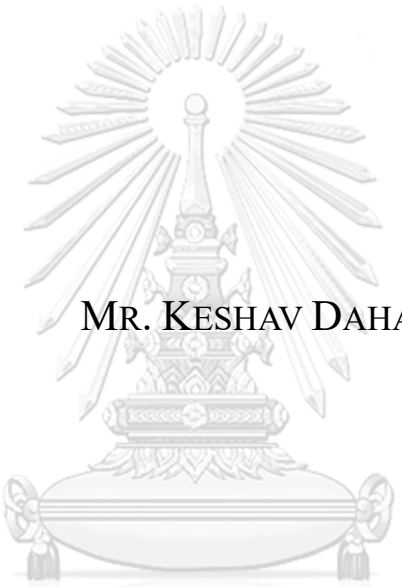
UNDERNUTRITION AND ITS DETERMINANTS AMONG UNDER-FIVE CHILDREN OF INDIGENOUS THAMI POPULATION IN DOLAKHA DISTRICT, NEPAL

MR. KESHAV DAHAL



A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF PUBLIC HEALTH IN PUBLIC HEALTH
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COLLEGE OF PUBLIC HEALTH SCIENCES
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ภาวะโภชนาการต่ำกว่าเกณฑ์ และปัจจัยที่กำหนดภาวะโภชนาการต่ำกว่าเกณฑ์ ของเด็กอายุต่ำกว่า 5 ปี ในกลุ่มชนพื้นเมืองทามิ เขตโดลาคา ประเทศเนปาล

นายเคชาร์ฟ ดาฮาล

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต
สาขาวิชาสาธารณสุขศาสตร์ไม่สังกัดภาควิชา/เทียบเท่า
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THESIS TITLE	UNDERNUTRITION AND ITS DETERMINANTS AMONG UNDER-FIVE CHILDREN OF INDIGENOUS THAMI POPULATION IN DOLAKHA DISTRICT, NEPAL
BY	MR. KESHAV DAHAL
FIELD OF STUDY	PUBLIC HEALTH
THESIS ADVISOR	MONTAKARN CHUEMCHIT, PH.D.

ACCEPTED BY THE COLLEGE OF PUBLIC HEALTH SCIENCES, CHULALONGKORN UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE MASTER OF PUBLIC HEALTH

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เคชาร์ฟ ดาฮาล : ภาวะโภชนาการต่ำกว่าเกณฑ์
และปัจจัยที่กำหนดภาวะโภชนาการต่ำกว่าเกณฑ์ของเด็กอายุต่ำกว่า 5 ปี
ในกลุ่มชนพื้นเมืองทามิ เขตโดลาคา ประเทศเนปาล. (UNDERNUTRITION AND ITS DETERMINANTS AMONG UNDER-FIVE CHILDREN OF INDIGENOUS THAMI POPULATION IN DOLAKHA DISTRICT, NEPAL) อ.ที่ปรึกษาหลัก : อ.
ดร.มนทกานติ์ เชื่อมชิต

ภาวะทุพโภชนาการเป็นปัญหาสาธารณสุขที่สำคัญที่นำไปสู่การเจ็บป่วยและการเสียชีวิตในเด็กอายุต่ำกว่า 5 ปี โดยเฉพาะอย่างยิ่งในประเทศที่มีรายได้ต่ำและประชาชนชายขอบ การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาความชุกของภาวะโภชนาการต่ำกว่าเกณฑ์และปัจจัยที่กำหนดภาวะโภชนาการต่ำกว่าเกณฑ์ในเด็กอายุต่ำกว่า 5 ปี ในกลุ่มชนพื้นเมืองทามิ เขตโดลาคา ประเทศเนปาล โดยได้ดำเนินการเก็บข้อมูลในช่วงเดือนสิงหาคมถึงกันยายน พ.ศ.2562 ด้วยเทคนิคการสุ่มตัวอย่างหลายขั้นตอน กลุ่มเป้าหมายคือเด็กอายุต่ำกว่า 5 ปี และมารดาผู้ให้กำเนิด จำนวน 366 คน เครื่องมือวัดสัดส่วนร่างกายถูกใช้เพื่อรวบรวมข้อมูลตามแนวทางขององค์การอนามัยโลก ซอฟต์แวร์ Anthro ของ WHO ถูกใช้เพื่อประเมินค่า Z-score และความชุกของภาวะโภชนาการต่ำกว่าเกณฑ์ รวมทั้งใช้โปรแกรม SPSS เวอร์ชั่น 22 ในการวิเคราะห์สถิติเชิงพรรณนา (ความถี่ร้อยละ ค่าเฉลี่ย และส่วนเบี่ยงเบนมาตรฐาน) การวิเคราะห์หาความสัมพันธ์ระหว่างตัวแปรได้ใช้การทดสอบไคร์แสควร์ ผลการศึกษาพบว่า มีเด็กที่น้ำหนักตามส่วนสูงต่ำกว่าเกณฑ์ จำนวน 31 คน (8.5%), มีเด็กที่ส่วนสูงตามอายุน้อยกว่าเกณฑ์ จำนวน 160 คน (43.7%) และมีเด็กที่น้ำหนักตามอายุต่ำกว่าเกณฑ์ จำนวน 101 คน (27.6%) โดยพบความชุกที่สูงขึ้นในเด็กอายุ 12-23 เดือนและในเด็กผู้ชาย สำหรับการหาความสัมพันธ์ระหว่างตัวแปร พบว่า เพศของเด็ก จำนวนการมีลูกของมารดา อายุของมาดา อายุของมารดาที่คลอดบุตรคนล่าสุด การใช้ยาคุมกำเนิด การแนะนำอาหารเสริมให้ทารกทันทีหลังคลอด การได้รับวัคซีน การล้างมือก่อนป้อนอาหารเด็ก มีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติกับภาวะส่วนสูงตามอายุน้อยกว่าเกณฑ์ การได้รับวัคซีนการป่วยของเด็กภายใน 2 สัปดาห์, การตรวจหลังคลอด, การใช้ยาคุมกำเนิด, การล้างมือก่อนให้นมบุตร, การดื่มแอลกอฮอล์ของแม่ในระหว่างตั้งครรภ์, การมีบัตรสุขภาพเด็ก, การเป็นโรคท้องร่วง, การติดเชื้อทางเดินหายใจของเด็ก มีความสัมพันธ์อย่างมีนัยสำคัญกับภาวะน้ำหนักตามอายุต่ำกว่าเกณฑ์ และการมีบัตรสุขภาพเด็กมีความสัมพันธ์อย่างมีนัยสำคัญกับภาวะน้ำหนักตามส่วนสูงต่ำกว่าเกณฑ์

สาขาวิชา	สาธารณสุขศาสตร์	ลายมือชื่อนิสิต .....
ปีการศึกษา	2562	ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

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KESHAV DAHAL : UNDERNUTRITION AND ITS DETERMINANTS AMONG UNDER-FIVE CHILDREN OF INDIGENOUS THAMI POPULATION IN DOLAKHA DISTRICT, NEPAL. ADVISOR: MONTAKARN CHUEMCHIT, PH.D.

Undernutrition is a major public health issue leading to morbidity and mortality in children of age under-five, especially with higher rate of prevalence in very low or low-income countries including socially deprived and marginalized group of population. This study was carried out to identify the prevalence of undernutrition and its determinants among under-five children of indigenous Thami population in Dolakha District, Nepal. A community based quantitative cross-sectional study was conducted during the period of August to September 2019 with multistage sampling technique among 366 under-five children and their biological mothers. Anthropometric measurement tools were used to collect the data as per WHO guideline. WHO anthro software was used to assess the Z-score and prevalence of Undernutrition. SPSS version 22 was used to analyze descriptive statistics (frequency, percentage, mean, median, and standard deviation) to examine the level and characteristic of the respondents. Bivariate analysis was applied using chi-square test for the categorical data to identify the association between independent variables and dependent variables. There were 31(8.5%) of wasting, 160 (43.7%) of stunting and 101 (27.6%) of underweight and found higher prevalence in 12–23 months of age and male children among 366 sample of under-five children. There were significant association between sex of child, number of children, age of mother, age of mother at youngest childbirth, use of contraceptive, introduction of extra food to baby immediately after birth, MR II vaccination, ARI, handwashing before feeding the child was statistically significant association with stunting. MR-I vaccination to child, child getting sick within 2 weeks, postnatal check-up, Contraceptive use, handwashing before feeding the child, consumption of alcohol by mother during pregnancy, presence of child health cards, diarrhoea, treatment with witch doctors, Acute respiratory infection to the child were significantly associated with underweight and keeping the safely the child health cards was significantly associated with wasting.

FIELD OF STUDY:	PUBLIC HEALTH	STUDENT'S SIGNATURE .....
ACADEMIC YEAR:	2019	ADVISOR'S SIGNATURE .....

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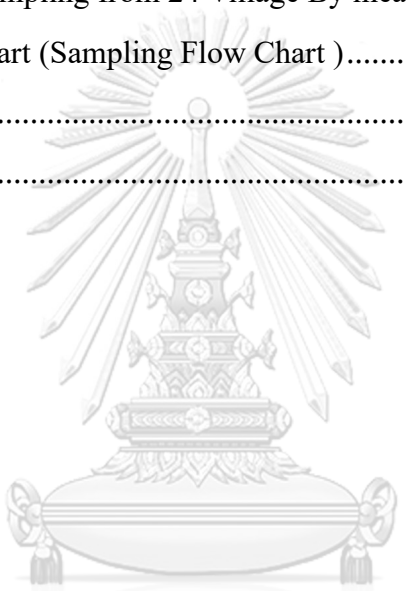


Chapter I
INTRODUCTION

Background and Rationale

Child growth is recognized as an important indicator of nutritional status of child health (1) nutritional deficiencies, excess or imbalances in a person's intake of energy and/or nutrients imbalance causes undernutrition or over-nutrition which is considered as malnutrition. Undernutrition includes underweight, wasting, stunting and micronutrient deficiencies or insufficiencies. Over-nutrition includes overweight, obesity, and resulting diet-related non-communicable diseases (such as heart disease, stroke, diabetes and cancer) (2, 3).

The cause of underweight is due to inadequate consumption, poor absorption or excessive loss of nutrients and results into much more vulnerable disease and death (4). Wasting is an acute form of malnutrition due to poor intake of nutrients or infectious disease. It causes rapid weight loss or failure to gain weight normally and sometimes leads to life threatening outcomes. Stunting is the result of chronic or recurrent inadequate nutrition it can cause slow intrauterine and postpartum growth, resulting in failure to achieve expected length of the child as compared to a healthy and well-nourished child of the same age. It leads to failure of linear growth & development, resulting in irreversible physical, neurocognitive damage and failure to gain their full possible height and cognitive development. It causes weakened immunity, susceptible delay of long term development, which leads to increased death rate, resulting in severe wasting of the child (2).

Undernutrition causes growth failure resulting in a child who is underweight and stunted with poor physical, emotional, and less intellectual productivity(5). Children with disabilities are almost three times more likely to be underweight, nearly twice as likely to experience stunting, wasting, neuro-developmental disability & hearing impairments (6). It can reduce their immunological function which leads to failure of adequate protective response of the child against infectious agent (7) and such children suffer from frequent infections with high severity, succumb more often

to infectious illnesses which is in fact a major determinant of the standard of living, quality of life and ultimately the overall social and economic development. Lower family income, lower maternal education, poor water supply, non-access to health services and large family size are associated with all three forms of undernutrition (8). Incomplete vaccinations, poor socio-economic statuses, poor household sanitation, low birth orders, frequent illness, poor maternal health nutrition, frequent illness, and or inappropriate infant and young child feeding and care in early life are the drawbacks of undernutrition (9).

Around 3.1 million (45%) deaths of under-five children is due to undernutrition and it mostly occur in low & middle-income countries (2). Although poor nutrition affects the entire population, women and children are especially vulnerable due to their unique physiology and additional supplementation of nutrition is necessary for them. Undernutrition is a major public health problem of low and middle lower income countries and widely exists worldwide which results from poor nutritional intake, bad hygiene practices and frequent infections. People who are financially not sound are more likely to be affected by different forms of malnutrition which increases their health care costs, reduces productivity and slows economic growth and can perpetuate a cycle of poverty and ill health. Malnutrition is a global double burden nutritional problem which is serious, long lasting and challenging for individuals and their families, for communities, and for countries through the impact of medical and socioeconomic development (10, 11).

Globally, over 25% of all under-five children experience malnutrition which leads to cognitive and emotional impairment that can persist to adulthood and even way far beyond. Globally in 2017, children were 22% stunted, 7.5% wasted & 5.6% were over nourished (12). There are two out of five stunted, and more than half of under five children who are wasted in the world reside only in southern Asia which requires critical public health emergency (2). Undernutrition increases the risk of mortality from diarrhoea and acute respiratory infection as well as malaria. Pneumonia, diarrhoea and malaria are leading causes of under-five deaths which is

around 16% and 8% under-five children, who lost their lives by pneumonia and diarrhoea respectively in 2016 worldwide and their mortality was strongly associated with undernutrition, lack of sanitation and safe water, poor access to health care (10)

The prevelence of child malnutrition is higher in indigenous population than in non-indigenous population. Based upon Nepal demographic and health survey (NDHS) 2016, the prevalence of stunting, wasting and underweight among under-five children were 36%, 10% and 27% respectively. Stunting is more common in rural (40%) than in urban children, which is more than the number in southern Asia and prevalence of malnutrition globally. According to newly established monitoring tools developed by who /UNICEF-2018, Nepal still has a very high level of prevalence thresholds of stunting and wasting than > 30% and >15% respectively in under five children. Even though there are a number of INGO/NGOS working together with the Ministry of health and population in nutrition sector, there is no satisfactory decrease in the trend of malnutrition in comparision to MDGs as well as SDGs of nutrition.

Among 62 indigenous ethnic group of population, there are 91.3% indigenous Thami population who reside in rural areas of Nepal (13). However, the magnitude of undernutrition and its determinants among under five children of indigenous ethnic group of Thami population of Nepal is not well understood even after referring various google websites and journal publication sites. Due to above evidences of high prevalence, and its consequences, undernutrition is a still global challenge especially in middle lower- and lower-income countries. Socially and geographically deprived & marginalized indigenous people are more vulnerable to malnutrition. Therefore, we require to find the prevalence of undernutrition and its determinants among under-five children of indigenous Thami population of Nepal.

Research Question

What is the prevalence rate of undernutrition and its determinants among under-five children of indigenous Thami population in Dolakha District, Nepal?

Objectives

General Objective

To find out the prevalence rate of undernutrition and it's determinants among under-five children of indigenous Thami population in Dolakha District, Nepal.

Specific Objectives

- To examine the Sociodemographic characteristics, mothers related factors, and child related Factors among under-five children in indigenous Thami population of Dolakha District, Nepal.
- To identify the Prevalence of wasting stunting and underweight among under-five children in indigenous Thami population of Dolakha District, Nepal.
- To determine the association between socio-demographic and stunting, wasting and underweight among under-five children in indigenous Thami population of Dolakha District, Nepal.
- To identify the association between mother related factors and stunting, wasting and underweight among under-five children of indigenous Thami population in Dolakha District, Nepal.
- To determine the association between child related factors and stunting, wasting and underweight among under-five children of indigenous Thami population in Dolakha District, Nepal.

Research Hypothesis

- There is a high prevalence rate of undernutrition among under-five children of indigenous Thami Population in Dolakha district, Nepal.
- There is a relationship between socio-demographic and stunting, wasting and underweight among under-five children of indigenous Thami Population in Dolakha District, Nepal.
- There is a relationship between mother related factors and stunting, wasting and underweight among under-five children of indigenous Thami Population in Dolakha District, Nepal.
- There is a relationship between child related factors and stunting, wasting and underweight among under-five children of indigenous Thami Population in Dolakha District, Nepal

Conceptual Framework

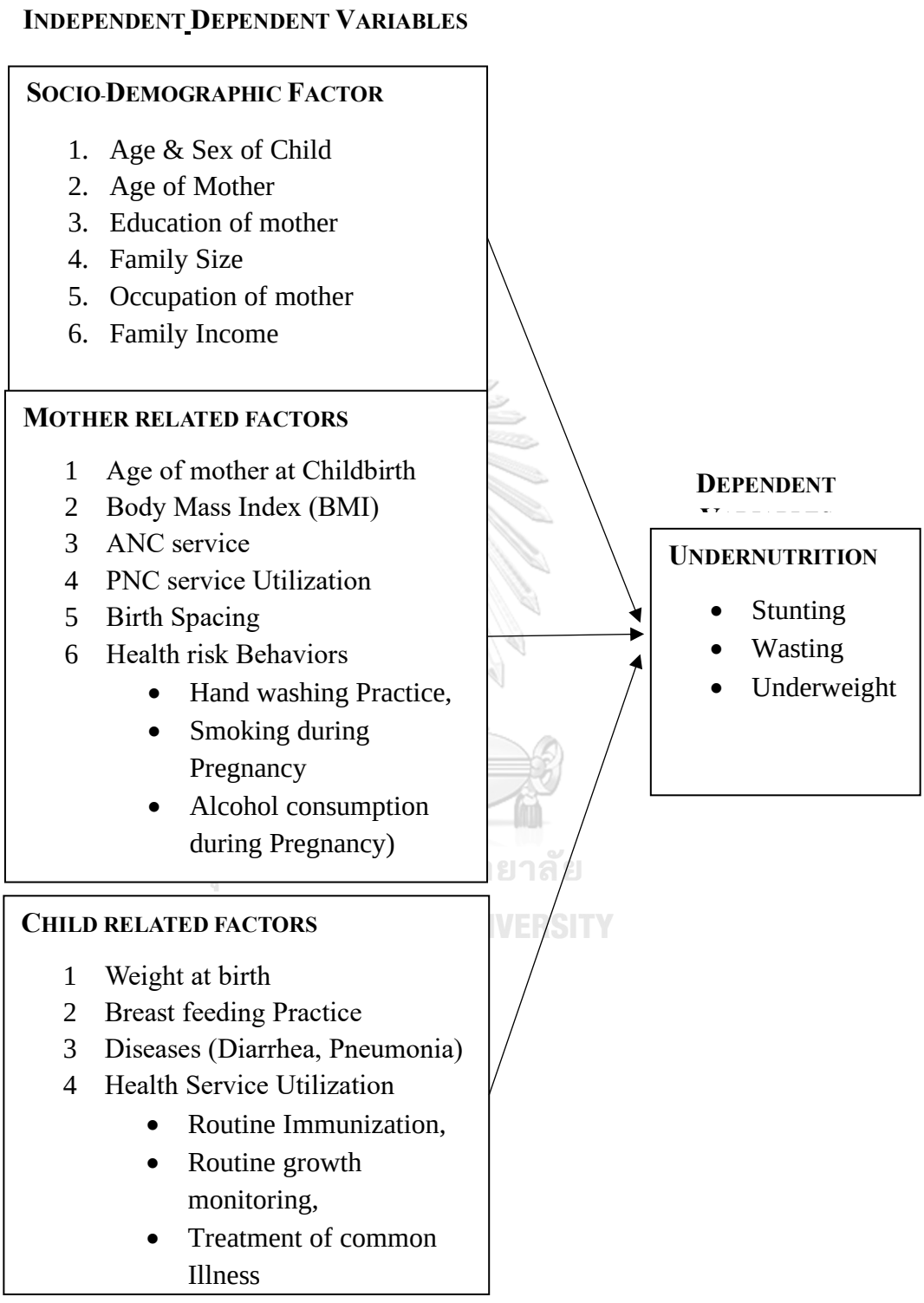


Figure 1. Conceptual Framework based on UNICEF conceptual Framework 1990.

