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**“Child undernutrition in the Far-West Terai
of Nepal”**

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ABSTRACT

Background

Child undernutrition remains a major health problem in Nepal. Nearly fifty percentages of children below 5 years of age are undernourished. The causes of child undernutrition are multifactorial, embracing aspects within the fields of dietary intake and food insecurity, health and care.

Objective

The aim with this study was to assess the prevalence of undernutrition and identify causes of undernutrition among children below 5 years of age in the Far West Terai of Nepal.

Methodology

A cross-sectional study was conducted in the Far West Terai of Nepal in 2009. A two-staged cluster sampling was used and 1500 children (0-59 months) from 1500 household were included. Anthropometric measurements (weight, height, MUAC) were performed. A pre-coded questionnaire was used to collect information of socio economic status, infant and young child feeding, disease, coping mechanisms related to food security, and prevention and control of diseases.

Results

In total 35 %, 35% and 16% of the children below five years were stunted, underweight and wasted, respectively. Of the children below 6 months, 77% were exclusively breastfed and the majority was breastfed for up to two years. The dietary diversity and meal frequency was inadequate. Only 8% of the children aged 6-11 months received food from at least 4 groups and 60% of the children aged 9-23 months were given at least 3 meals a day. Thirty eight percent had been sick, and fever (77%), cough (31%) and diarrhoea (11%) were the most prevalent diseases. The nutritional care during the illness was poor, 88% were fed less and 76% were given less liquid. One third of the households were using coping mechanisms which might indicate that they were food insecure. Multivariate regression analysis showed that households headed by the mother, households where the mother worked more than 8 hours a day and household belonging to a low caste and households with crop farming as the main source of income, had higher levels of stunting than other households, These variables explained 24 % of the variation in stunting.

Conclusion

According to the WHO classification of undernutrition, the prevalence of wasting and underweight is very high and the prevalence of stunting is high. There has been improvement in breastfeeding practices; however the complementary feeding is still inadequate. In addition the level of disease is high and the children do not receive appropriate care during illness. Despite high levels of breastfeeding and exclusive breastfeeding, programs which aim to improve these practices should be continued and more emphasis should be given to the quality and the quantity of complementary food.

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Hanne

LIST OF ABBREVIATIONS

ACF	Action contre la Faim
ARI	Acute respiratory infections
EPI	Expanded Program for Immunization
FAO	Food and Agriculture Organization of the United Nations
FCHV	Female Community Health Volunteer
GDI	Gender-related Development index
GNI	Gross National Income
HDI	Human Development Index
HFIAS	Household Food Insecurity Access Scale
HKI	Helen Keller International
IDP	Internally Displaced People
IFPRI	International Food Policy Research Institute
IMR	Infant Mortality Rate
INFHS	India National Family Health Survey
IYCF	Infant and Young Child Feeding
MoHP	Ministry of Health and Population
NCHS	National Centre for Health Statistics
NDHS	Nepal Demographic and Health Survey
NTAG	Nepali Technical Assistance
PPS	Probability Proportional to Size
SMART	Standardized Monitoring and Assessment of Relief and Transitions
UCPN- M	Communist Party of Nepal – Marxist
UML	United Marxist- Leninist
UNICEF	United Nations Children’s Fund
VDC	Village Development Committee
WFP	World Food Program
WHO	World Health Organisation

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CHAPTER 1: INTRODUCTION

1.1. Undernutrition

Child undernutrition is a global burden. Worldwide, more than 1 billion people are undernourished [1] and undernutrition contributes to more than 30% of all deaths in children below five years [2]. Undernutrition includes being stunted (low height for age), wasted (low weight for height) and underweight (low weight for age). The causes of undernutrition are multifactorial and embrace inadequate dietary intake and diseases, food insecurity, inadequate care, unhealthy environment and inadequate health services [2].

Nepal is one of the countries with the highest level of stunting in the world. Nearly 50% of the children below 5 years are stunted [3]. Due to the financial crisis and frequently natural disasters, several nutrition surveys have been conducted in the Mid and Far West Nepal since 2008. In 2009, UNICEF conducted surveys in six districts in the Mid and Far West of Nepal: I took part in the survey and used the data from two of the districts in my master thesis. Together with colleagues, I was responsible for developing a questionnaire, training of the fieldworkers and the follow up in the field.

The aim with this study was to assess the prevalence of undernutrition and identify causes of undernutrition among children 0-59 months in the Far West Terai region of Nepal. The UNICEF conceptual framework on the causes of malnutrition was the basis for analysis.

The results from this survey have been presented to UNICEF Nepal. The Government of Nepal has proposed a universal child cash transfer program in the West and Far West of Nepal. The aim with this programme is to improve the nutritional status in young children. The data in my thesis will be used as baseline for this program.

1.2. Literature review

1.2.1. Undernutrition

Malnutrition and undernutrition are often used interchangeably. As “malnutrition” includes both overnutrition and undernutrition [2], “undernutrition” will be used in this thesis.

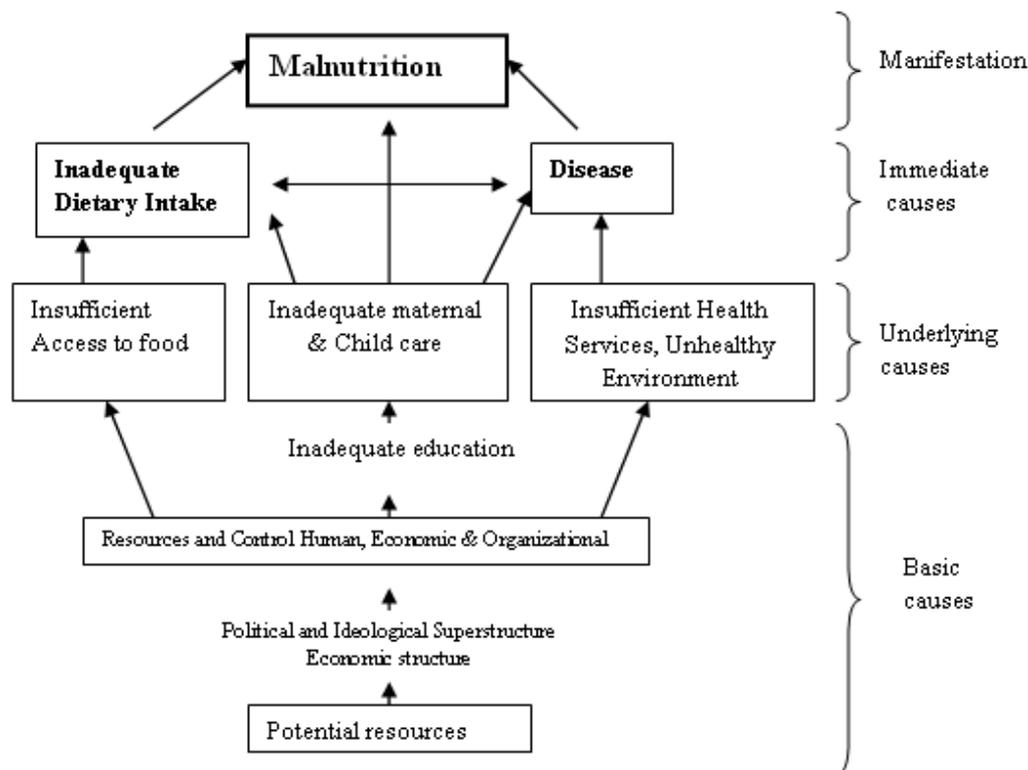
Undernutrition includes being stunted (low height for age), wasted (low weight for height) and underweight (low weight for age) [4]. The growth of the infants and children is related to socio economic environment in which they live. Children from developing countries grow more slowly and achieve a shorter adult height than those from wealthier regions [5].

Wasting is a measure of thinness. A wasted child has suffered from substantial weight loss, usually as a consequence of acute food shortage and/or diseases [6]. Undernutrition is influenced by both the height and the weight of the child, and reflects body mass relative to chronological age [7].

Undernutrition has serious affect on the child, the family and the development of the country. An undernourished child is more likely to be sick and die [8]. Further, undernutrition can lead to stunted growth [9], impaired cognitive and behaviour development [4], poor school performance and lower working capacity and lower income [11]. Undernutrition slows economic growth and leads to higher levels of poverty. Undernutrition restrains the society to meet its fully potential through loss in productivity, cognitive capacity and through increased cost in health care [10].

The following conceptual framework has been field tested by UNICEF in the 1980s and launched in 1990 as a basis for the UNICEF strategy for the improvement of nutrition of women and children [11] (figure 1).

Figure 1: UNICEF conceptual framework (UNICEF, 1990)



The UNICEF conceptual framework (Figure 1) shows that malnutrition is an outcome of causes at different levels: immediate, underlying and basic causes in a hierarchical manner. Factors at one level affect the factors at other levels. According to Urban Jonsson, strategies to prevent and control malnutrition should aim to attach all causes simultaneously [12]. The causes of malnutrition can be analyzed according to the different levels such as the international level, the national level, the local and the household level. Food intake might be inadequate and put the individual in higher risk of getting ill. However, frequent illness episodes also affect the appetite and the ability to absorb nutrients. Access to food, adequate care of children and women, and access to basic health services together with a healthy environment, are necessary conditions to obtain nutritional well-being [12]. Education influences the effectiveness of resources employed to achieve ideal nutrition. These resources include the availability, control, management of resources that might have an affect on economic, social, political, technological and cultural factors [12]. Other causes might be lack of tools or technology and limited knowledge and skills and inability to use the resources available [13].

1.2.2. Inadequate dietary intake

Breast milk contains all the nutrients that a child needs for optimal growth, development and health [14]. It is recommended that children are exclusively breastfed up to 6 months of age [15]. Exclusive breastfeeding means that no other foods or liquids are necessary during the first 6 months [16]. Children who are exclusively breast fed are less likely to die [19] and are more protected against illnesses like respiratory infections [17] and diarrhoea [21], compared to children who are not exclusively breastfed. Breastfeeding on demand should be continued up to 2 years of age and beyond, as a supplement to the complementary food [18].

Complementary foods should be introduced when breastfeeding no longer gives the energy and nutrients that the child needs for optimal development and growth. According to World Health Organization (WHO), “timely” introduction of complementary feeding is at the age of 6 months. The food should be “adequate”, meaning that it should contain enough energy, protein and micronutrients. It is important that the food is hygienically stored and prepared to ensure that the food is “safe”. Finally, the child needs to be properly fed, meaning that the food should be given according to the child’s signals of appetite and satiety [18]. A diet containing a diverse range of foods gives a higher intake of energy and micronutrients [23-28]. Dietary Diversity Score (DDS) is used to predict the nutritional status of an individual and to measure improvement in diets over time. All food groups that have been eaten over a period of time are calculated and given a DDS [29-30]. WHO recommends that a child aged 6-23 months receives at least four out of seven food groups. This would mean that the child is likely to eat at least one animal- source food and at least one fruit or vegetable each day in addition to staple foods (grain, root or tuber). The frequency of meals should increase with the child’s age. Breastfed children aged 6-8 months should be fed with complementary food at least 2 times a day. Breastfed children aged 9-23 months should be fed at least 3 times a day. Non- breastfed children aged 6-23 months should be given complementary food at least 4 times a day [19].

1.2.3. Disease

An undernourished child has a weaker immune system which makes him/her more vulnerable to sickness, and also to fatality from such common childhood illnesses as diarrhoea, measles and pneumonia [1, 32].

1.2.4. Insufficient household food security

Food security is defined as a state in which “all people at all times have both physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” [21]. Food insecurity, occurs whenever food supplies are limited or uncertain [22]. In situations where there is increased unemployment and declining wages, people find ways to cope. Some households choose to migrate or change to other income generating activities. Others will sell livestock assets or borrow money or food. In order to save money they will first reduce spending on durable goods. When food insecurity is high, households are forced to reduce spending on food. As a result, the diet may change from expensive- and nutrient- rich food- to calorie- rich and energy-dense foods [23].

1.2.5. Inadequate maternal and child care

According to Engle, “Care” can be divided into six categories: a) care for the women, b) breastfeeding and feeding of young children, c) psychosocial stimulation of children and support for their development, d) food preparation and food storage practices, e) hygiene practices and f) care for children during illness [24]. An important factor whether an illness becomes life threatening to the child is the caretaker’s knowledge of appropriate care during illness and health seeking behaviour. When a child is sick, he or she needs more fluid. Children below 6 months should receive more breast milk [20], and children above 6 months of age should receive more liquid (breast milk or other types of liquid) and complementary foods [19]. Many caretakers do not recognize the early signs of disease. In addition, distance to health service, cost of the service and the quality of the service are factors which inhibit the caretaker to use the healthcare available in the community [25].

1.2.6. Insufficient health services and unhealthy environment

High levels of diarrhoeal disorders and acute respiratory infections reflects the poor access to health services and inadequate treatment. Diseases can also be caused by poor hygiene, indoor air pollution or inadequate housing [32]. A large proportion of the deaths of children below 5 years of age are related to communicable and vaccine preventable diseases and some diseases can be prevented. Globally, 10% of deaths and disability- adjusted- life-years (DALYs) among children below five years are caused by micronutrient deficiencies. Vitamin A and zinc deficiency represent the highest health risk among children [19]. In countries with high levels of vitamin A deficiency, the risk of dying of diarrhea, measles and malaria increase with 20-24% compared to other countries [26]. It is also found that vitamin A

deficiency leads to poor growth among children. High coverage of vaccination can reduce deaths among children below 5 years and reduce the burden of illness and disability caused by preventable diseases like night blindness [27]. Twenty four percent did not receive the complete immunization the first year of life in 2007. Children living in the rural areas have the least access to routine vaccination [27].

