the prevalence of goiter in affected populations (Swaminathan, 2014).

2.4.3.4 Vitamin-A deficiency

Vitamin-A deficiency, as defined by eye damage, has been identified as a widespread public health problem in the developing countries. Each year it is estimated that between 250,000 and 500,000 preschool children go blind from vitamin A deficiency, and that within months of going blind, two-third of these children die. The peak prevalence seems to fall in the age range of two to four year (Scrimshaw, 1997). 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 blinds, dryness of conjunctiva and affected cornea. Softening of the cornea is likely to follow unless promptly treated. Necrosis and ulceration may occur and lead to permanent blindness (Davidson and Passimore, 1986).

2.5 Breast feeding practice and weaning process in Nepal

2.5.1 Breastfeeding practices

The WHO and the UNICEF recommend that all mothers should breastfeed their children exclusively for the first 6 months and thereafter they should continue to breastfeed for 2 years or longer. Breastfeeding alone with no water provides the ideal nourishment for infants for the 6 months of life as it provides all the nutrients, antibodies, hormones, immune factors and antioxidants an infant needs to thrive. It protects babies from diarrhea and acute respiratory infections and stimulates their immune systems (WHO and UNICEF, 2009). The indicators of appropriate breastfeeding practices include: early initiation of breastfeeding, exclusive breastfeeding for children under six months and continued breastfeeding for 2 years or beyond (UNICEF, 2013).

The practices such as early initiation of breastfeeding, avoiding prelacteal feeds, assuring intake of colostrum and maintaining exclusivity of breastfeeding in early infancy benefit child growth and development. Exclusive breastfeeding up to 6 months of age and continuance of breastfeeding during the first and second years of life have been associated with increased linear growth and better cognitive development scores. In Nepal, the prevalence of exclusive breastfeeding in early infancy may be in decline, as indicated by a slight reduction from about 70 to 66% between consecutive Demographic Health Surveys (DHS) from 2011 to 2016. The prevalence of

breastfeeding within an hour of birth was 41.8%, colostrum feeding was 83.5%, prelacteal feeding was 32.7% and predominant breastfeeding was 57.2% (Bhandari *et al.*, 2019).

2.5.2 Weaning practices

The word weaning comes from the word “wemian” which means to accustom. Weaning begins from the moment supplementary food is started and continues till the child is taken off the breast milk completely (Srilakshmi, 2002). During the weaning period, good food sources of energy, protein, calcium and iron are particularly important. On the basis of body weight, children require twice as much as protein, calcium and iron as do adult. In many traditional society, the weaning child seldom receives especially formulated food rather they are gradually introduced to adult food. Some of the weaning foods given to child in different regions of Nepal are *sattu*, *dalbhat*, *jaulo*, *dhindo*, *sarbottam pitho*, etc (Vaidya, 1987). Common traditional weaning foods include:

- Porridge (*Lito*), made from roasted rice flour (occasionally maize or millet), ghee (clarified butter) and sugar
- *Jaulo*, made from rice and turmeric or rice and salt
- *Dhindo*, made from maize flour (or millet or wheat)
- Maar, made in lowland areas by cooking rice, cracked maize and soybeans together
- Khichari, a mix of rice, pulses and vegetables.

In Nepal, 47% of children age 6-23 months receive meals with the minimum recommended diversity (at least four food groups), 71% receive meals at the minimum frequency, and 36% meet the criteria of a minimum acceptable diet (NDHS, 2016).

2.6 Nutritional status of women in Nepal

Adequate nutritional status of women is important for good health and increased work capacity of women themselves as well as for the health of their offspring. Poor nutrition is indicative of greater health risk to both mother and children born to them. Inadequate dietary intake pattern, reproductive biology, poverty, lack of education, socio-cultural traditions and disparities in household contribute to under nutrition in women (Bhandari *et al.*, 2016). Overall, 11% of women are shorter than 145 cm. A total of 17% women

are thin, with 11% mildly thin and 6% moderately and severely thin. Further, 22% are overweight or obese, with 17% being overweight and 5% obese (NDHS, 2016).

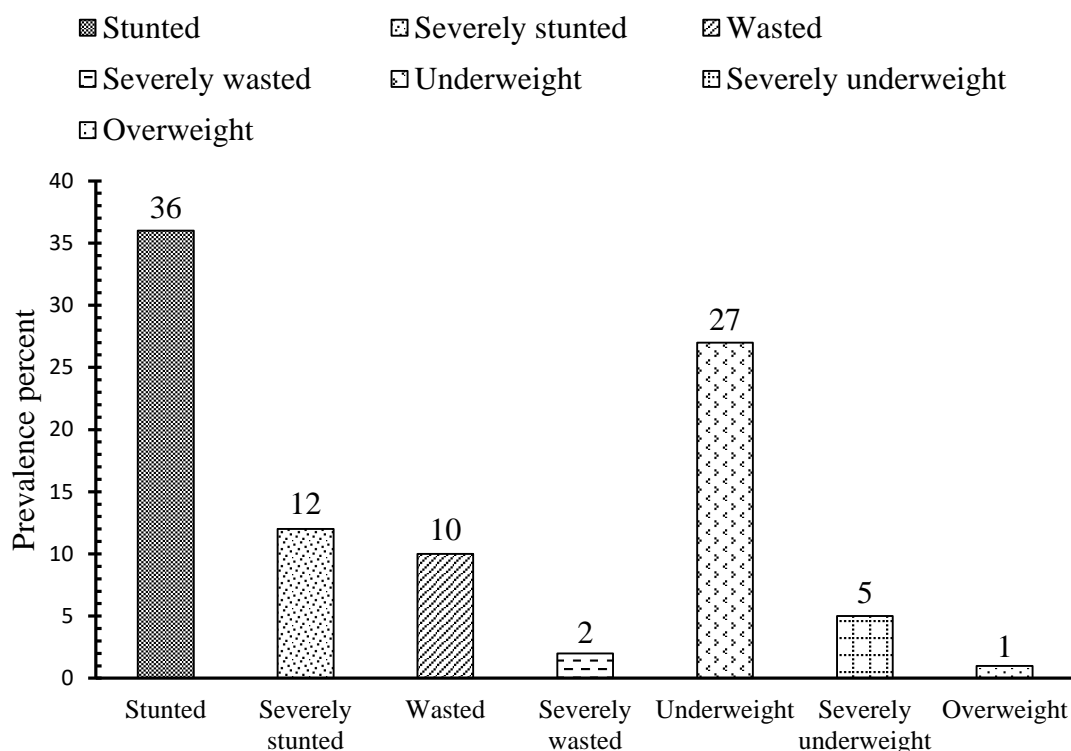
Between 2006 and 2011, the proportion of thin women (BMI less than 18.5, which indicates undernutrition) had decreased from 24% to 18% but thereafter remained steady at 17% through 2016. In contrast, the proportion of women who were overweight or obese, indicating over nutrition, increased from 9% in 2006 to 13% in 2011 and 22% in 2016 (NDHS, 2016).

The proportion of short women (below 145 cm) is lowest in Province 7 at 7% and highest in Province 2 at 14%. Younger women are more likely to be thin than their older counterparts. For instance, 30% of women age 15-19 are thin compared with 13% of women age 40-49. The proportion of thin women is higher in Terai (23%) than in mountain and hill ecological zones (12% each). Province 2 has the highest proportion of thin women (29%) while Province 4 has the lowest proportion of thin women (8%). Further, Province 3 has the highest proportion of overweight/obese women (35%), while Province 7 has the lowest (9%). Overweight/obesity increases with wealth and household food security. For example, 45% of women in the highest wealth quintile are overweight/obese compared with 10% in the lowest wealth quintile. In food-secure households, 27% are overweight/obese compared with 16% in moderately and severely food-insecure households (NDHS, 2016).

2.7 Nutritional status of under-five children in Nepal

Malnutrition is a major public health problem in Nepal. Overall, 36% of children under age 5 are stunted, with 12% being severely stunted (too short for their age); 10% are wasted, with 2% severely wasted (too thin for their height) and 27% are underweight, with 5% severely underweight (too thin for their age), while around 1% of the children are overweight (heavy for their height) (NDHS, 2016).

Figure 2.1 Prevalence of different forms of malnutrition



Source: (NDHS, 2016)

The prevalence of stunting and of underweight among children under age 5 have markedly decreased from 57% to 36% and from 42% to 27% respectively, in the last 20 years (1996-2016). This indicates stunting in children declined by 14% between 2001 and 2006, declined by an additional 16% between 2006 and 2011, and dropped by 12% between 2011 and 2016. A similar downward trend is observed for underweight children. However, in the same time period, changes in wasting were minimal (NDHS, 2016).

The prevalence of stunting and underweight increases with age of the children, peaking at age 24-35 months, while wasting is more prevalent among children younger than age 2. Almost half of the children reported to be very small at birth are stunted (49%) and underweight (45%). Wasting is also common among children who were born smaller. In contrast, only one-third (34%) of the children reported to be average or larger at birth are stunted, and only 24% are underweight. Children had higher levels of stunting (45%), wasting (15%) and underweight (43%) among thin mothers compared with those having a normal body mass index (36% stunted, 10% wasted and 27%

underweight). Mountain zone has the highest proportion of children who are stunted (47%), while the proportion of wasting and underweight is highest in Terai (12% and 33%) respectively. Province 6 has the highest proportion of stunted children (55%) while Province 3 and Province 4 have the lowest proportion of stunted children (29% each) (NDHS, 2016).

A higher proportion of children born to mothers with no education are undernourished compared with children whose mothers have an SLC and higher level of education (stunting: 46% versus 23% wasting: 13% versus 8%, and underweight: 37% versus 16%). Stunting is relatively high among children from the lowest wealth quintile (49%) compared with the highest wealth quantile (17%). Higher percentage of children are malnourished from severely food insecure households (46% stunted, and 35% underweight) compared with children from food secure households (29% stunted and 22% underweight) (NDHS, 2016).

2.8 Women's empowerment

Today women have access to education, healthcare, economic, social and political opportunities. They are involved in making decisions at household, community and national levels. Apart from household activities, women have started seeking employment outside home. It has improved the socioeconomic status of women. Globally, the proportion of women in employment declined from 50% in 2014 to 49% in 2018. Even with the decline, the gender gap in employment is gradually closing. In developing countries including sub-Saharan African countries, the proportion of women in employment at 69% was higher than the global rate at 65% (Nankinga *et al.*, 2019). In Nepal, 68% of currently married women are employed. The proportion of women who were employed decreased from 83% in 2006 and 77% in 2011 to 68% in 2016. However, the proportion of women paid in cash only has increased over the past decade, from 14% in 2006 and 24% in 2011 to 36% in 2016. About half of currently married women (52%) with cash earnings decide independently on how their earnings are used. More than half of currently married women participate, either by themselves or jointly with their husband, in decisions regarding their own health care, making major household purchases, and visits to their family or relatives (NDHS, 2016).

2.9 Assessment of nutritional status

Assessment of nutritional status of community is one step in the formulation of any public health strategy to combat malnutrition. The principle aim of such an assessment is to determine the type, magnitude and distribution of malnutrition in different geographic areas to identify at risk groups and to determine the contributory factors. In addition, factual evidence of the exact magnitude of malnutrition is essential to sensitize administrators and politicians to obtain allocation of materials and human resources and to plan appropriately (Srilakshmi, 2002).

The nutritional assessment may require encompassing nations, communities, vulnerable segments of communities or individuals. It may be done as a part of an exercise to document current status as compared with past status or as a specific attempt to evaluate the impact of an intervention program (Ramchandran, 1987). The assessment of nutritional status can be done using the following information (WHO, 1966).

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

2.9.1 Anthropometric assessment

It is the physical measurement of the human body and is commonly used to estimate the nutritional status of children. Anthropometry measures have been extensively used for identification and classification of children suffering from protein-energy malnutrition (PEM). Different anthropometric measurements are combined as ratios or indices such as weight-for-age, weight-for-height and height-for-age (Pietsch, 2000).

2.9.1.1 Height-for-age (H/A)

H/A is an indicator of past or chronic malnutrition. H/A cannot be used to measure short term changes in malnutrition. Deficits in L/A or H/A are signs of stunting. Stunting, usually results from extended periods of inadequate food intake, disease or a combination of both, especially during the periods of greatest growth for children when the slowing of skeletal growth results in reduced stature or length (Pietsch, 2000). Stunting begins in utero; therefore, the pro-pregnancy health and nutritional status of women and the nutrition and health of mothers during pregnancy is critical. Stunting is a result of a process over time; most of the damage occurs before 2 years of age. Emphasis should be on prevention.

Children whose height for age Z-score is below minus two standard deviations (-2SD) from the median of the WHO reference population are considered short for age (stunted), or chronically malnourished. Children who are below minus three standard deviations (-3SD) are considered severely stunted (WHO, 2015).