Operational Definitions

Dependent variables

Undernutrition

World Health organization (WHO) defines undernutrition as deficiencies or imbalances in a person's intake of energy and/ or nutrients. It includes wasting (low weight for height), stunting (low height for age), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (lack of important vitamins and minerals) (14, 15).

Wasting

Children having the index value for weight for height below two standard deviations (<2SD) units as classified, recommended and approved by WHO.

Stunting

Children having the index value for height for age below two standard deviation (<2SD) units as classified, recommended and approved by WHO.

Underweight

Children having the index value for weight for age below two standard deviation (<2SD) units as classified, recommended and approved by WHO.

Independent Variables

Sociodemographic Related Factors

Indigenous Population

The communities that live within, or are attached to, geographically distinct traditional habitats or ancestral territories, and who identify themselves as being part of a distinct cultural group, descended from groups present in the area before modern states were created and current borders defined. They generally maintain cultural and

social identities, and social, economic, cultural and political institutions, separate from the mainstream or dominant society or culture.

Thami:

It refers to indigenous Thami ethnic group of population generally residing in Dolakha District of Nepal.

Age of child

It refers to the current age of child from their birth to 59 months and 30 days.

Under Five children

It includes the age of child from their birth to 59 months and 30 days.

Age of Mother

It refers to the complete year of current age of mother residing in the study area of Dolakha District of Nepal

Education of mother

The education of mother of a child is classified into illiterate, informal and formal education. Illiterate refers to a mother of a child who cannot read and write. Informal education refers to the mother who can both read and write or read only or write only but she never joined School or college. According to Nepal's educational act 1972 and revised 2019, Primary education refers to child education to grade eight, secondary level refers to grade 9 to 12. Higher study implies to Graduate (Bachelor's degree) and Postgraduate (Master's, MPhil, PhD, and Post Doc.).

Family

A group of two or more people related by birth, marriage, or adoption and regularly residing together since last 6 months.

Family size

The number of family members who have been living together since last six months.

Occupation

It refers to the occupation of the mother of the child. The occupations are further divided into different sub-groups which are as follows.

- **Agriculture**

  It includes both traditional and modern types of agricultural practices like rice farming, Vegetable farming, Poultry farming, Fish farming, animal farming etc.

- **Public Servant**

  It refers to the mother involved in either government or non-governmental organization for social work. For example, civil servant, teacher, policeman, army etc.)

- **Business**

  It includes both traditional and modern type of businesses like manufacturing Soap, buying & selling agricultural products including bamboo products.

- **Daily wage**

  Mother who works on a daily income basis

Laborer/Porter

Mother who is involved as daily wage worker or porter anywhere.

Family income

It refers to the income in a family earn by in USD per day per head. The cutoff value of poverty whose income of family member <1.90USD/day /head as per new guideline of world bank.

Mother Related Factors

Age of mother at childbirth

It refers to the age of mother at current childbirth. The current child should be involved in anthropometric measurement.

Body Mass Index (BMI)

It refers to the measurement of a woman's weight with respect to her height. It will be calculated by body weight in kilograms divided by height of the mothers in meter square. If BMI score of mothers < 18.5 consider as underweight,18.5 to 24.9 consider as Normal, and 25.0 to 29.9 consider as overweight and if BMI score is ≥ 30 is a mother consider as obese according to WHO standard.

Antenatal Care services utilization

It refers to routine health care services provided by skilled health professionals to pregnant woman in order to ensure the best health condition for both mother and baby during pregnancy. The recommended routine visits 4, 6, 8 and 9 months of pregnancy as a WHO standard, receiving Iron Folate tablet/cap, albendazole tablet and pregnancy related health check-up.

Postnatal Care services utilization

It refers to the care of mother and child after delivery. It includes PNC visit as the first visit within 24 hours from birth, second visit within 3 days and third visit in 7 days, providing iron folate tab/cap up to 6 weeks and single dose 200000 IU Vitamin "A" Capsule within 6 weeks from recent child birth, infant and young child feeding Counselling and treatment of sick child community based integrated management of maternal, neonatal and childhood illness (CB-IMNCI) Protocol.

Birth Spacing

It is the time interval between youngest and just previous childbirth in the study area.

Health risk Behaviors

Any activity or lifestyle undertaken by people with a frequency or intensity that increases risk of disease or injury. In this study, it refers to the behavior of mothers towards handwashing practice, consumption of alcohol and consumption tobacco or tobacco product.

Hand washing

It refers to hand washing with soap before food Preparation, before feeding the child, disposal of child excreta and after handling dirty things.

Consumption of tobacco or tobacco product

It refers to consumption of tobacco or tobacco product by mothers during pregnancy or postpartum.

Alcohol consumption

It refers to use of alcoholic drinks by mother during pregnancy or postpartum period.

Child Related Factors

Weight at Birth

It refers to the weight of child at birth in kilograms.

Breast feeding Practice

It refers to initiation of breast feeding within first hours of life up-to two years as per the child's wants, both during the day and night with recommended technique (Position and attachment) during breast feeding and without bottle feeding.

Food adequacy

It is defined as food sufficiency for all family members till 12 months from either product of their own or from anywhere else.

Health Services Utilization

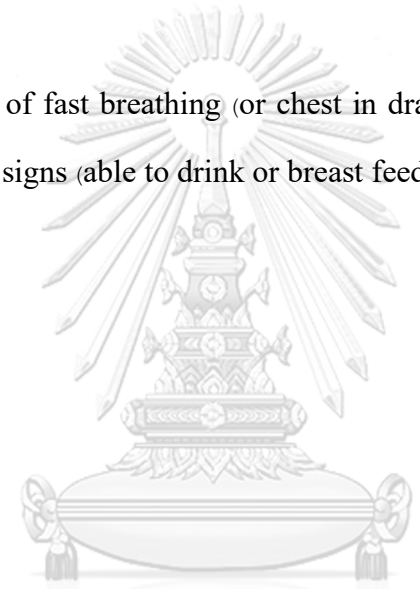
It refers to the child receiving routine Immunization , routine growth monitoring and treatment of minor illness according to CB-IMNCI treatment protocal.

Diarrhoea

It is the passage of three or more loose or liquid vomiting had convulsions, lethargy or unconscious and convulsions) stoop per day, or more frequently than a normal individual.

Pneumonia

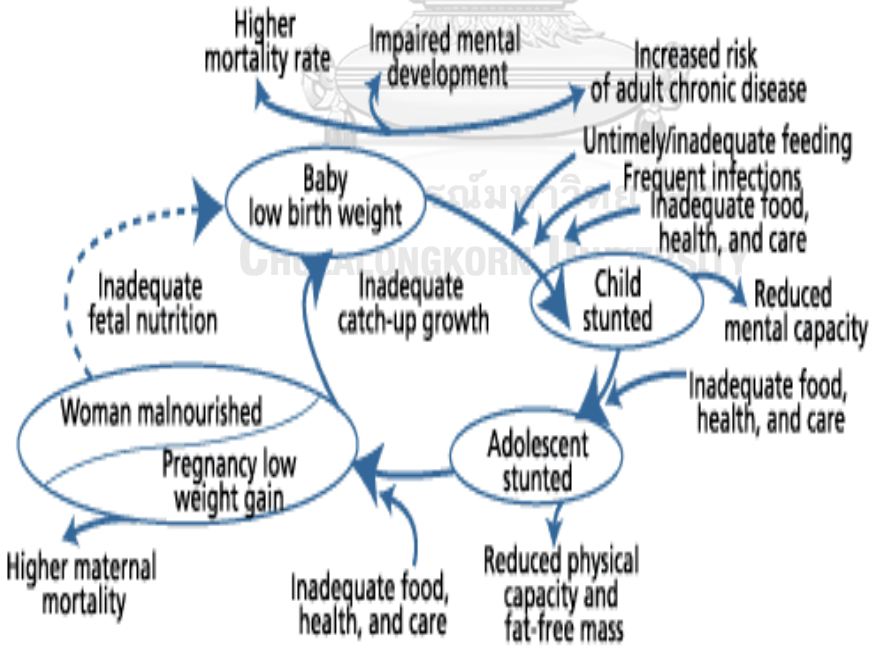
Children having signs of fast breathing (or chest in drawing or strider, wheezing and having general danger signs (able to drink or breast feed).



Chapter II
CLITERATURE REVIEW

Introduction of Nutrition and Undernutrition

The English Oxford living dictionary meaning of nutrition is the process of providing or obtaining the food necessary for health and growth ‘A guide to good health. According to Cambridge Dictionaries, nutrition is the substances that is take into body as a food and the way that they influence the health. It is the act of process of nourishing or getting nourished, specifically: the sum of the processes by which an animal or plant takes in and utilizes food substances (16). Nutrition is the intake of food, considered in relation to the body’s dietary needs. Good nutrition and adequate, well balanced diet combined with regular physical activity is a cornerstone of good health. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity (17). Poor nutrition can cause various effects throughout the life cycle as depicted in the following figure:

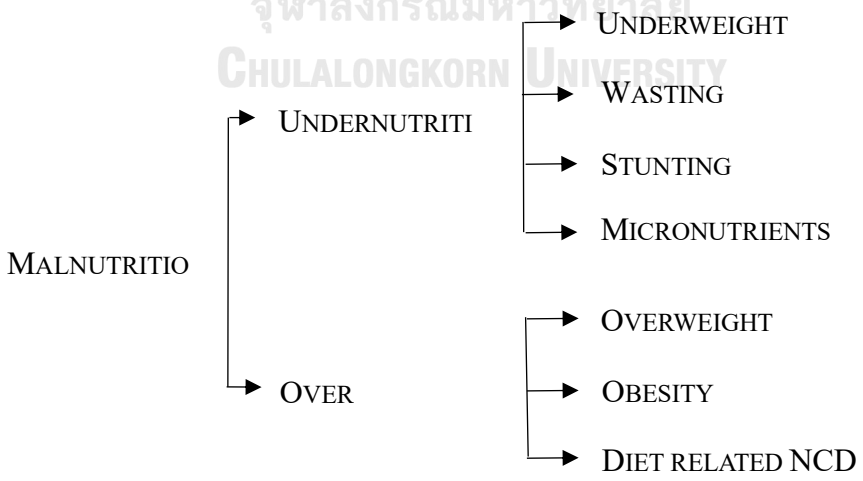


Source: Adapted from the ACC/SCN-appointed Commission on the Nutrition Challenges of the 21st Century.

Definition of Malnutrition

According to World Health Organization (WHO), Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. The term malnutrition addresses 3 broad groups of conditions: undernutrition, which includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age); micronutrient-related malnutrition, which includes micronutrient deficiencies (lack of important vitamins and minerals) or micronutrient excess; and overweight, obesity and diet-related non-communicable diseases (such as heart disease, stroke, diabetes and some cancers) (15). Malnutrition is a pathological condition resulting from inadequate nutrition (under nutrition- Protein energy malnutrition) due to insufficient intake of energy and other nutrients. Overweight and obesity) due to excessive consumption of energy and other nutrients; deficiency disease due to insufficient intake of one or more specific nutrients such as vitamins or minerals (3) The World health organization states that malnutrition in under-five children are classified broadly into two groups which are Undernutrition and overnutrition.

Classification of Malnutrition



Undernutrition

According to the English oxford Living dictionary, undernutrition is defined as the lack of proper nutrition, caused by not having enough food or not eating enough food containing substances required for growth and health. Mariam Webster medical dictionary defines Undernutrition as deficient bodily nutrition due to inadequate food intake or faulty assimilation (18). Undernutrition occurs when inadequate essential nutrients are consumed or when they are excreted more rapidly than they can be replaced (19). Based on the definition by the World Health organization, undernutrition is defined as deficiencies or imbalances in a person's intake of energy and/ or nutrients. It includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (lack of important vitamins and minerals) (14, 15). The WHO defines undernutrition as:

Underweight:

It is the weight for age of child <-2 Standard Deviation (SD) of the WHO child growth standards median.

Wasting:

It is the weight for height of child <-2 standard Deviation (SD) of the WHO growth standards median.

Severe wasting:

Children having anthropometric index value for weight for height below two standard deviations (<-3SD) units as classified, recommended and approved by WHO.

Stunting:

It is the height for age of the child <-2 standard Deviation (SD) of the WHO growth standards median.

Severe stunting:

Children having anthropometric index value for height for age below three standard deviations (<-3 SD) units as classified, recommended and approved by WHO

Table 1 Prevalence Cut-off value for public health significance

Sn.	Indicator	Prevalence Cut-off value for public health significance
1	Underweight	< 10% Low prevalence 10-19% Medium prevalence 20-29% High prevalence ≥ 30% Very high prevalence
2	Wasting	<5% Acceptable 5-9%: Poor 10-14% Serious ≥ 15% Critical
3	Stunting	< 20% Low prevalence 20-29% Medium prevalence 30-39% High prevalence ≥ 40% Very high prevalence

Source: Nutritional Landscapes information system NLIS, Country profile indicators interpretation guide (1).

WHO-UNICEF technical advisory group on nutrition monitoring team designed the new prevalence threshold in 2018, The new prevalence threshold shows that wasting, overweight, and stunting in under five years of age in relation to standard deviations (SD) of the normative WHO child growth standard.

Table 2 New Prevalence threshold value of malnutrition developed by WHO-UNICEF, 2018

Level	Prevalence Threshold Percentage (%)	
	Stunting	Wasting and Overweight
Very low	<2.5	<2.5
Low	2.5 - <10	2.5 - <5
Medium	10 - <20	5 - <10
High	<20 - <30	10 - <15
Very High	≥30	≥15

Source: (20, 21)

Severe Acute Malnutrition

Severe acute malnutrition is defined by a very low weight for height (below -3z scores of the median WHO growth standards), by visible severe wasting, or by the presence of nutritional oedema. Decreasing child mortality and improving maternal health depend heavily on reducing malnutrition, which is responsible, directly or indirectly, for 35% of deaths among children under five.

Body Mass index (BMI) of adults

Body mass index (BMI) is a simple Calculation of weight and height of an adult in order to measure underweight, overweight and obesity. It is calculated by the weight of a person in kilogram divided by height in meter square (kg/m2) of the same person.

TABLE 3 Body mass index and its classification

Classification	BMI Index value
Moderate and Severe thinness	<17
Underweight	< 18.5
Normal weight	18.5- 24.9
Overweight	≥25.0
Obesity	≥30.0

Source: Nutritional Landscapes information system NLIS, Country profile indicators interpretation guide (1)

TABLE 4 Cut-off values for public health significances BMI of Adult

Indicator	Indicator Prevalence cut-off values for public health significance
Adult BMI < 18.5 indicate Underweight	5-9% Low prevalence (warning sign, monitoring required)
	>9- <20% Medium Prevalence (Poor situation)
	20-39% high Prevalence (Serious situation)
	≥40% Very high Prevalence (critical situation)

Source: Nutritional Landscapes information system NLIS, Country profile indicators interpretation guide (1)

Causes and consequences of Undernutrition

Causes of Undernutrition:

Poverty is the principle cause for malnutrition. Unfortunately, malnutrition is still a common situation of poverty, social isolation and substance misuse. The main causes of malnutrition are reduced dietary intake, reduced absorption of macro- and /or micronutrients, increased losses or altered requirements and increased energy expenditure (22). The causes and adverse effects of undernutrition are more multifactorial and complex which are Immediate, underlying and basic causes based on UNICEF conceptual framework of maternal and child undernutrition 1990 .

Immediate causes

The immediate causes are because of inadequate dietary intake or disease. It includes family size and composition, gender equity, rules of distribution of food within the household, income, availability of food, access to food. If a child doesn't get an adequate diet, they will get malnourished. The inadequacy in dietary intake could be due to inadequate food, lack of diversified food, not having proper amount of nutrients such as carbohydrate, protein, fat, minerals, vitamin in meals. Infrequent meals, insufficient breastmilk and early weaning process. Infectious disease can cause undernutrition due to inadequate eating or poor absorption or losing of nutrients via vomiting or diarrhoea or unmet need of nutrients. The most common diseases (measles, diarrhoea, respiratory infections, malaria, AIDS and intestinal parasite infestation) which can cause undernutrition an infection causes undernutrition, and this can lead to infections which will persist from generation to generation.