CHAPTER 2: BACKGROUND

2.1. Country Profile

2.1.1. Geography

Nepal is a landlocked country in the foothills of the Himalayas. The country is surrounded by India in the east, south and west and China in the north [3]. Nepal is divided into three district belts, the mountains in the north, the hills in the middle and the plains of the Terai in the south. Only 7% of the population lives in the mountain zone, which ranges from 4,877- 8,848 meters above sea level. Forty- four percent stays in the hills at 610- 4,876 meters above sea level. The terai zone represents the most populated areas of Nepal. Because of the flat landscape, 48% of the population lives in the Terai [28]. Nepal is further divided into five regions (Eastern, Central, Western, Mid- West and Far- West). Each of these regions is further divided into 14 zones and 75 administrative districts. The districts consist of smaller units called the Village Development Committees (VDCs) [29]. Each VDC are composed of nine clusters [30].

2.1.2. Political situation

Nepal has gone through period of political unrest, insurgency and violence. In 1990, Nepal switched from monarchic rule to multi- party democracy. This shift gave hopes of a better future and improved economic conditions [31]. At the same time, some groups were not satisfied with the government. The criticism concerned the governments' effort to improve the living conditions in the rural areas of Nepal. The result was a ten year long "People's War" led by the Maoist activists. The main objective with the war was to establish a republic and to change the constitution. The Comprehensive Peace Agreement between the Government of Nepal and the Communist Party of Nepal- Maoist (UCPN- M) was signed 21 November 2006. The conflict had a huge impact on affected peoples. Almost 15 000 were killed and 50 000 became Internally Displaced People (IDPs). IDPs could not return to their homes or settle elsewhere in the country [32]. The conflict has caused major physical, psychological, social and economic damage [33]. In 2008, the country was declared a republic and the monarchy was formally abolished [34]. UCPN-M was in power from August 2008 to May 2009. No political consensus led to resignation on 4 May 2009 of Prime Minister Pushpa Kamal Dahal. Only three weeks later, a senior leader of the Communist Party of Nepal United Marxist- Leninist (UML) was elected as Prime Minister. He formed a new coalition with the support of 21 other political parties, but without the Maoist's

participation. UCPN-M refused to join the new coalition and blocked parliamentary proceeding until an agreement allowed them to resume the budget discussion. Due to interruptions, the new constitution is still not finalized [32]. Various marginalized groups carry out protest programmes and strikes to advocate for their agenda. Political instability has caused interruptions and problems for schools, shops and in the transport sector [34]. The protests have led to increased violence and insecurity especially in the Terai region [32].

2.1.3. Poverty and human development

Nepal is classified as a low- income country and is among the poorest and least developed countries in the world. Almost one third of the population are living below the poverty line [3]. The level of poverty is much higher in rural areas (35%) compared to urban areas (10%) [35]. Nepal is among the lowest- ranked countries in the world with only 350\$ per capita gross national income (GDI) [36]. Nepal ranks as number 144 on the human development index (HDI), which is low according to the HDI¹ [37]. During the 1990s, Nepal went through a period of improved economic growth. The current political instability has led to a contradiction in the economy [38]. Tourism has been hardly hit and many young people are going abroad in search for better jobs. Agriculture is the main source of income in Nepal, however, remittance, small scale industry, tourism, and foreign aid are also important components of the economy [35].

2.1.4. Population

Table 1: Country profile of Nepal

Indicator	
Total population ¹	28.2 mill
% Urbanization ²	16%
People below poverty line (national) ²	31%
People below poverty line of 1 \$ a day (international) ²	24%
Life expectancy	
Male ³	62.9
Female ³	63.7
Under 5 mortality rate ³	61/1000 live births

Source:¹ [39], ²[40], ³[3]

¹ The HDI measures achievements in terms of three indicators: life expectancy, educational attainment and adjusted real income. The countries ranked number one scores highest on all the three indicators. The counts are ranked from a high development index with numbers from 1-55, medium rank development index from 55-141 and a low development index from 142- 175.

The population has increased dramatically the last 90 years from 5.6 million in 1911 to 23.1 million in 2001 [28]. Recent data shows that the population size has now reached 28 196 000 people [39] (table 1). Nepal has a young population, where two thirds of the population is below 15 years of age. However, the number of people above 60 years is increasing [35]. The sex ratio shows that there are 988 males per 1000 females [41]

2.1.5. Literacy

Individuals are considered to be literate if they can read and write. In Nepal, about 50% of the population use Nepali as their first language [3]. Only 38% of the Nepali population above 6 years of age is literate. The highest level of literacy is found in the Western region and the lowest in the Mid and Far Western region. People living in urban areas are in general more literate than people in the rural areas [42]. The main causes of illiteracy are low access to schools and exclusion based on caste, ethnicity, gender [43]. The literacy level is higher among the males (52%) compared to the females (24%). The main reason for not going to school is parental prohibition. School is expensive and therefore, education for the males is prioritised [42].

2.1.6. Religion and caste system

In Nepal, the largest religions are Hinduism (86%) and Buddhism (9%) [3]. There are 103 ethnic or caste groups in Nepal. People within each caste have their own language and distinct culture [44]. The largest caste groups are Chhreti (16%), Brahmins (13%), Magar (7%), Tharu (7%), Tamang (6%) and Newar (5%) [3].

Figure 2: The Nepali caste pyramid [61]



The Nepali caste pyramid is shown in figure 2. The level of caste describes the political and economic power of the people. The caste is also an indication of employment. The hindu caste system was officially abolished in 1963. Originally, the Brahmins were at the top and the majority of them were priests. The Brahmins were kings and warriors, merchants, peasants and labourers. The indigenous groups and the Janajatis, belonged to the middle rank. The Dalits were at the very bottom and had the lowest social rank. The Dalits were seen as “impure” and “untouchable”. Discrimination based on caste still exists, where 205 practices of caste- based discrimination are related to the Dalits. For example, Dalits are denied entry to public places like temples and restaurants and to share water sources with other higher castes. As a result, people from lower castes are poorer, more illiterate, undernourished and have less access to health facilities than people belonging to other casts [45].

2.1.7. Gender inequality

Nepal is ranked 119 out of 175 countries on the Gender- Related Development Index (GDI)² [46]. In most castes, women have lower social status and heavier workload than the men. The majority of the women are engaged in agriculture [47]. Due to low education and few training opportunities, the majority of the women are self- employed and have a low income job [46].

² GDP: measures achievements in life expectancy, educational attainment and adjusted real income but takes note of inequality in achievement between women and men.

Undernutrition among is high (24%) among the women in Nepal [3]. In addition, many women are suffering from mental illnesses due to early marriage, domestic violence or sexual abuse [34].

2.1.8. Food security

Due to population growth and declining rates of agricultural growth, Nepal has been a food deficit country since 1990's [48]. Districts in the hills and the mountains are especially vulnerable to food insecurity. Forty- one out of 75 districts are categorized as food deficit [35] and 3.7 million people were food insecure in 2009 [33]. Natural disasters have destroyed the infrastructure, especially in the rural areas. As a result, farmers in the remote areas have little access to inputs like seeds and agricultural tools. The food, fuel and financial crisis starting in 2008, worsened the country's food situation. In addition, frequent natural disasters like the winter drought in 2009 lowered production of wheat and barley [49].

2.2. Health and nutrition situation in Nepal

2.2.1. The health situation in Nepal

Life expectancy has gone up among the males from 42 years (in 1990) to 62.9 years (in 2006) however is still among the lowest in South Asia. Female, life expectancy has gone up from 40 years (in 1971) to 63.7 years (in 2006) [50]. About one in 25 children dies during the first month. Infant mortality is among the highest in the world and neonatal mortality accounts for 54% of all deaths among children below five years. The ones who survive are vulnerable to diseases like diarrhoea and acute respiratory infectious which are leading causes of death in children below five years of age in Nepal [51].

Other threats to the child's health are vaccine preventable diseases like measles, tetanus and polio. All children below one year are offered the full course of routine immunization during the first year of life [25]. In addition to the routine immunization program, the government has successfully managed to develop a biannual vitamin A supplementation program linked with distribution of deworming tablets [3].

2.2.2. Overview of nutrition situation issues in Nepal

Despite some improvements, undernutrition is one of the most important health problems in Nepal [3]. The 2006 Nepal Demographic and Health Study (NDHS) reported stunting, wasting and underweight to be 49%, 13% and 39% respectively. Especially high rates of wasting was found in the Terai (17%), Mid- and Far Western hill districts (16%) and in some

conflict areas in the Terai (21%) [3]. The 2006 NDHS demonstrated that the majority of the children in Nepal were breastfed. Thirty five percent of the children were given breast milk within one hour of birth. The duration of exclusively breastfeeding was inadequate. At 4-5 months of age, only 31% of the children were exclusively breastfed. Three in four of the children aged 6-9 months received complementary food. The dietary diversity of the food was not adequate [3].

2.3. The study area: The Far West Terai

The study areas, Kanchanpur and Kailali districts, are both districts in the Far West Terai of Nepal (figure 3). Kanchanpur and Kailali have the same characteristics in culture, health and livelihood [3] and are therefore not separated in the discussion. Kanchanpur borders to Kailali district in the east, Dadeldhura district in the north, and India in the south and west (figure 3). In Kanchanpur, 377 899 people are spread over 60 158 households [52]. Kanchanpur is among the most populated districts in Nepal, with a density of 235 inhabitants/ km² [41]. The other study area, Kailali, is in addition to Kanchanpur and Dadeldhura bordering to Bardiya and Surkhet in the east and Doti in the north. There are 616 697 people living in Kailali [52].

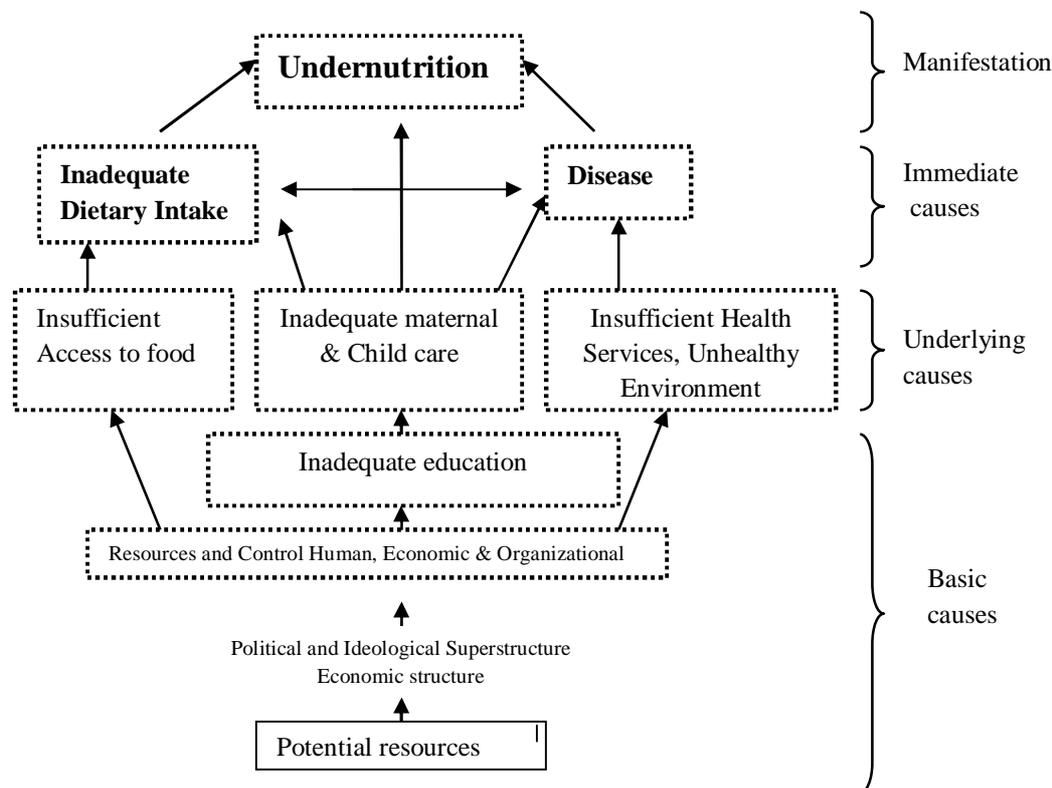
Figure 3: Map of Nepal and the study areas [3]



UNICEF- Nepal supports programs in the Far- West Terai. Among the programs are Emergency Wash, HIV& AIDS, Child Protection and WASH. The only Health and Nutrition programs in this area are the Expanded Programme on Immunization and the Vitamin A and Deworming programme [53]. In case of an emergency like floods or a diarrhoea outbreak, medicines like oral dehydration salts (ORS), zinc tablets and mosquito nets to the people in need are provided by UNICEF [54]. Besides the programs of UNICEF, programs like Action Against Malnutrition through Agriculture (AAMA) is currently running in Kailali district. AAMA aims to improve the nutritional status of lactating women and children below two years of age. Their activities include workshops about micro- nutrient rich foods and how it can be grown in their own garden. They also teach about breastfeeding, complementary feeding, nutritional care during illness, maternal nutrition and hygiene [55].