Stunted growth is a reduced growth rate in human development. It is a primary manifestation of malnutrition in early childhood, including malnutrition during fetal development brought on by the malnourished mother. In developing countries, stunted growth is a common problem affecting a large percentage of children. Once established, stunting and its effects typically become permanent. Stunted children may never regain the height lost as a result of stunting, and most children will never gain the corresponding body weight. It also leads to premature death later in life because vital organs never fully developed during childhood (Badrialaily, 2008).

2.9.1.2 Weight-for-height (W/H)

Weight-for-Height (W/H) helps to identify children suffering from current or acute malnutrition. It is used to examine short terms effects, i.e. recent rapid weight loss associated with a period of starvation and/or severe disease (Gomez *et al.*, 2000).

Children with Z-scores below minus two standard deviations (-2SD) are considered thin (wasted) or acutely malnourished. Children with weight for height index below minus three standard deviations (-3SD) are considered severely wasted and children

with more than two standard deviations (+2SD) above the median weight for height are considered overweight or obese (WHO, 2015).

Wasting results from weight falling significantly below the weight expected of a child of the same length or height. Wasting indicates current/acute malnutrition resulting from feeding practices, diseases and infection, or, more frequently, a combination of these factors. Wasting in individual children and population groups can change rapidly and shows marked seasonal patterns associated with change in food availability or disease prevalence (Smith and Haddad, 2000).

2.9.1.3 Weight-for-age (W/A)

Low weight-for-age identifies the condition of being underweight at a specific age. W/A may reflect both (chronic) and present (acute) under nutrition; however, it is unable to distinguish between the two (Smith and Haddad, 2000).

Children whose weight for age Z-score is below minus two standard deviations (-2SD) are classified as underweight while children whose weight for age Z-score is below minus three standard deviation (-3SD) are considered severely underweight (WHO, 2015).

W/A is used to identify the nutritional condition underweight, which is a composite measure of stunting and wasting. Just over 15% of the study children were severely malnourished, having a Z-score ≤ -3 standard deviations (SD) for any index (Hommes, 2005).

2.9.1.4 Mid-upper-arm circumference (MUAC)

Measurement of the mid-upper arm appears to be most useful in practice. The reason is easily accessible, even with a young child sitting in front of the examiner on his mother's lap. The arm circumference is measured to the nearest 0.1 cm with a flexible steel or fibre-tape, which must be placed gently, but firmly, round the limb to avoid compression of the soft tissue (WHO, 1966).

PART III

Materials and methods

3.1 Research design

A community based cross-sectional survey of children (6-59) months having working mothers in Dharan sub-metropolitan city at household level was conducted which includes:

- a) Anthropometric measurement of children (6-59) months having working mothers in Dharan sub-metropolitan city.
- b) Bilateral pitting oedema was observed.
- c) A well designed and pretested set of questionnaire to collect data regarding factors associated with the nutritional status of children.

3.2 Study area

The study was conducted in Dharan sub-metropolitan city, Sunsari district, Koshi zone. It is located in the eastern development region. It has total area of 192.61 Square Kilometer and is located at an altitude of 119-1778 meter. It lies in Province 1 and the district headquarter is in Inurwa. There are total 20 wards in Dharan sub-metropolitan city. It has total population of 1,25,499. Out of which 63,856 (50.88%) are females and 61,608 (49.09%) are males. 14.51% of females and 40.35% of males are employed in Dharan. The total number of working females is 6,581 out of total population and 21,116 are working males. 1.03% of daughter-in-law has right to decide about household expenditure in Dharan. The data regarding total population of working mothers in Dharan sub-metropolitan city wasn't available (Sub-metropolitan, 2075). The survey was done from 2020/6/1 to 2020/6/23.

3.3 Study variables

- Dependent variable: Nutritional status of 6-59 months children having working mothers
- Independent variable: It includes:
 - ✓ Socio-demographic: Sex, Caste, Socio-economic (Income).

- ✓ Maternal characteristics: Age, education of mother, age during marriage and pregnancy, iron and folate intake, maternal employment, etc.
- ✓ Child characteristics: Feeding practices, hygiene.
- ✓ Environmental and hygiene characteristics: Water supply, sanitation and housing condition.

3.4 Target population

Children of 6-59 months having working mothers were included as target population of the study. Inclusion and exclusion criteria:

a) Inclusion criteria:

- ✓ Children (6-59) months having working mothers were included in the study.

b) Exclusion criteria:

- ✓ The study participants who were seriously ill, disabled or not available at household during the time of survey were not included in the study.
- ✓ A child whose mother died or a child and mother living separately were not included in the study.

3.5 Sampling technique

- a) Among the total wards of Dharan (map of Dharan is shown in Appendix C), five wards (15, 17, 12, 8 and 13) were chosen by using simple random sampling technique.
- b) Equal number of households were taken from each wards.
- c) From total households of every ward, required samples were selected by using simple random sampling.
- d) Only one child from one household was chosen for sample selection.

3.6 Sample size

Sample size was determined by literature review and by statistical calculation. The sample size was calculated to represent entire children aged 6-59 months having working mothers residing in Dharan. In order to achieve this statistical inference, the sample size was determined using a single proportional formula assuming the prevalence rate of malnutrition to be 50% in the survey area, 95% confidence interval

(CI), 7% margin of error (d) and 10% non-response rate was added to the total calculated sample size.

N = sample size,

P = estimated proportion of an attribute present in the population, (50%)

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

Sample size (N) = $Z^2 \times p(1 - p)/d^2$

Now, $N = 1.96^2 \times 0.5(1 - 0.5)/0.07^2 = 196$

Thus, calculated sample size was adjusted for non-response. Considering non-response rate as 10%, the adjusted sample size was calculated to be 216.

3.7 Research instruments

Instruments and equipment used during the survey were:

- a) Weighing machine manufactured by Micro-life Pvt. Ltd.
- b) Height measuring scale (Stadiometer) designed according to UNICEF standards under the supervision of Central Campus of Technology, Nutrition and Dietetics.
- c) UNICEF MUAC tape: For measuring mid-upper arm circumference.
- d) Questionnaire: A well designed and pretested set of questionnaire to collect data regarding factors associated with the nutritional status of children.

3.8 Pre-testing

First of all the prepared sets of questionnaire and anthropometric instruments was pre-tested among few children (6-59) months respectively under the sampling plan. The pretesting was conducted to establish accuracy of questions and clarity and to check for consistency in the interpretation of questions and to identify ambiguous items. After review of instruments all suggested revisions 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 purposed to measure, the instruments was validated by a group of professionals from Central Campus of Technology, Department of Nutrition and Dietetics. Reliability refers to quality control measure of data collected. Questionnaire was checked for completeness, consistency and clarity. Validity and reliability of the study was ensured by pre-testing of the tools, using standardized instruments.

3.10 Data collection techniques

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. The instruments used for data collection were as follows:

a) Questionnaire for household survey:

Out of 28,366 houses, 216 houses were taken for the household survey. A questionnaire given in appendix was used to collect the various kinds of information which are directly or indirectly indicative of causes of malnutrition. The questionnaire provided information such as demographic and socioeconomic status of family, maternal and child caring practices and environmental characteristics of the household.

b) Anthropometric measurement:

Anthropometric measurements (height, weight and MUAC) were obtained from all children 6-59 months of age.

Weight: The weight was measured using digital weighing machine with child weighing capacity of 100 kg (1 piece) and having the least count of 0.1 kg, manufactured by Micro-life Pvt. Ltd. The weight of the child was measured when he/she was standing on the weighing nude, with a minimum of clothes and no shoes. If the child was not able to stand on the scale by her/his own, the mother's weight was taken first and then mother's weight while carrying the infant was taken. The child's weight was found by subtracting the mother's weight from mother's weight

while carrying the child. The scales were checked for accuracy before taken to the field (Tamiru *et al.*, 2015).

Height/length: The height measuring tape of five feet capacity (1 piece) was used. The instrument was designed according to UNICEF standards which were easily transportable and accurate. It was prepared under the supervision of Central Campus of Technology, Department of Nutrition and Dietetics. The length of each child aged 6-24 months was measured lying flat and centrally on measuring boards placed on a hard flat surface on the ground. The length was read to the nearest 0.1 cm (head and feet against the base of the board and foot piece respectively) (Tamiru *et al.*, 2015). The height of children aged above 24 months was measured standing straight on measuring board placed on hard flat surface with line of sight perpendicular to the horizontal surface. Children were made to stand bare foot on height board and with feet parallel and joined together and with heels and buttock touching the wall. It was made sure that the head was held erect and hands were hung closely at the sides. The child's height was measured to the nearest one decimal place.

Mid upper arm circumference (MUAC): UNICEF MUAC tape was used to measure the MUAC reading. The tape was flexible, non-stretchable and made of fiber glass. MUAC of the left arm was taken and recorded to the nearest 0.01 cm. The enumerator located the mid-point between the shoulder and the tip of the elbow with the arm bent. The measurement was taken at this midpoint with the arm extended and relaxed. A cut-off 115 mm was used to distinguish the well-nourished with the children that were severely wasted (also called severely acute malnourished) (WHO and UNICEF, 2009).

Date of birth: The date of birth for each child was inquired from the caretaker/mother and recorded in months. An event calendar was used to state the age as accurate as possible. Age was written down with “day/month/year” and “age in months”. The Nepali date was converted into English date.

c) Clinical measurement:

Bilateral pitting oedema was observed. It is a clinical sign of severe acute malnutrition. A child is considered to have nutritional oedema if a depression

(shallow print or pit) is left after normal thumb pressure is applied on both feet for 3 seconds. Oedema is swelling from excess fluid in the tissues. It is usually seen in the feet and lower legs and arms. In severe cases it may also be seen in the upper limbs and face. It can be classified into three grades:

- Grade + (Mild): Oedema is present in both feet.
- Grade ++ (Moderate): Oedema is present in both feet plus the lower legs, hands and lower arms.
- Grade +++ (Severe): Oedema is present in both feet, legs, arms, hands and face (MoHP, 2018).

3.11 Data analysis

Quantitative data was firstly cleaned, coded and entered in SPSS 20 and WHO Anthro version 3.2.2. Similarly, qualitative data was transcribed and coded by assigning labels to various categories. Chi-Square test was used to identify the association between maternal employment and undernutrition in children.

Anthropometric indices were calculated using reference medians recommended by the World Health Organization (WHO) and classified according to standard deviation units (z-scores), based on the WHO criteria. Wasting (weight-for-height z-score-WHZ) indicates thinness. It is usually the result of recent nutritional deficiency and is affected by seasonal shifts associated with availability of foods and/or prevalence of disease. A WHZ of <-2 defines the presence of acute malnutrition (wasting). Stunting, represented by low height-for-age z-score (HAZ), results from extended periods of inadequate food intake, poor dietary quality, increased morbidity, or a combination of these factors. A HAZ of <-2 defines chronic malnutrition (stunting). Weight-for-age z-score (WAZ) is essentially a composite of weight-for-height and height-for-age, thus a measure of both acute and chronic malnutrition. A WAZ of <-2 is used for defining a child as underweight. A z-score of <-3 defines severe levels of each of the indices (Tamiru *et al.*, 2015).

3.12 Logistical and ethical considerations

Ethical approval for the study has been provided by the Nepal Health Research council (NHRC), a statutory and autonomous body under the Government of Nepal.

Permission was taken from Central Campus of Technology and Dharan Sub-metropolitan city. Verbal consent from parents or caretakers of the study subject was obtained and the objective of the study was explained to them. Privacy and confidentiality of the information obtained was ensured at all level.

PART IV

Results and discussion

The study was conducted to assess the nutritional status of 6-59 months children having working mothers in Dharan sub-metropolitan city and the factors associated with the nutritional status of children. The results and findings of the study are expressed into several following headings.

4.1 Demographic and socio-economic characteristics of household

Table 4.1 shows the household with joint family (53.7%) had the highest percentage while the household with single family is 46.3%. The educational status in father of children was superseded by higher secondary and above 45.8% followed by secondary level 30.6%, primary 18.5% and illiterate 5.1%.

Table 4.1 Socio-demographic characteristics of study population (N=216)

Variables	Frequency	Percent
Family size		
Single	100	46.3
Joint	116	53.7
Education of father		
Illiterate	11	5.1
Primary	40	18.5
Secondary	66	30.6
Higher secondary and above	99	45.8

Out of five wards chosen for the survey, Table 4.2 shows the major occupation of the people residing there were business (40.7%), job (27.8%), followed by foreign employment (16.2%), driving (5.6%), labour (4.2%), tailor (3.2%) and agriculture (2.3%). Considering the estimated monthly income depicted in Table 4.1 of all respondents, those with monthly income above 35000 has the highest percentage (36.1%) followed by household with monthly income 25000-35000 (25.9%), 18000-25000 (23.6%), 12000-18000 (12.5%) and 6000-12000 (1.9%).

Table 4.2 Economic characteristics of study population (N=216)

Variables	Frequency	Percent
Occupation		
Agriculture	5	2.3
Job	60	27.8
Labour	9	4.2
Business	88	40.7
Foreign employment	35	16.2
Driver	12	5.6
Tailor	7	3.2
Monthly income		
6000-12000	4	1.9
12000-18000	27	12.5
18000-25000	51	23.6
25000-35000	56	25.9
Above 35000	78	36.1

4.2 Child characteristics

From the total of 216 children included in the study 104 (48.1%) were males and 112 (51.9%) were females. Majority of children fall between 36-47 months age group (24.5%).