Underlying Causes

The Underlying causes of undernutrition occur at household levels as well as in community levels which includes household food insecurity, inadequate care and feeding practices and unhealthy household environment and inadequate health services, family size and composition, gender equity, rules of distribution of food within the household, income, availability of food, access to food. Household food insecurity is the most crucial factor for acute protein energy malnutrition. Inadequate

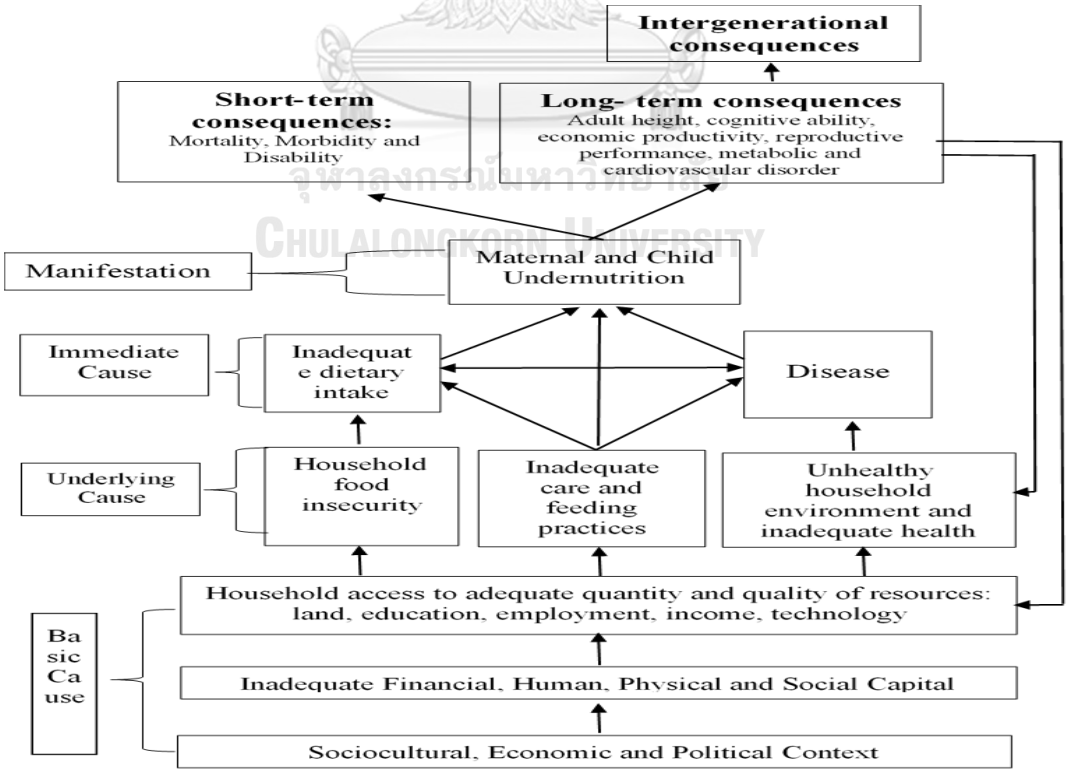
maternal and childcare practices are other health problems which are linked with poor infant feeding practices, poor home base care for ill children and poor health care seeking behaviors. Other significant underlying causes are poor water/ sanitation and inadequate health services. It includes family food insecurity, inadequate care of vulnerable household members, sharing of food within a family, unhygienic living conditions and inadequate health services. Care implies to the social environment, within the household and local community and its effect onto nutrition regarding to vulnerable group such as women, children, and the elderly HIV patients with TB.

Basic Causes:

It comprises of social, economic and political structures, trade agreements, population size, population growth distribution and environmental degradation. The basic causes of malnutrition appear on national and international levels which are comprised of quantity and quality of resources available, who controls them and who uses them. There are three main resources namely Human resources, which incorporates people's knowledge, beliefs, skills, physical health and nutritional status etc. Economic resources which comprise of income, assets, food, time etc. and Organizational resources which at a community level comprise of alternative caregiver or community support for care. At the national level, health infrastructure, formal and non- formal institutions at all levels are organizational resources. Legal, political and cultural factors also affect the nutritional status populations. The political ideology, government rules and their commitment are highly important to prevent the underlying causes of undernutrition to the population. Government can endorse certain rules & regulations & policy to prevent undernutrition. Internationally, there are provision and principles embedded in international human right laws that upload fundamental human rights, and international humanitarian law and assistance. The war and conflict also affect under nutritional status of people in the community. Prompt change in social and political arena often characterize situations of war and insecurity. Advanced networks may develop based on political alliances in places of traditional links based on economic and social independence. New leaders get elected, who may be more promising than traditional leaders because their superiority comes from external factors such as wealth or arms rather than from the support of the

population they claim to represent. The marginalization or oppression of particular social or ethnic groups can be the main cause of their nutritional vulnerability. The War and conflicts disrupt state institution thus civil society falls apart resulting in much boarder effect on health and nutrition. Based on the UNICEF conceptual framework in 1990, the level of undernutrition are immediate causes, underlying causes and basic causes that are associated with socio demographic factors (Age of child, sex of child, age of mother, Family-Size, Occupation of mother, family income). Mother related factors (Age of mother at childbirth, Body mass index of mother (BMI), ANC service utilization, PNC service utilization, Birth order, Health risk behaviors (hand washing practice, smoking during pregnancy, alcohol drinking during pregnancy). Child related factors (child weight at birth, breast feeding practice, complementary feeding practice, Disease (pneumonia, Diarrhea, health services utilization, Routine immunization, routine growth monitoring, Treatment of common illness) of the community and that can lead to undernutrition among under-five children in the community.

Figure 2 UNICEF Conceptual framework of malnutrition



Source: Adapted from UNICEF Conceptual framework 1990 (23)

Consequences of undernutrition:

The consequences are divided into short-term and long-term effects. Short-term effects include illness, weakness, delayed physical & mental health, irritability, loss of appetite, and low weight for age. Long-term effects are short height for age, poor learning and reduced school performance and poor health conditions. They reflect into poor working capacity, resulting low income. Short heighted girls can have effects on low birth weight babies. The first and foremost effects of undernutrition are on children under the age of two, but young children less than five years of age, adolescents, pregnant or lactating mothers, the elderly and the chronically ill (including those with HIV/AIDS and TB) are also prone to it (24). Undernutrition also affects the function and delays recovery of every organ system such as muscle function, cardiorespiratory function, Gastrointestinal function, immunity and wound healing and psychosocial function (25).

Magnitude of Undernutrition

Global magnitude of undernutrition: In 2017, Globally 1.51 million (22%) and 51 million (7.5) Children suffered from stunting (too short for their age) and wasting (too light for their height) respectively (26). Africa and Asia show the highest prevalence of all forms of malnutrition in 2017. There are two out of five stunted under five children in the world who live only in southern Asia. Southern Asia faces critical public health emergency, 2.5 million children died in the first month of life in 2017 and 7000 died every day and 18 children died in each month worldwide in 2017. Pneumonia and diarrhoea are leading causes of death among children under five years of age. Approximately 16% and 8% children were killed by pneumonia and diarrhoea respectively in 2016 in the world and most of its victims were less than 2 years of age. The mortality is strongly associated with undernutrition, lack of sanitation and safe water, poor access to health care (10, 27). According to Nepal Demographic and Health Survey (NDHS) 2016, national prevalence of stunting, wasting and underweight are 36%, 10% and 27% respectively. Stunting is more common in rural

(40%) than in urban children. Among the total Level of undernutrition, there were 12% severely stunted, 2% severely wasted and 5% severely underweight (28). A cross sectional study in rural hill communities of Ilam district, Nepal, 17% of under- 5 children were moderately and 10.4 % were severely underweight, 22.9%, and 17.5% were found to be moderately and severely stunted respectively. Less than 10% were found to be moderately and severely wasted (29). Likely in a low income country like Ethiopia, a cross sectional study of malnutrition and related factors among under 5 years aged children showed that the prevalence of stunting was 42.7% in rural areas and 29.2% in urban areas (30).

Socio-Demographic Related Factors

Child Age:

Age of child is linked with undernutrition, it showed that the prevalence of underweight, stunting and wasting were 60.4 %, 55.4% and 43% respectively which was significantly associated with respect to age (31). Another community-based cross-sectional Study about factors associated with underweight among <5 children in Ilam district of eastern Nepal revealed that children who were more than 24 months of age were more likely to be underweight than children aged less than 24 months and underweight among <5 children was significantly associated with respect to their age (32). The older age group of children, education level of mother, in exclusive breast-feeding practices had tremendous ($p < 0.05$) effect on stunting. More than 50% children were affected with stunting, underweight and wasting at the same time(29). The prevalence of underweight and stunting increases with age of the children, peaking at age 24-35 months, while wasting is more prevalent among children younger than two years (33).

Child Sex:

Sex is a fundamental determinant of nutritional statuses of under five children. A cross-sectional, analytical and population-based study of nutritional status and the associated factors in under five years' children of Lamjung, Gorkha and Tanahun

districts of Nepal showed that wasting, stunting and underweight was higher in boys than in girls (31). A Cross Sectional Study in ten Villages of Bijapur District of India om January 2013 to November 3013, showed that the prevalence of stunting was 40.1% male & 35.9% female and the prevalence of wasting among children was 36.5 % male and 21.2 % which was statically significant and associated with gender(34). Another study carried out in south Ethiopia revealed that male sex were significantly associated with stunting (35) Another study showed that male children were more stunted when compared to females (8).

Age of mother

The age of mother is also related indirectly to the cause of undernutrition. In case control study of Children of teenage mothers in comparison to adult mothers, in Ghana it was 8 times more likely to be stunted, 3 times more likely to be wasted and 13 times more likely to be underweight after adjusting for potential confounders (36). The cross-sectional data from Demographic Health Surveys from 18 countries revealed significant bivariate associations between low child HAZ and young maternal age (37).

Education level:

Children of educate women had low prevalence of underweight, wasting, stunting. The prevalence of stunting in 0-42 month of children was higher (76.7%) in low level (Primary and below) of mothers' education than higher level (Secondary +) of mothers' education (38). A cross sectional study among 6-23 month children in Ethiopia 2012 showed that the mother's educational status ($r = 0.25$ $P = 0.001$) were associated with WHZ of children (39). Another study in Cambodia shows, stunting was inversely associated with mothers' education(40). Maternal education had significant association with growth parameters (41). Association remained the same after applying bivariate logistic regression analysis. A descriptive cross-sectional study in Nigeria 2010, shows the children with less educated mothers were more likely to be stunted (42)

Family -Size

The family size is also an important cause for undernutrition. A cross-sectional population based study of nutritional status and the associated factors in under five years' children of Lamjung, Gorkha and Tanahun districts of Nepal in 2014 revealed that family size was associated with undernutrition (31).

Occupation

A cross-sectional study of prevalence of underweight and associated factors among children aged 6-59 months in the Pastoral Community of Korahay Zone, Somali Regional State, Ethiopia 2016 shows that maternal occupation (Government employee) is significantly associated with underweight of child (43). Another study of nutritional status and determinant of malnutrition among under 3 years' children carried out in Vietnam in 2007, that shows the mother's occupation was significantly associated with malnutrition (44). A community based cross-sectional study of Prevalence of malnutrition and associated factors in children aged 6-59 months among rural dwellers of damot gale district, south Ethiopia shows that the Children whose mother's main occupation was non-farm (AOR: 7.06;95% CI: (1.31-38.21), were associated with wasting (4).

Family Income

Family income is the most important nutritional related factor. A community based case control study carried out in Bara district of Nepal showed that low socioeconomic status was significantly associated with the prevalence of severe acute malnutrition (SAM) among children under the age of 5 years (45). A case control study carried out in Ibadan, Nigeria showed that monthly income below $20 was significantly associated with undernutrition (46).

Geography

Nepal Demographic health survey 2016 showed that the prevalence of malnutrition was greater in rural area (40%) than in urban areas. A cross-sectional study conducted in rural and Urban Ecuadorian highlands showed that Stunting prevalence was significantly higher in the rural areas (47)

Mothers Related Factors

Age of mother at childbirth

Preterm birth and low birth weight and maternal anaemia is associated with young maternal age (<15 years) and is a precursor to other infant outcomes such as neonatal mortalities (48).The outcome of low maternal age on child height limits from 0 to 11 months and poorer growth continuing after 24 months in children of younger mothers (37). A Perspective cohort study carried out in low income and middle income countries showed that the result of maternal age ≤19 and ≥35 years were linked with low birthweight, preterm birth, 2-year stunting, Older maternal age is linked with high risk of preterm birth, but children of older mothers had less 2-year stunting (49). A study among under two children and their mothers in Bhutanese Refugees, in Nepal 2013, showed that the significant increased risk of stunting in children with decreasing maternal age with compared ≥ 20 years of maternal age (50)

Body Mass Index (BMI)

It is a simple measurement method of weight for height, which is generally used to classify underweight, overweight and obesity in adults. It is calculated by weight in kilograms, divided by the square of the height in meters (kg/m2) (51). A cross sectional study among 6-23months children in Ethiopia 2012 showed that children were 7% < -2 WHZ, 11.5 %< -2 HAZ and 9.9% -2 WAZ. The maternal BMI and maternal height were linked with WHZ (P = 0.04) and HAZ (P = 0.01) score of children (39). Another study in Ethiopia showed that the BMI of mothers were significantly and highly correlated with HAZ (0.709) and BMIZ (0.748) of children and significant associations between mother's and children's nutritional status (52). Another study in Brazil showed that children whose mothers' height was<145 cm had 1.2 lower HAZ than children whose mothers were ≥160 cm tall (p-trend<0.0001) (53)

Antenatal Check-up (ANC visit)

Undernutrition is a multidimensional problem of nutrients. Antenatal care during pregnancy is also linked to under nutritional status of a child. A cross-sectional study conducted in Nigeria-2011 showed that a child whose mother had fewer than

four government antenatal care visits was more likely to be malnourished. A child whose mother who rarely or never discussed pregnancy and childbirth with her husband, and who did not have her last delivery attended by a skilled health worker was more likely to be malnourished(54). Another study was carried out in three Andean countries - Bolivia, Colombia, and Peru since1990s, antenatal care was associated with malnutrition of child(55). According to NDHS report 2016, at least four-time antenatal check-up coverage in health facilities is 69% in Nepal. Among the total antenatal check-up, 91% woman took iron folate during pregnancy. According to Nepal safe motherhood guidelines/ protocol recommended at least four antenatal visits (4,6,8, and 9 month) in health facilities for pregnant woman.

Postnatal Care (PNC Visit):

It is another important factor which leads to child undernutrition. During the time of postnatal visit, the mother is provided with health services as well as health education about child immunization, growth monitoring, home base care when the child is sick, breast feeding practices, complementary feeding, personal hygiene of mother and child, hand washing practices, diversified food etc. At least one out of four child deaths occur during the first month of life. It occurs before the child receives child health care services. Low coverage of care in the postnatal period negatively influences other maternal, new-born, and child health (56). According to Nepal's safe motherhood guidelines and protocol, it recommends that a woman should receive at least three postnatal check-ups, the first within 24 hours of delivery, the second on the third day following the delivery, and the third on the seventh day after delivery. There was 57% postnatal service coverage in the first two days after birth and 42 % woman did not receive any postnatal check-up (57)

Birth Spacing

Birth spacing is another cause of undernutrition of child which is directly associated with breast feeding. If the nearest gap is more than two years, the child can't be breast feed to the recommended period (two years). Not using family planning methods were linked with wasting (35). Birth order is one of the significant predictors of child being stunted (58). A study about malnutrition and birth related

determinants among children in Qazvin, Iran, shows that, there is non-significant association was obtained between factors, number of children at home and birth order with wasting, stunting and underweight (59).

Health Risk Behaviors

- **Hand Washing**

WHO estimates that 50% of cases of child undernutrition are due to Diarrhoea and Intestinal infection which is caused by poor sanitation and hygiene or unsafe water. Hand washing with soap is a critical determine for achieving and maintaining good nutritional status (60). A community based cross-sectional study about undernutrition and associated factors among 24 - 36 month child carried out in Ethiopia shows that the lack of hand washing practice were independent predictors for underweight (61).

- **Smoking during Pregnancy**

Maternal smoking during pregnancy contribute variety of infant health problems at birth as well as long lasting behavioral and neurodevelopmental impairments. Maternal smoking increases the risk for several adverse birth outcomes including infant death, preterm birth, low birth weight and poor intrauterine growth (62). Global and southeast Asia regional prevalence of smoking during pregnancy is 1.7 % and 1.2% respectively, Globally, 72.5% of pregnant woman smokes daily and 27.5 % were smoke occasional (63)

- **Alcohol Consumption during Pregnancy**

Prenatal alcohol consumption is a major public health problem, since 19th Century approximately were 15% of pregnant women, with rates as high as 20% reported in recent decades (64). Alcohol consumption was not related to any anthropometric indicator of pregnant mother (65), but maternal alcohol consumption was significantly associated with child malnutrition (66).

Child Related Factors

Weight at Birth:

Childhood malnutrition is significantly associated with number of children, child hunger, protein intake, vitamin A intake, low birth weight, frequent illness, and history of worm infection (67). The prevalence of malnutrition was markedly greater in children with LBW than those with normal birth-weights (stunting: 51% vs 39%; wasting: 25% vs 14% and underweight: 52% vs 33%) (68)

Breast feeding Practice

Breast milk contains all necessary nutrients for the child. It plays a vital role to have a child with healthy. First breast milk after birth contains more nutrients which is called colostrum which acts as first immunization to the child because it produces antibodies to the child. A cross-sectional of study of relation between breast feeding practice and malnutrition done in people's republic of china showed, the prevalence of all form of malnutrition (stunting, wasting and underweight) were high in poor breast feeding practices (69)

Complimentary Food: -

Complementary foods are essential to maintain good health of the child which provides all necessary energy and nutrients. In general, it is introduced from the time of weaning of the child. If complementary foods are not introduced adequately, safely, and appropriately fed in order to meet the young child's energy and nutrient needs after 6 month of child age may hamper an infant's growth. The time period between 6-23 months is the most peak incidence of growth faltering, micronutrient deficiencies and infectious illnesses. It is therefore recommended that breastfeeding on demand should be continued with adequate complementary feeding up to 2 years or beyond. However, complementary feeding is often associated with risks, with food being too dilute, not fed often enough or in too small amounts, or replacing breast milk while being of an inferior quality. Both food and feeding practices influence the quality of complementary feeding, and mothers and families need support to practice good

complementary feeding (70). The complementary foods are divided into four types which are as follows.

Dairy product

It includes milk, cheese, yoghurt are useful sources of calcium, protein, energy and vitamins.

Legumes: It is a body building food which includes peas, beans, lentils, peanuts, and soybeans which are a good source of protein and iron.

Orange: It is a body protecting and defending food which is as good as colored fruits and vegetables: carrot, pumpkin, mango and papaya, and dark green

Cereals: Energy giving foods such as rice, wheat, corn, millet etc.

Complimentary Feeding Practice

A descriptive cross-sectional study in Nigeria 2010, showed that the food-insecure households were five times more likely than secure households to have wasted children (42) A healthy diet is one that meets the nutritional needs of individuals by providing sufficient, safe, and diversified foods to maintain active life and reduce risks of disease. It contains fruits, vegetables, legumes (e.g. lentils, beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat, brown rice), and is low in fats (especially saturated fats), free sugars and salt6. Unhealthy diets are an important cause of malnutrition. They are now responsible for more adult deaths and disability than alcohol and tobacco use (71).\

Supplementary Feeding Practice

It is the provision of extra food to children additional to their normal diet. A study conducted in Jamaica (n = 65 children) reported a positive effect on length (cm) in the supplemented group compared to controls [WMD 1.3 (0.03 to 2.57)] after 12 months of intervention. A trial from Indonesia (n = 75 children) found no benefit in growth after 12 months of supplementation (72). Cochrane database of systemic reviews of Community-based supplementary feeding for promoting the growth of children under five years of age in low and middle income countries reported as statistical significant difference of effect was only found for length during the

intervention in children aged less than 12 months (two studies; 795 children; mean difference 0.19 cm; 95% confidence interval (CI) 0.07 to 0.31 (73).