CHAPTER 3: THEORETICAL FRAMEWORK AND OBJECTIVES

Figure 4: Conceptual framework of the causes of undernutrition. Adopted from UNICEF conceptual framework (1990)



The main theoretical tool used for this survey was a model adopted from the UNICEF conceptual framework (Figure 4). The dotted boxes in figure 4 represent the focus areas of this thesis. The remaining boxes will not be discussed in this thesis.

The aim of the present study will be explored on the basis of the following objectives:

1. Determine the socio economic situation of the household
2. Assess the nutritional status among children 0-59 months by sex and age
3. Assess the dietary intake among children 0-23 months by assessing the breastfeeding practices and the intake of complementary foods
4. Describe the most prevalent diseases and care during illness among children 0-59 months
5. Assess the households' coping mechanisms related to food insecurity
6. Assess the association between stunting and selected background factors

The socio economic status of the household will first be presented in order to get some background information about the household. Thereafter, the nutritional status of the children will be presented. In regard to the underlying causes, both disease and inadequate dietary intake will be addressed. Breastfeeding and feeding of young children are defined as important elements of the concept of “care”. However, in the present study, breastfeeding and young child feeding will be discussed in regard to inadequate dietary intake. Among the underlying causes, coping mechanisms related to food security, care during illness and prevention of diseases are the main issues discussed. Regarding the last objective, stunting was chosen to be the dependent variable because it is the most prevalent form for undernutrition in Nepal. Stunting represents poor growth and have serious impact on the health of the child. Association between stunting and variables that are assumed to have long-term impact on stunting will be identified.

CHAPTER 4: METHODOLOGY

4.1. Study design

A cross-sectional study was carried out by UNICEF and other partners in the Far- West Terai of Nepal in September 2009.

4.1.1. Sampling procedure

In the present study, a two staged cluster sampling was employed. Nutrisurvey software was used to calculate the sample size using the latest available data on undernutrition. Thirty clusters within each district and 25 households within each cluster was visited. Within the household, one child below five years was randomly selected. Additional 5 clusters were randomly selected, but were only used if there were not enough children in the selected clusters. Total sample size in the present survey was 1500 households representing 1500 children.

In the first stage, clusters³ were randomly selected based on Probability Proportional to Size (PPS) using the Nutrisurvey software. In the second stage, the households within each cluster were selected using random systematic sampling procedure. A household was defined as persons routinely sharing food from the same cooking pot and living in the same household. Arriving in the field, the enumerators got an updated list of all the households in the cluster from the leader of the cluster. The sampling interval was found by dividing the total number of households in the cluster by the total number of households required. The first household was randomly selected within the sampling interval by drawing a random number between 1 and the sampling interval. Within the household, all children below 5 years of age that are living in the household were listed and one child was randomly selected. The next household was found by adding the sampling interval to the first household that was selected. This process continued until 25 households were visited [56].

³ Clusters are the same as wards. Clusters will be used throughout this thesis

4.1.2. Inclusion criteria and particular cases

In this study, the mother was considered to be the key respondent. If the household members were not present when the survey team visited the household, the team had to return to the household. Each household could be visited up to three times in an effort to identify household members unless logistical constraints prohibited the amount of time spent in a cluster. A household was skipped and not replaced if the members of the household had left the house permanently or were not expected to return before the survey team had left the cluster. Abandoned or empty houses were not counted as households because they did not meet the definition of a household.

4.1.3. Ethical consideration

Research clearance was obtained from the Ministry of Health and Population (MoHP) and the district leaders in Kailali and Kanchanpur. All eligible subjects were informed about the study before they were asked to participate in the survey. Informed oral consent from the parents of the children in the study was given since many of them were illiterate. Assurance was made that participation was voluntary and that there would be no negative consequences if they decided not to participate in the survey.

4.2. The fieldworkers

4.2.1. Training of the fieldworkers

Nepali Technical Assistance Group (NTAG) was contracted to do the data collection. The fieldworkers attended three days training. Representatives from World Food Program (WFP), UNICEF and Nepali Technical Assistance Group (NTAG) were participating in the training. Two days of the training were spent on discussion of the objectives of the study, the sampling procedure, the questionnaire and anthropometric measurements. On the third day of the training, the enumerators got practical experience in the field. The field exercise included testing of the sampling procedure, the questionnaire and the anthropometric measurements. In total, 40 enumerators did the data collection with two people in each team. There were both male and female enumerators and all of them were Nepalese. The majority of the enumerators had collected data in previous surveys led by NTAG.

4.2.2. Working in the field

The enumerators started the data collection at about 8 am and finished at 16 pm. The interview and the anthropometric measurements lasted for about 45 minutes. Each

questionnaire was checked by the team leader. Anthropometric information was faxed to UNICEF- Nepal for preliminary analysis.

4.3. Data collection tools

4.3.1. Anthropometry

Anthropometric measurements (height, weight and MUAC) were obtained from all children below 5 years of age. The weight was taken using a Uniscale and recorded to the nearest 0.1kg. The weight of the child was measured when he/she was standing on the Uniscale, nude or with a minimum of clothes. If the child was not able to stand on the scale by her/his own, the mother's weight was taken first and then, mother's weight while carrying the infant was taken. The child's weight was found by subtracting the mother's weight from mother's weight while carrying the child. The scales were checked for accuracy before taken to the field. The height board was at least 130 cm long and made of hardwood. The height was recorded to the nearest 0.1cm. The height was taken in a lying position for children with a height less than 85 cm. The children with a height above 85 cm were measured in standing position. Mid arm upper circumference (MUAC) was measured on children aged 6- 59 months. MUAC of the left arm was taken and recorded to the nearest mm. The enumerator located the mid- point between the shoulder and the tip of the elbow with the arm bent. The measurement was taken at this mid point with the arm extended and relaxed. A cut- off 115 mm was used to distinguish the well nourished with the children that were severely wasted (also called severely acute malnourished) [57]. MUAC, height and weight were taken twice and the mean was calculated. The statistic program, EPI info, did the same calculation in order to check for accuracy. An event calendar was used to state the age as accurate as possible. Age was written down with "day/month/year" and "age in months". The date was converted to months and compared with "age in months" for consistency. The Nepali date was converted into English date.

The severity of undernutrition was assessed using three indicators: weight- for- age, weight- for- height and height- for – age. The new growth standard developed by the World Health Organization was used [58]. Z- scores for stunting, wasting and underweight were obtained using Nutrisurvey software. Stunting, wasting and underweight were transformed to categorical variables following. The children falling below -2 z-scores were classified as stunted, wasted or underweight. Children with z-scores above -2 were categorized as not stunted/ wasted/underweight. Children with z-score below -3 z- score were categorized as

severely stunted/wasted/underweight. The ones with z-scores above -3 were coded categorized as not severely stunted/wasted/underweight.

4.3.2. Structured questionnaire

Face to face structured interviews were conducted by a team of trained enumerators in the national language Nepali. The questionnaire was developed in English and translated into Nepalese, the main language spoken in the area. The questionnaire contained 121 questions which were precoded. The particular questions will be referred to as a “Q” and a number whenever attention is directed to the particular question. For the majority of the questions, the respondents were told to give only one answer. However multiple answers were also possible (Q70 and Q89). All of the questions had fixed categories, however the category “other” was used if the listed alternatives were inappropriate do describe the respondent’s opinion or behaviour.

The questionnaire included six parts: A) and B) Socio- economic status, C) Coping mechanisms, D) Infant and young child feeding, E) Prevention and control of diseases and F) Anthropometric measurements (appendix 3). The different sections of the questionnaire will now be described, however only questions which were relevant for this thesis will be discussed.

A+ B) Socio economic status

Questions concerning socio- economic status of the household were addressed in Q1 to Q18. The questions were based on a questionnaires from DHS [3] and Concern Worldwide [59]. The socio economic indicators included head of household (Q1), caste (Q2), the number of children living in the household (Q5) and level of education (Q6- Q7). In addition, information about the construction materials of the house (Q8-Q9), rooms in the house (Q10), total area of land (Q11-Q12), domestic animals (Q13- Q14), assets (Q17), and transport facilities (Q18) were obtained. Based on these indicators a wealth index was developed. Cut off values were developed and new variables containing yes/no responses were employed (see appendix 2 for details about the development of the wealth index). As in DHS [3], a wealth index of five categories was developed (lowest, second, middle, fourth and highest wealth category). The lowest wealth category included households that responded “no” on all of the socio economic variables. The second wealth category included households that scored “yes” on one or two of the variables. The third wealth category included households

responding “yes” on three or four of the selected variables. The fourth wealth category included households that reported “yes” on five or six of the variables. The highest wealth category included households which reported “yes” on seven or more of the variables included in the wealth index. In addition, the types of livelihoods (Q28) were obtained and used to describe the socio economic status of the household.

C) Coping mechanisms

Food security was addressed by asking about the households’ use of coping mechanisms (Q31-Q54). Coping mechanisms are used to assess the household’s vulnerability in relation to food and economy during times of hardship [60]. In the present questionnaire, coping mechanisms like reduction in the size of meals (Q31), reduction in the number of meals (Q33), spending of their savings on food (Q37), collection of wild foods (Q39), restricted consumption by adults (Q41), consumption of seed stocks (Q43), whether the children have been taken out of school to work (Q45), begging for food (Q47), borrowing food (Q49), out migration (Q51), sale of land (Q52), sale of household assets (Q53) and sale of agricultural assets (Q54) were included. The questions were based on previous food security surveys held by World Food Program (WFP) [61] and the Household Food Insecurity Access Scale (HFIAS) [62]. Like the HFIAS questionnaire, a 4 weeks recall period was employed to assess the coping mechanisms in the present study [62]. In the thesis, only coping mechanisms with yes/no categories were included. Based on Q31-Q54, two categories (food secure and food insecure households) were developed. The households which had not experienced any of the 13 food security related questions were categorized as food secure households. The household which responded that they had experienced one or more of the conditions were categorized as food insecure.

D) Infant and young child feeding

In the present survey, breastfeeding and feeding of young children was assessed using the Infant and Young child feeding (IYCF) indicators developed by WHO [15]. The DHS was used as the basis for the question formulation [3] (see appendix 1 for definition of the variables). The questions included exclusive breastfeeding (Q73), breastfeeding (Q69, Q64, Q68) and complementary feeding (Q78-Q80). The majority of the questions were asked with a 24 hour recall period. The only exception was the question regarding “ever breastfed” (Q64) and “how long after birth did you start breastfeeding” (Q68). Additional questions

from the DHS [3] were added to the questionnaire, like reasons for not breastfeeding (Q70) and liquid given immediately after birth (Q63).

E) Prevention and control of diseases

Prevention and control of diseases among children were covered in Q88-Q104. The mother was asked to report the type of illness(es) that the child had 2 weeks prior to the study (Q89), nutritional care during illness (Q90-92) and health seeking behaviour (Q96). Further information about the coverage of vitamin A capsules (Q98), deworming tablets (Q99) and vaccination (Q103- Q104) was obtained. These questions were based on questions from Concern- Worldwide [59] and DHS [3].

F) Anthropometry

The last part of the questionnaire contained questions regarding anthropometry (Q105-Q121). This section included child's age (Q111), sex (Q112), height (Q118-Q119), weight (Q116-Q117) and MUAC (Q114- Q115).

4.3.3. Dependent and independent variables

Table 2: Variables used in the study, organized according to UNICEF conceptual framework on the causes of undernutrition

Causal	Problem	Variable of measurements¹
MANIFESTATION	Undernutrition	<-2 weight for height
		<-2 height for age
		<-2 weight for age
		Stunting (z- score) ²
IMMEDIATE CAUSES	Inadequate dietary intake	Exclusive breastfeeding
		Breastfeeding
		Complementary foods
	Disease	Type of illness
UNDERLYING CAUSES	Inadequate maternal and child care	Nutritional care when the child was sick
		Health seeking behaviour when the child was sick
	Insufficient health service, unhealthy environment	Vaccination
		Vitamin A supplements and Deworming tablets
Insufficient food security	Coping strategies	
BASIC CAUSES	Education, resources and control of resources (human, economic and organizational)	Head of the household
		Number of children below 5 years in the household
		Caste
		Mothers' education level
		Fathers' educational level
		Maternal work
		Hours spent on work by the mother
		Livelihood
Wealth index		

¹ The majority of the variables were categorical

² Stunting was continuous but only used in objective number 6.

Table 2 gives an overview of the dependent and independent variables that were used in the analysis. Undernutrition (stunting, wasting and underweight) was the dependent variable, and the other variables were independent variables.

4.4. Statistical analysis

Data was entered into EPI INFO and transferred to SPSS 16 (The Statistical Package for the Social Sciences) for analysis. Microsoft Excel 2003 was used to create the graphs and histograms. In SPSS, frequency checks were run for missing values. Extreme values were checked with the questionnaire. Wasting with z- scores below -5 SD and above +5 SD, stunting with z- score lower than -6 SD and above 6 SD, and underweight with z- scores below -6 SD and above 5 SD, were counted as outrange values and excluded from the analysis [63].

Independent-samples t-test was used to test for associations between age and undernutrition because age was found to be normally distributed. Stunting was not normally distributed, therefore, the median was presented. In order to test for association between two or more categorical variables, the Chi-Square test and Pearson rho test was used [64]. Categorical data was presented as percentage and number in each category (See table 2). In the analysis, a 5% significance level was used to test for association and differences (two- sided). Stunting was the dependent variable in a two-step model using linear regression analysis. Linear regression analyses were used for assessing the association between stunting and selected long term variables like vaccination status, food security index, and socio economic status. All covariates showing linear association ($p < 0.1$) were included in a preliminary model. Multivariate analysis was used to verify if the identified determinants remained significant after controlling for confounding factors. Variables contributing to the variation in the model ($p < 0.1$) were included in the final model. Dummy variables were developed when the categorical variables had more the two categories. Analysis of the residuals was performed in order to examine how well the model predicted the dependent variable. In the final model interactions between the independent variables were checked for.