Table 4.3 Child characteristics of study population (N=216)

Variables	Frequency	Percent
Gender		
Male	104	48.1
Female	112	51.9
Wt. at birth		
Below 2.5kg	16	7.4
Equal to 2.5kg	16	7.4
Above 2.5kg	172	79.6
Don't know	12	5.6
Age in month		
6-11 months	27	12.5
12-23 months	42	19.4
24-35 months	42	19.4
36-47 months	53	24.5
48-59 months	52	24.1
Birth order		
First child	123	56.9
Other child	93	43.1
Birth type		
Normal delivery	139	64.4
Caesarian delivery	77	35.6

The children's weight at birth below normal (below 2.5kg) and children's birth weight equal to 2.5kg was 7.4% each; 79.6% was above normal (above 2.5kg) and 5.6% of children's birth weight was unknown. 123 (56.9%) families under the survey had only one child below 5 years of age while 93 (43.1%) families had other or more than

one children. 139 (64.4%) children were born through normal delivery whereas 77 (35.6%) were born through caesarian section.

4.3 Child caring practices

Majority of infants were fed colostrum 90.3%, 7.9% did not feed colostrum and 1.9% of the mothers didn't know whether the child was fed colostrum or not. The mean duration of breastfeeding was found to be 2.61 ± 1.07 years.

Almost 88% of infants were not given prelacteal feeds while 12% of caretaker practiced the rituals of given prelacteal feeds. 88.9% children were given complementary feed after completion of 6 months; 7.9% of the children were given complementary feed before 6 months and 3.2% children were given complementary feed after 1 year and above. 76.4% of children were given complementary food similar to that of family member and 23.6% of children were given other food items such as jawlo, sarbottam pitho and cerelac. Out of 216 children, 62% were fed micronutrient powder whereas 38% were not fed micronutrient powder. 81% of children were fed food different from usual days like jawlo during the period of illness while 19% of children were given foods consumed during usual days. 65.3% of children consumed homemade foods, 16.7% consumed market foods and 18.1% consumed both homemade and market foods.

Regarding Vitamin A and deworming tablet supplementation, 92.1% of children were supplemented with Vitamin A and deworming tablet while 7.9% were not supplemented with Vitamin A and deworming tablet. 99.5% of children were vaccinated while 0.5% of children were not vaccinated. 69.9% of children were taken to hospital during illness while 30.1% were taken to pharmacy for treatment. Almost 100% of household used packaged iodized salt. The finding was similar to that of National Demographic and Health Survey 2016 which revealed that more than 95% of households were using iodized salt (NDHS, 2016).

Table 4.4 Distribution of different child caring practices (N=216)

Variables	Frequency	Percent
Colostrum feeding		
Yes	195	90.3
No	17	7.9
Don't know	4	1.9
Prelacteal feeding		
Yes	26	12
No	190	88
Frequency of breastfeeding		
Below 10 times	83	38.4
10-12 times	5	2.3
No	128	59.3
Duration of breastfeeding		
Below 2 years	15	6.9
Above 2 years	101	46.8
2 years	100	46.3
Initiation of complementary feeding		
Below 6 months	17	7.9
After 6 months	192	88.9
After 1 year and above	7	3.2
Frequency of complementary feeding		
Less than 3 times	25	11.6
3-5 times	119	55.1
More than 5 times	12	5.6

3 times	60	27.8
Type of complementary feeding		
Similar to family member	165	76.4
Different	51	23.6
Feeding during illness		
As usual	41	19
Different	175	81
Food preference		
Market	36	16.7
Homemade	141	65.3
Both	39	18.1
Vitamin A and deworming tablet		
Yes	199	92.1
No	17	7.9
Micronutrient powder for child		
Yes	134	62
No	82	38
Vaccination of child		
Yes	215	99.5
No	1	0.5
Place of treatment		
Hospital	151	69.9
Pharmacy	65	30.1
Type of salts		
Iodised salt	216	100

4.4 Maternal characteristics

Out of 216 samples included in the study, 11 (5.1%) mothers were illiterate, 40 (18.5%) mothers had primary level education, 66 (30.6%) mothers had secondary level and 99 (45.8%) mothers with higher secondary and above educational status. Most of the mothers were engaged in sales and services (46.3%), followed by professional of formal work (31%), agriculture and manual work (16.7%) and domestic or household work (6%). 31% mothers earned 6000-12000 monthly followed by 12000-18000 (25.9%), 18000-25000 (13%), 3000-6000 (12.5%), above 35000 (7.4%), 25000-35000 (6.5%) and below 3000 (3.7%). 81.9% (177) of mothers had participation in household decision making while 18.1% (39%) didn't have participation in household decision making. Among the total respondents only 97 (44.9%) had knowledge about sarbottam pitho and 119 (55.1%) of the respondents didn't know about sarbottam pitho. Only 23 (10.6%) of mothers knew the correct composition of sarbottam pitho while 142 (65.7%) didn't know the composition of sarbottam pitho.

172 (79.6%) of mothers had knowledge about PEM while 44 (20.4%) of mothers didn't know about PEM. 163 (75.5%) of mothers mentioned the cause of disease to be lack of balanced diet while 53 (24.5%) of mothers didn't know the cause of PEM. In the survey area the maximum age of mother during marriage was found to be 20-30 years while the minimum age of mother during marriage was above 30 years. 88.9% (192) of mothers age was above 20 years during first pregnancy while 11.1% (24) mothers age was below 20 years during first pregnancy. About 96.8% (209) mothers mentioned that they need additional nutrient during pregnancy while 3.2% (7) mothers mentioned that they don't need additional nutrient during pregnancy. 96.8% (209) mothers consumed more nutrients than usual days during pregnancy while 7 (3.2%) mothers mentioned that they consumed nutrients like as usual days during pregnancy. 94% (203) mothers consumed iron tablet during pregnancy while 6% (13) mothers didn't consume iron tablets during pregnancy. 95.8% (207) mothers received vaccination during pregnancy while 4.2% (9) mothers didn't receive vaccination during pregnancy.

Table 4.5 Distribution of maternal characteristics in study population (N=216)

Variables	Frequency	Percent
Mother's education		
Illiterate	11	5.1
Primary	40	18.5
Secondary	66	30.6
Higher secondary and above	99	45.8
Mother's occupation		
Professional or formal	67	31
Sales and services	100	46.3
Agriculture and manual work	36	16.7
Domestic or household work	13	6
Monthly income		
Below 3000	8	3.7
3000-6000	27	12.5
6000-12000	67	31
12000-18000	56	25.9
18000-25000	28	13
25000-35000	14	6.5
Above 35000	16	7.4
Mother's participation in decision making		
Yes	177	81.9
No	39	18.1
Knowledge about sarbottam pitho		

Yes	97	44.9
No	119	55.1
Composition of sarbottam pitho		
Equal	46	21.3
Cereal:legume=2:1	23	10.6
Cereal:legume=1:2	5	2.3
Don't know	142	65.7
Knowledge about PEM		
Yes	172	79.6
No	44	20.4
Causes of PEM		
Lack of balanced diet	163	75.5
Don't know	53	24.5
Age at marriage		
Below 20 years	55	25.5
20-30 years	154	71.3
Above 30 years	7	3.2
Age at first pregnancy		
Below 20 years	24	11.1
Above 20 years	192	88.9
Additional nutrient during pregnancy		
Yes	209	96.8
No	7	3.2
Management of nutrient during pregnancy		

Give more than usual	209	96.8
Give as usual	7	3.2
Iron tablet		
Yes	203	94
No	13	6
Vaccination of mother during pregnancy		
Yes	207	95.8
No	9	4.2

4.5 Environmental characteristics

Almost 98.1% (212) household used tap as a source of water and 0.9% (2) household used river as a source of water and also 0.9% (2) household used jar water. 94.4% (204) household used purified water while 5.6% (12) household used water without purification. Almost 100% household had toilet facility. 81% (175) household had proper waste management through municipality followed by incineration 15.7% (34) and dumping 3.2% (7). 98.1% (212) household used gas as a source of cooking fuel while 1.9% (4) used firewood.

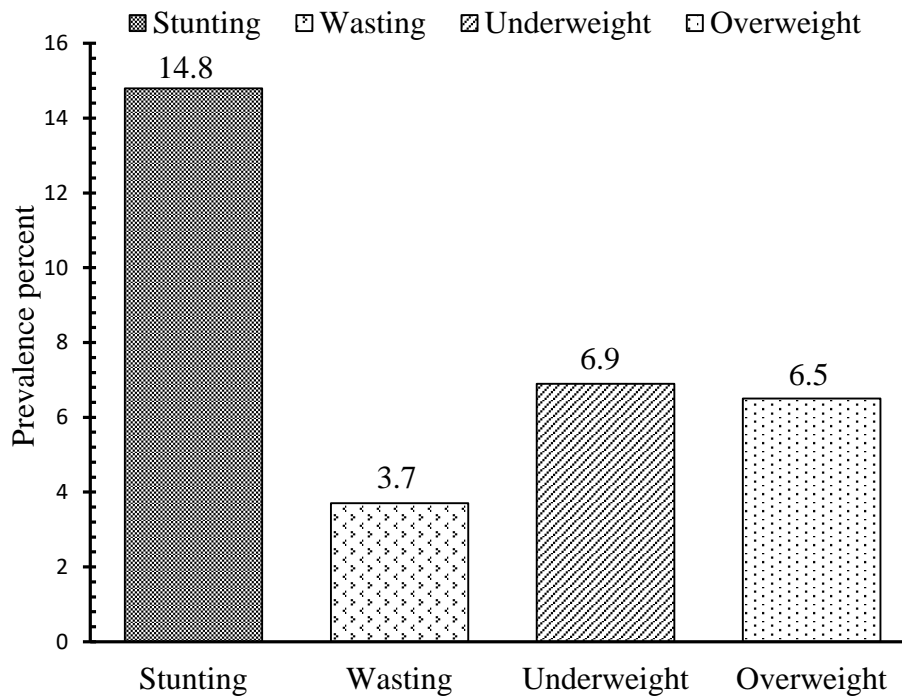
Table 4.6 Environmental characteristics of study population (N=216)

Variables	Frequency	Percent
Source of water		
Tap	212	98.1
River	2	0.9
Jar	2	0.9
Purification of water		
Yes	204	94.4
No	12	5.6
Toilet facility		
Yes	216	100
Waste management		
Incineration	34	15.7
Dumping	7	3.2
Management by municipality	175	81
Cooking fuel		
Gas	212	98.1
Firewood	4	1.9

4.6 Prevalence of malnutrition

In the survey, among 216 children the overall magnitude of malnutrition was found to be 14.8%, 6.9%, 6.5% and 3.7% stunting, underweight, overweight and wasting respectively.

Fig. 4.1 Prevalence of malnutrition among 6 to 59 months children having working mothers in the studied area



The prevalence of stunting was found to be lower i.e. 14.8% than that of the findings of NDHS (2016) (36%), while findings of underweight 6.9% which was found to be lower than that of NDHS (2016) (27%) and wasting i.e. 3.7% was also found to be lower than that of NDHS (2016) (10%). The prevalence of stunting was found to be lower than that of the study done in Uganda where 28% children of working mothers were stunted; the rate of wasting was also found to be lower where 4% children were wasted and the rate of underweight was also found to be lower where 11% children were found to be underweight (Nankinga *et al.*, 2019).

Table 4.7 Prevalence of malnutrition among 6 to 59 months children having working mothers in Dharan sub-metropolitan city

Nutritional indicator	Percent
Length/height for age (stunting)	14.8
Weight for age (underweight)	6.9
Weight for height (wasting)	3.7
Weight for height (overweight)	6.5

Moreover, 14.8% children were found to be moderately stunted; 6.9% were moderately underweight and 3.7% were moderately wasted. Severe case of undernutrition was not observed in the studied area, also oedema wasn't present in the studied population.