Health Service utilization

- **Immunization:**

A study carried out in Ethiopia showed that immunization status of child were significantly associated with undernutrition (74). Cross-country studies of the developing world have shown that child immunization explains the lower prevalence of both wasting and stunting (75).

- **Routine Growth monitoring:**

Health service utilization is a major factor to prevent nutritional deficiencies in child as well as in all age groups. A community based cross-sectional study (>70% Indigenous population of Rai, Limbu, Rajbansi) of Illam District in 2012 showed the results of Children whose growth was monitored had a low chance of being underweight (32).

- **Treatment of Common Illness**

A cross-sectional study of factors associated with malnutrition among under five in Burkina-Faso showed that 51.0% of children were male and 57.8% of children had an average size at birth. There were 15.6, 21.5 and 10.6% of children who recently suffered from diarrhoea, fever and acute respiratory infection respectively (76). Malnourished children in low developing countries are susceptible to more severe infections than their healthy counterparts, in particular enteric infections that cause diarrhoea (77). Malnutrition is the primary cause of immunodeficiency that lowers immune function and prevents the host adequate protective response to the infective agent and resulting into malnutrition and infection that act synergistically to increase morbidity and mortality (7). Severe acute malnutrition (SAM) is associated with increased severity of common infectious diseases, and death amongst children with SAM is almost always as a result of infection. HIV; malaria; pneumonia; diarrhoea;

sepsis; measles; urinary tract infection; nosocomial Infections; soil transmitted helminths; skin infections and pharmacology in the context of SAM (78). Undernutrition in childhood is estimated to cause 3.1 million child deaths annually through a potentiating effect on common infectious diseases, such as pneumonia and diarrhoea (79). Another study showed incomplete immunization for age recent history of diarrhoea and acute respiratory infection are also significantly associated with undernutrition (46).

Recommendation of food for infant and young child

Proper feeding of infants and young child provides optimal growth and development especially from birth to 2 years of age. Ideally, infant should be breastfed within one hour of birth and breastfeed exclusively up to 6 months of age and continue to be breastfeed up to 2 years of age and beyond. Starting at 6 months, breastfeeding should be combined with safe, age-appropriate feeding of solid, semi–solid and soft foods.

Table 5 WHO guideline to prefer for infant and young child the feeding. (80)

Practical guidance on quality, frequency and amount of food to offer children 6 -23 months of age who are breast feed on demand				
Age	Energy needed per day in addition to breast milk	Texture	Frequency	Amount of food an average child will usually eat at each meal
6-8 months	200 kcal per day	Start with thick porridge, well mashed foods	2-3 meals per day	Start with 2-3 tablespoonful's per feed, increasing gradually to 1/2of a 250 ml cup
		continue with mashed family food	Depending on the child's appetite, 1-2 snakes may be offered	
9-11 months	300 kcal per day	Finely chopped or mashed foods and foods that baby can pick up	3-4 meals per day	1/2 of a 250 ml cup/ bowl
			Depending on the child's appetite, 1-2 snacks may be offered	
12- 23 month	550 kcal per day	Family foods, chopped or mashed if necessary	3-4 meals per day	3/4 to full 250 ml cup /bowl
			Depending on the child's appetite, 1-2 snacks may be offered	

Chapter - III
RESEARCH METHODOLOGY

Research Design:

This study was a community based quantitative cross-sectional to identify the prevalence of undernutrition and its' determinants among under-five children of indigenous Thami population in Dolakha District, Nepal

Study Population

According to the National Population and Household survey 2011, the total number of indigenous Thami population was 28671, which is 0.1% of the national population, 16597(57.9%) who reside only in Dolakha District, which is also 8.9% of the total population of Dolakha District. Almost 75% indigenous Thami population reside in central mountain region of the country and they have a growth rate of 2.2, average household size was 4.5, sex ratio was 94, Male dependency ratio was 85%, Female dependency ratio was 76.9%, Almost 75% population were involved in the occupation of. 8.92 % of skilled agricultural, forestry and fishery workers, followed by in elementary occupation i.e. 8.92%, craft and related trade workers were 8.92%. Only 5.5 % household used clean cooking energy. Around 80% household used improved source of drinking water and 64.5% household had toilet facilities, female literacy rate was 50.5 & male literacy rate was 57.4% (81).

According to NPHS-2011, the average household size of indigenous Thami population was 4.5. The current indigenous Thami population of Dolakha district was calculated by applying the formula of Pt = P(1+r/100) t with reference of indigenous Thami population growth rate 2.20, NPHS report 2011. Under-five indigenous Thami total population was projected as 7.36% of the under five children of hilly district according to NPHS 2011. Then the final projected population was 19753 and under five children was 1454 by 2019 (81). Then the sample size was calculated from the projected population.

Table 6 Projected Indigenous Thami population from 2012 to 2019 in Dolakha District.

Sn.	Village where Thami Population residing	Total Population in 2011	Projected Population in 2019	
			Total Population	<5 Population
1	Aalampu	1668	1985	146
2	Babare	1615	1922	141
3	Bhimeshwor Municipality -2	1357	1615	119
4	Bigu	377	449	33
5	Chilangkha	202	240	18
6	Dadakharka	207	246	18
7	Fasku	27	32	2
8	Kalinichowk	1938	2307	170
9	Khare	97	115	8
10	Khopachagu	1214	1445	106
11	Suspa-chhemawoti	2407	2865	211
12	chhetrapa	32	38	3
13	Laduk	25	30	2
14	Lakuridada	313	373	27
15	Lamidada	551	656	48
16	Lapilang	2805	3338	246
17	Marbu	24	29	2
18	Melung	87	104	8
19	Namdu	89	106	8
20	Orang	22	26	2
21	Pawoti	18	21	2
22	Sundrawoti	1321	1572	116
23	Sunkhani	187	223	16
24	Virkot	14	17	1
Total		16597	19753	1454

Source: (81)
Note: The latest survey in 2011, after that there is no recent survey.

Study Area:

Nepal has 125 ethnic groups of population with 123 people who speak their own ethnic language, and 62 indigenous ethnicities (81, 82). Thami's are one of those highly marginalized ethnic groups among 62 indigenous populations based on human

developmental indicator as literacy/education, income, wealth, land holding and other assets (Nepal federation of indigenous Nationalities-NEFIN). They are confined in Dolakha, Ramechhap and Shidhupalchwok District at their own ancestral land (Kipat) and few are in others part of country as well (83). They speak Tibeto-Burman language (own language) and maintain unique shamanistic religious practices that are neither Hinduism nor Buddhism. The ancestral land of indigenous Thami ethnic population is Dolakha District.

Figure 3 Projected Indigenous Thami population from 2012 to 2019 in Dolakha District.

Source: Web page of ministry of Federal Affairs and General Administration of Nepal

Research Duration

The data was collected during the period of August to September 2019

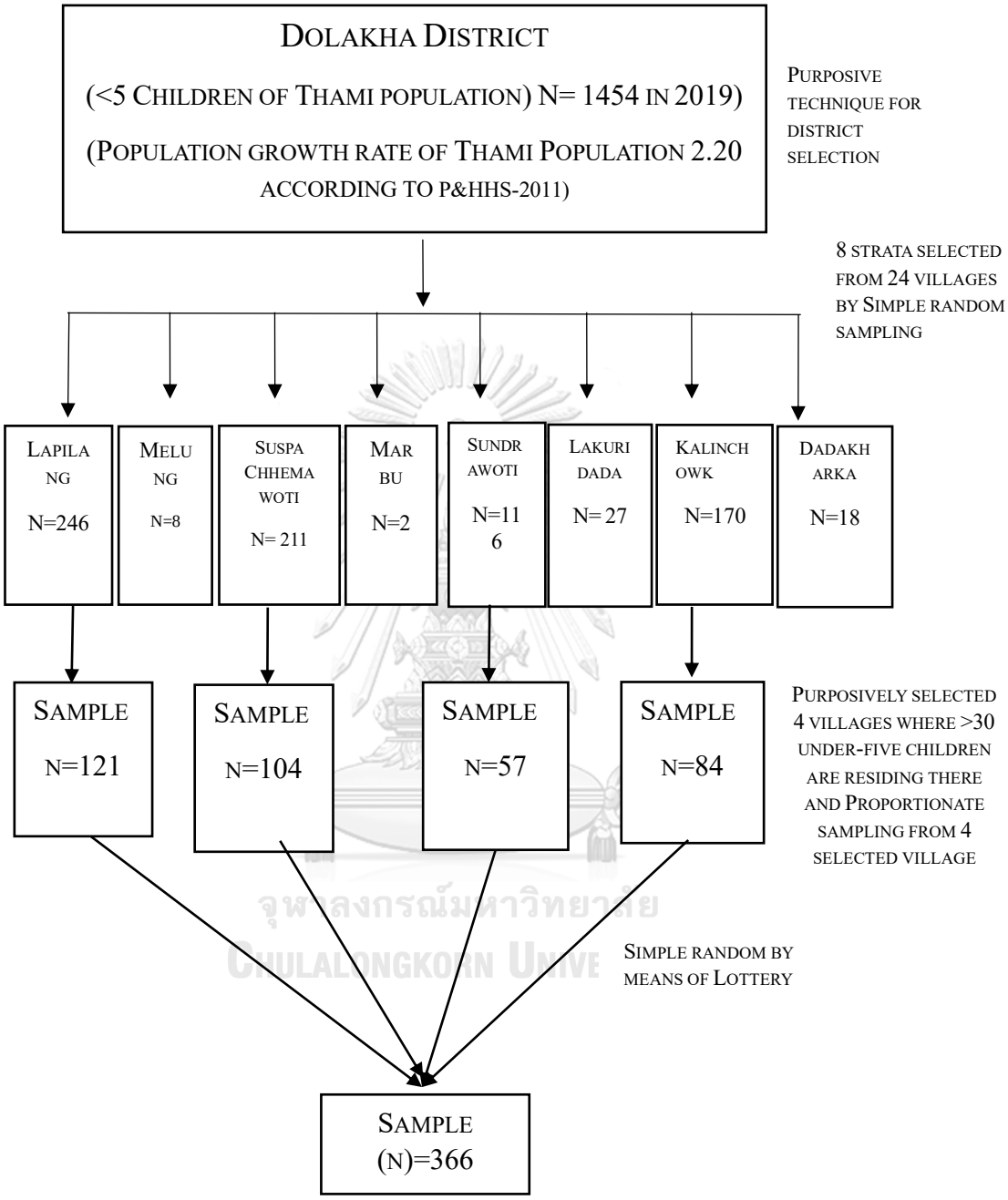
Sampling Technique

The sampling technique was multistage sampling method, that included Dolakha district which was selected purposively where Thami ethnic group reside. Sampling frame was made into 8 strata by simple random sampling technique by the help of google online random sampling (https://www.dcode.fr/random-selection). Then required sample size was calculated by multistage random and population proportionate sampling technique. Sampling frame was made into 8 strata by 24 villages where indigenous Thami Population residing out of 74 wards of Dolakha District Nepal, and purposively 4 Village (Kalinchwok, Lapilang, Sundrawoti and Suspa-chhemawoti) was selected from 8 strata where more than 30 under-five children are residing there.

Figure 4 Random Sampling from 24 Village By means of Google

Simple random sampling technique was carried out in each stratum with the help of Vitamin A supplementation register and Immunization Register. It is because both are successful programs of Nepal, and the Vitamin “A” Supplementation coverage almost universal in Nepal and the register update every 6 months. The required sample size 84,121,57and 104 (Total 366) was selected from Kalinchowk, Lapilang, Sundrawoti, and Suspa-chhemawoti respectively. The simple random technique was made from the vitamin “A” supplementation register and Immunization register where under five children registered.

Figure 5 Consort Chart (Sampling Flow Chart)



Step of Sampling Technique

Sampling Technique was carried out by following four steps.

Step 1

Dolakha District was purposively selected out of four districts where Thami ethnic Population reside.

Step 2

The whole district was divided into eight strata by simple random sampling because the population are of homogeneous nature of same ethnic group.

Step 3

Purposively 4 villages were selected where >30 under-five children reside among selected 8 strata.

Step 4

The sample sizes were calculated from each stratum by proportionate sampling technique to reduce the selection bias.

Step 5

Sample household was selected by simple random sampling technique with the help of recorded vitamin "A" supplementary register and child immunization register of selected 4 villages. Then the mother and child were selected from sample household.

Sample and sample size

The highly marginalized indigenous Thami Children whose age was under five year and mother residing in study area of Dolakha district since last six months. Considering the reference, national prevalence of underweight 27% as per Nepal Demographic Health Survey (NDHS) 2016, 95% Confidence interval (CI) and allowable or marginal error (L) to be 5% and nonresponse rate was 10%. The required sample size (n) was calculated as:

$n = (z\ a/2)2\ p(1-P)/d2$, Where,

$Z = 1.96$

$P = 0.27$

$q = (1-p) = (1-0.27) = 0.73$

$d = 0.05$

The calculated sample size was: 333

Assuming non-response rate of 10% = 33

The total sample size was 366.

Measurement Tools

Consent form, pre-structured questionnaire, weighing machine for child and mothers (Seca 876 model), length/ height measurement wooden board for child (Medical wooden height board for height and length measurement) and measuring tape for height measurement of mother was used for measurement tools for data collection.

Consent Form:

Informed consent of the individual respondents was taken before interview and anthropometric measurements of the child.

Questionnaire

Pre-structured questionnaire was used for interviewing of the mother and anthropometric measurement was used both mother and child. Questionnaire was divided into three parts as Socio-demographic related factors, Mother related factors and child related factors. There were 45 questions including anthropometric measurement, recording table of immunization, growth monitoring table and food recall within 24 hours of child.

Weight, Height/length measuring instruments

For the accurate anthropometric measurement, a digital weighing machine Seca 876 model was used to measure weight child and mother. The unit of weight was measured in kilogram (Kg) which was shown in digital form on that machine. Medical wooden height board and measuring tape was used to measure length and height of under-five children and mother respectively. Both measuring equipments were calibrated in centimeter therefore the measurement was recorded in centimeter. All anthropometric tools except measuring tape were provided by UICEF, Nepal

.

FIGURE 7
CONSORT CHART (SAMPLING FLOW CHART)

FIGURE 6
MEDICAL WOODEN HEIGHT BOARD FOR HEIGHT AND

Data Collection Techniques

The household having under-five children was confirmed by the help of vitamin "A" Supplementary Register and child Immunization register of selected 4 villages from local health facilities. Then the sample household was selected by simple random sampling technique. The sample household was found by the help of female community health volunteers (FCHV), local health staffs and local political leader. Then the mother and child were selected from sample household. The mother was requested to bring child health card to observe and record the immunization and growth monitoring status of child. Face to face interview were done with mother of under five children by using semi structured questionnaire. The digital weighing machine (weight measurement instrument Seca 876 model) was calibrated by weighing known weight of an object with zero setting at first for the accurate weight measurement. Then the anthropometric measurement was carried out by using weight measurement instrument Seca 876 model with weight less clothes and shoes of child and mother. Measuring tape was used for measurement of mother's height. Medical wooden height board was used to measure the length and height of children and the same board was also used for recumbent position of the child. Informed consent from each respondent was taken before interview and anthropometric measurements of the child. All the process of data collection was taken 40 minute per smple (mother and child). The data collector gave thanks to participents for kindly participate and

cooperate during the time of data collection. The data collector gave thanks to participents for kindly participate and cooperate during the time of data collection and kindly informed to participants to inconvinients to provide any compansation and transportation fees for time loss inconvenience

Inclusion, Exclusion and Discontinuation Criteria

Inclusion Criteria

- Children aged under-five of indigenous Thami population should be residing at study area science at least 6 months.
- Mother of child should be residing at Dolakha district science at least 6 months.
- If a family had twins aged under-five, randomly selected child was respondent.
- If a family had more than two children aged under-five, the younger child was respondent.
- The height and weight of mother only was measured for non-pregnant mothers

Exclusion Criteria

- Sick child was not measured for height and weight.
- Sick mother was not respondent of this the study.
- The height and weight of the child was not measured whose mother rejected to participate in that study.

Discontinuation Criteria

- The respondent could quit participation at any time if she didn't have enough time to interview & do anthropometric measurement.
- If any natural devastating events occurred, respondent could quit the interview and anthropometric measurement.

Validity and Reliability

Construct Validity

The questionnaires were designed to corresponding UNICEF conceptual framework of Malnutrition, objectives of the study and operational definitions as similar studies conducted in Nepal (Nepal Demographic health survey 2016). The questionnaires were validated by Nutritional experts and exam committee members (Dr. Montakarn chuemchit, thesis advisor, Dr. Ratana Somrongthong, Associate Professor, College of Public Health Sciences, Chulalongkorn University and 3. Dr. Nipunporn Voranmoongkol, M.D., MPH (Maternal and Child Health) The questionnaires were revised according to exam committee members' comments and experts' comments.

Content Validity

The questionnaires were adapted from Nepal population and household survey 2011 and Nepal demographic health survey 1016 and prepared for Sociodemographic factors, mothers related factors, child related factors, weight & height of mothers and weight and height /length of children. The questionnaires were restructured and modified according to nutritional, Family planning and immunization protocol. These items of questionnaires were either adapted wholesome or in some cases restructured and modified by researcher using existing national level and WHO guidelines of nutrition, family planning, and immunization for making more suitable to the current study of undernutrition and its determinants. The questionnaires were re-structured and modified by the researcher using the guideline and not taken from validated questions and previous literature. It was validated by using item-objective congruence (IOC) by one Nutrition experts (Dr. Nipunporn Voranmoongkol, M.D. MPH) and two examiner committee members (Dr. Montakarn chuemchit, thesis advisor, Dr. Ratana Somrongthong, Associate Professor, College of Public Health Sciences, Chulalongkorn University). After validating the questionnaires, IOC scores by three experts were summed up and divided by three. The average score of all 45 items was 0.75. As IOC for each question was more than 0.75 (84), questionnaires was accepted. Questions number 13, 18 19, 32, 33, 34, 39, 40, 41, 44 and 45 having the score less

than 0.75 were revised according to expert's comments and advice. Then the final score became one.

Face Validity

Face validity of questionnaire and weight measuring machine and height/length measuring was checked during pilot testing (Pre-test) which was done among under-five children of similar characteristics of indigenous Thami Population of Bhimeshwor municipality ward number two Rampa and Dokhthali, Dolakha District of Nepal for clarification and comprehension of each question.