CHAPTER 5: RESULTS

5.1. Socio economic status of the household

Table 3: Socio economic status of the household (n=1500)

Socio economic indicator	%	(n)
<i>Children below 5 living in the household (n=1500)</i>		
1 child	60	(898)
2 children	32	(486)
More than 2 children	8	(114)
<i>Head of the household (n=1500)</i>		
Father	35	(633)
Grandfather	42	(531)
Mother	9	(132)
Grandmother	9	(132)
Other	5	(72)
<i>Caste(n=1500)¹</i>		
Low caste: Dalit	17	(250)
Middle caste: Disadvantage janajatis	43	(658)
High caste: Relatively advantaged janajatis/upallow jatis	40	(592)
<i>Education: father(n=1499)</i>		
None	16	(242)
Primary level	4	(52)
Lower secondary/informal	24	(352)
Secondary level	42	(629)
Higher secondary	9	(135)
Intermediate and above	5	(79)
<i>Education: mother(n=1499)</i>		
None	35	(527)
Primary level	18	(268)
Lower secondary/informal	15	(228)
Secondary level	26	(393)
Higher secondary	4	(62)
Intermediate and above	2	(21)
<i>Livelihoods (n=1497)²</i>		
Crop farming/ livelihood farming	45	669
Remittance/assistance programs	20	309
Regular employment/trade business	29	277
Casual wage labour/other employment	16	339
<i>Mother with paid work (n=1498)</i>		
Yes	18	(270)
No	82	(1128)
<i>Hours spent on paid work by the mother(N=267)⁴</i>		
0,5- 3,5 hours	5	(14)
4- 7,5 hours	32	(86)
More than 8 hours	63	(167)
<i>Wealth index³</i>		
Lowest	7	(109)
Second	39	(581)
Middle	34	(513)
Fourth	16	(242)
Highest	4	(55)

1 Three categories of castes were developed based on the Nepali caste pyramid

2 Livelihood: the households' main source of income. 4 main categories of livelihoods were developed.

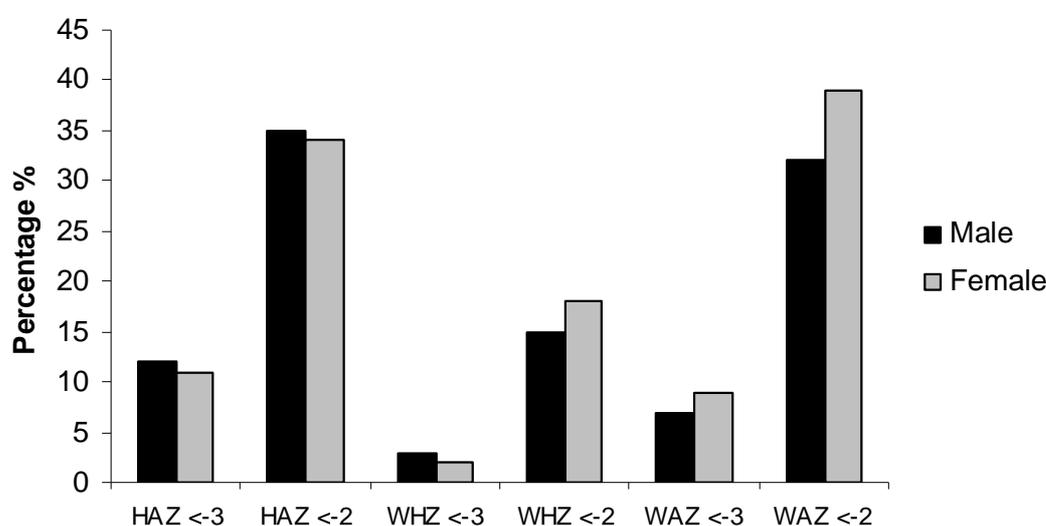
3 Wealth index was based on socio economic variables (see appendix 2). Lowest wealth: reported "no" on all of the variables. Second: reported "yes" on 1-2 of the socio economic variables. Middle: reported "yes" on 3-4 of the socio economic variables. Fourth: reported "yes" on 5-6 of the variables. Highest: reported "yes" on ≥ 7 of the variables.

Information about the socio economic status of the household is presented in Table 3. Eight percent (n=114) of the households had more than two children below 5 years. Seventy- seven percent (n=1164) of the households were headed by the father or the grandfather of the child. Seventeen percent belonged to the Dalit group. Forty three percent (n=658) belonged to the disadvantaged janajatis and disadvantaged non dalit caste group. Forty percent belonged to the relatively advantaged group or the upallow caste. The father of the child was more likely to have education (84%, n=1257) compared to the mother of the child (65%, n=972). The level of education was higher among the fathers, where 42% (n=629) had completed secondary level compared to 6% (n=393) of the mothers. Households of low caste were less likely to have parents with education compared to higher casts (<.001). Among the mothers with education, 9% (n=128) were dalits and 56% (n=844) were non dalits (<.001). Eighteen percent of the women had paid work (n=270) and 63% (n=167) of the women worked more than 8 hours a day. In the Far West Terai, the main source of income was farming (crop or livelihood farming) (45%, n=669). Twenty percent (n=309) reported that the main source of income was remittance or support from assistance programs. The wealth quintile showed that a high proportion of the households (73%, n=1094) belonged to the second or middle wealth index. Only 4 % (n= 55) of the households were of the highest wealth category.

5.2. Nutritional status of the children

A total number of 1500 children were included in the survey. The mean (\pm SD) age of children was 28 ± 15 months and slightly more children in the sample were male (54%, $n=692$). The percentage distribution of stunting, wasting and underweight according to sex is presented in figure 5. The percentage distribution of stunting, wasting and underweight according to age is presented in table 4 and figure 6.

Figure 5: Percentage distribution of stunting (HAZ)¹, wasting (WHZ)² and underweight (WAZ)³ in children 0-59 months according to sex ($n=1484$)



¹ Height for age z- score ($< -3SD$ and $< -2SD$).

² Weight for height z-score ($< -3SD$ and $< -2SD$).

³ Weight for age z-score ($< -3SD$ and $< -2SD$).

⁴ Statistically differences ($p < .05$) between underweight ($< -2SD$) and sex.

Table 4: Percentage distribution of stunting, wasting and underweight in children 0-59 months according to age ($n=1484$)

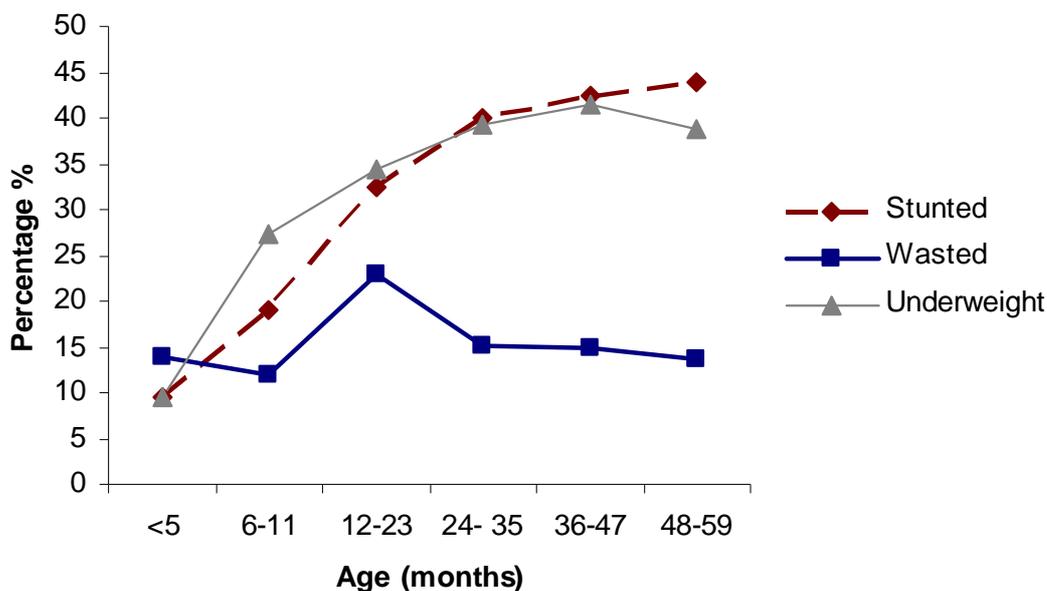
Age (months)	Stunting (HAZ)			Wasting (WHZ)			Underweight (WAZ)		
	<-3 z-score % (n)	<-2 z-score % (n)	Median score (SD) ¹	<-3 z-score % (n)	<-2 z-score % (n)	Median score (SD) ²	<-3 z-score % (n)	<-2 z-score % (n)	Median score (SD) ³
0-5	1 (1)	9 (11)	-0.2	3 (3)	14 (16)	-0.7	3 (3)	10 (11)	-0.6
6-11	7 (10)	19 (29)	-1.0	1 (2)	12 (8)	-1.1	7 (10)	27 (41)	-1.3
12-23	11 (38)	32 (11)	-1.4	5 (16)	23 (78)	-1.2	9 (31)	34 (116)	-1.7
24-35	13 (49)	40 (151)	-1.7	2 (8)	15 (57)	-1.2	9 (34)	39 (147)	-1.8
36-47	16 (51)	42 (137)	-1.8	1 (2)	15 (48)	-1.0	8 (26)	42 (134)	-1.8
48-59	10 (18)	44 (81)	-1.9	2 (3)	14 (25)	-1.2	6 (10)	39 (71)	-1.8
Total	11 (167)	35 (520)	-1.6	2 (34)	16 (242)	-1.7	8 (114)	35 (520)	-1.1

¹ Median of HAZ (continuous), $p < .05$

² Median of WHZ (continuous)

³ Median of WAZ (continues), $p < .05$

Figure 6: Stunting, wasting and underweight in children 0-59 months according to age (n=1484)



5.2.1. Stunting

Approximately 35% (n=520) of the children were stunted (<-2 SD height for age) and 11% (n=167) were severely stunted (<-3 SD height for age) (table 4). There was no significant difference between males and females in stunting. The mean (SD) age in months of the stunted children was 32.0 (13.5) and 25.7, (15.7), $p < 0.01$, of the non- stunted children. Children aged 48-59 months (44%, n=81) had the highest level of stunting. Severe stunting increased with age and was highest among the children aged 36 to 47 months (16%, n=51) (table 4 and figure 6).

5.2.2. Wasting

Sixteen percent (n=242) were wasted (<-2SD weight for height) and 2% (n=34) were severely wasted (<-3 SD weight for height) (table 3). No significant difference was found between sex and wasting. There was no significant differences in mean (SD) age in months among the children who were wasted 26.9, (14.5) and those who were not wasted 28.1 (15.4), $p = 0.26$.

Table 5: Mid - Upper Arm Circumference¹

MUAC \leq 115 mm	1% (n=10)
MUAC > 115 mm	99% (n=1373)

¹ Children with a MUAC \leq 115 mm are categorized as severely malnourished/ severe wasted

Table 5 shows that the majority (99%, n=1373) of the children had a Mid- Upper- Arm Circumference (MUAC) which was above the cut off level of 115 mm. Only 1% of the children (n=10) were below the cut off.

5.2.3. Underweight

Thirty- five percent (n=520) of the children were underweight (<-2 SD weight for age) and 8 % (n=114) were severely underweight (<-3 SD weight for age) (table 3). Underweight (<-2 SD) was more prevalent among the female children (38%, n=265), compared to the male children (32%, n=255) (p=.008) (figure 4). The mean (SD) age in months of the children with underweight was 30.9 (13.9) compared to the non- underweight children 26.4 (15.7), (p<0.01). Table 4 and figure 6 show that the highest prevalence of underweight was found among the children aged 36 to 47 months (42%, n=134). The highest prevalence of severe underweight was found among the children aged 12 to 35 months (18%, n=65).