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

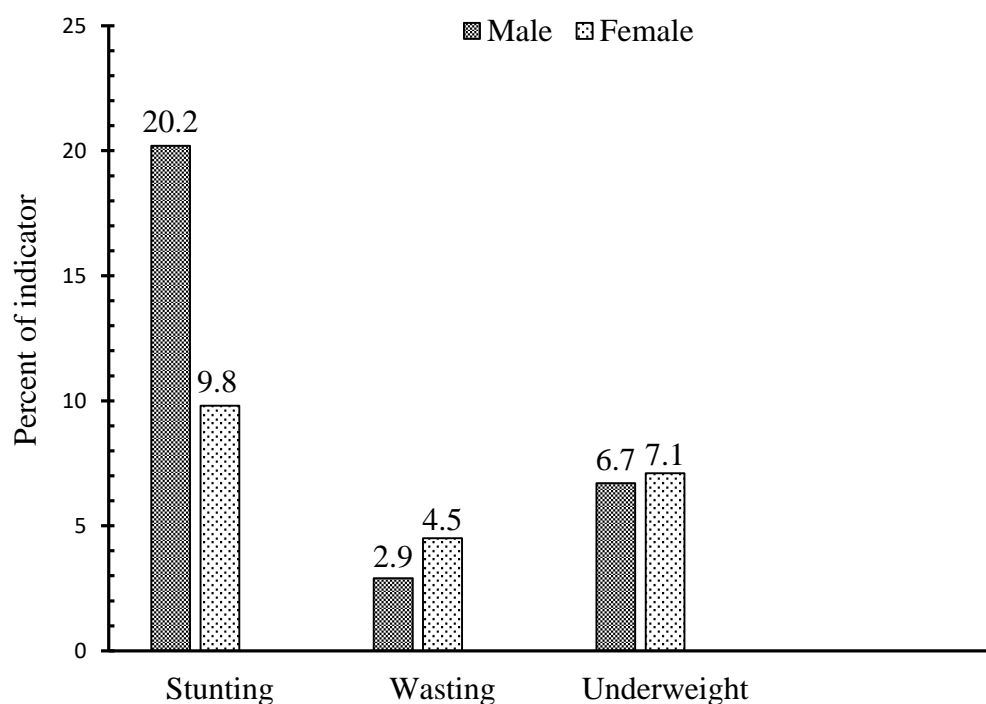


Figure 4.2 shows the prevalence of stunting was higher in males (20.2%) than that in females (9.8%). The prevalence of wasting was higher in females (4.5%) than that of males (2.9%). The prevalence of underweight was slightly higher in females (7.1%)

than that of males (6.7%). Overweight was found to be 7.1% in females and 5.8% in males.

Table 4.8 shows among 104 males, 2.9% males were moderately wasted, 20.2% were moderately stunted and 6.7% were moderately underweight. Similarly, among 112 females 4.5% were moderately wasted, 9.8% were moderately stunted and 7.1% were moderately underweight.

Table 4.8 Gender wise distribution of wasting, stunting and underweight

Characteristics		Male (%)	Female (%)	All (%)
WHZ	Moderately wasted (>-3&<-2)	2.9	4.5	3.7
	Overweight (>+2)	5.8	7.1	6.5
	Normal	91.3	88.4	89.8
HAZ	Moderately stunted (>-3&<-2)	20.2	9.8	14.8
	Normal	79.8	90.2	85.2
WAZ	Moderately underweight (>-3&<-2)	6.7	7.1	6.9
	Normal	93.3	92.9	93.1

Figure 4.3 shows stunting was higher in 48-59 months children whereas wasting was found to be higher in 6-11 months children. Similarly, underweight was found to be higher in 36-47 months of children and overweight was found to be higher in 6-11 months children.

Fig. 4.3 Distribution of stunting, wasting and underweight among different age groups

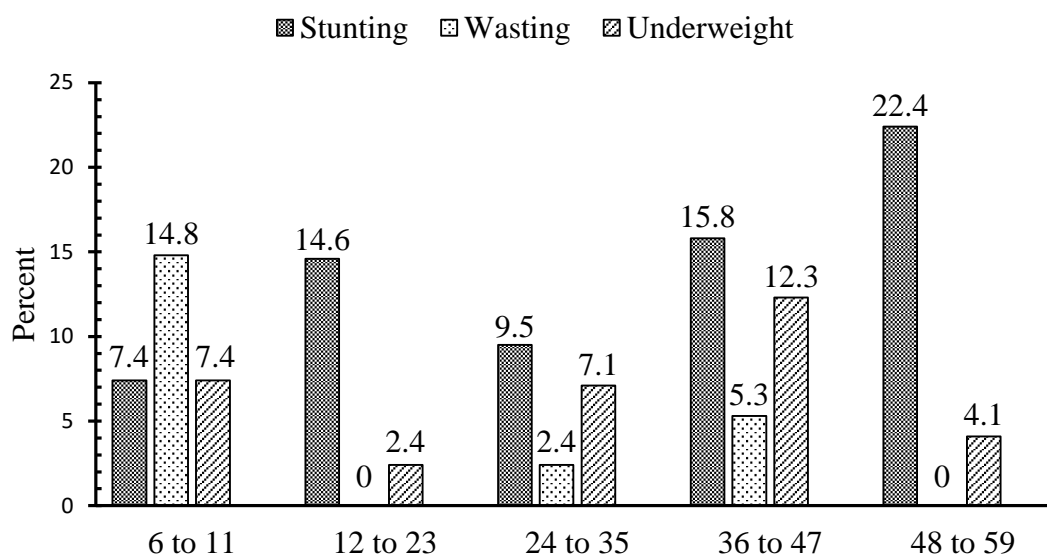


Table 4.9 Distribution of wasting, stunting and underweight among children of different age groups

Age groups (months)	N	WHZ (%)			HAZ (%)		WAZ (%)	
		<-3	<-2	>+2	<-3	<-2	<-3	<-2
(6-11)	27	Nil	14.8	11.1	Nil	7.4	Nil	7.4
(12-23)	41	Nil	Nil	4.9	Nil	14.6	Nil	2.4
(24-35)	42	Nil	2.4	2.4	Nil	9.5	Nil	7.1
(36-47)	57	Nil	5.3	8.8	Nil	15.8	Nil	12.3
(48-59)	49	Nil	Nil	6.1	Nil	22.4	Nil	4.1
Total	216	Nil	3.7	6.5	Nil	14.8	Nil	6.9

Table 4.9 shows wasting was higher in 6-11 months children (14.8%) while lower in 24-35 months children (2.4%), whereas no children were found to be wasted in age group 12-23 months and 48-59 months. Likewise, stunting was found to be higher in

48-59 months children (22.4%) while lower in 6-11 months children (7.4%). Similarly, underweight was found to be higher in 36-47 months children (12.3%) and lower in 12-23 months children (2.4%). Overweight was found to be higher in 6-11 months children (11.1%) while lower in 24-35 months children (2.4%).

Figure 4.4 shows the prevalence of wasting was higher in children of mothers engaged in agriculture and manual work (8.3%). Likewise, the prevalence of stunting was higher in children of mothers engaged in domestic or household work (46.2%). Similarly, the prevalence of underweight was higher in children of mothers engaged in domestic or household work (23.1%).

Fig. 4.4 Distribution of stunting, wasting and underweight based on work category of mothers

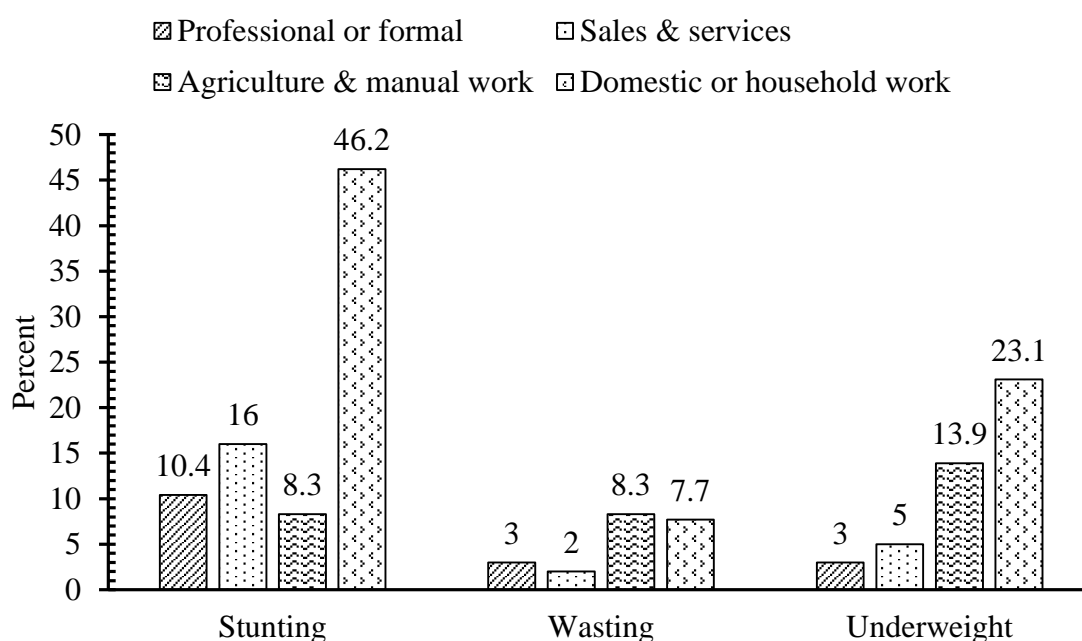


Table 4.10 shows among the children having working mothers, 3% children of mothers engaged in professional or formal work were moderately wasted, 10.4% were moderately stunted and 3% children were moderately underweight. Likewise, 2% children of mothers engaged in sales and services were moderately wasted, 16% children were moderately stunted and 5% were moderately underweight. Among the children of mothers engaged in agriculture and manual work, 8.3% children were moderately wasted and moderately stunted and 13.9% children were moderately underweight. Similarly, 7.7% children of mothers engaged in domestic or household

work were moderately wasted, 46.2% were moderately stunted and 23.1% were moderately underweight.

Table 4.10 Distribution of wasting, stunting and underweight based on work category of mothers

	Characteristics	Professional or formal (%)	Sales and services (%)	Agriculture and manual work (%)	Domestic or household work (%)	All (%)
WHZ	Moderately wasted (>-3&<-2)	3	2	8.3	7.7	3.7
	Overweight (>+2)	4.5	8	8.3	Nil	6.5
	Normal	92.5	90	83.3	92.3	89.8
HAZ	Moderately stunted (>-3&<-2)	10.4	16	8.3	46.2	14.8
	Normal	89.6	84	91.7	53.8	85.2
WAZ	Moderately underweight (>-3&<-2)	3	5	13.9	23.1	6.9
	Normal	97	95	86.1	76.9	93.1

Figure 4.5 shows higher prevalence of stunting, wasting and underweight among children of mothers who earned below 3000 per month i.e. 25%, 12.5% and 12.5% respectively.

Fig. 4.5 Distribution of stunting, wasting and underweight based on monthly income of mothers

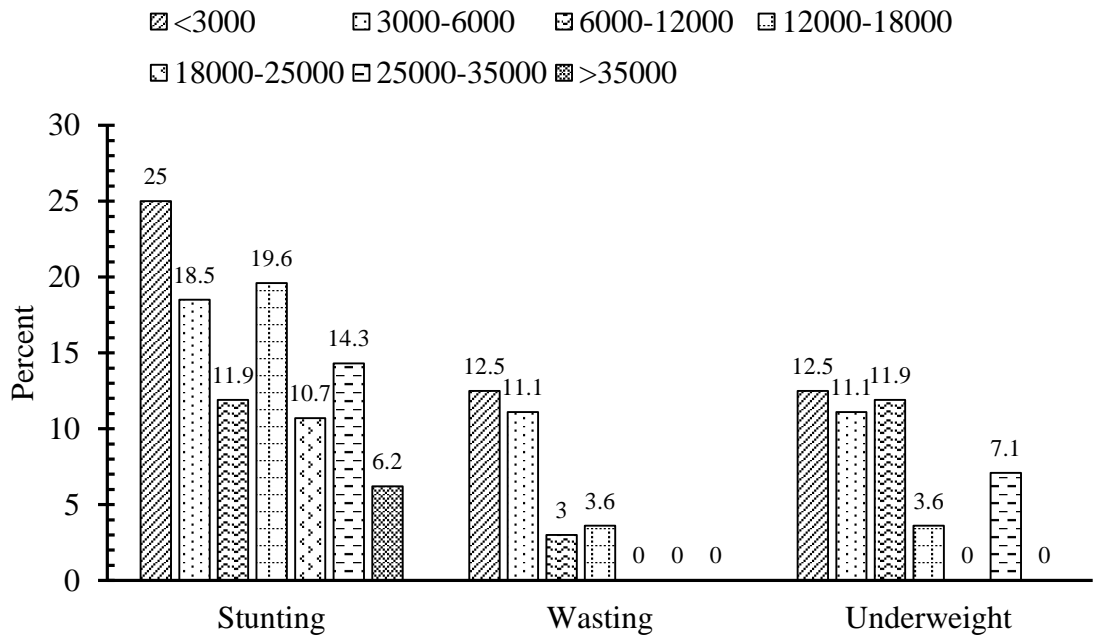


Table 4.11 shows higher percentage of children of mothers earning below 3000 per month were moderately stunted (25%). Also higher percentage of children of mothers earning below 3000 per month were moderately stunted and wasted (12.5%).