Translation of research Tools

After validation and reliability test, the English version of the research instrument was translated into Nepali language by Shanta Kumari Ojha (MA in English literature) and translated Nepali questionnaire was verified by Balaram Dahal (MA in Nepali Literature)

Pilot Testing

The pilot test was done for determination of the duration of interview, to check clarity, follow questions, appropriateness, cultural acceptability and finding the accuracy of anthropometric instruments in the study area of Bhimeshwor municipality ward number 1 Dolakha District; Nepal. To avoid data contamination, the Principle investigator (PI) was assured that there were no linkages between respondents from the actual study. To yield reliable result, pre-testing was conducted by the PI using approximately 6% of sample size; that was 20 of total sample size 336.

Reliability:

Some questions were revised after the result of pilot test and before the actual data collection. The tools' internal consistency for scale item was measured by Cronbach's alpha correlation coefficient. The Cronbach's alpha correlation coefficient for scale reliability was used to test the tool's internal consistency for undernutrition and its determinants. Overall, results from the pre-test was shown whether the questionnaire was reliable or not with Cronbach's alpha scores of 0.82 and 0.78 for

undernutrition and its determinants. For each item, the minimum score was set at $\alpha \geq 0.7$ with the level of statistical significance set at < 0.05 was accepted (implying that 70% of the measured variance was reliable, and 30% was due to random error). Items yielding a score below this cut-off point was either removed for improvements in order to minimize random error (85)

Data Collection

Face to face interview was performed with mother of under-five children by using semi structured questionnaire and anthropometric measurement tools for data collection. Digital weight machine (Seca model number 876) was used to measure the weight of child and the mother. The weight of the mother was measured in Standing position on weight machine. The weight of child whose age was < 2 years was measured by holding the baby along with the mother). The weight of child whose age was >2 years, measurement was done in standing position. For the anthropometric measurement of height/length of child was performed by Medical Wooden Height Board and as the following procedures.

- If a child was < 2 years old, measurement was taken in recumbent (lying down Position) and was recorded in length. If the child age was > 2 years old, measurement was taken in standing height.
- If a child < 2 years old was not laid down for measurement of length, measurement was taken in standing position and add 0.7 cm to convert it to length. If a child aged 2 years or older couldn't stand, measurement was done in recumbent length and 0.7 cm was subtracted to convert it to height.

Informed consent from individual respondents was taken before the interview process and anthropometric measurements of the child. Data was collected by the researcher and one local research assistant (health worker) was recruited. The assistant researcher was trained by Principle researcher to measure the weight and height/length of mother and child accurately. The training was arranged one day before data collection to reduce interviewer bias. Training topics were included in the purpose of research (research objectives), research methodology and detailed

information about questionnaires, handling of and ethics about conducting research. The principal researcher explained and taught the research assistants about how researchers should administer a questionnaire, introduce themselves, rapport build, create convenient and friendly environment, getting informed consent, distribution of questionnaires, explaining questionnaires, collection of questionnaires and checking the completeness of the answers. After the training session role play was done two times as interviewer and interviewee to each other to assess their understanding about training, procedures and performance to minimize interviewer's bias. There was same question which was used for child and mother of each household. After each interview and measurement of height and weight, the researcher and research assistant checked the completeness of answers for each question in the questionnaire before leaving the field site. All the documents were checked for completeness by the principal researcher to prevent losing documents during data collection before leaving each village.

Data Entry and Analysis

Data were verified by principle researcher and the questionnaire was coded before entering data to the computer. Data entry was done by double entry process and data cleaning was performed before the analysis. Data analysis was processed by using SPSS software version 22 (licensed from Chulalongkorn University) for windows. Most of the socio-demographic, maternal factors and child factors related variables were categorical and those anthropometric variables were of scale in nature. Descriptive statistics was calculated for summarizing quantitative data and statistical analysis was performed as frequency, percentage, mean and standard deviation. Frequency and percentage for socio-demographic factors, Mothers related factors and child related factors. The Prevalence of undernutrition was calculated by WHO anthro software (version 3.3.2, January 2011) and prevalence was presented in number and percentage. Stunting and wasting underweight were categorized by using information regarding weight for height, height for age, weight for age. Severe undernutrition was further categorized as severe wasting: if z-score was less than -3, moderate wasting: if z-score was between <-3 to <-2 . Not undernutrition: if z-score was more equal or than

- 2 . Chi-square test ($\chi 2$) was applied for the identification of associated factors with undernutrition. The level of statistically significant was set up that the value of α is less than 0.05.

Ethical Consideration

Written permission was taken from Chulalongkorn University with certificate of approval No. 184/2019 and study title no. 097.1/62. Written permission was also granted by executive body of district co-ordination committee of Dolakha district, Nepal with reference no. 97/ 076/77 dated 30/05/2076 BS. It was clearly mentioned to mothers about objectives, needs, limitation, benefit, risk and harm of the conducting research towards the mothers and their under five children as clearly stated in the consent and information sheet. Written consents were taken with mothers after clear explanation of the procedure of collecting data before taking interview and anthropometric measurement. After data collection, education and information about child nutrition was given to those mothers whose children were under nourished. Those who were severely undernourished were also advised to visit the nearest health institution where nutritional services were provided.

Chapter IV
Results

It was a community based quantitative cross-sectional study. It was carried out in marginalized Thami community of Dolakha district of Nepal. The study area was ward no. 1, 5, 6 & 9 (Kalinchowk, Lapilang, Leptung, & Sundrawoti) of Kalinchowk rural municipality and ward no. 1 (chhemawoti) of Bhimeshwor municipality of Dolakha District, Nepal. There were 366 mothers and their biological 366 under five children. Mothers were involved for interview and measurement of height & weight, while Children were involved only for height/length & weight measurement. The aim of this study was to identify the prevalence of undernutrition and its' determinants among under-five children of that community. This chapter deals with the study of identification of prevalence of undernutrition, determining the association between sociodemographic characteristics and undernutrition, identifying the association between mother related factors and undernutrition and determining the association between child related factors and undernutrition. The prevalence of undernutrition was analyzed by the help of WHO anthro software. Whereas, frequency, percentage, mean, median, standard deviation, minimum and maximum was analyzed in descriptive study by means of SPSS. Chi-square test was used for to identify the association between independent variables and dependent variables the results of this study are presented as follows.

Part I – Descriptive findings

- Socio - demographic characteristics
- Mother related factors
- Child related factors
- Prevalence of undernutrition

Part II- Bivariate Analysis

- Chi-square test for the association between Socio-demographic Characteristics and undernutrition (wasting, stunting and underweight)
- Chi-square test for the association between Mothers related factors and undernutrition (wasting, stunting and underweight)

- Chi-square test for the association between Child related factors and undernutrition (wasting, stunting and underweight)

Descriptive Findings

Sociodemographic Characteristics

Brief description of study area

Among the total respondents, the highest percentage 121 (33.1 %) was from ward number 5 & 6 of Kalinchowk rural municipality and followed by 104 (28.4 %,) from ward number 1 of Bhimeshwor municipality, 84 (23%) and 57 (15.6 %) from ward number 1 and 9 of Kalinchowk rural municipality. which is shown in table no.7.

Table 7 Distribution of study area

Village	Frequency	Percentage (%)
Kalinchowk	84	23.0
Lapilang	121	33.1
Sundrawoti	57	15.6
Suspa chhemawoti	104	28.4
Total	366	100.0

Age and Sex of Children

Initially the age group of children was categorized into 6 categories as shown in table no. 4.1 as per WHO criteria of identification of nutritional status of under-five children. There were 29.8% of under-five children fell under the age 12 - 23 months, followed by 19.4% (12 - 23 months), 19.4%, (24 - 35 months), 12.6% (36 - 47 months) and 6.8% (48 - 59 months) among the total 366 sample . The median age of children was 19 months, minimum age of child was 1 month, and the maximum age of child was 58 months. There were 184 (50.3%) female and 182 (49.7%) male children participated for the anthropometric measurements and all the data are shown in table number 4.

Table 8 Distribution of study area

Variables	Frequency	Percentage (%)
Age of child in month		
0 - 5	44	12
6-11	71	19.4
12-23	109	29.8
24 - 35	71	19.4
36 - 47	46	12.6
48 -59	25	6.8
Median	19	
Minimum	1	
Maximum	58	
Sex of child		
Female	184	50.3
Male	182	49.7

Age and educational Status of mothers

The median age of the mother was found 19 years. Whereas, the minimum age mother was 19 years and the maximum age was 50 years. Regarding the educational status of the mothers, there were 30 %, of mothers who had completed secondary level of schooling, 30. 6% of the mothers achieved informal education (literate), 31.1% of the mothers had completed primary schooling and 8.2 % were illiterate.

Table 9 Age and Educational Status of Mothers (n=366)

Variables	Frequency	Percentage (%)
Age of mother		
< 20	29	7.9
21- 35	307	83.9
> 35	30	8.2
Mean (± Std. Deviation)	26.78 (± 5.810)	
Minimum	19	
Maximum	50	
Educational status of mother		
Illiterate	30	8.2
Literate (Informal Education)	112	30.6
Primary School	114	31.1
Secondary	110	30.1

Family size, occupation of mothers and income of family members

Regarding the family size, there were 72.4 % of the respondents living together in a family with ≤ 5 members since last 6 months and 27.6% of the respondents had a family with ≥6 members. The mean standard deviation of that family was 4.75(± 1.517), minimum members of family was 3 and maximum number of family number was 9. Majority of the respondents were involved in agriculture (93.4%), followed by business (3%), public servants (2.7%) and daily wage workers (0.8%). Out of the total respondents, 97.81% fell under the category with daily income per head per person < 1.90 USD) and 2.19% of ≥ 1.90 USD. The mean standard deviation of the income was 0.6231(±0.40750) US Dollar/day/head, the median income was 0.4824 USD/Day/Head, minimum income was 0.17USD/day/head and the maximum income was 3.01 USD/day/head.

Table 10 Family size, occupation of mothers and income of family members

Variables	Frequency	Percentage (%)
Family size		
≤ 5 members	265	72.4
≥ 6 members	101	27.6
Mean (± Std. Deviation)	4.75(± 1.517)	
Minimum	3	
Maximum	9	
Occupation of mother		
Agriculture	342	93.4
Public Servant	10	2.7
Business	11	3
Daily wage	3	0.8
Family Income		
<1.90USD/Day/Head	358	97.81
≥ 1.90 USD/Day/Head	8	2.19
Mean (± Std. Deviation)	0.6231(± 0.40750)	
Median	0.4824	
Minimum	0.17	
Maximum	3.01	

Mother Related Factors

Table 11 Age of mother at childbirth and Birth spacing between two children

Variables	Frequency	Percentage (%)
Age of mother at first childbirth (n=366)		
< 20 years	111	30.3
20 - 35 years	255	69.7
Mean (± Std. Deviation)	20.90 (±2.642)	
Minimum	16	
Maximum	33	
Age of mothers at last childbirth (n=366)		
< 20 years	37	10
20 35 years	310	85
> 35 years	19	5
Mean (± Std. Deviation)	25.06 (±5.539)	
Minimum	16	
Maximum	48	
Birth spacing between two children(n=232)		
< 2 years	31	8.5
3 - 5 years	188	51.4
> 5 years	13	3.6
Mean (± Std. Deviation)	1.90 (±1.883)	
Minimum	1	
Maximum	9	

#Total 134 questions were not applicable for birth spacing of those respondents.

The above table shows that 255 (69.7%) of mothers gave birth to their first child in between the age of 20 to 35 years of age, followed by 111 (30.3%) mothers who gave birth below the age of 20 years and the average age of mother at first delivery was found to be 20.90 with the deviation of ± 2.642 years. The minimum age of mother at first delivery was 16 years, whereas the maximum age of mother was 33 years. The majority of the age group 84.7% of mothers gave birth to their youngest child in between the age of 20 to 35 years of age, followed by 10.1% and 5.2% mothers who gave birth below the age of 20 years and more than 35 years respectively and the mean age of mother at last delivery was 25.06 years with the standard deviation of ±5.539 years and the same age group of mothers gave the

childbirth at the minimum age of 16 years, whereas the maximum age of delivery was 48 years of age. Regarding the birth spacing between two children among 366 mothers, 63.4% of mothers had 2 or > 2 children and 36.6% mothers had only one child. Out of 233 mothers, 44.4% of the mothers had delivered within 2 years of previous childbirth, 129 mothers had maintained the birth space of more than two years. The mean standard deviation of birth spacing between two children were 1.90 (±1.883) years, whereas the minimum birth spacing between two children were 1 year and the maximum was 9 years.

Body mass index of mothers

Table 12 Body mass index (BMI) of mothers (n=366)

BMI and Classification	**Frequency**	**Percent**
< 18.5 Kg/m2	21	5.7
18.5 - 24.9 kg/m2	277	75.7
25 -29.9 kg/m2	62	16.9
≥30 kg/m2	6	1.6
Mean (± Std. Deviation)	22.5393 (±3.04089)	
Median	22.3	
Minimum	14.9	
Maximum	34.9	
Classification		
Normal	276 (75.4%)	
Undernutrition:	22 (6%)	
Overweight:	63 (17.2%)	
Obese:	5 (1.4)	

The body mass index (BMI) of mothers were calculated and categorized as per the WHO guidelines such as BMI= weight in Kg/Height m2 and categorized into four categories. If the BMI score is found <18.5 kg/m2 then it is called undernutrition, if the score falls under the range between 18.5 to 24.9Kg/m2 it is considered normal. If the score is in between 25 to 29.9 Kg/m2 it is overweight and if the score more than

30 then it's called obese. In this study, 277 (75.7%) were normal, 63 (17.2%) were overweight, 21(5.7%) were underweight and 6 (1.6%) of mothers were obese, the mean standard deviation, median, minimum and maximum BMI of mothers were 22.5393 (±3.04089), 22.3, 14.9 and 34.9 respectively.

Health Service Utilizations

Table 13 Body mass index (BMI) of mothers (n=366)

Variables	Frequency	Percentage (%)
Antenatal check-up		
< 4 times	21	5.7
≥ 4 times	345	94.3
Mean (± Std. Deviation)	4.32 (±1.227)	
Median	4	
Minimum	1	
Maximum	10	
Iron & folate intake during last pregnancy		
Yes	363	99.2
No	3	0.8
Albendazole tablet intake during last Pregnancy		
Yes	351	95.9
No	15	4.1

From the above table, most of the respondents 94.3% of mothers had taken antenatal check-up (ANC) services more than four times, whereas only 5.7% of the mothers had taken ANC services less than four times. Almost 99.2% mothers had taken iron and folate tablet during pregnancy and 95.9% of the mothers had taken iron & folate and albendazole tablet respectively during their pregnancy period after completion of three months of pregnancy.

Table 14 Body mass index (BMI) of mothers (n=366)

Variables	Frequency	Percentage (%)
Postnatal check-up		
Yes	315	86.1
No	51	13.9
Irion & folate intake during last postpartum period		
Yes	360	98.4
No	6	1.6
Vitamin "A" capsule intake during last postpartum period		
Yes	360	98.4
No	6	1.6
Use of modern contraceptives		
Yes	258	70.5
No	108	29.5

Postnatal care was availed by 315 (86.1%) mothers, 98.4% mothers took Vitamin "A" capsule and iron and folate tablet during postpartum period and 258 (70.5%) of couples used contraceptives during the study period.

Health Risk Behaviors

Regarding the health risk behaviors of total 366 respondents, 97.8% participants mentioned that they practiced the habit of handwashing before cooking, 97.7% of them practiced hand washing after touching animals or animal waste, 97.5% of the respondents washed their hand before food handling, 99.5% of the respondents washed their hand after handling rubbish, 98.6 % of the respondents washed their hand before feeding the child and 99.7% of the respondents washed their hand after disposal of excreta and after using toilet. There were 10.1 % of the respondents who consumed tobacco or tobacco products while 89.9% of the respondents didn't consume tobacco or tobacco products. There were 36.3%, of the respondents who had consumed alcohol but 63.7 % of the respondents had not consumed alcohol.

Table 15 Hand washing Practice, consumption tobacco or tobacco products, and alcohol

Variables	Responses	Percent %
Hand Washing Practice of the respondents		
Hand washing before cooking	358	97.8
Hand washing after touching animals or animal waste	358	97.8
Hand washing before food handling	357	97.5
Hand washing after handling rubbish	364	99.5
Hand washing before feeding the child	361	98.6
Hand washing after disposal of excreta using toilet	365	99.7
Consumption of tobacco or tobacco products during last pregnancy		
Yes	37	10.1
No	329	89.9
Consumption of alcohol during last pregnancy by mothers		
Yes	133	36.3
No	233	63.7

 # (Hand washing practice was multiple response Question)

Child Related Factors

Birth characteristics

Among the total 366 respondents, 26.5% of mothers attained home delivery services and 73.5% of the mothers who attained institutional delivery services. Among the total 269 institutional deliveries, there were 4.1% babies weighing < 2.5 kilograms at birth, followed by 73.5% babies weighing >2.5 kilograms at birth.

Table 9 Maternal and child health services

Variables	Frequency	Percent
Place of last deliveries done (n=366)		
Home	97	26.5
Health Institution	269	73.5
Weight of baby at birth (n=269)		
< 2.5 Kilogram	15	5.6
≥ 2.5 Kilogram	254	94.4

Feeding Practices to Child

Table 16 Hand washing Practice, consumption tobacco or tobacco products, and alcohol

Variables	Frequency	Percentage (%)
Initiation of breast feeding to child (n=366)		
Within one hour	298	81.4
After one hours	68	18.6
Colostrum feeding to child immediately after birth (n=366)		
Yes	355	97
No	11	3
Extra food item fed immediately after childbirth before breast feeding (n=366)		
Yes	16	4.4
No	350	95.6
Frequency of breast feeding within 24 hours (n=255)		
< 10 times	28	12.4
≥10 times	197	87.6
Age of child until breast feeding in years (n=141)		
< 24 months	4	2.8
≥ 24 months	137	97.2
Introduction of weaning to child (n=366)		
Yes	319	87.2
No	47	12.8
Age of weaning to child (n=320)		
< 6 months	31	9.7
≥ 6 months	289	90.3
Introduction of diary product to child (n=366)		
Yes	290	79.2
No	76	20.8
Bottle feeding practice of child (n=366)		
Yes	75	20.5
No	291	79.5

The above table shows that 81.4 % of mothers had initiated breast feeding within one hour of childbirth, followed by 18.6% of the mothers had initiated to feed the breast milk after one hour of childbirth. Out of the 366 mothers, 97 % mothers had fed colostrum after childbirth whereas 3% of mothers didn't feed colostrum to their child after birth and 4.4% of mother had fed extra food item (such as honey) instead of breast milk before initiating to feed the breast milk. There were 225 children aged between 0 to 23 months among 366 under five children. Out of 225 children, 12.4 % of the children were breast fed <10 times within 24 hours but most of the mothers i.e. 87.6 % of the mothers fed breast milk > 10 times within 24 hours.