5.3. Infant and young feeding practices

Table 6: Infant and young child feeding practices among children 0-23 months (n=1500)

Variables	%	(n)
Exclusive breastfeeding		
<i>Exclusive breastfeeding: 0-5 months (n=113)</i>	77	(87)
Breastfeeding		
<i>Ever breastfed the child (n=609)</i>	99.8	(608)
<i>Initiating of breastfeeding (n=610)</i> ¹		
Within 1 hour after birth	68	(414)
Given other liquid than breast milk immediately after birth (n=584)	5	(29)
<i>Types of liquids other than breast milk given immediately after birth (n=29)</i>		
Honey	48	(14)
Sugar water	3	(1)
Ghee	3	(1)
Water	0	(0)
Other liquid given	44	(13)
<i>Continued breastfeeding at 1 year(n=114)</i> ²	98	(112)
<i>Continued breastfeeding at 2 years (n=125)</i> ³	95	(118)
<i>Reasons given for stop breastfeeding (n=12)</i>		
New pregnancy	36	(4)
Not enough breast milk	9	(1)
Child refused	9	(1)
Start using contraceptives	0	(0)
Workload	0	(0)
Child ill/weak	0	(0)
Nipple/breast problems	0	(0)
Weaning age/ started to give complementary food	0	(0)
Other reasons	55	(6)
<i>Age- appropriate breastfeeding (n=613)</i> ⁴	91	(548)

Complementary food	%	(n)
<i>Introduction of complementary foods</i>⁵		
0-2 months (n=56)	0	(0)
3-5 months (n=56)	14	(8)
6-8 months (n=79)	80	(63)
9-11 months (n=72)	97	(70)
12-23 months (n=341)	96	(328)
<i>Meal frequency</i>⁶		
6- 8 months receiving at least 2 meals a day (n=63)	70	(44)
9-23 months receiving at least 3 meals a day (n=396)	60	(228)
6- 23 non breastfed receiving at least 4 meals a day (n=10)	50	(5)
<i>Dietary diversity (n=506)</i>		
Grain, roots and tubers	93	(458)
Legumes and nuts	62	(305)
Dairy products	42	(205)
Flesh foods	8	(37)
Egg	4	(17)
Vitamin A rich fruit and vegetables	19	(95)
Other fruits and vegetables	13	(63)
<i>Minimum dietary diversity \geq 4 food groups</i>⁷		
6 -11 months (n=134)	8	(12)
12 -17 months (n= 156)	15	(25)
18 -23 months (n=177)	20	(36)
<i>Liquid given from a bottle with a nipple (n=608)</i>	6	(35)

¹ Put the child to the breast within 1 hour after birth

² Children aged 12-15 months who were breastfed

³ Children aged 20-23 months who were breastfed

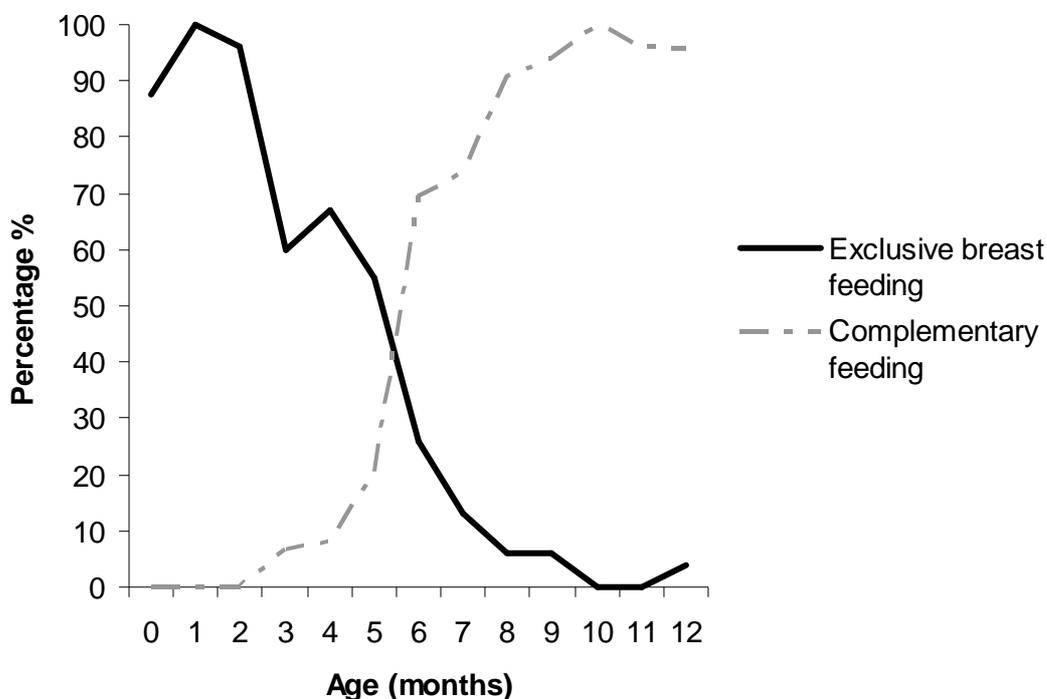
⁴ Age appropriate feeding: Infants 0-5 months of age who received only breast milk during the previous day and children 6-23 months who received breast milk, as well as solid, semi- solid or soft solid foods, during the previous day

⁵ Complementary food: solid, semi- solid or soft foods

⁶ Minimum meal frequency for children aged 6-8 months (2 times), 9-23 months (3 times) and 6-23 months (4 times)

⁷ WHO recommend that children aged 6-23 months receive food from at least 4 food groups out of 7 food groups (grains/roots/ tubers, legumes/nuts, dairy products, flesh foods, eggs, vitamin A rich fruits and vegetables, other fruits and vegetables)

Figure 7: Percentage of infants and young children 0-23 months who are exclusively breastfed and receiving complementary food (n=613)



5.3.1. Exclusive breastfeeding

Table 6 shows that 77% (n=87) of the children below 6 months were exclusively breastfed. The prevalence of exclusive breastfeeding was high during the first two months of age, but decreased rapidly from 2-6 months of age. Among the children aged 5 months, 55% (n=16) were exclusively breastfed (figure 7).

5.3.2. Breastfeeding

Nearly all of the children below 2 years had been breastfed at some time (99.8%, n=608). Sixty-eight percent (n=414) of the children were put to the mothers breast within one hour after the birth. Five percent (n=29) received foods or liquids other than breast milk immediately after birth. Among these children, 48% (n=14) were fed with honey. The reasons for stop breastfeeding were new pregnancy (33%, n=4), not sufficient breast milk (8%, n=1) and that the child refused to drink breast milk (8%, n=1) (Table 6).

5.3.3. Complementary feeding

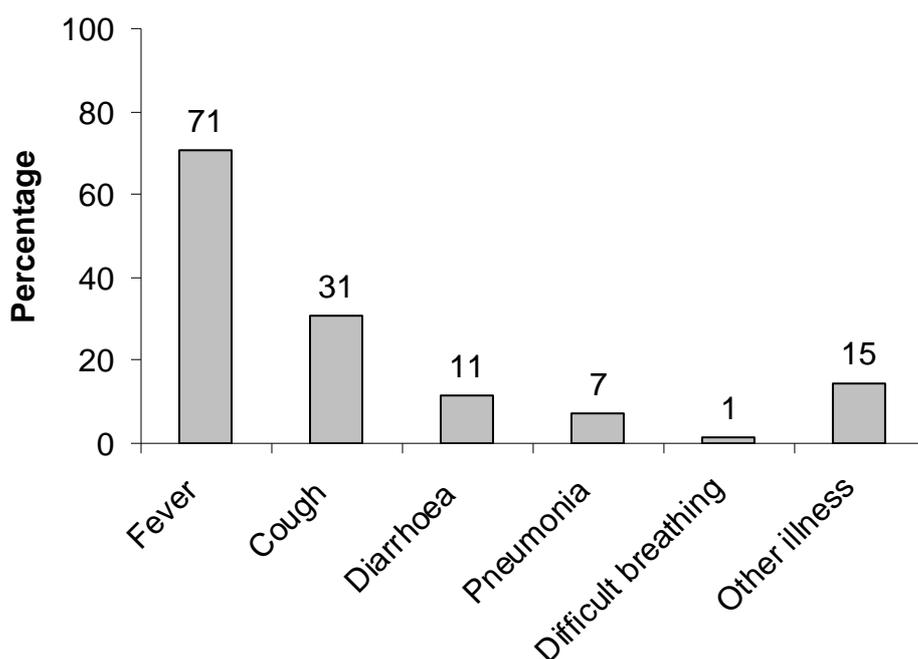
Fourteen percent (n=8) of the children 3-5 months of age received complementary food, and 80 % (n=63) of the children aged 6 to 8 months received complementary food (Table 6).

Among the breastfed children aged 6-8 months, 70% (n=44) were fed according to the recommendation of at least 2 meals a day. Among the breastfed children 9-23 months, 60% (n=228) were given the at least 3 meals a day. Among the non- breast fed children aged 6-23 months, 50% (n=5) received at least 4 meals a day. The most common types of complementary food were grains, roots and tubers (93%, n=458), legumes and nuts (62%, n=305) and dairy products (42%, n=205). Only 8% (n=12) of the children aged 6 to 11 months were given food from at least four out of seven food groups. Among children 18- 23 months, 20 % (n=36) of the children were fed according to the recommendations of four food groups a day (Table 6).

5.4. Disease

5.4.1. Percentage distribution of disease among children 0-59 months of age

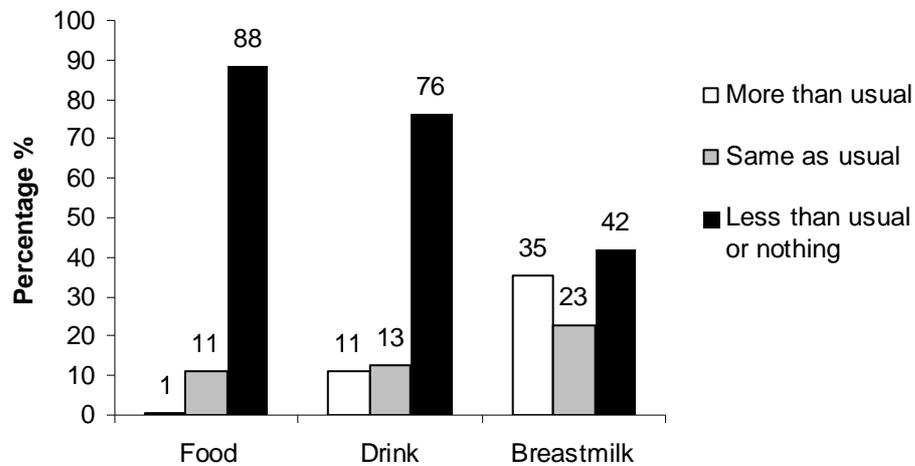
Figure 8: Percentage distribution of disease among children 0- 59 months two weeks preceding the study (n=574)



The percentage distribution of disease among children 0-59 months is presented in figure 8. Thirty- eight percent (n=574) of the children below 5 years had been sick. Among the sick children, seventy- one percent (n=406) had fever, 11% (n=65) had diarrhoea and 31% (n=177) had cough. No significantly differences were found between sex and disease.

5.4.2. Nutritional care of children during illness (0-59 months)

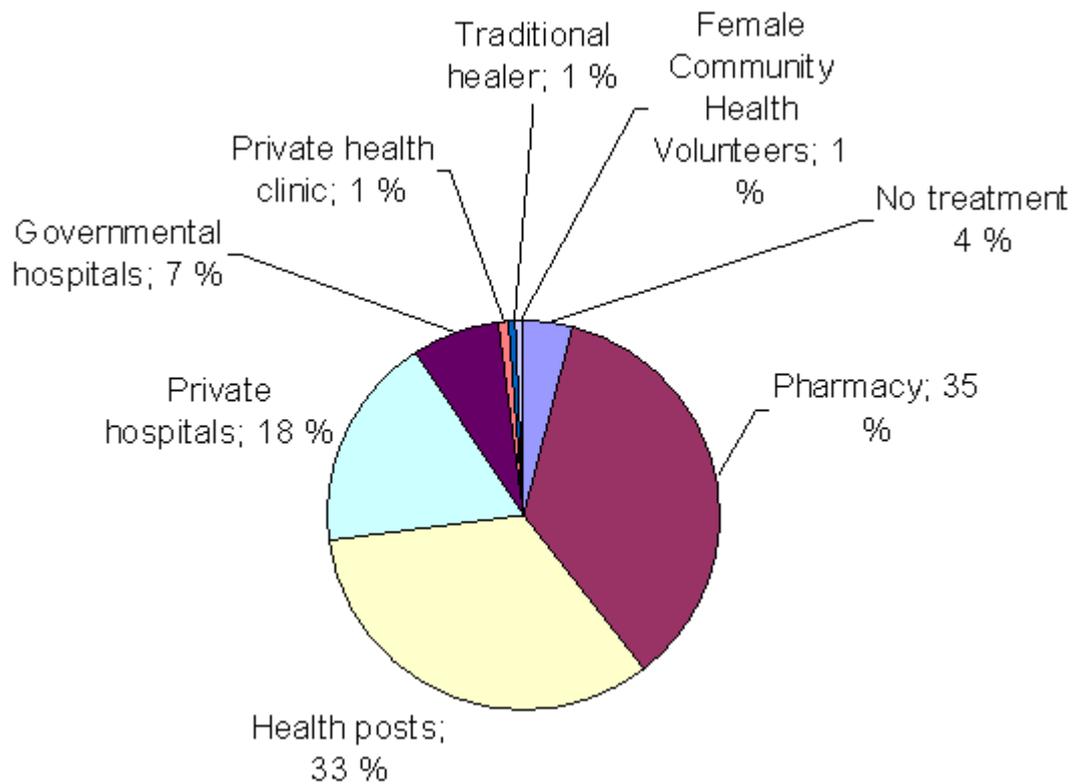
Figure 9: Nutritional care of children during illness (0-59 months)



The nutritional care of children (0-59 months) during illness is presented in figure 9. Eighty-eight percent received less food than usual or nothing during the illness period (88%, n=476). Seventy six percent (n=414) received less amount of liquid than usual or nothing. Among the breastfed children (0-23 months), 35% (n= 86) were breastfed more than usual and 42% (n=108) were breast fed less than usual or given nothing. There was no significant difference between sex and nutritional care during illness.