Table 4.11 Distribution of wasting, stunting and underweight based on monthly income of mothers

	Characteristics	<3000 (%)	3000 - 6000 (%)	6000-12000 (%)	12000-18000 (%)	18000-25000 (%)	25000-35000 (%)	>35000 (%)	All (%)
WHZ	Moderately wasted (>-3&<-2)	12.5	11.1	3	3.6	Nil	Nil	Nil	3.7
	Overweight (>+2)	Nil	7.4	1.5	10.7	3.6	14.3	12.5	6.5
	Normal	87.5	81.5	95.5	85.7	96.4	85.7	87.5	89.8
HAZ	Moderately stunted (>-3&<-2)	25	18.5	11.9	19.6	10.7	14.3	6.2	14.8
	Normal	75	81.5	88.1	80.4	89.3	85.7	93.8	85.2
WAZ	Moderately underweight (>-3&<-2)	12.5	11.1	11.9	3.6	Nil	7	Nil	6.9
	Normal	87.5	88.9	88.1	96.4	100	92.9	100	93.1

Figure 4.6 shows higher percentage of children of illiterate mothers were stunted (27.3%). Similarly, the prevalence of wasting (9.1%) and underweight (27.3%) were also higher among the children of illiterate mothers.

Fig. 4.6 Distribution of stunting, wasting and underweight based on education of mothers

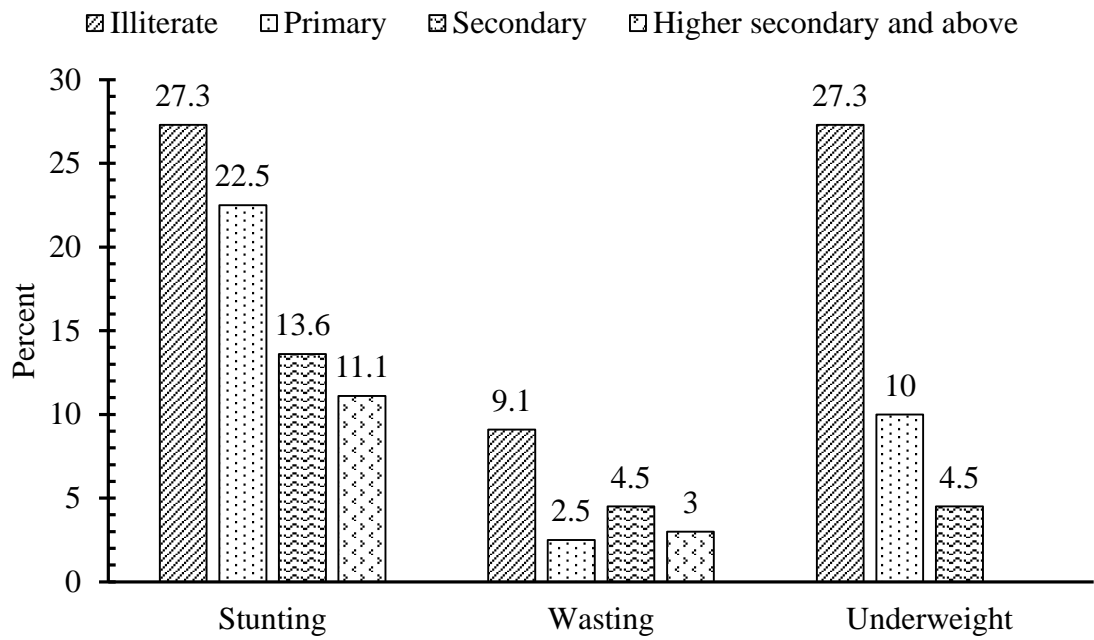


Table 4.12 shows higher percentage of children of mothers who were illiterate were moderately wasted (9.1%). Likewise, higher percentage of children of mothers who were illiterate were moderately stunted and moderately underweight (27.3%).

Table 4.12 Distribution of wasting, stunting and underweight based on education of mothers

	Characteristics	Illiterate (%)	Primary (%)	Secondary (%)	Higher secondary and above (%)	All (%)
WHZ	Moderately wasted (>-3 & <-2)	9.1	2.5	4.5	3	3.7
	Overweight ($>+2$)	Nil	2.5	7.6	8.1	6.5
	Normal	90.9	95	87.9	88.9	89.8
HAZ	Moderately stunted (>-3 & <-2)	27.3	22.5	13.6	11.1	14.8
	Normal	72.7	77.5	86.4	88.9	85.2
WAZ	Moderately underweight (>-3 & <-2)	27.3	10	4.5	5.1	6.9
	Normal	72.7	90	95.5	94.9	93.1

4.6.1 Nutrition status comparison with WHO standard

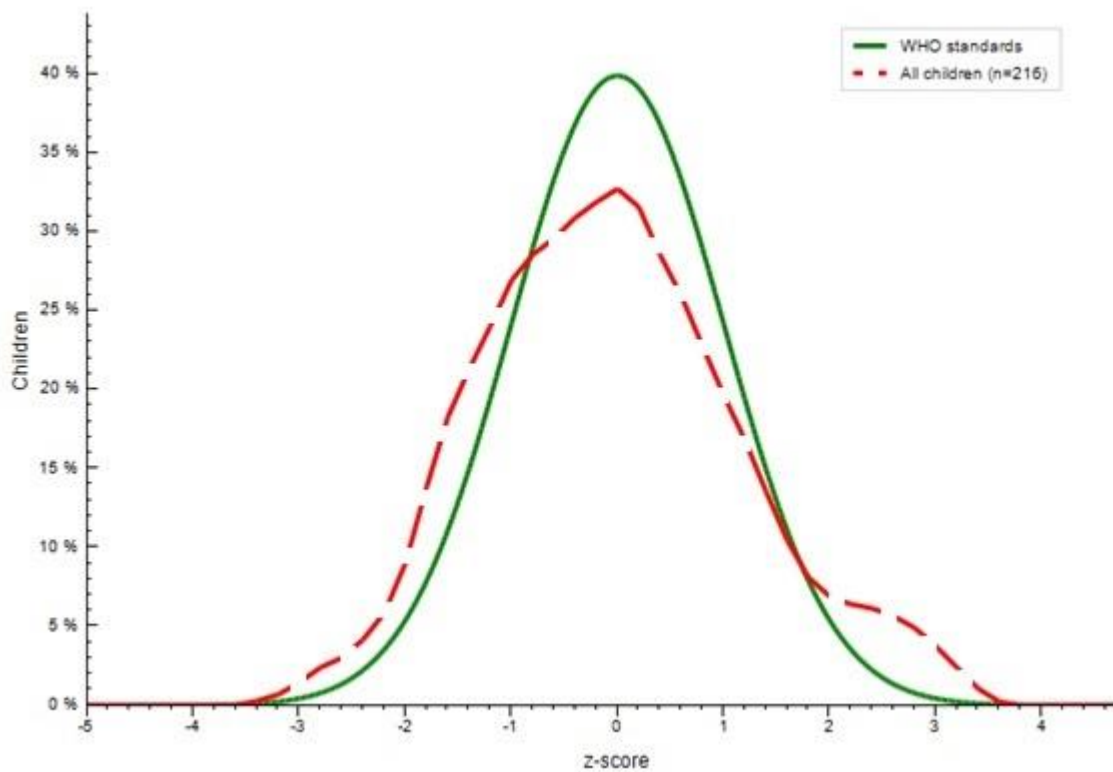


Fig. 4.7 Distribution of wasting among 6-59 months children of studied area based on WHO standard (N=216)

The weight for height curve obtained from the survey is different than that of the WHO standard curve. The median weight for height z-score of the children was found to be -0.1 i.e. the median value is slightly shifted to the left showing the prevalence of wasting among the study population.

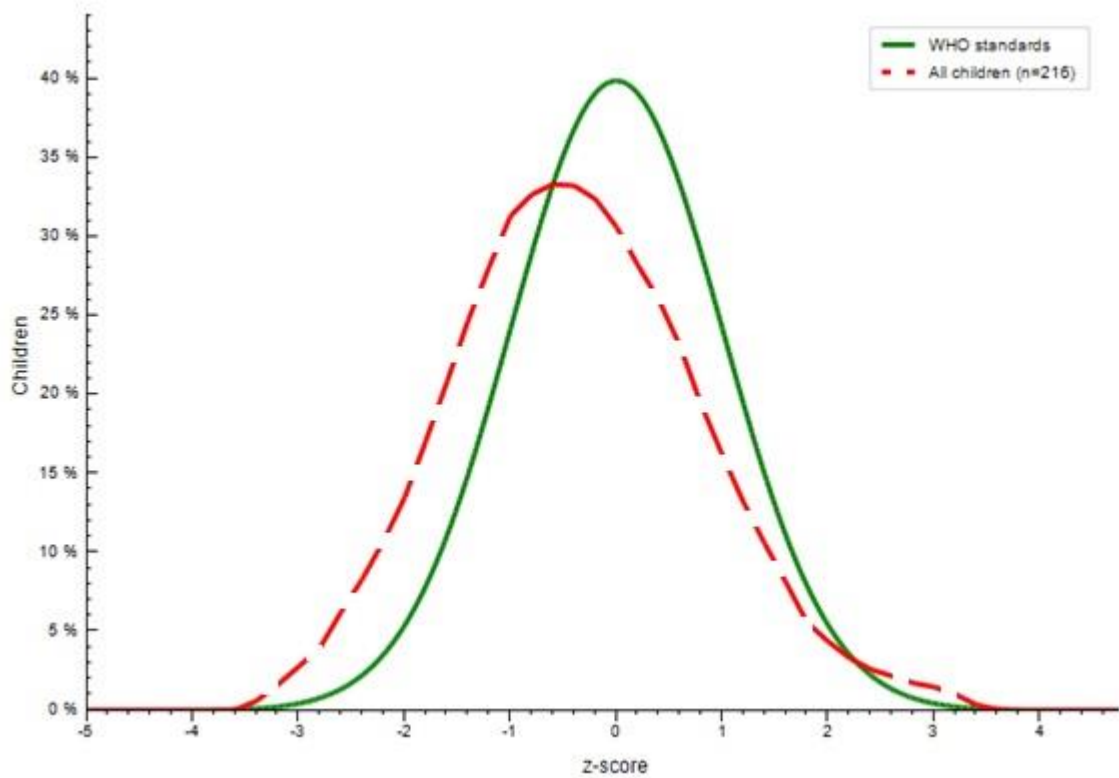


Fig. 4.8 Distribution of underweight among 6-59 months children of studied area based on WHO standard (N=216)

The weight for age curve obtained from the survey is different than that of the WHO standard curve. The median weight for age z-score of the children was found to be -0.45 i.e. the median value is slightly shifted to the left showing the prevalence of underweight among the study population.

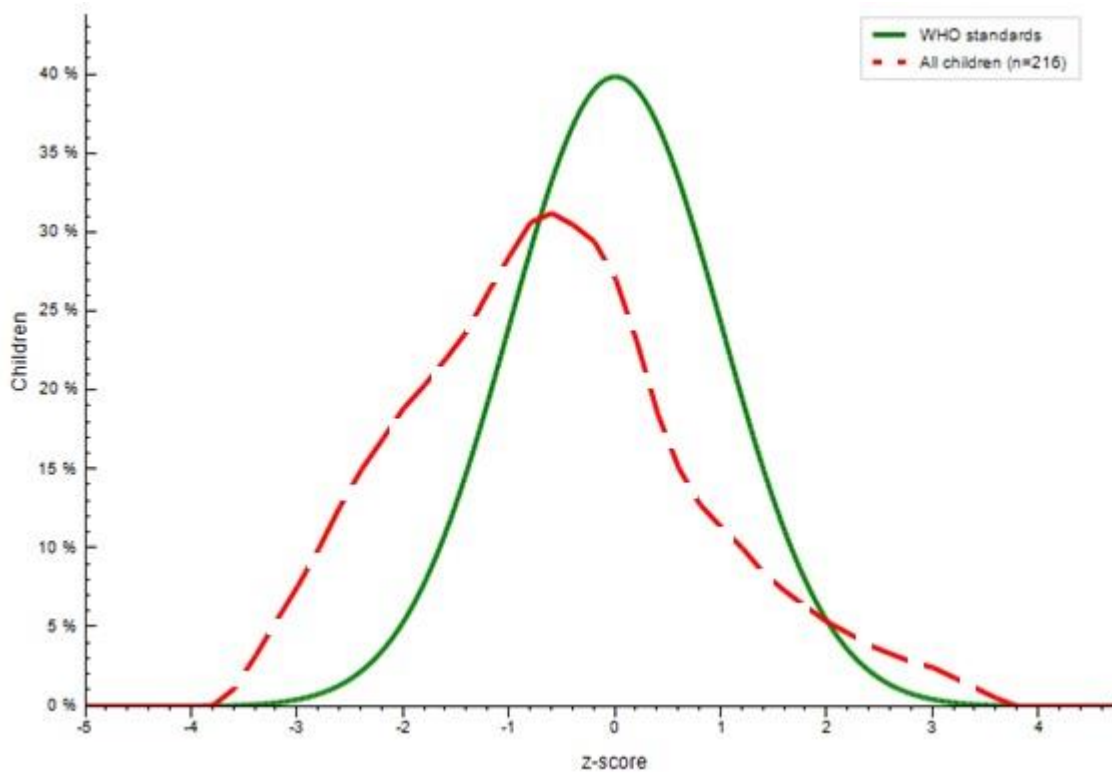


Fig. 4.9 Distribution of stunting among 6-59 months children of studied area based on WHO standard (N=216)

The height for age curve obtained from the survey is different than that of the WHO standard curve. The median height for age z-score was found to be -0.565 i.e. the median value is slightly shifted to the left showing the prevalence of stunting among the study population.