There were 141 children with the age of 24 to 59 months. Out of 141 children, 97.2% of the children were breast fed until the age of ≥ 24 months, whereas the least percentage i.e. 2.8% of children were not breast fed up to the age of 24 months. Out of 366 children, 12.8% of children had not started the weaning, whereas 87.2% of the children had started weaning till the date of data collection. There were 9.7% children who were introduced weaning before the age of below 6 months whereas 90.3% of children were introduced weaning from the age of six months. Among the total 366 respondents, 79.2% of children had introduced diary product (cow/buffalo/goat milk) and the remaining children had not introduced diary product and 20.5% had used bottle feeding and the remaining 79.5% of the children hadn't used bottle feeding.

Food recall within 24 hours

Twenty-four hours food recall of 366 under five children was recorded during the time of study. The food items were divided into four groups such as cereals (rice, bread, porridge, potato etc.), Legumes (beans, soybeans, etc.), green leafy vegetables (Spinach, cabbages, etc.), fruits (mango, papaya, locally available fruits, etc.), and milk or milk products (ghee, eggs, meat, fish, etc.). The frequency and type of food given to the child were recorded. According to findings of 24 hours food recall, 64.8% of the children were fed cereals with the frequency of 2 - 3 times within 24 hours, followed by 21.9% of the children were fed with the frequency of ≥ 4 in times a day, and only 0.5% of the children were fed only one time in a day. There were 66.9 % of the respondents who used legumes to feed their children 2-3 times a day, followed by

20.2% of child were fed legumes one time in a day. None of the respondents fed legumes to their child ≥ 4 times in a day. Regarding the green leafy vegetable, 41.5 % of children were fed 2-3 times in a day and 45.6% of the child were fed legumes one time in a day and 87.2% of the children were fed fruits items only one time in a day.

Table 17 Food recall within 24 hours (n=319)

Food items	Child feeding within 24 hours					
	1 time		2 - 3 times		≥4 times	
	Frequency	%	Frequency	%	Frequency	%
Cereals	2	.5	237	64.8	80	21.9
Legumes	74	20.2	245	66.9	0	0
Green leafy vegetable	167	45.6	152	41.5	0	0
Fruits	319	87.2	0	0	0	0
Milk or meat products	167	45.6	152	41.5	0	0

Health Services Utilization

In this study, the health service utilization included three types of services such as routine immunization, routine growth monitoring and treatment of common illness of the under-five children. Child health cards were observed and kept record of the immunization & growth monitoring status of the children and mothers were asked about common health problems of the children within two weeks of study period. Out of the 366 children, 284 child health cards were observed during the time of data collection and rest of the 82 child health cards were not observed during the time of data collection.

Immunization

The immunization status was observed from all 284 child health cards with respect to age of child and immunization schedule to identify the status of immunization. There were 284 (100%) of the children completed the vaccination of DPT, HIB, HeP-B I, II., III and OPV I, II. and III dose of vaccine with respect to age

of child and immunization schedule of study area. Whereas 15 .9 % of Children had not completed the vaccination of Measles & Rubella (MR) II and 14.2 % of children did not complete the Japanese Encephalitis (JE) Vaccination.

Table 18 Immunization status of under-five children (284 Child health cards observed)

Vaccine	Complete		Incomplete (Dropout)	
	(N)	%	(N)	%
BCG	284	100.0	0	0.0
DPT, HIB, HeP-B - Ist	280	100.0	0	0.0
DPT, HIB, HeP-B -IInd	275	100.0	0	0.0
DPT, HIB, HeP-B -IIIrd	267	100.0	0	0.0
OPV-Ist	280	100.0	0	0.0
OPV-IInd	275	100.0	0	0.0
OPV-IIIrd	268	100.0	0	0.0
PCV- Ist	276	98.9	3	1.1
PCV- IInd	272	98.9	3	1.1
PCV- III	204	96.2	8	3.8
MR -I	203	95.8	9	4.2
MR -II	159	84.1	30	15.9
JE	163	85.8	27	14.2

Note*: (Based on record of child health cards, age of child and immunization schedule)*

Routine Growth Monitoring

The child health card was also used for routine growth monitoring and providing necessary health education to the targeted people through government policy. It also helped to identify the nutritional status as well as health services utilization of under-five children. Out of the 284 children, only 34.2% of children had their weight measured in routine growth monitoring. Whereas the weight of

remaining 45.4 % of the children were not measured. Out of the 277 children who completed 6 months of age, 92.2% of children took Vitamin “A” capsule and out of 250 eligible children who completed 12 months of age, 82.5% of children took albendazole tablet in the last campaign of mass distribution of Vitamin “A” capsule and Albendazole (19 & 20 April 2019).

Table 19 Status of routine growth monitoring, vitamin A capsule and Albendazole intake

Variables	Frequency	Percentage (%)
Growth monitoring status (n=284)		
Yes	124	43.7
No	160	56.3
Vitamin “A” capsule intake (n-=277)		
Yes	269	92.2
No	8	2.7
Albendazole tablet intake (n=250)		
Yes	240	82.5
No	10	3.4

Treatment Practice for Child getting sick

Among the total 366 children, only 83 (22.3%) got sick within two weeks of the study period. Some of the respondents had multiple issues with their wellbeing. Out of 22.3% of children, the main problem was fever, followed by 27% diarrhoea, 20% pneumonia, 14% oral problems, and 13% local infections. All mothers had been asked for the presence or absence of acute respiratory signs and symptoms. ARI sign and symptoms were fast breathing than usual, chest indrawing, running nose, and cough related question were asked to mother for the perception of presence or absence of acute respiratory symptoms. Cough was the most common symptom perceived by mothers followed by 22.8% running nose, 20.8% of fast breathing, 12 % felt chest indrawing of their children

Table 20 Status of health problems within two weeks of study period

Variables	Frequency	Percentage (%)
Child sickness within two weeks		
Yes	83	22.7
No	283	77.3
Types of health problems within two weeks		
Diarrhoea	27	33.3%
Pneumonia	20	24.7%
Fever	30	37.0%
Local infections	13	16.0%
Oral infections	14	17.3%
ARI symptoms of children perceived by mothers		
Fast breathing	22	20.8
Chest indrawing	12	11.3
Running Nose	24	22.6
Cough	92	86.8

Treatment practice for child getting sick

There were 71 (89.9%) of children taken to health institution for the treatment, followed by 38 (48.1%) to FCHVs, 36 (45.6%) of mother used homemade medicines for the treatment of their child, 31(39.2%) of mother still went to witch doctors for the treatment of child and the least percentage 5(6.3) of mother went to traditional healer for the treatment of their child.

TABLE 21 TREATMENT PRACTICE CHILD GETTING SICK WITHIN TWO WEEK OF STUDY PERIOD

Variables	Frequency (N)	Percentage (%)
Hospital / Health post	71	89.9%
Female community health Volunteers (FCHVs)	38	48.1%
Traditional healer	5	6.3%
Witch doctors	31	39.2%
Homemade treatment	36	45.6%

 # (Multiple response question was applied)

Sanitation Related Factors

Regarding the sanitation related factors there were majority of the respondents i.e.275 (42.2) who used boiled water for drinking purpose in household level followed by 308 (47.2%) out of 366 respondents who used raw water for drinking purpose, 65 (10 %) of the respondent used filtered water for drinking purpose, and the least number i.e. 4 (0.65) percentage used chlorinated water for drinking purpose. Among the total 366 respondents, 339(92.6 %) of the respondents had disposed their child excreta in toilet, 23(6.3%) had disposed in river and only 4 (1.1%) of the respondents had disposed their child excreta in open field.

Table 22 Status of drinking water and child excreta disposal

Variables	Frequency	Percentage (%)
water for drinking purpose		
Boiled water	275	42.2
Filtered water	65	10.0
Chlorinated water	4	0.6
Use raw water	308	47.2
Place of Child excreta disposal		
Toilet	339	92.6
Open field	4	1.1
River	23	6.3

 # (Multiple response question was applied)

Prevalence of Underweight of Under-five Children

The data were analyzed in WHO Anthro software (version 3.3.2, January 2011) with 95% confidence interval level. The data was analyzed by the software after entering the data of age (birthday), sex, date of anthropometric measurement position of measurement (standing or recumbent) of children. Among 366 under five children, the prevalence of undernutrition was found as 31(8.5 %) of weight for height (Wasting), 160 (43.7 %) of height for age (stunting) and 101 (27.6 %) of weight for height (underweight). No case of severe wasting was found. While severe cases of stunting and underweight were found, the higher rate of wasting (<-2SD) was found in the age group of 12 to 23 months of child's age. Among 31 wasting cases, there was higher prevalence of weight for length/height and height/length for age in the age group of 12 to 23 months and higher prevalence of weight for age in 24 to 35 months both the sexes of children.

TABLE 23Prevalence of undernutrition among under five children (n=366)

Variables	**Z score or Standard deviation (SD)**							
	Normal		Undernutrition					
	≥ -2 SD		<-3 SD		<-3 - <-2 SD		<-2 SD	
	No.	%	No.	%	No.	%	No.	%
Weight for height	335	91.5	0	0	31	8.5	31	8.5
Height for age	206	56.3	52	14.2	108	29.5	160	43.7
Weight for age	265	72.4	22	6.0	79	21.6	101	27.6

Wasting (Weight for height) <-2 SD = 31 (8.5%), Normal = 335 (91.5)
Stunting (Height for age) <-2 SD = 160 (43.5), Normal= 206 (56.3)
Underweight (Weight for age) <-2 SD = 101(27.6), Normal =265 (72.4)

Table 19 – Age -wise prevalence of Undernutrition

Table 24 Prevalence of undernutrition among under five children (n=366)

Prevalence of Wasting (Weight for Height) (n=366)

Variables	No. of Child	Normal		Undernutrition						
		≥ -2 SD		<-3SD		<-3 SD-<-2SD		<-2SD		Total %
		No.	%	No.	%	No.	%	No.	%	
0 - 5	44	43	11.7	0	0	1	0.3	1	0.3	0.3
6 -111	71	62	16.9	0	0	9	2.5	9	2.5	2.5
12 -23	109	95	26.0	0	0	14	3.8	14	3.8	3.8
24 - 35	71	69	18.9	0	0	2	0.5	2	0.5	0.5
36 - 47	46	42	11.5	0	0	4	1.1	4	1.1	1.1
48 - 59	25	24	6.6	0	0	1	0.3	1	0.3	0.3
Total	366	335	91.5	0	0	31	8.5	31	8.5	8.5

Prevalence of Stunting (Height for age) (n=366)

Variables	No. of Child	Normal		Undernutrition						
		≥ -2 SD		<-3SD		<-3 SD-<-2SD		<-2SD		Total %
		No.	%	No.	%	No.	%	No.	%	
0 - 5	44	24	6.6	7	1.9	13	3.6	20	5.5	5.5
6 -11	71	43	11.7	8	2.2	20	5.5	28	7.7	7.7
12 -23	109	66	18.0	17	4.6	26	7.1	43	11.7	11.7
24 - 35	71	44	12.0	7	1.9	20	5.5	27	7.4	7.4
36 - 47	46	21	5.7	8	2.2	17	4.6	25	6.8	6.8
48 - 59	25	8	2.2	5	1.4	12	3.3	17	4.6	4.6
Total	366	206	56.3	52	14.2	108	29.5	160	43.7	43.7

Prevalence of Underweight (Weight for age) (n=366)

Variables	No. of Child	Normal		Undernutrition						
		≥ -2 SD		<-3SD		<-3 SD-<-2SD		<-2SD		Total %
		No.	%	No.	%	No.	%	No.	%	
0 - 5	44	34	9.3	2	0.5	8	2.2	10	2.7	2.7
6 -11	71	51	13.9	5	1.4	15	4.1	20	5.5	5.5
12 -23	109	77	21.0	10	2.7	22	6.0	32	8.7	8.7
24 - 35	71	55	15.0	1	0.3	15	4.1	16	4.4	4.4
36 - 47	46	31	8.5	3	0.8	12	3.3	15	4.1	4.1
48 - 59	25	17	4.6	1	0.3	7	1.9	8	2.2	2.2
Total	366	265	72.4	22	6.0	79	21.6	101	27.6	27.6

Sex-wise prevalence of undernutrition

TABLE 25 Sex-wise prevalence of Undernutrition (n=366)

Prevalence of Wasting (Weight for Height)

Variables	No. of Children	Normal		Undernutrition						
		≥ -2 SD		<-3SD		<-3 SD-<-2SD		<-2SD		Total %
		No.	%	No.	%	No.	%	No.	%	
Female	184	171	92.9	0	0	13	3.6	13	3.55	3.6
Male	182	164	90.1	0	0	18	4.9	18	4.92	4.9
Total	366	335	91.5	0	0	31	8.5	31	8.47	8.5

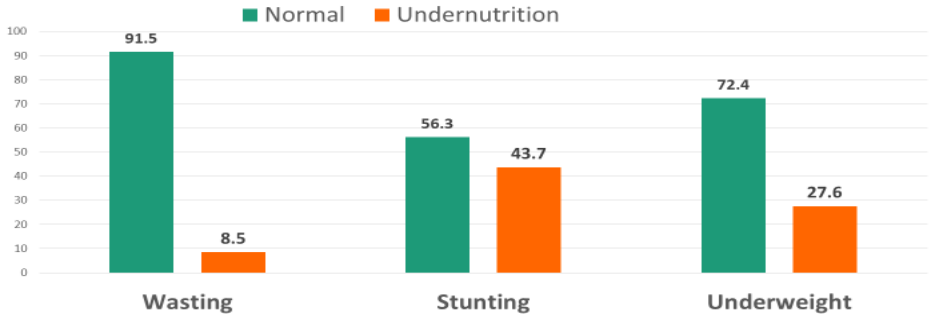
Prevalence of Stunting (Height for age) (n=366)

Variables	No. of Children	Normal		Undernutrition						
		≥ -2 SD		<-3SD		<-3SD-<2SD		<-2SD		Total %
		No.	%	No.	%	No.	%	No.	%	
Female	184	114	62.0	28	7.7	42	11.5	70	19.1	19.1
Male	182	92	50.5	24	6.6	66	18.0	90	24.6	24.6
Total	366	206	56.3	52	14.2	108	29.5	160	43.7	43.7

Prevalence of Underweight (Weight for age) (n=366)

Variables	No. of Children	Normal		Undernutrition						
		≥ -2 SD		<-3SD		<-3SD-< 2SD		<-2SD		Total %
		No.	%	No.	%	No.	%	No.	%	
Female	184	136	73.9	8	2.2	40	10.9	48	13.1	13.1
Male	182	129	70.9	14	3.8	39	10.7	53	14.5	14.5
Total	366	265	72.4	22	6.0	79	21.6	101	27.6	27.6

Prevalence of Undernutrition among <5 Children



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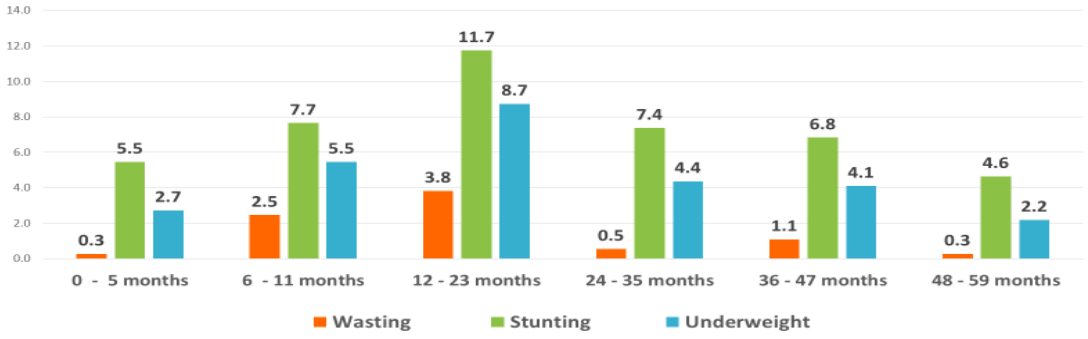
Age wise prevalence of Undernutrition nutrition



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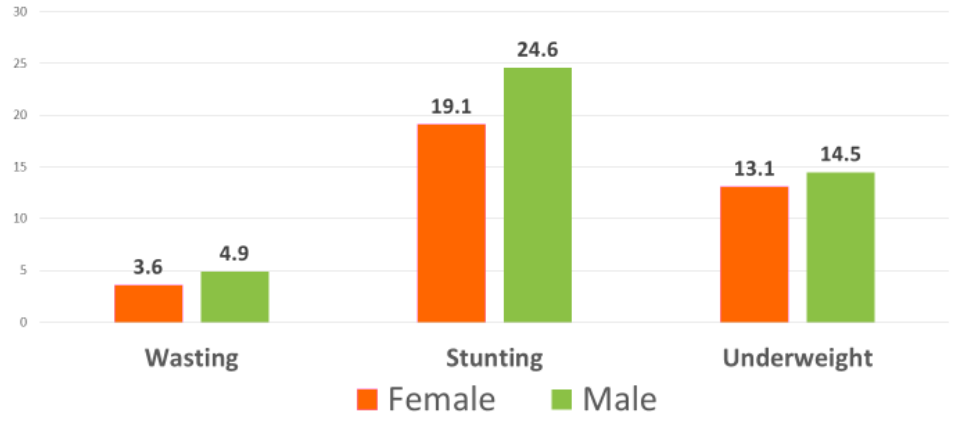
Sex-wise Prevalence of Undernutrition



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Part II - Bivariate analysis

Association between Socio-demographic factors and undernutrition

Age , Sex and number of children

Table 26 Chi-Square test for the Association between age, sex and number children and wasting, stunting and underweight of Children

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Age of child	0 - 5	43	1	#0.069	24	20	0.064	34	10	0.786
	6 -11	62	9		43	28		51	20	
	12 - 23	95	14		66	43		77	32	
	24 - 35	69	2		44	27		55	16	
	36 - 47	42	4		21	25		31	15	
	48 - 59	24	1		8	17		17	8	
Sex of Child	Female	171	13	0.332	114	70	0.028*	136	48	0.516
	Male	164	18		92	90		129	53	
Number of children in a family	one	267	23	0.469	155	135	0.033*	206	84	0.252
	two	68	8		51	25		59	17	

Fisher's Exact Test

*P <0.05

The above table shows that sex of child and number of children were significantly associated with stunting with the p value of <0.05. While the age of children was not significantly associated with all three form of undernutrition (wasting, stunting and underweight) similarly, there was no statistically significant association between the age, number of children and wasting and underweight.

Association between age, education, age at first delivery and age at youngest childbirth of mothers and Undernutrition (wasting, stunting and underweight) of children.