5.4.3. Health seeking behaviour during illness (0-59 months)

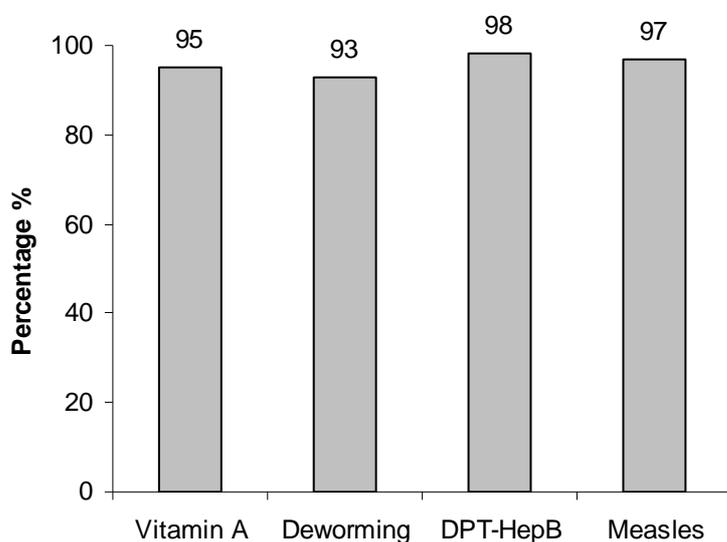
Figure 10: Health seeking behaviour (0-59 months) (n=444)



The health seeking behaviour during illness is shown in figure 10. Ninety six percent (n=431) of the sick children were taken for treatment. No significantly difference was found between sex and the health seeking behaviour. Thirty six percent was brought to the pharmacy (n=156) and 33% (n=147) were brought to the health post. One percent (n=2) of the children were brought to traditional healers.

5.4.4. Prevention of diseases

Figure 11: Percentage of children 0-59 who received vitamin A capsules, deworming tablets, DPT- HepB vaccination or measles vaccination among children 0-59 months (n=1500)



The percentage of children who received vitamin A capsules, deworming tablets, DPT- HepB vaccination and measles vaccinations is shown in figure 11. The majority of the children above 6 months received vitamin A capsules (95%, n=1202) and most of the children above 12 months (93%, n=1046) received deworming tablets 6 months prior to the study. The figure also shows that 98% (n=1439) of the children aged 0-59 months had received DPT- HepB (diphtheria, pertussis and tetanus Hepatitis B). Ninety- seven percent (n= 1237) of the children above 9 months had received the measles vaccination.

5.5. Coping mechanisms related to household food insecurity

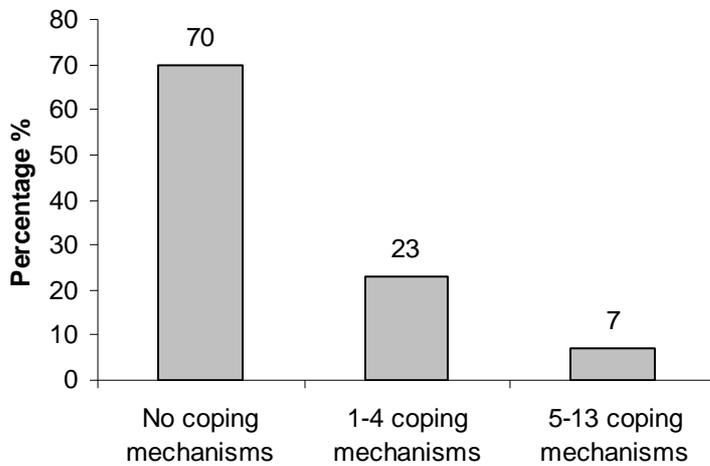
Table 7: Proportion of households that had used different coping mechanisms related to food insecurity 4 weeks prior to the study

Different coping mechanisms ¹	%	(n)
Have to eat smaller meals? (n=1500)	11	(170)
Have to eat fewer meals a day? (n=1500)	11	(158)
Spend savings on food? (n=1500)	16	(240)
Collect wild food due to shortage of food? (n= 1500)	4	(66)
Restricted adult food intake? (n=1499)	10	(137)
Consume seed stocks held for the next season? (n=1488)	6	(75)
Taken children out of school to work? (n=1496)	1	(15)
Beg for food? (n=1499)	5	(76)
Borrowed food? (n=1500)	20	(297)
Outmigration (n=1500)	3	(44)
Sold land? (n=1490)	0	(0)
Sold agricultural assets? (n=1495)	1	(21)
Sold household assets? (n=1500)	1	(10)

¹ The respondent was asked if the household had used any of the 13 coping mechanisms (yes/no) due to food shortage

The proportions of households that had used any of the different coping strategies related to food insecurity are shown in Table 7. Eleven percent (n=170) of the households had reported to have eaten smaller meals and 11% (n=158) had eaten fewer meals the last month due to food shortage. Every fifth (n=294) household had borrowed food the last month.

Figure 12: Percentage distribution of the number of coping mechanisms that were used in the household (n=1500)



Based on the different coping mechanisms in table 7, a new index with three categories of coping mechanisms was developed. Figure 12 shows that 70% (n=1051) of the households did not use any of the coping mechanisms and 23 % (n=337) had used 1-4 coping mechanisms. Seven percent (n=112) had used at least five of the selected coping mechanisms. No households used all of 13 coping mechanisms.

5.7. Determinants of stunting

Multivariate analyses were used to identify which factors that explained the variation in stunting (Table 8).

Table 8: Univariate and multivariate regression analysis: the probability of being stunted (n= 1498). Beta (B) and 95% Confidence Interval (95% CI).

Variable	Univariate			Multivariate		
	B	95% CI	P- value	B	95% CI	P- value
Disease prevention						
Vitamin A ¹	-.06	-0.36,-0.24	.677			
Measles ²	-.73	1,-0.46	.000*	-.70	-1.42,0.02	.058
Deworming tablets ³	-.08	-.33, 0.18	.175			
DPT- HepB ⁴	-.88	-1.43, -0.32	.002*	-.23	-2.51,2.06	.845
Food security						
Food security index ⁵	.33	0.19, 0.47	.000*	.17	-0.21,0.54	.392
Socio economic status						
One child below 5 years ⁶	-.05	-.027,0.01	.039*	.178	-0.49,0.13	.260
Education⁷						
Father with education	.21	0.03,0.39	.022*	-.12	-0.51,0.28	.558
Mother with education	.22	0.08, 0.35	.002*	-.06	-0.41, 0.28	.714
Maternal work						
Mother with paid work ⁸	-.18	-0.35,-0.01	.039*	-.67	-2.98, 1.64	.569
Mother work more than 8 h/day ⁹	-.51	-0.81,-0.21	.001*	-.47	-0.80, -0.15	.004*
Head of household						
Mother	Reference					
Father	-.08	-0.21, 0.06	.255	.60	0.09, 1.10	.022*
Grandfather	.25	0.11, 0.38	.000*	.89	0.32,1.45	.002*
Grandmother	.01	-0.22,0.24	.952	.90	0.12,1.67	.024*
Other	-.01	-0.31,0.30	.952	.20	-0.65,1.07	.633
Caste						
Low caste	Reference					
Middle Caste	-.38	0.25,0.51	.000*	.52	0.11,0.93	.013*
High caste	-.06	-0.20,0.07	.348	-.02	-0.51, 0.46	.926

Livelihood						
Crop farming	Reference					
Remittance, assistance programs	-.31	-0.47,-0.15	.000*	.07	-0.45,0.59	.797
Regular employment	.26	0.09,0.43	.002*	.46	0.01,0.90	.045*
Casual employment and other	-.18	-0.36,0.00	.050*	.12	-0.37,0.61	.619
Wealth index						
Lowest Wealth	Reference					
Middle Wealth	-.28	-0.41, -0.15	.000*	.19	-0.30,0.70	.445
Second Wealth	.15	0.02,0.29	.030*	.45	-0.11,1.01	.113
Fourth Wealth	.43	0.25,0.60	.000*	.69	-0.02,1.39	.056
Highest Wealth	.46	0.11,0.81	.009*	.10	-0.22,2.44	.102
R ²					0.24= 24%	

¹ Vitamin A: 0=no, 1=yes

² Measles: 0= no, 1=yes

³ Deworming tablets: 0=no, 1=yes

⁴ DPT- HepB: 0=no, 1=yes

⁵ Food security index: 0=food insecure, 1= food secure. Food insecure= used more than one coping mechanism.

⁶ Children the household: 0= less than 2 children below 5 years, 1= at least 2 children below 5 years

⁷ Education: 0= no education, 1= education

⁸ Mother paid work: 0=no, 1=yes

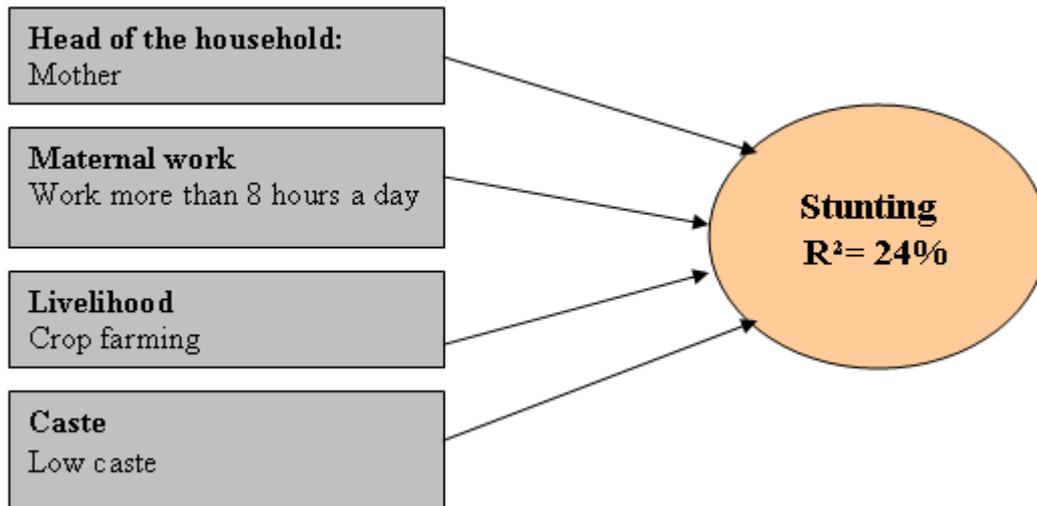
⁹ Mother work more than 8h/day: 0= no, 1=yes

¹⁰ Due to multiple categories, dummy variables were created. The presence of the variable gives score 1. All dummy variables were compared with the reference category.

¹¹ * = Significant, p<.05

Predictions for stunting were assessed in multiple regression models (Table 8). Variables that were significantly associated with stunting were identified. All variables showing linear association with stunting were entered into a preliminary model. In the final model variables that significantly added the variation were included: Households where the mother was working more than 8 hours/ day had higher levels of stunting than households where the mother was working less than 8 hours/day -0.47 (CI: -0.80- -0.15). Households headed by the father, the grandfather or the grandmother, had respectively 0.60 (CI: 0.09- 1.10), 0.89 (CI: 0.32- 1.45) and 0.90 (CI: 0.12—1.67) z-score lower stunting than household headed by the mother. Households from the middle caste group had 0.52 z-score (CI: 0.11-0.93) lower stunting than households from the lowest caste group. Households which depended on regular employment had 0.46 z-score (CI: 0.01-0.90) lower stunting than households that depended on farming. These variables explained 24 % of the variation in stunting (figure 13).

Figure 13: Prediction model: variables that predict the probability of children 0-59 months being stunted



CHAPTER 6: DISCUSSION

This discussion is divided into two sections. In the first section, results from the present study are discussed and compared with previous studies in Nepal and other low income countries. In the second section issues concerning the sample, study design, sampling procedure and data collection instruments will be discussed.

6.1. Evaluation of the results

6.1.1. Socio economic status of the household

This study confirmed that the main source of income in the Terai was farming [65]. According to the wealth index, most people were categorised as middle income households. However, a higher proportion of the households belonged to the higher castes.

6.1.2. Undernutrition

Undernutrition continues to be a major problem in Nepal. In the present study, 35%, 16% and 35% were stunted, wasted and underweight, respectively. According to WHO classification index, the levels of stunting was categorized as high (30-39.9%), and wasting ($\geq 15\%$) and underweight ($\geq 30\%$) were very high [66]. At the national level, the 2006 Nepal Demographic and Health Survey (NDHS) showed that 49% and 11% were stunted and underweight respectively. The present study showed lower prevalence of stunting and underweight compared to data from the 2006 NDHS. The prevalence of wasting had increased from 13% in 2006 [3] to 16% in the present study (2009). The 2006 NDHS showed that 43% were stunted, 20% were wasted and 41% were underweight in the Far West Terai [3]. Comparing the nutritional status in the Far West Terai in 2006 with present study in 2009, the nutritional situation among children below five years has improved. In the present study, the only difference in sex was found in underweight, where girls were more likely to be underweight than boys. These findings confirms previous findings from NDHS 2006 [3]. In NDHS 2002, girls were more stunted and underweight than the boys [67]. The present study showed that stunting and underweight increased with age. This results are in concordance with previous national studies from Nepal [3, 67] and India [68]. In the present study, wasting was highest (23%) among the children aged 12-23 months. However, other studies from Nepal [3] and India [68] have shown that children below 12 months have highest prevalence of wasting.

There are several possible explanations for high levels of wasting in the present study. First, the survey was employed in September when malaria is a particular threat. Second, Terai is particularly vulnerable to political instability like strikes. This might affect the household's access to food. Third, poor hygiene and polluted drinking water might have caused disease like diarrhea and led to weight loss. And last, the health of the mother is likely to have an important effect on her child's nutritional situation. NDHS 2006 showed that the proportion of women that were moderately and severely wasted were higher in the Far West Terai (except from the central terai) compared to other subregions in Nepal [3]. Other studies have found that the mother's nutritional status before and during pregnancy affects the health of the unborn child [83-84].