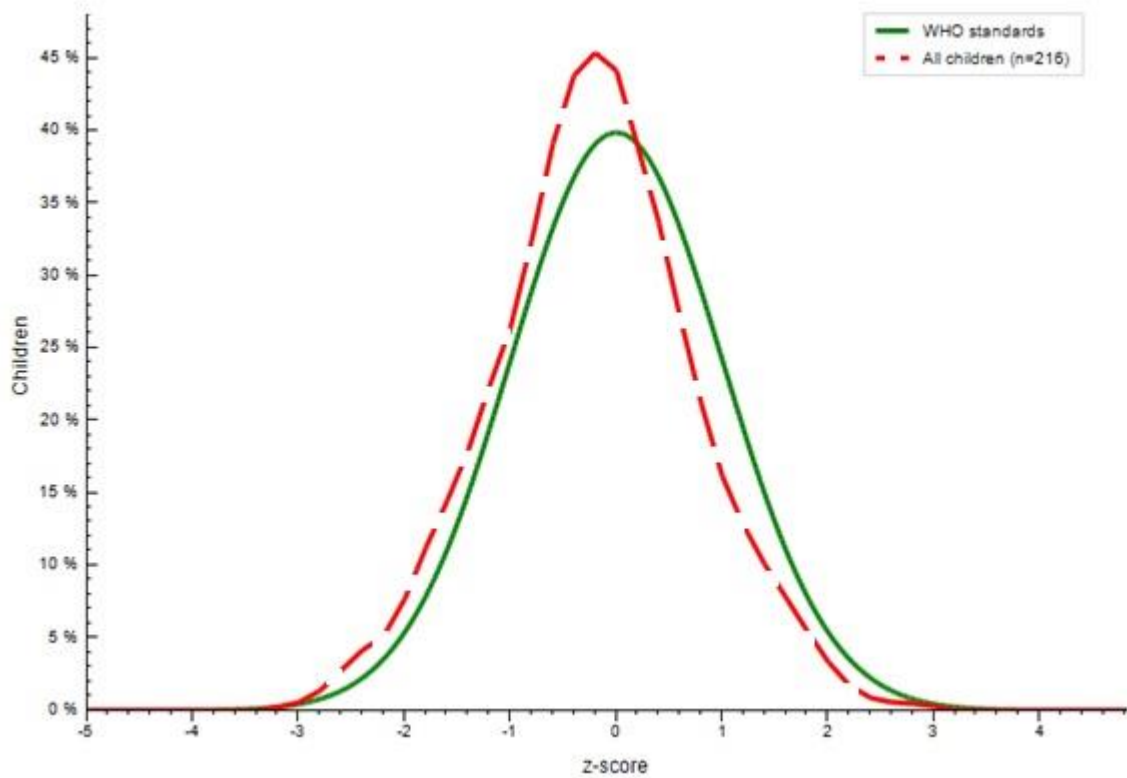


Fig. 4.10 Distribution of MUAC among 6-59 months children of studied area based on WHO standard (N=216)

The MUAC for age curve obtained from the survey is different than that of the WHO standard curve. The median MUAC for age z-score of the children was found to be -0.24 i.e. the median value is slightly shifted to the left showing the prevalence of wasting among the study population.

Table 4.10 shows the prevalence of wasting based on MUAC measurement. Based on MUAC measurement, 0.5% of children were found to be moderately wasted while no cases of severely wasting were observed in the studied area.

Table 4.13 Distribution of wasting based on MUAC measurement

MUAC	Frequency	Percent
Moderately wasted	1	0.5
Normal	215	99.5

4.7 Food consumption pattern

Usual dietary practices and pattern of food and food groups consumption was assessed using the food frequency questionnaire (FFQ). The consumption of food items were considered “frequent” if consumed at least once a day, “regular” when ingested 2-4 times a week and “rare” if ingested once a week or less (Sato *et al.*, 2010).

As we know rice, is our staple cereal grain which is consumed daily and constitute dominant portion. Table 4.11 shows that more than half of study population, 77.3% (167) consumed pulses frequently; 15.7% (34) consumed regularly; 3.2% (7) consumed rarely and 3.7% (8) never consumed pulses. Only 21.3% (46) children consumed green leafy vegetables frequently while 42.1% (91) consumed regularly; 15.7% (34) consumed rarely and 20.8% (45) never consumed green leafy vegetables. Among 216 children, only 7.4% (16) consumed meat frequently while half of the study population, 50% (108) consumed meat on a regular basis, 23.6% (51) consumed rarely and 19% (41) never consumed meat. Majority of the children, 70.4% (152) consumed milk and milk products frequently while 15.7% (34) consumed milk and milk products on a regular basis; 3.2% (7) consumed rarely and 10.6% (23) never consumed milk and milk products. Only 30.6% (66) children consumed fruits frequently while 26.4% (57) consumed fruits on a regular basis; 39.4% (85) consumed rarely and 3.7% (8) children never consumed fruits.

Table 4.14 Distribution of foods from FFQ (N=216)

Variables	Frequency	Percent
Pulses		
Frequent	167	77.3
Regular	34	15.7
Rare	7	3.2
Never	8	3.7
GLV		
Frequent	46	21.3
Regular	91	42.1
Rare	34	15.7
Never	45	20.8
Meat		
Frequent	16	7.4
Regular	108	50
Rare	51	23.6
Never	41	19
Milk and milk products		
Frequent	152	70.4
Regular	34	15.7
Rare	7	3.2
Never	23	10.6
Fruits		
Frequent	66	30.6
Regular	57	26.4
Rare	85	39.4
Never	8	3.7

4.8 Factors associated with under nutrition of children

Under nutrition was assessed by stunting, wasting and underweight. Chi-square test was used to identify the characteristics that were related to the nutritional status of children.

4.8.1 Factors associated with stunting

Table 4.15 shows Chi-square test analysis results of factors associated with stunting. The Chi-square test revealed that the maternal employment ($p=0.006$) was significantly associated with stunting. This was supported by the study done in Adama Town, Central Ethiopia (M *et al.*, 2017). Also the study done in urban low-income community of Indonesia showed that maternal employment was significantly associated with stunting (Toyama *et al.*, 2001). The study done in Uganda also showed that maternal employment is a significant determinant of stunting (Nankinga *et al.*, 2019). While mother's monthly income ($p=0.713$), mother's education ($p=0.224$) and mother's participation in making household decisions ($p=0.912$) were not associated with stunting.

Table 4.15 Factors associated with stunting

		Stunting		χ^2	P-value
		Normal	Stunted		
Mother's occupation	Professional or formal	60 (89.6%)	7 (10.4%)	12.439	0.006*
	Sales and services	84 (84%)	16 (16%)		
	Agriculture and manual work	33 (91.7%)	3 (8.3%)		
	Domestic or household work	7 (53.8%)	6 (46.2%)		
Mother's monthly income	<3000	6 (75%)	2 (25%)	3.730	0.713
	3000-6000	22 (81.5%)	5 (18.5%)		

	6000-12000	59 (88.1%)	8 (11.9%)		
	12000-18000	45 (80.4%)	11(19.6%)		
	18000-25000	25 (89.3%)	3 (10.7%)		
	25000-35000	12 (85.7%)	2 (14.3%)		
	>35000	15 (93.8%)	1 (6.2%)		
Mother's education	Illiterate	8 (72.7%)	3 (27.3%)	4.373	0.224
	Primary	31 (77.5%)	9 (22.5%)		
	Secondary	57 (86.4%)	9 (13.6%)		
	Higher secondary and above	88 (88.9%)	11 (11.1%)		
Mother's participation in decision making	Yes	151 (85.3%)	26 (14.7%)	0.012	0.912
	No	33 (84.6%)	6 (15.4%)		

* Statistically significant ($P < 0.05$)

4.8.2 Factors associated with wasting

Table 4.16 shows Chi-square test analysis results of factors associated with wasting. Maternal employment ($p=0.475$), mother's monthly income ($p=0.196$), mother's education ($p=0.727$) and mother's participation in making household decisions ($p=0.362$) was not associated with wasting.

Table 4.16 Factors associated with wasting

		Wasting		χ^2	P-value
		Normal	Wasted		
Mother's occupation	Professional or formal	62 (92.5%)	2 (3%)	5.556	0.475
	Sales and services	90 (90%)	2 (2%)		
	Agriculture and manual work	30 (83.3%)	3 (8.3%)		
	Domestic or household work	12 (92.3%)	1 (7.7%)		
Mother's monthly income	<3000	7 (87.5%)	1 (12.5%)	15.900	0.196
	3000-6000	22 (81.5%)	3 (11.1%)		
	6000-12000	64 (95.5%)	2 (3%)		
	12000-18000	48 (85.7%)	2 (3.6%)		
	18000-25000	27 (96.4%)	0 (0%)		
	25000-35000	12 (85.7%)	0 (0%)		
	>35000	14 (87.5%)	0 (0%)		
Mother's education	Illiterate	10 (90.9%)	1 (9.1%)	3.628	0.727
	Primary	38 (95%)	1 (2.5%)		
	Secondary	58 (87.9%)	3 (4.5%)		
	Higher secondary and above	88 (88.9%)	3 (3%)		
Mother's participation in decision making	Yes	157 (88.7%)	8 (4.5%)	2.033	0.362
	No	37 (94.9%)	0 (0%)		

* Statistically significant (P < 0.05)

4.8.3 Factors associated with underweight

Table 4.17 shows Chi-square test analysis results of factors associated with underweight. Maternal employment ($p=0.017$) was significantly associated with underweight. This was supported by the study done in Adama Town, Central Ethiopia (M *et al.*, 2017). Also the study done in urban low-income community of Indonesia showed that maternal employment was significantly associated with underweight (Toyama *et al.*, 2001). Also mother's education ($p=0.033$) was significantly associated with underweight. While mother's monthly income ($p=0.241$) and mother's participation making household decisions ($p=0.839$) was not associated with underweight.

Table 4.17 Factors associated with underweight

		Underweight		χ^2	P-value
		Normal	Underweight		
Mother's occupation	Professional or formal	65 (97%)	2 (3%)	10.133	0.017*
	Sales and services	95 (95%)	5 (5%)		
	Agriculture and manual work	31 (86.1%)	5 (13.9%)		
	Domestic or household work	10 (76.9%)	3 (23.1%)		
Mother's monthly income	<3000	7 (87.5%)	1 (12.5%)	7.966	0.241
	3000-6000	24 (88.9%)	3 (11.1%)		
	6000-12000	59 (88.1%)	8 (11.9%)		
	12000-18000	54 (96.4%)	2 (3.6%)		
	18000-25000	28 (100%)	0 (0%)		
	25000-35000	13 (92.9%)	1 (7.1%)		

	>35000	16 (100%)	0 (0%)		
Mother's education	Illiterate	8 (72.7%)	3 (27.3%)	8.749	0.033*
	Primary	36 (90%)	4 (10%)		
	Secondary	63 (95.5%)	3 (4.5%)		
	Higher secondary and above	94 (94.9%)	5 (5.1%)		
Mother's participation in decision making	Yes	165 (93.2%)	12 (6.8%)	0.041	0.839
	No	36 (92.3%)	3 (7.7%)		

* Statistically significant ($P < 0.05$)

Part V

Conclusions and recommendations

5.1 Conclusions

The objectives of this study were to assess the nutritional status of 6-59 months children having working mothers in Dharan sub-metropolitan city and the factors associated with the nutritional status of children. Following points can be concluded from this study:

- a) The prevalence of stunting was 14.8%, underweight was 6.9%, wasting was 3.7% and overweight was 6.5%. Severe case of undernutrition was not observed in the studied area, also oedema wasn't present in the studied population.
- b) Based on gender, the prevalence of stunting was higher in males (20.2%) than that in females (9.8%). Likewise, wasting was higher in females (4.5%) than that of males (2.9%) and underweight was slightly higher in females (7.1%) than that of males (6.7%).
- c) On the basis of age group, wasting was found to be higher in 6-11 months children (14.8%). Similarly, stunting was higher in 48-59 months children (22.4%) and underweight was higher in 36-47 months children (12.3%).
- d) The prevalence of wasting was higher in children of mothers engaged in agriculture and manual work (8.3%). Likewise, the prevalence of stunting was higher in children of mothers engaged in domestic or household work (46.2%). Similarly, the prevalence of underweight was higher in children of mothers engaged in domestic or household work (23.1%).
- e) Higher prevalence of stunting, wasting and underweight among children of mothers who earned below 3000 per month i.e. 25%, 12.5% and 12.5% respectively.
- f) Higher percentage of children of illiterate mothers were stunted (27.3%). Similarly, the prevalence of wasting (9.1%) and underweight (27.3%) were also higher among the children of illiterate mothers.