Table 27 Chi-Square test for association between age, education, age at first delivery & age at youngest childbirth of mothers and undernutrition

Variables	Category	wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P- value	No	Yes	P-value
Age of Mother	< 20	28	1	#.395	14	15	.042*	20	9	.241
	21- 35	281	26		181	126		227	80	
	> 35	26	4		11	19		18	12	
Educational status of mother	Illiterate	27	3	.786	12	18	.168	18	12	.350
	Literate	105	7		61	51		79	33	
	Primary School	103	11		71	43		86	28	
	Secondary	100	10		62	48		82	28	
Family size	≤ 5 members	240	25	.283	146	119	.457	186	79	.125
	≥ 6 members	95	6		60	41		79	22	
Occupation of mother	Agriculture	314	28	#.265	192	150	#.182	248	94	#.058
	Public Servant	9	1		6	4		8	2	
	Business	10	1		8	3		9	2	
	Daily wage	2	1		0	3		0	3	
Family income	<1.90USD/ head/day	202	156	#1.000	202	156	#.733	258	100	#.453
	≥ 1.90USD/ head/day	4	4		4	4		7	1	

#Fisher's Exact Test

**P <0.05*

Regarding the association between age of mother and stunting was significantly associated with the P-value of 0.042, and rest of the dependent variables like wasting, and underweight were insignificant association with respect to age of mothers. Education and income had also insignificant relationship with wasting, stunting and underweight having P-value of <0.05. while educational status of mothers, family size, Occupation of mothers and income of family member, was insignificant association with wasting, stunting and underweight.

Association between Mothers related factors and undernutrition

Birth related factors

Table 28 Chi-Square test for association between age of mother at first delivery, age at youngest childbirth & age gap, BMI of mother and undernutrition

Variables	Category	wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Age of mother at first delivery (n=366)	< 20 yrs	98	13	.142	65	46	.563	80	31	.925
	20 - 35 yrs	237	18		141	114		185	70	
Age of mother at youngest childbirth (n=366)	< 20 yrs	33	4	.271	17	20	.026*	25	12	0.098
	20 - 35 yrs	286	24		183	127		230	80	
	>35 yrs.	16	3		6	13		10	9	
Birth Spacing (n=232)	<2 yrs.	26	5	#.187	18	13	.863	22	9	.710
	≥ 2 yrs.	184	17		120	81		149	52	

 # Fisher's Exact Test

**P<0.05*

From the table above it can be seen that there was significant association between age of mother at youngest childbirth and stunting with (P = 0.026) and rest of independent variables as age of mother at first delivery, birth spacing were not associated with wasting, stunting and underweight. Similarly, there was no significant association between age of mother at youngest childbirth and wasting & underweight with p-value >0.05.

Maternal health services utilization by mothers

Table 29 Chi-Square test for association between ANC, PNC service utilization and Undernutrition (n=366)

Variables	Category	wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Number of ANC services taken	< 4 times	20	1	#1.000	11	10	.710	16	5	.689
	≥ 4 times	315	30		195	150		249	96	
Iron & folate intake during last pregnancy	Yes	332	31	#1.000	205	158	#.583	263	100	#1.000
	No	3	0		1	2		2	1	
Albendazole tablet intake during last Pregnancy	Yes	321	30	#1.000	197	154	#.767	252	99	#.253
	No	14	1		9	6		13	2	
Postnatal check-up during last delivery	Yes	289	26	#.785	182	133	.152	235	80	.019*
	No	46	5		24	27		30	21	
Iron & folate intake during last postpartum period	Yes	329	31	#1.000	203	157	#1.000	261	99	#.669
	No	6	0		3	3		4	2	
Vitamin “A” capsule intake during last postpartum period	Yes	329	31	#1.000	204	156	#.410	263	97	#.052
	No	6	0		2	4		2	4	
Use of contraceptives by couple	Yes	238	20	.446	155	103	.024*	198	60	.004*
	No	97	11		51	57		67	41	

Fisher's Exact Test

*P<0.05

Regarding the association between maternal health services utilization, there were no significant associations between ANC check-up, iron folate, albendazole

tablet intake during pregnancy, intake of iron folate & vitamin “A” capsule during postpartum period and all three form of undernutrition (wasting, stunting and underweight) of children. Similarly, there was no significant association between postnatal check-up and wasting and stunting of children. While PNC checkup was significantly associated with underweight with (P = 0.019) and contraceptive use was also significantly associated with stunting and underweight of child with (p = 0.024) and (p = 0.004) respectively.

Health Risk Behaviors

It had three independent variables such as hand washing practice, consumption of tobacco or tobacco product and alcohol

Hand Washing

Table 30 Chi-Square test for association between hand washing practice and undernutrition

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Hand washing before cooking	Yes	327	31	#1.000	203	155	#.304	260	98	#.690
	No	8	0		3	5		5	3	
Hand washing after touching animals or animal waste	Yes	327	31	#1.000	203	155	#.304	260	98	#.690
	No	8	0		3	5		5	3	
Hand washing before food handling	Yes	326	31	#1.000	203	154	#.187	259	98	#.711
	No	9	0		3	6		6	3	
Hand washing after handling rubbish	Yes	333	31	#1.000	206	158	#.190	265	99	#.076
	No	2	0		0	2		0	2	
Hand washing before feeding the child	Yes	331	30	#.359	206	155	#.015*	264	97	#.022*
	No	4	1		0	5		1	4	
Hand washing after disposal of excreta or using toilet	Yes	334	31	#1.000	206	159	#.437	265	100	#.276
	No	1	0		0	1		0	1	

 # Fisher's Exact Test

**P<0.05*

Handwashing before feeding the child were significantly associated with stunting (p= 0.015) and underweight (p=0.022) while insignificant association with wasting. Whereas rest of the other independent variables like handwashing before cooking, washing hand after touching animal or animal waste, hand washing before handling food, hand washing after handling rubbish, and hand washing after disposal of excreta or using toilet were not significantly associated with all three form of undernutrition (wasting, stunting and underweight)

Consumption of Tobacco or tobacco Product and Alcohol

Table 31 Chi-Square test for association between consumption of tobacco or tobacco product and alcohol and undernutrition

Variables	Category	wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Consumption of tobacco or tobacco products during last pregnancy	Yes	32	5	#.223	18	19	.383	22	15	.063
	No	303	26		188	141		243	86	
Consumption of alcohol during last pregnancy by mother	Yes	125	8	.203	80	53	.260	106	27	.018*
	No	210	23		126	107		159	74	

Fisher's Exact Test

*P<0.05

Regarding the health risk behaviors of the mothers, there was no significant association between tobacco and tobacco product consumption during last pregnancy

and undernutrition (wasting, stunting and underweight) with p values of 0.223, 0.383 and 0.063 respectively. Similarly, there was no significant association between consumption of alcohol during last pregnancy and wasting and stunting, but the significant association was found with underweight with (P=0.018).

Association between Child related factors and undernutrition

Birthplace and weight of child at birth

Table 32 Association between Birthplace and weight of child at birth and undernutrition

Variables	Category	wasting			Stunting			Underweight		
		No	Yes	P value	No	Yes	P value	No	Yes	P value
Place of last delivery	Home	90	7	0.605	49	48	.182	67	30	.392
	Health Institution	245	24		157	112		198	71	
Weight of child at birth	<2.5 kg	14	1	#1.000	7	8	.344	12	3	#.766
	≥2.5 kg	231	23		150	104		186	68	

 # Fisher's Exact Test

There was no statistically significant association between birthplace and birth weight which have the P value of >0.05.

Table 33 Chi-Square test for introduction weaning, dairy product, age at introduction of dairy product

Variables	Category	wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Initiation of breast feeding	within one hour	272	26	.714	168	130	.941	216	82	.944
	after one hours	63	5		38	30		49	19	
Colostrum feeding to child immediately after birth	Yes	326	29	#.237	200	155	#1.000	258	97	#.504
	No	9	2		6	5		7	4	
Extra food item fed immediately after childbirth before breast feeding	Yes	14	2	#.635	13	3	.040*	13	3	#.572
	No	321	29		193	157		252	98	
Frequency of breast feeding within 24 hours	< 10 times	25	3	#1.000	17	11	.814	20	8	.898
	≥10 times	177	20		115	82		143	54	
Duration of breast feeding	< 24 months	4	0	#1.000	2	2	#1.000	2	2	#.306
	> 24 months	129	8		72	65		100	37	

 # Fisher's Exact Test

**P <0.05*

Feeding Practice to child

T able 21 Chi-Square test for association between feeding practice and undernutrition

Extra food item fed immediately after childbirth was associated with stunting of child with the significant (p=0.040). While there were no significant associations of wasting and underweight with extra food item fed immediately after childbirth. The remaining independent variables like initiation of breast feeding, colostrum feeding to child immediately after birth, frequency of breast feeding within 24 hours, and duration of breast feeding were not significantly associated with wasting, stunting and underweight of under-five children.

TABLE 34 chi-square test for introduction weaning, dairy product, age at introduction of dairy product

Variables	Category	wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Introduction of weaning to child	Yes	289	30	#.155	182	137	.440	232	87	.719
	No	46	1		24	23		33	14	
Age at weaning of child	< 6 months	28	3	#1.000	19	12	.627	21	10	.504
	≥ 6 months	262	27		164	125		212	77	
Bottle feeding practice to child	Yes	70	5	.529	49	26	.076	61	14	.052
	No	265	26		157	134		204	87	
Introduction of diary product to child	Yes	265	25	.840	169	121	.133	216	74	.082
	No	70	6		37	39		49	27	
Age at introduction of dairy product	Before 6 months	42	7	#.157	30	19	.662	34	15	.361
	After six months	224	18		140	102		183	59	

 # Fisher's Exact Test

**P <0.05*

Regarding feeding practice to child, there were not statically significant association between introduction of weaning, age at weaning, bottle feeding practice,

Introduction of diary product, age at introduction of dairy product to the child and wasting, stunting and underweight (P= >0.05).

Table 35 Chi-square test for Association between Immunization and Undernutrition

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Having child health card	Yes	268	16	.000*	164	120	0.294	213	71	.039*
	No	67	15		42	40		52	30	
Routine growth monitoring	Yes	119	6	.609	79	46	0.058	99	26	.167
	No	155	11		86	80		116	50	

**P <0.05*

Regarding the child health cards with their mother and routine growth monitoring, there were significant association between having child cards to their mothers and wasting and underweight (P=0.000 and p= 0.039). While there were not significant association between routine growth monitoring and wasting, stunting and underweight.

Association between Immunization and Undernutrition

Immunization

Table 36 Chi square test for the Association between Immunization and Underweight

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
BCG	Complete	268	16	NA	163	121	NA	212	72	NA
DPT, HIB, HeP-B - IIIrd	Complete	251	16	NA	160	107	NA	202	65	NA
OPV- III rd	Complete	252	16	NA	160	108	NA	202	66	NA
PCV- III rd	Complete	191	13	#0.427	119	85	#.723	156	48	#.103
	Incomplete	7	1		4	4		4	4	
MR - I st	Complete	191	12	#.441	120	83	#.170	156	47	#.042*
	Incomplete	8	1		3	6		4	5	
MR - II nd	Complete	148	11	#1.000	96	63	.016*	120	39	.313
	Incomplete	28	2		11	19		20	10	
JE	Complete	152	11	#1.000	93	70	.614	121	42	.986
	Incomplete	25	2		14	13		20	7	

NA= Not Applicable

#Fisher's Extract Test

**P<0.05*

Regarding the immunization, Completion of first dose of measles and rubella (MR) vaccination was significantly associated to underweight of child with the significant p value of 0.042. and completion of second dose of MR vaccination was significantly associated to stunting but it was not significantly associated with wasting and underweight. Such variables like BCG, DPT, HIB, HeP-B – IIIrd, OPV- III rd were not applicable for the chi-square test due 100% coverage of immunization of them. There were not significantly associated PCV- III rd and JE vaccination with wasting, stunting and underweight.

TABLE 37 Chi square test for the Association between child getting sick within two weeks of study period and Undernutrition

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Child getting sick within past two weeks	Yes	73	9	.355	40	42	.120	52	30	.039*
	No	262	22		166	118		213	71	
Sick due to diarrhoea	Yes	23	4	#.436	11	16	.307	13	14	.044*
	No	50	5		29	26		39	16	
Sick due to pneumonia	Yes	18	2	#1.000	8	12	.445	11	9	.369
	No	55	7		32	30		41	21	
Sick due to fever	Yes	25	5	#.276	16	14	.531	21	9	.347
	No	48	4		24	28		31	21	
Sick due to measles	No	73	9	NA	40	42	NA	52	30	NA
Sick due to Malaria	No	73	9	NA	40	42	NA	52	30	NA
Sick due to local infection	Yes	11	2	#.629	6	7	.836	8	5	#1.000
	No	62	7		34	35		44	25	
Sick due to oral infection	Yes	14	0	#.346	8	6	.492	8	6	.593
	No	59	9		32	36		44	24	
Sick due to other causes (Ear infection)	Yes	1	0	#1.000	1	0	#.488	1	0	#1.000
	No	72	9		39	42		51	30	

NA= Not Applicable

#Fisher's Extract Test

** P<0.05*

The above table shows that children getting sick within two weeks was significantly associated with underweight with the p Value of 0.039 and child getting

sick with diarrhoea was significantly associated with undernutrition (p=0.44). Children getting sick within two weeks of study period due to Pneumonia, Fever, local infection, oral infection, other causes (ear infection) was not significantly associated with wasting, stunting and underweight. Sickness due to measles and Malaria were not applicable for the chi square test.

Table 38 Chi-square test for the association between Treatment practice during child getting sick and undernutrition

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Health institution	Yes	63	8	#1.000	33	38	.289	45	26	1.000
	No	10	1		7	4		7	4	
Female community Volunteers (FCHVs)	Yes	34	4	#1.000	19	19	1.000	21	17	.154
	No	39	5		21	23		31	13	
Traditional healer	Yes	4	1	#.450	0	5	#.055	3	2	#.000
	No	69	8		40	37		49	28	
Witch doctors	Yes	27	4	#.724	11	20	.060	14	17	.007*
	No	46	5		29	22		38	13	
Homemade treatment	Yes	31	5	#.496	19	17	.522	20	16	.191
	No	42	4		21	25		32	14	

#Fisher's Extract Test

** P<0.05*

Regarding the association between treatment practice during child getting sick within two weeks of study period and wasting, stunting and underweight, there were no significant association between treatment in health institution, female community health volunteers (FCHVs), homemade treatment and traditional healer and all three form of undernutrition (wasting, stunting and underweight). Whereas, the children

were treatment by witch doctor was significantly associated with underweight with the P value of 0.007, but it was not associated with wasting and stunting with the non-significant P value <0.05. While it was not associated with wasting and stunting. Witch doctors was also significantly associated with stunting and underweight with the p value of 0.008

Drinking Water for household purpose

Table 39 Chi-square test for the association between Treatment practice during child getting sick and undernutrition

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Boiled water	Yes	250	25	.458	148	127	.098	194	81	.167
	No	85	6		58	33		71	20	
Filtered water	Yes	60	5	.804	37	28	.909	48	17	.774
	No	275	26		169	132		217	84	
Chlorinated water	Yes	4	0	#1.000	1	3	#.322	2	2	#.306
	No	331	31		205	157		263	99	
Raw water	Yes	282	26	#1.000	171	137	.497	225	83	.523
	No	53	5		35	23		40	18	

#Fisher's Extract Test

There were no significant association between undernutrition and the various forms of water like boiling, filtered, chlorinated and raw water that was used for drinking purpose in household level.

Practice of Excreta disposal

Table 40 chi-square test for association between place of child excreta disposal and undernutrition

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Place of child's excreta disposal	Toilet	308	31	#.468	194	145	#.419	245	94	#.670
	Open field	4	0		2	2		4	0	
	River	23	0		10	13		16	7	

#Fisher's Extract Test

Regarding the association between place of child's excreta disposal and undernutrition, there were no significant association between them.

Mother perceived ARI to their Child within 2 weeks

Table 41 Chi-square test for the association between Acute respiratory infection (ARI) in child and undernutrition

Variables	Category	Wasting			Stunting			Underweight		
		No	Yes	P-value	No	Yes	P-value	No	Yes	P-value
Fast breathing	Yes	20	2	#1.000	7	15	.017*	12	10	.053
	No	315	29		199	145		253	91	
Chest indrawing	Yes	11	1	#1.000	4	8	.103	5	7	.023*
	No	324	30		202	152		260	94	
Running nose	Yes	20	4	#.134	15	9	.525	18	6	.769
	No	315	27		191	151		247	95	
Cough	Yes	85	7	.732	45	47	.099	59	33	.040*
	No	250	24		161	113		206	68	

#Fisher's Extract Test

** P<0.05*

Regarding the perception by mother to their child getting acute respiratory infection (ARI) within two weeks during the study period, Fast breathing, chest indrawing, running nose and cough are the sign and symptoms of the acute respiratory infection in child. Fast, breathing, chest indrawing, and cough were significantly associated with underweight with the P value <0.05. While running nose was not significantly associated with all three form of undernutrition) wasting, stunting and underweight). Similarly, chest indrawing, running nose and cough was not significantly associated with wasting and stunting.

Chapter – V
DISCUSSION, CONCLUSION AND RECOMMENDATION

This research study examined various determinants associated with undernutrition among under-five indigenous Thami population by using community based quantitative cross-sectional study during August to September 2019.

The findings of the primary research are discussed under the following parts.

- Identification of prevalence of undernutrition (wasting, stunting and underweight)
- Association between socio-demographic and stunting, wasting and underweight among study population
- Association between mother related factors and stunting, wasting and underweight among study population
- Association between child-related factors and stunting, wasting and underweight among study population

Discussion

Prevalence of undernutrition (Wasting, stunting and Underweight)

This study was conducted in marginalized indigenous Thami population of Dolakha District Nepal. The prevalence of the undernutrition was identified as wasting (weight for height /length <-2 SD) was 31(8.5%), stunting (height for age <-2 SD) was 160 (43.7%) and 101 (27.6%) was underweight. Stunting and underweight had higher prevalence rate while wasting had 1.5 % lower than the national level whereas the prevalence rate of wasting was 10%, stunting was 36% and underweight was 27 % (86) and also was higher than developing countries with 25% of stunting, 8.9% of wasting, according to NDHS survey 2016. The prevalence of underweight (27.6) of children was less than 37% of a similar study carried out in 2017 in eastern Nepal(87) Among the total undernutrition of children, 14.2% children had severe stunting and 6% were severely underweight, which is also higher than NDHS Survey 2016. Severe wasting cases were not identified in the study. According to the WHO-UNICEF, 2018 new threshold value of malnutrition, there was very high prevalence

of stunting which was ≥ 30% prevalence and medium prevalence was found with the reference of new threshold of WHO criteria of wasting, as shown in the table below. The prevalence of the study area lied between 5%-<10%, which is called medium prevalence of wasting.