6.1.3. Inadequate dietary intake

Exclusive Breastfeeding

In the present study, 77% of the children below 6 months were exclusively breastfed the day prior to the study. The prevalence of exclusive breastfeeding was high compared to results from previous NDHS [3, 67]. In 2001, 68% were exclusively breastfed, and only 53% were exclusively breastfed in 2006 [3, 67]. The proportion of children being exclusive breastfed was higher than what was found in Asia (41%) and Africa (32%) [2].

Breastfeeding

The present study confirmed that breastfeeding is nearly universal in Nepal [3]. The percentage who initiated breastfeeding within one hour of birth (68%) was similar to previous findings from the Far-Western Terai (63%) but lower than the national level (35%) [3]. The proportion of mothers who initiated breastfeeding within one hour of birth was higher in the present study compared to studies from Asia (31%) and Africa (47%) [2].

In a country where undernutrition is high, appropriate breastfeeding practices are especially important. There are several possible explanations for high levels of breastfeeding and exclusive breastfeeding in Nepal. First, high levels of breastfed children might be due to public campaigns which aim to educate the mothers about infant and young child feeding practices. Second, the mothers might be knowledgeable about child care because she has visited the Female Community Health Volunteers (FCHVs) or other health services. The FCHVs supports the women during pregnancy and gives advice about child health [69]. Third

women decide to breastfeed because it is cultural accepted and valued. A survey from Makawampur district in Nepal found that grandmothers supported early initiation of breastfeeding [70]. At last, lack of money might encourage the mother to breastfeed the child because she cannot find any other way to feed the child.

Complementary feeding

This study showed that 14% mothers introduced complementary feeding before the child turned 6 months. The same feeding pattern was found in NDHS 2006 [3]. The proportion of children who received complementary food at 6-8 months was slightly higher in the present study (80%) compared to in the 2006 NDHS (72%) (children aged 6-9 months were assessed in 2006 NDHS) [3]. The proportion of children introduced to complementary food at 6-8 months of age was higher in the present study than in India (55%) [68] and in a survey which included several developing countries in Asia and Africa (58%) [2].

In the present study, 70% of the children aged 6-8 months and 60% of the children aged 9-23 months of age were fed the minimum times of complementary foods. Higher meal frequency was found in 2006 NDHS, where 84% of the children aged 6-23 months in the Far Western region received the minimum of meals a day [3]. In a national study from India, only 42% of the children aged 6-23 months received the minimum times of meals a day [68]. In the present study, the variety of food was not adequate. Many children had a Dietary Diversity Score (DDS) that was below four, meaning that the child received food from less than four food groups. The majority of the children aged 6-23 months received grains, roots and tubers, however few children received flesh foods. The low DDS confirms the findings from 2006 NDHS where only 36% of the breastfed children received the minimum of food groups (at least three food groups). Among the non breastfed children, 27% received food from the minimum of food groups (at least four food groups) [3]. Another study from Nepal found that only 12% of the children received foods from 5-7 food groups [71]. Studies have shown that the dietary diversity is lowest in Asia, intermediate in Africa and highest in Latin America [89-95]. There are several possible explanations for the poor diversity in the diet. The 2008/2009 winter drought might have caused poor summer harvest in the Terai. In addition, frequent rainfall, flooding and landslides might cause food shortage because of damage to the crops. There are also reasons to believe that the international food crisis which resulted in higher food prices forced the households to reduce the variety of food [33].

6.1.4. Disease

In the present study, 38% of the children were sick 2 weeks prior to the study. The prevalence of fever (71%) was much higher than what has been reported of the Far West Terai of Nepal (13%) in 2006 NDHS [3]. The high prevalence of fever in this area might be due to malaria. Kanchanpur and Kailali are considered to be malaria affected districts and the transmission [72] is a particular threat in September when the survey was employed [73]. Another possible explanation for the high levels of child illnesses might be due to HIV and AIDS which are higher in the Terai region compared to other parts of Nepal [74]. Illness becomes particular threat to the child's health if the care that is given is inadequate. The present study found that 88% were fed less during the illness and 76% were given less food. The nutritional care during illness was far better in a survey from Bardiya in 2008 [59] where 38% were fed less or not given any food and 35% were given less or no liquids during the illness period. In the study from Bardiya, only information about care during diarrhea was assessed. Care during illness also includes health seeking behavior. In the present survey, 36% of the children were brought to the pharmacy to seek advice, treatment or to buy medications. Few children were brought to the governmental hospitals (8%). The mothers' decision to take the child to the pharmacy and not the governmental hospitals is determined by many factors. The respondent might take the child to the pharmacy for treatment because she did not perceive the illness as "serious enough" to visit the governmental hospitals. Other explanations for going to the pharmacy are long distance or high cost of treatment at the governmental hospitals. In our study only 1% of the sick children were brought to a traditional healer for treatment. A study from Kanchanpur found that a sick child would get traditional home treatment. If the treatment did not help, the child was brought to a traditional healer. If neither of these options helped, they would visit the Female Community Health Volunteer (FCHV) [30].

6.1.5. Coping mechanisms related to household food insecurity

A third of the households were food insecure in the present study. To borrow food and to spend savings on food were the most common practices. Within the Far- Western regions, the Hill and the Mountain districts are more food insecure than the Terai districts [75]. The difference within the Far West region might be due to higher food prices and poorer crops and frequent nature disasters [75]. The people living in Terai have better access to roads and markets, and therefore better access to food and health care [3].

6.1.6. Determinants of stunting

The UNICEF conceptual framework was used to determine the causes of stunting in the survey districts. The present survey reconfirms that stunting is due to a complex interaction of multiple factors like caste, head of household, livelihood, economy and the work burden of the mother. Our findings are in concordance with another survey from the Terai region (Bara and Rautahat district) [100]. This survey found that district, age, place of residence, household income, breast-feeding practices, and some food items were significant with stunting among children 3-10 years of age [100]. Similar determinants have also been found in a study by Lisa C. Smith and Lawrence Haddad [76]. They analyzed different underlying factors in 63 low-income countries that contributed to a reduction in child malnutrition (underweight) in the period 1970- 1995. They found that women's education, per capita food availability, women's status relative to men's and the quality of countries' health environment were important determinants of child malnutrition [76].

6.2. Evaluation of the sample and method

6.2.1. The sample

The sample size of the study was found to be adequate. There were an equal proportion of girls and boys in the sample and the age was normally distributed.

6.2.2. The study design

A cross sectional study is collection of data from a specific population at a single point in time [77]. The main advantage with a cross sectional design is that it is relatively quick and cheaper than other types of study designs. The data makes it possible to detect prevalence and associations between variables. The main weakness with cross sectional study design, is that it is not possible to detect cause –effect relationship between the variables [77].

6.2.3. Sampling procedure

In the present study, the clusters were randomly chosen, and the households were randomly chosen within the clusters. The present survey is representative for the nutritional situation of children in the Far West Terai of Nepal, however can not be generalized to the whole Nepali population. Using a simple random sampling at the population level would give a sample with higher representativity. Simple random sampling is used where there is an up-dated list of all individuals or households in the population. The households are randomly chosen using a random number from the list of individuals or households. In the present study, a simple random sampling was not chosen because no list of individual or households were available

[56]. To reduce the cost of the survey, the Expanded Program for Immunization (EPI) method could have been employed. The EPI method has been widely used in rapid cluster sampling surveys where an up-to date household sampling frame is not available. The centre of the cluster is found and a bottle or pencil is spun to find the direction to walk. From there the households are randomly chosen. When they reach the edge of the cluster, the same procedure is repeated. The method has been criticized because it is not a probability sample, does not allow for population movement since the last survey and does not ensure objectivity in the households which are chosen [78].

6.2.4. The instruments strengths and weaknesses

The anthropometric measurements are associated with both random and systematic errors. Systematic errors influence the validity and random errors influence the reliability. The results are reliable if they with repeated measurements, or with measurements taken under identical circumstances, give the same results [79]. The validity of a measurement is defined by which degree the measured value reflects the characteristics it is intended to measure [80].

Anthropometric measurements

Anthropometric measurements are used to detect the individual's growth and are an expression of health, nutritional status, and well-being [81]. The enumerators received the same practical training with written and oral explanation on how to do the anthropometric measurements. The anthropometric measurements were done according to standardized procedures developed by The World Health Organization (WHO) and United Children's Fund (UNICEF). There are therefore reasons to believe that all enumerators were measuring the child the same way, and that the reliability of the study was high. Cut off values developed by WHO was used to exclude outrange values [63]. The cleaning process revealed that 1.1% (n=16) of the observations of underweight and wasting and 0.1% (n=2) of the observations of wasting were out of range. These cases were excluded from the analyses. The height was taken in a standing or lying position depending on the child's height. Systematic errors might have occurred if the height was wrongly read from the height board throughout the whole survey. Random errors might have occurred if the height was measured wrong on a particular child. This could easily have happened if the child protested and refused to be measured. To increase reliability, the height of the child was measured twice by two enumerators. To increase the validity, Uniscales were calibrated before the study started. Since some of the anthropometric measurements were dependent on age, knowing the exact

age was essential. The mother of the child reported the child's birth date and age in months. To validate the information from the mother, the birth date was checked with the vaccination card.

As the enumerators followed standard procedures for the anthropometric measurements, it is likely that the anthropometric data had high external validity. The internal validity was high because the results were interpreted according to the new WHO growth standard from 2006. The main disadvantage using the new WHO growth standard is the fact that it is not possible to compare the results with studies using the old International Centre for Health Statistics/World Health Organization (NCHS/WHO) reference. The different methods have shown to give different levels of stunting, wasting and underweight [82]. There has been a discussion about the impact of altitude on the growth of the child. Some studies showed that people living at high altitude are more stunted than the ones living on lower altitude [83-86]. Other studies have not found any clear association between altitude and growth [87-89]. WHO state that children who live under optimum conditions follow the same growth curve the first 5 years. The growth curve is based on children which are appropriate breastfed and given adequate complementary feeding and the necessary vaccinations. In addition, the growth standard is based on mother of children who did not smoke during pregnancy or after the child was born [90]. Peter Svedberg argued that the current anthropometric indicators (stunting, wasting, underweight) can overlap and lead to inaccurate prevalence of undernutrition [91]. A child can be underweight and stunted at the same time and the prevalence of undernutrition is highly dependent on which of the indicators that are used. He has developed a new index called the Composite Index of Anthropometric Failure (CIAF). The CIAF includes all individuals who are wasted, stunted or / and overweight [91].

The structured questionnaire

A structured standardized face- to face interview was used because the literacy among the respondents was low. The questions are asked in order and in a set manner to ensure no variation between the interviews [92]. Structured standardized interview is less time-consuming than using in- depth interviews. Further, it is easier to train enumerators to do structured interview because each question has a common meaning [93]. A structured questionnaire made it possible to do quantitative analysis and assess different causes of undernutrition related to socio economic status, infant and young child feeding, disease, food security and health care. In order to get an in-depth understanding on these issues,

triangulation of methods could have been employed. Using qualitative method like focus groups in addition to structured questionnaire could have yield new ways of understanding undernutrition and increased the validity of the data [94]. Due to limited of time and resources, structured questionnaire was used as the main research tool in this survey. To meet the required sample size it was necessary to engage several enumerators. The enumerators were from all over Nepal. They knew the language (Nepali) and the culture however they did not have any relation to the districts other than the survey work.

The validity of the questionnaire depends on three matters: error from the enumerator, the respondent, and error from the questionnaire [93].

A face to face interview is likely to give high response rate because enumerator could motivate the respondent to fully and accurately answer the questions, and misunderstandings could be clarified. However, due to inadequate training, interviewer bias might have occurred. Only 13 out of 40 enumerators attended a 3 days training in Kathmandu before they went to the field. The rest were trained by Nepali Technical Assistance Group (NTAG) or other enumerators. Due to inadequate training, the enumerators might not have insufficient knowledge about the meaning of different terms used in the questionnaire. The enumerators might try to use their own wording, however the meaning of the question might change [92]. Higher reliability and validity would have been accomplished if the whole group was trained at the same time before going to the field.

In the present study, recall bias occurred if the respondent failed to answer correctly on the question due to poor memory. To reduce recall bias, the mother was used as the main respondent because she was most likely to remember details about infant and young child feeding practices and issues regarding the health of the child. Recall bias was also reduced using a short recall period like 24 hours and 2 weeks recall period. To further reduce recall bias, the interview was held in their homes where some of the questions could be checked with the responses given, for example construction of the household and assets ownership. In the present survey, bias might have occurred because family members or neighbors would want to join in the discussion. A situation like this might have important implications for the data that is obtained. “Social desirability” is a phenomenon where the respondent answers according to what would give respect or credibility instead of giving the true answer [95]. Sensitive questions are particular vulnerable for the effect of social desirability [96]. There is

a chance that the mother underestimated the use of coping mechanisms or reported more appropriate child feeding patterns than what was actual the case. To reduce bias due to social desirability, effort was made to keep neighbors and family members away during the interview.

The study aimed to assess causes of undernutrition based on the UNICEF conceptual framework. It was challenging to decide what elements to include in the questionnaire. As undernutrition has multifactorial causes, only questions which were considered to have most impact on undernutrition were included in the questionnaire. To ensure high validity, the majority of the questions were taken from questionnaires which have been validated like the Demographic Health Survey (DHS), Concern Worldwide [59], Household Food Insecurity Access Scale (HFIAS) [62], Coping Strategy Index (CSI) [60] and surveys from the World Food Program (WFP) [61]. In addition, people from WFP, UNICEF and NTAG gave their comments on the questionnaire which is likely to increase the validity of the study.