- g) Majority of infants were fed colostrum (90.3%). The mean duration of breastfeeding was found to be 2.61 ± 1.07 years.
- h) Most of the infants were not given prelacteal feeds (88%). About 88.9% children were given complementary feed after completion of 6 months and 62% were fed micronutrient powder.
- i) More than half of the study population consumed pulses (77.3%) and milk and milk products (70.4%) frequently. Only 21.3% consumed green leafy vegetables frequently. Similarly, only 7.4% consumed meat frequently. Likewise, only 30.6% consumed fruits frequently.
- j) Maternal employment was significantly associated with stunting. While mother's monthly income, mother's education and mother's participation in making household decisions were not associated with stunting ($P < 0.05$).
- k) Maternal employment, mother's monthly income, mother's education and mother's participation in making household decisions were not associated with wasting ($P < 0.05$).
- l) Maternal employment and mother's education were significantly associated with underweight. While mother's income and mother's participation in making household decisions were not significantly associated with underweight ($P < 0.05$).

5.2 Recommendations

Based on the findings of this study concerted efforts should be made to greatly decrease the proportion of malnourished children.

- a) Interventions aimed at improving the nutritional status of children of employed women should promote breastfeeding and flexible conditions in workplaces.
- b) Maternal employment should be promoted as it influences child's growth by increasing income, providing improvements in acquisition of healthy foods, material goods, access to sanitation and health care services which are important determinant of child's nutritional status.
- c) Public awareness should be raised regarding the importance of educating the girl child.
- d) The socioeconomic factors should be taken into account when proposing programs and strategies aimed at health and nutrition improvement of children.
- e) Prevention and nutritional monitoring activities are required to implement effective interventions for the prevention of childhood malnutrition.

PART VI

Summary

A cross-sectional study was conducted to assess the nutritional status of 6-59 months children having working mothers in Dharan sub-metropolitan city and the factors associated with the nutritional status of children. Nutritional status is affected by various factors among them maternal employment is also one of the factor affecting child's nutritional status. 216 children having working mothers were included in the study. A structured questionnaire and anthropometric and clinical measurements were used to assess the nutritional status of children. Data collected was analyzed using WHO Anthro version 3.2.2 and SPSS 20. Chi-Square test was used to analyze the factors associated with the nutritional status of children.

Among 216 children, 48.1% were males and 51.9% were females. In the study area 45.8% of mothers had higher secondary and above educational level and 5.1% of mothers were illiterate. Most of the mothers were engaged in sales and services (46.3%), followed by professional of formal work (31%), agriculture and manual work (16.7%) and domestic or household work (6%). The monthly income of mothers were found to be as 31% earned 6000-12000 followed by 25.9% earned 12000-18000, 13% earned 18000-25000, 12.5% earned 3000-6000, 7.4% earned above 35000, 6.5% earned 25000-35000 and 3.7% earned below 3000. Majority of mothers (81.9%) were involved in making household decisions.

The prevalence of stunting was 14.8%, underweight was 6.9%, and wasting was 3.7% was lower than that of the findings of NDHS (2016). The prevalence of stunting was found to be lower than that of the study done in Uganda where 28% children of working mothers were stunted; the rate of wasting was also found to be lower where 4% children were wasted and the rate of underweight was also found to be lower where 11% children were found to be underweight. Maternal employment was found to be associated with stunting ($P = 0.006$) and underweight ($P = 0.017$). Mother's education was also found to be associated with underweight ($P = 0.033$).

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Appendices

Appendix A

केन्द्रिय प्राविधि क्याम्पस
हातिसार, धरान
पोषण तथा आहार बिज्ञान, चौथो बर्ष
मन्जुरिनामा

नमस्कार,

म साहेमा शाक्य , केन्द्रिय प्राविधि क्याम्पस, धरानमा पोषण तथा आहार बिज्ञान (BND), चौथो बर्षमा अध्ययनरत बिद्यार्थी हु । यस संकायको चौथो बर्षको पाठ्यक्रम अन्तर्गत म सोधपत्र गरिरहेको छु । मेरो सोधकार्यको बिषय “धरान उप-महानगरपालिकाको ६ देखि ९९ महिनाका रोजगारी महिलाहरुको बालबालिकाहरुको पोषण स्थितिको अध्ययन” रहेको छ । यो अध्ययनको उदेश्य यस क्षेत्रका बालबालिकाको पोषण स्थितिको बारे जानकारी संकलन गर्नु रहेको छ । यो जानकारीले हाम्रो अध्ययनलाई सहज बनाई हामीलाई सहयोग गर्नेछ र यसले यस नगरपालिकाको पोषण स्थितिलाई सुधार गर्नलाई केहि मदत गर्न सक्नेछ ।

तपाईंको छोरा / छोरी यस अध्ययनको लागि सहभागी हुन छानिनु भएको छ र म तपाइलाई यस सर्वेक्षणका केहि प्रश्नहरु गर्ने छु साथै तपाईंको बच्चाको केहि नाप लिनेछु । यो सर्वेक्षणले तपाईंको बच्चाको पोषण स्थित बारे थाहा हुन्छ र बच्चालाई पोषण सम्बन्धि बिशेश हेरचाह आवश्यक पर्ने वा नपर्ने पनि थाहा पाउन सक्नुहुनेछ। अध्ययनका केहि प्रश्नहरु नितान्त व्यक्तिगत पनि हुन सक्छन र तपाईंले दिनु भएको सबै जानकारीहरु महत्वपूर्ण हुनेछन् र सो जानकारीहरु एकदमै गोप्य राखिनेछ साथै तपाईंले दिनुभएको सूचना तथा तथ्यांकको दुरुपयोग गरिनेछैन । यो अध्ययनमा तपाइको सहभागिता स्वइच्छिक हुनेछ । यदि तपाईंलाई कुनै वा सबै प्रश्न व्यक्तिगत वा सम्बेदनसिल लागेमा उत्तर नदिन पनि सक्नुहुन्छ । तर म यो आशा गर्दछु कि तपाईं यस अध्ययनमा सहभागी हुनुहुनेछ।

के तपाईं यस अध्ययनमा सहभागी हुन इच्छुक हुनुहुन्छ ? (इच्छुक भए मात्र प्रश्न गर्ने नभए अन्तर्वार्ता टुंग्याउने)

म यस अध्ययनमा सहभागी हुन इच्छुक छु र यस अध्ययनका लागि आवश्यक पर्ने मेरो बच्चाको नाप तौल लिन अनुमति दिन्छु ।

अध्ययनमा छानिएको बच्चाको अभिभावकको सहि :

सर्वेक्षण गर्नेको सहि :

सर्वेक्षण गरेको मिति :

Appendix B

सर्वेक्षण प्रश्नपत्र

कोड नम्बर :

अन्तर्वार्ताको मिति:

१) सामान्य जानकारीहरु

१. घरमुलीको नाम :

२. वडा नम्बर :

३. टोलको नाम :

४. उत्तरदाता : १. आमा २. बुवा ३. अन्य सदस्य

५. आमाको नाम :

६. आमाको उमेर :

७. सर्वेक्षणमा परेको बच्चाको नाम :

८. सम्पर्क नम्बर:

२) पारिवारिक विवरण

९. जम्मा परिवार सदस्य संख्या:

महिला संख्या : पुरुष संख्या:

बालबालिका संख्या : महिला: पुरुष:

५ वर्ष मुनिका बच्चाको संख्या :

१०. तपाईंको घरमा अहिले सम्म कुनै बच्चाको मृत्यु भएको छ ?

१. छ २. छैन

छ भने कति जना

मृत्युको कारण

११. परिवारको प्रकार ? १. एकल २. संयुक्त

१२. तपाईंको जात क हो ?

१. ब्राह्मण २. छेत्री ३. जनजाति ४. दलित ५. मधेसी ६. अन्य.....

१३. तपाईं कुन धर्म मान्नुहुन्छ ?

१. हिन्दु २. बौद्ध ३. क्रिश्चियन ४. इस्लाम ५. अन्य (खुलाउनुहोस्)

१४. तपाईंको बच्चा बिध्यालय जान्छ कि जाँदैन?

१. जान्छ २. जाँदैन

१५. तपाईंको मुख्य पेशा के हो ?

१. कृषि २. सेवा(जागिर) ३. श्रमिक ४. व्यापार ५. बैदेशिक रोजगार
६. अन्य

१६. तपाईंको घरको मासिक आम्दानी कति छ ?

१. ३००० भन्दा कम २. ३०००-६००० ३. ६०००-१२००० ४. १२०००-१८०००
५. १८०००-२५००० ६. २५०००-३५००० ७. ३५००० देखि माथि

१७. तपाईंको घरको मासिक बचत कति छ?

१. ५००० भन्दा कम २. ५०००-१०००० ३. १००००-१५००० ४. १५०००-२००००
५. २०००० भन्दा बढि

१८. मासिक खानामा खर्च:

१९. आमाको शैक्षिक योग्यता कति छ ?

१. निरक्षर २. प्राथमिक तह ३. मा.वि. तह

४. उ.मा.वि. तह वा सो भन्दा माथि

२०. बाबुको शैक्षिक योग्यता कति छ ?

१. निरक्षर २. प्राथमिक तह ३. मा.वि. तह

४. उ.मा.वि. तह वा सो भन्दा माथि

२१. आमाको पेशा के हो ?

१. सेवा (जागिर) २. श्रमिक ३. व्यापार ४. अन्य (खुलाउनुहोस)

२२. आमाको मासिक आम्दानी:

१. ३००० भन्दा कम २. ३०००-६००० ३. ६०००-१२००० ४. १२०००-१८०००

५. १८०००-२५००० ६. २५०००-३५००० ७. ३५००० देखि माथि

२३. खर्चको निर्णय अधिकार:

१. आफै २. आफै र श्रीमान मिलेर ३. श्रीमानले ४. अन्य सदस्यहरु

२४. प्राप्त आम्दानी के गर्नु हुन्छ?

१. आफै राख्नु हुन्छ २. श्रीमानलाई दिनुहुन्छ ३. अन्य सदस्यहरुलाई दिनुहुन्छ

३) व्यक्तिगत तथा वातावरणिय स्वास्थ्य

२५. तपाईंले पिउनका लागि प्रयोग गर्ने पानीको श्रोत क हो ? (बहु उत्तर प्रश्न)

१. कल २. खोला ३. इनार ४. खानेपानीको धारा ५. अन्य

२६. तपाईंले पिउने पानीको सुद्धिकरण गर्नु हुन्छ कि हुदैन ?

१. गर्छु २. गर्दिन

२७. तपाइको घरमा चर्पी छ ?

१. छ २. छैन

२८. दिसापिसाब गरेपछि साबुनपानीले हात धुनुहुन्छ ?
 १. धुन्छु २. धुन्न
२९. फोहोरमैलाको व्यवस्थापन कसरी गर्नुहुन्छ?
 १. गाडेर २. जलाएर ३. फालेर ४. अन्य
३०. घरमा खाना पकाउन इन्धन के प्रयोग गर्नुहुन्छ ?
 १. दाउरा २. गुइठा ३. स्टोभ ४. गोबरग्यास ५. सिलिन्डर ग्यास
 ६. अन्य

४) पाँच वर्ष मुनिका बालबालिकाकी आमालाई सोध्ने प्रश्नहरू

३१. तपाईंको घरमा ५ वर्षमुनिका कति जना बालबच्चाहरू छन्?
३२. तपाईंको आनुपस्थितिमा तपाइको बच्चाको प्रायः कसले हेरविचार गर्छन ?
 १. सासु/ससुरा २. श्रीमान् ३. बच्चाको दाजु/दिदि
 ४. परिवारको अन्य सदस्यहरू ५. नातेदार ६. छिमेकी/साथी
 ७. घरमा एकलै छाड्ने ८. आफैले ९. अन्य
३३. अध्ययनमा परेको बच्चाको जन्म क्रम कति हो ?
- (पहिलो बच्चा भए प्रश्न ३५ मा जाने)
३४. यो बच्चा जन्मिदा अघिल्लो बच्चाको उमेर कति थियो ? वर्ष/महिना
३५. तपाईंको बच्चालाई कुनै किसिमको स्वास्थ्य समस्या छ ?
 १. छ २. छैन
३६. छ भने कस्ता समस्याहरू छन्?
 १. दिर्ग रोगहरू जस्तै मुटु रोग / स्वासप्रस्वास समस्या / क्यानसर / अन्य
 २. कुपोषण ३. सबै ४. अन्य.....
३७. बिगत २ हप्ता भित्र तपाइको बच्चालाई कुनै किसिमको स्वास्थ्य समस्या देखिएको छ ?
 १. छ २. छैन

३. छ भने के स्वास्थ्य समस्या छ ?
३८. तपाईंको बच्चा बिरामी पर्दा उपचारको लागि सर्वप्रथम कहाँ जाने गर्नुहुन्छ ?
१. नजिकको स्वास्थ्य चौकी २. औसधि पसल ३. महिला स्वास्थ्य स्वयंसेविका
४. धामी झाक्री ५. कहिँ पनि जान्न ६. अन्य