Table 42 Global status of malnutrition

Distribution	**Stunting**	**Wasting**	**Undernutrition**	**Reference**
Global	(150.8 million) 22%	(50.5 million) 7.5%	20 million LBW	World Health Statistics 2018
Southern Asia	58.7 million 33.3%	(35million) 15.3%		World Health Statistics 2018
Nepal	36% Country Level (40% in Rural)	10%	27%	NDHS Survey 2016
Study Area	43.70%	8.50%	27.6	

Prevalence Cut-off value for public health significance (WHO)

Level	Stunting	Wasting	Underweight
Very low	<2.5	<2.5	
Low	2.5 - <10	2.5 - <5	<10
Medium	10 - <20	5 - <10	20 to 29 %
High	<20 - <30	10 - <15	20 -29
Very High	≥30	≥15	≥30
Prevalence in study area	**43.7%**	**8.5%**	**27.6%**
Classification & Result	**Very High Prevalence**	**Medium Prevalence**	**High Prevalence**

42

Association between sociodemographic factors and undernutrition (Wasting, stunting and Underweight)

Socio-demographic characteristics is the most influential factors which plays an important role to health seeking behavior of the population. In this study, the socio-demographic factors of Thami population of Dolakha district, Nepal included age and sex of child, age of mother(biological), education of mother, family size, occupation of mother and family income. There were 366 under 5 years children in this study and their median age was 19 months, minimum age was 1 months and the maximum age was 58 months. Among this population, all three forms of undernutrition(wasting, stunting and underweight) was the highest between the age of 12-23 months. Age wise nutritional status such as wasting, stunting and underweight showed significantly more and at risk at second year of life may be due to a combination of interactive effects. which was also like NDHS survey 2016. While there was no statistically significant association between age of child and undernutrition. Prevalence of undernutrition are higher in male than female as for wasting 3.6% in female and 4.9 % in male, for stunting,19.1% female and 24.6% in male, for underweight, 13.1 % in female and 14.5 % in male high prevalence which is similar as the previous study conducted in Lampung, Tanahu and Gorkha district if 2017AD(31). But considering the development indicators, Dolakha lies in mountain districts of Nepal, nutritional indicators do not seem to be progressing as per development. Age of mothers had statistically significant association with stunting which is similar to the study carried out in Ghana whereas 8 times higher stunting rate in teenager mother in comparison to adult mother(36). The average family size of that community was 4.5 like mentioned in national statistics 2012. There was no significant association between education and wasting, stunting and underweight although there were 8.2 % mothers still illiterate and the other hand a study shows that higher maternal education lower the prevalence of undernutrition.(41, 88). So that education is not a single determinant to cause child undernutrition. The family size using the same cooking pot was significantly associated in this study which is also similar with the study conducted in Nepal(31). There were almost 93 % of mothers who were involved in agriculture. They spent more time in farming their field and they did not give proper time to take

care of the child. Occupation of mothers was significantly associated to underweight in this study which is also like the previous study carried out in 2018 in Ethiopia. Family income is another important factor causing undernutrition, but in this study, there was no significant relationship between income and undernutrition whereas almost 97 % family fell under the line of poverty according to recent cut-off point declared by world bank which is 1.90 USD/Per person /day

Table 43List of sociodemographic related factors significantly associated with under nutrition

Variables	P - value		
Sociodemographic Factors	**Wasting**	**Stunting**	**Underweight**
Child Sex		0.028	
Number of children in family		0.033	
Age of Mother		0.042	

From this study concluded that child sex, number of children in a family, age of mother was statistically significant association between stunting. It also found that sociodemographic factors like child sex, number of children in a family and age of mother related with stunting than wasting and underweight.

Association between Mothers related factors and undernutrition (Wasting, stunting and Underweight)

In this study, the age of mother at first childbirth and antenatal check-up was not significantly associated with undernutrition. While another study shows that the age of mothers at last delivery (most recent), use of contraceptives, and extra food feeding before breast feed after immediate childbirth were significantly associated to stunting. Similarly, postnatal check-up vitamin “A” capsule intake in postpartum period, uses of contraceptives, consumption of alcohol was significantly associated with underweight. These significant associations are like the previous study conducted in different time in different geographical territory.

Table 44 List of MOTHERS related factors significantly associated with under nutrition

Variables	P - value		
Mother related factor	**Wasting**	**Stunting**	**Underweight**
Age of mother at youngest Childbirth		0.026	
Use of Contraceptives		0.024	0.004
Postnatal Check-up			0.019
Hand washing before feeding child		0.015	0.022
Consumption alcohol during Pregnancy)			0.018

In this study, age of mother at youngest childbirth, use of contraceptive, hand washing before feeding the child were significantly associated with stunting whereas Contraceptive use, postnatal check-up, hand washing before feeding the child consumption of alcohol during pregnancy were statistically significant association with underweight of child . which was similar to the other study and national level surveys.

Association between Child related factors and undernutrition (Wasting, stunting and Underweight)

Regarding the child related factors and its association with undernutrition are discussed in the following independent variables. These variables are child weight at birth, breast feeding practice, complementary feeding practice, supplementary feeding practices, disease like child diarrhoea, pneumonia, health services utilization, like routine immunization routine growth monitoring and treatment of common illness.

This study shows that the birth 26.5 % of mothers delivered in out of health institution. The attained their delivery in home. Therefore, they didn't have any record of birth weight. Only 73.5 % of mothers told the weight of child at birth. There was 15 (5.6%) of the child below the cut-off point <2.5 Kg weight but from the chi

square test there were no significant association between birthplace and birthweight and undernutrition. Whereas the P value was >0.05. while the previous research shows that birth weight was significantly associated with under nutrition. That may be due to recall bias because some mothers were asked after 58 months of birth of child.

Table 45 List of child related factors significantly associated with under nutrition

Variables	P - value		
Sociodemographic Factors	**Wasting**	**Stunting**	**Underweight**
Extra food Item fed immediately after birth before breast feeding		0.4	
Presence of child health cards	0.00		0.039
MR Vaccine I			0.042
MR Vaccine II		0.016	
Child Getting Sick within2 weeks			0.039
Diarrhoea			0.044
Witch Doctors			0.007
ARI - Fast Breathing		0.17	
ARI- Chest Indrawing			0.023
Cough			0.040

Extra food Item fed immediately after birth before breast feeding, MR II vaccination, ARI- Fast breathing were significantly associated with stunting. Presence of child health cards, MR Vaccine I, Child Getting Sick within2 weeks, Diarrhoea. Witch doctors, Ari-chest indrawing and cough in child were statistically significant with underweight. From the above statement we can clearly say that undernutrition Is a multidisciplinary issue which is associated with sociodemographic characteristics, mothers related factors and child related factors

Conclusion

Undernutrition is still alarming issue with high prevalence rate among under-five children. Number of children in a family using same cooking pot, age of mother at last delivery, contraceptive uses, introduction of other food items to child immediately after birth was significantly associated with stunting. Similarly,

occupation of mothers, Postnatal check-up, intake of vitamin A capsule during postpartum period, uses of contraceptives, consumption of alcohol during pregnancy were significantly associated with underweight. These findings suggest that intervention on health risk behaviors, health service utilization may reduce the childhood undernutrition.

Limitation of the Study

It is a small-scale study; this study only covers the Thami ethnic group of population and who attained the health services utilization of that community. Undernutrition of children was considered as undernourished children only identifying the prevalence of stunting, underweight and wasting by using anthropometric measurement as weight, length/height. This study was not included micronutrients deficiencies (Minerals and Vitamins). Recall bias may occurred in the study regarding exclusive and complementary breast-feeding practices.similarly

Expected Benefit & Application

This study will help the researcher know the prevalence, determinants and association between undernutrition. It will also help for policy making and allocating the budget in marginalized Thami of Dolakha District. It will be used for further research literature review for further study.

Recommendation

I will recommend to take necessary action for the policy makers to reduce the allarming situation of undernutrition in Thami population of Dolakha district especially focused on stunting and underweight. There were almost 98 % of population who were below the level of poverty. I would recommend to generate the economic product through agriculture sectors. There were higher number of association of undernutrition with health services utilization. So I would like to recommend to promote public health awareness at local level and make sure every population take ownership of health in that community. This study shows that there were still 255 mothers who attained home delivery and took post partum service coverage which was quite high (90 %). Undernutrition is not ony a concern of health authorities so multiple agency need to combact with undernutrition at the same time.

Health promotion activities will reduce the problems so i would recommend the local level government to pay attention to health care services in that area.

APPENDIX III

QUESTIONNAIRE

RESEARCH TITLE:

UNDERNUTRITION AND ITS DETERMINANTS AMONG UNDER-FIVE CHILDREN OF INDIGENOUS THAMI POPULATION IN DOLAKHA DISTRICT, NEPAL

RESPONDENTS' CODE TO BE ASSIGNED BY THE INTERVIEWER:

DATE AND TIME OF INTERVIEW:

NAME OF INTERVIEWER:

NAME OF VILLAGE

A. SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. AGE OF CHILD IN MONTHS…… (DATE OF BIRTH:……DAY…..…...MONTH……YEAR)
2. SEX OF CHILD

   ☐ MALE ☐FEMALE

3. AGE OF MOTHER IN YEARS…….

4. EDUCATIONAL STATUS OF MOTHER

☐ILLITERATE ☐ LITERATE (INFORMAL EDUCATION)☐ PRIMARY SCHOOL

☐ SECONDARY ☐GRADUATE ☐POST GRADUATE

5. HOW MANY OF YOUR FAMILY MEMBERS USE THE SAME COOKING POT?

…… PEOPLE

6. HOW MANY UNDER FIVE CHILDREN DO YOU HAVE?

…… CHILDREN (IF SHE HAS ONLY ONE CHILD, GO Q. 8)

7. HOW MANY YEARS OF AGE GAP DID YOU HAVE BETWEEN THE YOUNGEST AND JUST PREVIOUS CHILD?

…… YEARS

8. OCCUPATION OF MOTHER

AGRICULTURE ☐PUBLIC SERVANT ☐BUSINESS ☐DAILY WAGE LABOR/PORTER ☐OTHERS (PLEASE SPECIFY……)

9. ANNUAL FAMILY INCOME IN NPR …….……. PER YEAR

B. MOTHER RELATED QUESTIONS (QUESTION ONLY FOR MOTHER OF UNDER-FIVE CHILDREN)

10 AT WHICH AGE DID YOU GET THE FIRST CHILD? ……...YEARS

11 AT WHICH AGE DID YOU DELIVER YOUR YOUNGEST CHILD? ……...……YEARS

12 HOW MANY TIMES DID YOU GET ANTENATAL CHECK-UP IN LAST PREGNANCY? ……...TIMES.

13 DID YOU TAKE IRON & FOLATE DURING YOUR LAST PREGNANCY?

☐YES NO DON'T KNOW

14 DID YOU TAKE ANTHELMINTIC DRUG (DEWORMING TABLET) DURING YOUR LAST PREGNANCY?

☐ YES ☐ NO ☐ DON'T KNOW

15 DID YOU SMOKE TOBACCO OR TOBACCO PRODUCTS DURING LAST PREGNANCY?

☐ YES ☐ NO

16 DID YOU CONSUME ALCOHOL DURING LAST PREGNANCY?

☐ YES ☐ NO

17 WHEN DO YOU WASH YOUR HANDS TO MAINTAIN HYGIENE?

BEFORE COOKING ☐ YES ☐ NO

AFTER TOUCHING ANIMALS OR ANIMAL WASTE ☐ YES ☐ NO

BEFORE FOOD HANDLING ☐ YES ☐ NO

AFTER HANDLING RUBBISH ☐ YES ☐ NO

BEFORE FEEDING THE CHILD ☐ YES ☐ NO

AFTER DISPOSAL OF EXCRETA OR USING TOILET ☐ YES ☐ NO

18 DID YOU GET POSTNATAL CHECK-UP DURING LAST POSTPARTUM PERIOD?

☐ YES ☐ NO ☐ DON'T KNOW

19 DID YOU TAKE IRON & FOLATE DURING THAT LAST POSTPARTUM PERIOD?

☐ YES ☐ NO ☐ DON'T KNOW

20 DID YOU TAKE VITAMIN "A" CAPSULE DURING YOUR LAST POSTPARTUM PERIOD?

☐ YES ☐ NO ☐ DON'T KNOW

21 ARE YOU PREGNANT NOW? (IF SHE HAS PREGNANT, ANTHROPOMETRIC MEASUREMENT WILL NOT APPLICABLE FOR HER HEIGHT AND WEIGHT)

☐ YES (IF YES GO TO Q 23) ☐NO

22 IF NOT, HAVE YOU BEEN USING ANY CONTRACEPTIVES?

☐ YES ☐NO

C. CHILD RELATED FACTORS INFORMATION

23 WHERE DID YOU GET YOUR LAST DELIVERY DONE?

☐ HOME ☐HEALTH INSTITUTION ☐ OTHERS (COW SHADE ETC…….)

24 WHAT WAS THE WEIGHT OF YOUR YOUNGEST CHILD AT BIRTH? ……. KILOGRAM

25 WHEN DID YOU INITIATE THE BREAST FEEDING TO YOUR YOUNGEST CHILD?

.....HOURS AFTER CHILD BIRTH

26 DID YOU FEED COLOSTRUM TO YOUR YOUNGEST CHILD'S IMMEDIATELY AFTER BIRTH?

☐ YES ☐NO ☐NOT SURE

27 DID YOU FEED ANY FOOD ITEM IMMEDIATELY AFTER CHILD BIRTH BEFORE BREAST FEEDING?

☐YES ☐NO ☐NOT SURE

28 HOW MANY TIMES DID YOU BREAST FEED YOUR CHILD WITHIN 24 HOURS? (QUESTION IS ONLY APPLICABLE IF THE CHILD'S AGE IS LESS THAN OR EQUAL 23 MONTHS)

……TIMES

29 How long did you breast feed to your youngest child? (Question is only applicable if the child's age is more or equal than 23 months)

……. months

30 When did you start the first weaning (First rice eating ceremony) process?

☐Start from …… months ☐ Not Start Yet ☐ Not sure

31 Did you use bottle feed for the child?

☐ Yes ☐No

32 When did you give cow/ buffalo/goat milk to the child?

……month

33 Food recall within 24 hours of child in (times)

Food recall within 24 hours of child	Times
Cereals (rice, bread, porridge Potato, etc.)	……. (times)
Legumes (Bean, Soybeans, etc.)	……. (times)
Green leafy Vegetable (Spanish, cabbages etc.)	……. (times)
Fruits (Mango, Papaya, locally available fruits etc.)	……. (times)
Milk or Meat Products (Ghee Eggs, Meat, fish etc.	……. (times)

34 Do you have Child Health Card?

☐YES NO (IF NO GO TO Q. 37)

35. IF YES RECORD THE IMMUNIZATION DATA ACCORDING TO CHILD HEALTH CARD

Vaccine Name	Recommended Schedule	Dose of Vaccine Received and Date		
		1	2	3
BCG	At birth	D D / M M /YR		
DPT/HIB/HeP-B	6, 10 and 14 weeks	D D / M M /YR	D D / M M /YR	D D / M M /YR
OPV	6, 10 and 14 weeks	D D / M M /YR	D D / M M /YR	D D / M M /YR
PCV	6, 1o weeks and 9 months	D D / M M /YR	D D / M M /YR	D D / M M /YR
IPV	14 weeks	D D / M M /YR		
MR	9 and 15 months	D D / M M /YR	D D / M M /YR	
JE	12 months	D D / M M /YR		

36 PLEASE TICK (√) IN THE APPROPRIATE BOX AS SAME AS GROWTH MONITORING OF CHILD HEALTH CARD.

Sex	Indicator	Child age in month (1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59)
Female	Green	
	Yellow	
	Red	
Male	Green	
	Yellow	
	Red	

37 DID YOUR CHILDREN TAKE VITAMIN "A" CAPSULE IN THE LAST CAMPAIGN?

☐ YES NO NOT ☐JRE

38 DID YOUR CHILDREN TAKE DEWORMING (ALBEDAZOLE) TABLET CAPSULE IN LAST CAMPAIGN?

□YES NO□ NOT □URE

39 DURING THE PAST TWO WEEKS DID YOUR YOUNGEST CHILD GET SICK?

□YES NO□(IF NO GO TO Q. 42)

40 IF YES, WHAT WAS THE HEALTH PROBLEM DID YOUR CHILD GET? (MULTIPLE RESPONSE)

DIARRHOEA □YES □NO

PNEUMONIA □YES □NO

FEVER □YES NO□

MEASLES □YES NO

MALARIA □YES □NO

LOCAL INFECTION □ YES □NO

ORAL INFECTION □ YES □NO

OTHERS □YES NO (IF YES PLEASE SPECIFY……....)

41 WHERE DID YOU GO TO TREAT THE CHILD GOT SICK?

HEALTH POST/HOSPITAL □ES NO

FEMALE COMMUNITY VOLUNTEERS (FCHV)□ YES □ NO

TRADITIONAL HEALER □ES NO

WITCH DOCTORS YES NO□

HOMEMADE TREATMENT □ES NO

42 WHAT KIND OF DRINKING WATER USING IN YOUR HOUSE?

BOIL WATER □YES NO

FILTERED WATER □ YES □NO

CHLORINATED □ YES □NO

RAW WATER ☐YES NO

43 WHERE DO YOU DISPOSE YOUR CHILD'S EXCRETA(STOOL)?

☐TOILET ☐ OPEN ☐ELD ☐ RIVER OTHERS (PLEASE SPECIFY……)

44 DURING THE PAST TWO WEEKS DID YOU PERCEIVE YOUR YOUNGEST CHILD HAVE ANY SIGN AND SYMPTOMS OF ACUTE RESPIRATORY INFECTION?

FAST BREATHING (FAST THAN USUAL) ☐ YES ☐ NO

CHEST IN-DRAWING ☐ES N☐

RUNNING NOSE Y☐S NO☐

COUGH YES☐ NO ☐

45 ANTHROPOMETRIC MEASUREMENT (ONLY ALLOWED TO DO RESEARCHER AND ASSISTANT RESEARCHER)

MEASUREMENTS	MOTHER AND CHILD	MOTHER	CHILD	REMARKS
WEIGHT IN KILOGRAMS (KG.)				
HEIGHT IN CENTIMETER (CM)				
LENGTH IN CENTIMETER (CM)				

THANK YOU VERY MUCH FOR YOUR KIND CO-OPERATION

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