५) पोषण तथा स्तनपान सम्बन्धी जानकारी

३९. के तपाईंले बच्चालाई जन्मेकै दिन देखि आफ्नो दुध खुवाउनुभएको थियो ?
१. थियो २. थिएन
४०. के तपाईंले बच्चालाई आफ्नो दुध खुवाउनुभएको थियो ?
१. थियो २. थिएन (यदी थियो भने ४२ मा जाने)
४१. यदी खुवाउनुभएको थिएन भने किन ?
१. चलन नभएर २. हानी गर्छ भनेर ३. फोहोर हुन्छ भनेर
४. बच्चाले निल्न सक्दैन ५. अन्य
४२. यदी थियो भने बच्चालाई जन्मेको कति समयपछि तपाईंले पहिलो पटक आफ्नो दुध खुवाउनुभएको थियो ?
१. १ घण्टा भित्रै २. ८ घण्टा भित्र ३. २४ घण्टा पछि ४. सम्झना छैन
५. अन्य.....
४३. बच्चालाई आफ्नो बिगौती दुध खुवाउनु भयो ?
१. खुवाए २. खुवाईन / निचोरेर फाले ३. सम्झना छैन
४४. आमाको बिगौती दुध खुवाउनु भन्दा पहिला बच्चालाई के खुवाउनु भएको थियो ?
१. केहि खुवाएको थिएन २. महपानी, घिउ ३. गाइको दुध ४. अन्य
४५. तपाईं अहिले बच्चालाई आमाको दुध खुवाउदै हुनुहुन्छ ?
१. छ २. छैन

४६. यदी छ भने दिनमा कति पटक खुवाउनुहुन्छ? पटक
४७. बच्चालाई कति महिना / बर्षसम्म आफ्नो दुध खुवाउनु भयो/पर्छ ?
..... महिना / बर्ष सम्म
४८. बच्चालाई ६ महिना सम्म आफ्नो दुध खुवाउनु भयो ?
१. खुवाएँ २. खुवाइन
४९. तपाइले बच्चालाई बजार /बट्टाको दुध खुवाउनु भएको छ ?
१. छ २. छैन
५०. बच्चालाई आफ्नो दुधबाहेक अन्य केहि खानेकुरा पनि खुवाउदै हुनुहुन्छ ?
१. छु २. छैन
५१. तपाइको बिचारमा बच्चा कति उमेरको भएपछि उसलाई आमाको दुध साथसाथै अन्य खानेकुरा खुवाउनुपर्छ ?
१. ४ महिना २. ५ महिना ३. ६ महिना ४. ७ महिना
५२. स्तनपान बाहेक अन्य खानेकुराहरु बच्चालाई दिनमा कति पटक खुवाउनु हुन्छ ?
.....पटक
५३. बच्चालाई के कस्तो खानेकुरा खुवाउनु हुन्छ ?
१. लिटो २. जाउलो ३. सर्वोत्तम पिठो ४. परिवारका अन्य सदस्य जस्तै
५. अन्य
५४. बच्चा बिरामि भएको बेलामा कस्तो खाना खुवाउनुहुन्छ?
१. सधैँझै २. फरक किसिमको
५५. के तपाईंलाई बालआहरको बारेमा थाहा छ ?
१. छ २. छैन
५६. बच्चालाई सर्वोत्तम पिठोको लिटो खुवाउनुहुन्छ ?
१. खुवाउछु २. खुवाउदिन
५७. यदी खुवाउनुहुन्छ भने बजारबाट खरिद गर्नुहुन्छ कि घरमा आफै बनाउनुहुन्छ ?
१. बजारबाट २. घरमा आफै ३. कहिले बजार/ कहिले घरबाट

६९. बच्चाले माछामासु खान्छ कि खाँदैन?
१. खान्छ २. खाँदैन
७०. मासु खान्छ भने हसामा कति पटक खान्छ?
१. १ २. २-४ ३. ४-७ ४. सधैं
७१. तपाईंहरूले खाने अन्न कस्तो प्रकारको हो?
१. आफै उत्पादन गरेको २. बजारबाट किनेर ल्याएको ३. अन्य
७२. बच्चाले हसामा कति पटक दुध र त्यसका परिकार खान्छ?
१. १ २. २-४ ३. ४-७ ४. सधैं ५. खाँदैन
७३. चौलानि पानि के गर्नुहुन्छ?
१. खाना पकाउन प्रयोग गर्छ २. फ्याल्छ
७४. तपाईं तरकारि पखालेर काट्नुहुन्छ कि काटेर पखाल्नुहुन्छ?
१. काटेर पखाल्छ २. पखालेर काट्छ ३. दुवै
- ६) मातृस्वास्थ्य र नवजातसिसुको स्वास्थ्य सम्बन्धि जानकारी
७५. तपाईंको बिबाह हुँदा कति बर्षको हुनुहुनथियो ?बर्ष
७६. पहिलो बच्चा जन्मिदा तपाईंको उमेर कति थियो ? ----- बर्ष
७७. बच्चाको जन्म कस्तो प्रकारको हो ?
१. प्राकृतिक २. शल्यकृया गरेर
७८. तपाईंको यो बच्चा जन्मिदा उसको तौल कति थियो ?
१. २.५ के. जी. भन्दा कम २. २.५ के. जी. भन्दा बडी ३. २.५ ४. थाहा छैन
७९. के गर्भवती आमालाई थप आहार चाहिन्छ ?
१. चाहिन्छ २. चाहिँदैन
८०. तपाईंको परिवारमा कोहि गर्भवती हुदा खानपानको व्यवस्थापन कसरि मिलाउनु हुनुहुन्छ?
१. सधैं को भन्दा बडी खाना दिनुहुन्छ २. सधैं को भन्दा कम खाना दिनुहुन्छ
३. सधैंको जस्तो खाना दिनुहुन्छ

८१. गर्भावस्थामा तपाइले आइरन चक्की खानुभएको थियो ?

१. थियो २. थिएन ३. थाहा छैन

८२. यदी खानुभएको थियो भने कति अवधिसम्म खानुभएको थियो ? दिन

७) खोप सम्बन्धि जानकारी

८३. तपाईंले आफ्नो बच्चालाई खोप लगाउनुभयो ?

१. छ २. छैन

८४. गर्भावस्थामा खोप लगाउनु भयो ?

१. लगाए २. लगाइन

८५. यदी लगाएको भए कुन लाउनुभयो ?.....

८) ५ वर्षभन्दा मुनिका बच्चाहरूको पोषण स्थिती

जन्म मिति :

उमेर (Months)	लिङ्ग (M/F)	तौल (Kg)	उचाई (Cm)	MUAC (Cm)	OEDEMA (Y/N)

अन्तर्वार्ता दिनेको सहि :

.....

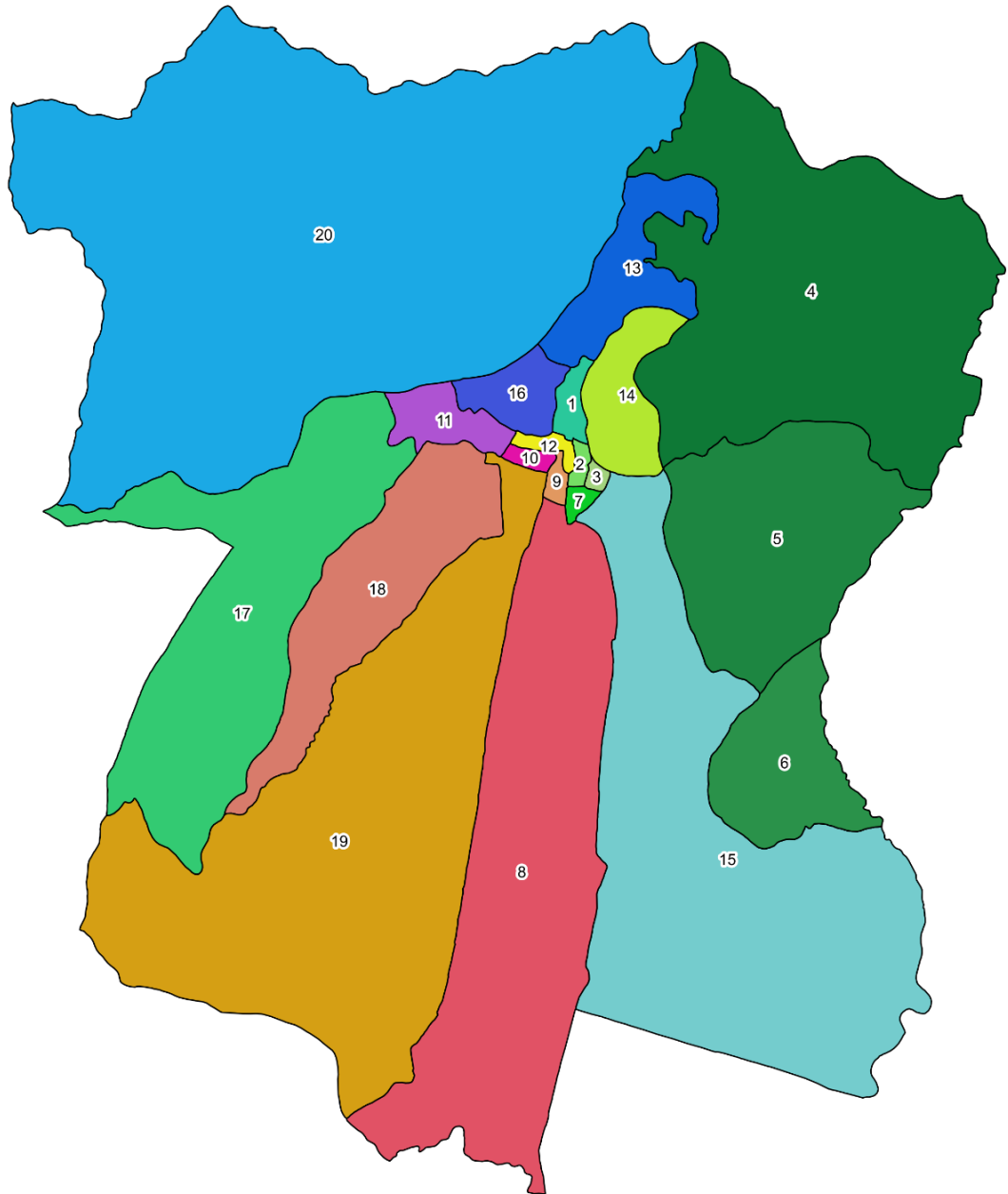
अन्तर्वार्ताकारको सहि :

.....

सर्वेक्षणमा सहभागी भएर सहयोग गर्नु भएकोमा धेरै धेरै धन्यवाद /

Appendix C

Map of Dharan sub-metropolitan city



Appendix D

NHRC approval letter



Government of Nepal
Nepal Health Research Council (NHRC)
ESTD. 1991

Ref. No.: 2085.

9 April 2020

Ms. Sahema Shakya
Principal Investigator
Central Campus of Technology
Dharan

Ref: Approval of thesis proposal

Dear Ms. Shakya,

This is to certify that the following protocol and related documents have been reviewed and granted expedited from review by the Expedited Review Sub Committee for implementation.

ERB Protocol Registration No.	899/2019 BT	Sponsor Protocol No	NA
Principal Investigator/s	Ms. Sahema Shakya	Sponsor Institution	NA
Title	Nutritional assessment of 6-59 months children of working mothers in Dharan Sub-metropolitan city		
Protocol Version No	Version 8.0	Version Date	5 January 2020
Other Documents	1. Data collection tools	Risk Category	Less than minimal risk
Expedited Review	Proposal <input checked="" type="checkbox"/>	Duration of Approval 9 April 2020 to 9 April 2021	Frequency of continuing review
	Amendment <input type="checkbox"/>		
	Re-submitted <input type="checkbox"/>		
	Meeting Date: 6 April 2020		
Total budget of research	Self-Funded		
Ethical review processing fee	NRs 1,000.00		

P.

Tel: +977 1 4254220, Fax: +977 1 4262469, Ramshah Path, PO Box: 7626, Kathmandu, Nepal
Website: <http://www.nhrc.gov.np>, E-mail: nhrc@nhrc.gov.np



Government of Nepal
Nepal Health Research Council (NHRC)



Ref. No.: 2085.

Investigator Responsibilities

- Any amendments shall be approved from the ERB before implementing them
- Submit progress report every 3 months
- Submit final report after completion of protocol procedures at the study site
- Report protocol deviation / violation within 7 days
- Comply with all relevant international and NHRC guidelines
- Abide by the principles of Good Clinical Practice and ethical conduct of the research

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

Thanking you,

Dr. Pradip Gyanwali
Executive Chief
(Member-Secretary)

Appendix E

Photo gallery



P1: Measurement of height



P2: Measurement of weight



P3: MUAC measurement



P4: Asking survey questionnaire