Adjustments were made to ensure that the questionnaire was culturally acceptable and met the objectives of the survey. The questionnaire was translated to Nepali by experienced translators from NTAG and UNICEF and tested in the field during the training. However, due to time constraints no pilot survey or validity test was employed. To increase the reliability of the questionnaire, a repeated test of the questionnaire could have been employed on the same respondents. There might be systematic or random errors in the questionnaire due to mistakes by the enumerator. Defined categories in the questionnaire minimized this type of error. In addition, each questionnaire was cross checked before it was handed over to NTAG for data entering.

The different parts in the questionnaire will now be discussed in further detail in relation to relevant literature. Strengths and weaknesses related to the assessment of, socio economic status, infant and young child feeding, disease and coping mechanisms of the household will be the focus in this part of the discussion.

Socio economic status of the household

In the present study, no information about the income of the household was collected. Several indicators were asked in order to get an overview of the socio economic situation. These questions included of the household like the number of children below five years in the household, head of household, caste, education and livelihoods, and household information

which were incorporated into the wealth index. The scores were summed and a wealth index of five categories was developed (appendix 2). This wealth index has not been validated and might be biased because the animals and assets were treated as they were of equal value and not given a score based on its value. Alternatively, the assets of each household were given a weight or factor score generated through the Principal Component Analysis (PCA). This method makes it possible to compare the socio economic status with other countries [97]. The method used in the present study was appropriate because the categories were adjusted to the socio- economic situation in the districts, through the use of average score.

Infant and young child feeding

The results from the survey indicated that the breastfeeding practices in Nepal were satisfying according to the recommendations given by World Health Organization (WHO) [15].

However, as discussed earlier, the breastfeeding patterns, particularly exclusive breastfeeding, was not in concordance with other national studies from Nepal [3, 67]. The mother might have misunderstood the meaning of exclusive breastfeeding. Another study from Nepal found that water was not considered fluid, and therefore a child receiving only water in addition to breast milk was still considered as being exclusively breastfed [59]. This misunderstanding would mainly be due to inadequate training and the enumerator's wrong or poor explanation of meaning of the term "exclusively breastfed". The infant feeding indicators, especially exclusive breastfeeding, have been discussed in terms of validity. WHO recommends to exclusively breastfeed the child up to the age of 6 months. Using a 24 hours recall period to assess exclusive breastfeeding gives less recall bias, is easier and less time consuming than a longer recall period [98]. However, some argue that a 24 hour recall period is not adequate to measure exclusive breastfeeding [99]. The argument is based on the fact that the prevalence of exclusive breastfeeding is high during the first months, and decrease up to four and five months. Therefore, a high prevalence of exclusive breastfeeding does not give a true picture of the actual breastfeeding practice. It has been suggested that an indicator which measure exclusive breastfeeding since birth is more appropriate than using a 24 hour recall [99].

In order to assess the variety of the complementary food, a Dietary Diversity Score (DDS) was employed. A DDS was convenient and easy to use in a survey which included many questions. A child aged 6-23 months should receive a diet with foods from at least four out of seven food groups [15]. Studies from several low income countries have validated the DDS

based on 7 food groups and found that it is the best predictor of micronutrient density in the food [100-105]. Therefore, oil and fats were excluded from the recommended food groups [15]. A weakness with this type of DDS, was the fact that no details about the amount of foods eaten was collected.

Disease

The mother was requested to report the types of diseases that the child had two weeks prior to the study. Studies have found that a recall period of 2 weeks underestimates the true disease rates. It has been suggested that a shorter recall periods of 3 days would yield more accurate data of the disease pattern [106-108]. A recall period of 2 weeks was employed in the present study in order to compare the results with DHS.

Coping mechanisms

The households' food security can be assessed using variety of indicators for example caloric acquisition and dietary diversity [109]. In the present study, coping mechanisms were used to assess the food security situation of the household. Coping mechanisms have been validated in several studies [60, 62]. Still, there is no consensus on which coping mechanisms that are the best predictors of food insecurity. Specific coping mechanisms do not always reflect the same severity of food insecurity across cultures. Further, all coping mechanisms are not equally accepted in the community [62]. To increase the validity of the questions related to coping mechanisms help advice was given from experienced people from WFP.

It is found that the recall period that is employed to assess food insecurity has high impact on the results. A recall period of 12 months, 6 months, 30 days and 7 days has been used assess food security [60, 62]. Like the HFIAS, a four weeks recall period was employed in the present study. This recall period was appropriate in the present study the coping mechanisms that had been used recently were of interest. In the present study, a household was categorized as food insecure if they had used any of the selected coping mechanisms. This is a very strict way of categorizing. The prevalence of food insecurity might have been overestimated. Alternatively, each coping mechanisms could be given a weight depending on the severity of the mechanism. Based on the sum score, a house is characterised as food secure or food insecure [62]. The prevalence of food insecurity is likely to be correct due to the severity of the coping mechanisms included in the questionnaire.

6.3. Conclusions and further recommendations

The aims of the present study were to assess the prevalence of undernutrition and identify causes of undernutrition among children below five years in the Far West Terai of Nepal. This study demonstrated that undernutrition continues to be a serious problem in the Far West Terai. Thirty-five percent of the children were stunted, 16% were wasted and 35% were underweight. Though there has been a declined rate of stunting and underweight, the rate of wasting has gone up since 2006. According to WHO classification of severity of undernutrition, the stunting rate was classified as high, and wasting and underweight were classified as very high. Stunting and underweight increased with age. The only difference in sex was found in underweight, where girls had higher chance of being underweight than the boys.

The complementary feeding was timely introduced, however the quality and quantity was inadequate. The prevalence of disease was high and was likely to be caused by inadequate care during illness. In regard to the households coping mechanisms related to food security, one third of the households were using coping mechanisms which might indicate that they were food insecure. The most common coping mechanism was to borrow food or spend savings on food. Finally, the multiple regression models showed that households where the mother worked more than 8 hours a day, where the mother was the head of the households, belonged to low caste, and households where the main source of income was farming had higher levels of stunting than other households. These variables explained 24 % of the variation in stunting.

Despite high levels of breastfeeding and exclusive breastfeeding, programs which aim to improve these practices should be continued. In addition, more emphasis should be given to the quality and the quantity of complementary food. There is also a strong need to continue to validate food security indicators and to address new coping mechanisms.

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CHAPTER 8: APPENDICES

Appendix 1: Description of the variables

Appendix 2: Wealth index

Appendix 3: The questionnaire used in the survey

Appendix 1: Description of the variables used

Table 9: Description of the variables used in the analysis

Indicator	Inclusion criteria	Description of the variable
Early initiation of breastfeeding	<24 months	% put to the breast within one hour of birth.
Exclusive breastfeeding	<6 months	% breast fed exclusively with breast milk, expressed or from the wet nurse, the previous day. The child was allowed to receive ORS, drops, syrups (vitamins, minerals and medicines).
Continued breastfeeding at 1 year	12-15 months	% fed with breast milk the previous day
Introduction of complementary foods	6-8 months	% who received solid, semi-solid or soft foods during the previous day. The child is allowed to drink breast milk and any food or liquid including non- human milk and formula.
Minimum dietary diversity	6-23 months	% Receive foods from at least 4 food groups the previous day
		<ol style="list-style-type: none"> 1) Grains, roots and tubers, 2) Legumes and nuts 3) Dairy products 4) Flesh foods 5) Eggs 6) Vitamin A rich fruits and vegetables 7) Other fruits and vegetables
Minimum meal frequency	6-23 months	% Receive complementary foods the minimum of times or more the previous day
	6-8 months	2 meals a day
	9-23 months	3 meals a day
	6-23 months	4 meals a day
Children ever breastfed	<24	% ever breastfed.
Children breastfeeding at 2 years	20-23 months	% fed with breast milk the previous day.

Bottle feeding	0-23		% fed with a bottle the previous day
Age Appropriate feeding	0-23		% Appropriate breastfed the previous day
		0-5	% Exclusively breast fed
		6-23	% Given complementary foods
Prenatal feeding	0-23	Multiple response	% receiving other foods than breast milk immediately after birth
Reasons for stop breastfeeding	0-23	Multiple response	Among the ones who did not breastfed the day prior to the study, what was the reason for stop breastfeeding.
Disease	0-59		% of children being sick two weeks prior to the study
Type of illness	0-59	Multiple response	Among the children which had been sick, % of children that had fever, cough, diarrhoea, pneumonia, difficult breathing and other illnesses
Nutritional care during illness	0-59		Among the children which had been sick, % receiving more, same, or less than usual/or nothing at all.
Health seeking behaviour	0-59		Among the children which had been sick, % of the children which were taken to pharmacy, health posts, private hospitals, governmental hospitals, private hospitals, traditional healers, FCHVs and others to treat the disease
Vitamin A	6-59		% recieved vitamin A
Deworming	12-59		% recieved deworming tablets
DPT- HepB	0-59		% received DPT- HepB
Measles	9-59		% received measles vaccination
Coping mechanisms	0-59		% of the households which had used any of the coping mechanisms 4 weeks prior to the study - eaten smaller meals - eaten fewer meals - spent savings on food - collected wild food -consumed seed stock held for the next season - taken children out of school - begged for food - borrowed food - outmigrated - sold land - sold agricultural assets -sold household assets
Coping mechanisms	0-59		% of the households that were food secure and food insecure

Children below 5 years living in the household	0-59	% of the household having one child, two children or more than two children below 5 living in the household
Head of the household	0-59	% of households which were headed by the father, mother, grandfather, grandmother or others
Caste	0-59	% of households belonging to the dalits, disadvantaged janajatis/disadvantaged non dalit group, and the relatively advantaged janajatis/ uppalow jatis
Education: father	0-59	% of the fathers with no education, primary level, lower secondary/informal, secondary level, higher secondary and immediate and above
Education: mother	0-59	% of the mothers with no education, primary level, lower secondary/informal, secondary level, higher secondary and immediate and above
Livelihoods	0-59	% of the households that reports that the main source of income is: crop farming/ livestock farming, remittance/assistance programs, re, regular employment/ trade/ business/ forest products collection and casual employment/ other sources of livelihood
Working mother	0-59	% of the households with a mother with paid work
Hours spend on work by mother	0-59	Among the mothers with paid work, % of the mothers working 0.5-3.5 hours, 4-7.5 hours and more than 8 hours.

Appendix 2: Wealth index

- *Roof*: The roof was aggregated into two groups: improved roof and unimproved roof. Improved roof was made of for example cement, iron, cardboard or wood planks and got a score of 1. The cheaper version is the unimproved roof, which are made of materials available in the field like thatch, straw and mud and were given a score 0.
- *Walls*: The walls were divided into two categories: improved and not improved walls. Improved walls were for example finished walls made of cement and wood planks. These types of walls were considered to be of best quality and therefore including the people with high socio economic status and got a score of 1. Unimproved walls like walls made of mud or local materials are used by people with lower socioeconomic status and were given a score of 0.
- *Size of the dwelling*: The size of the dwelling was calculated by dividing total people in the household by number of rooms in the household. Households with 2 persons per room or more, were given a score of 0, and in households where there were less than 2 persons per room were given a score of 1.
- *Land*: The households that owned less than 9000m² were given score 0, and the households with more than 9000m² of land were given score 1.
- *Animals*: Mean was found at the animal variables and 1 was given to household with number of animals above the mean, and 0 was given to households with number of animals below the mean.
- *Assets*: Used multiple choice, the household ticked out which assets that were available to them. The ones that answered that they had more than 5 assets were classified as better off and given a score of 1, and the ones owning less than 5 assets were classified as worse off and given a score of 0. It is assumed that a poor family has access to some assets, however are still poor (for example cell phone, landline, television, radio). If the household have 5 assets or more, they have assets which are not that usual, and which are more expensive to buy, and the household are then classified as better off.
- *Transport*: The transport facilities were divided into two categories: the household which had a transport facility (categorized 1) and the household without a transport facility (categorized 0).

Appendix 3: Questionnaire used in the survey

Questionnaire for Nutrition Assessment of children 0-59 months in districts in the Mid and Far West Regions of Nepal

Interview mother of one randomly selected child in the household. Tell the mother about the purpose of the study and ask for her participation.							
Do you agree to participate in this survey? Yes <input type="checkbox"/> No <input type="checkbox"/>							
Form no. <input type="text"/>		Date of Interview (DD/MM/YY) <input type="text"/>					
Interviewer name:		Interviewer Code: <input type="text"/>					
District code:	VDC code:	Ward code:	Household code:	Child code:	Settlement name:		
Name of household head:		Name of mother:					
A. SOCIO ECONOMIC STATUS OF THE HOUSEHOLD. PART A							
No	QUESTIONS AND FILTERS	CODING CATEGORIES				SKIP	VARIABLE
1.	Who is the head of the household?	1. <input type="checkbox"/> Mother 2. <input type="checkbox"/> Father 3. <input type="checkbox"/> Grandmother 4. <input type="checkbox"/> Grandfather 5. <input type="checkbox"/> Others.....					HEAD
2.	Caste	1. <input type="checkbox"/> Dalit Hill/Tarai 2. <input type="checkbox"/> Disadvantage Janajati/Hill/Tarai 3. <input type="checkbox"/> Disadvantage Non Dalit Tarai Caste Group 4. <input type="checkbox"/> Religious Minorities 5. <input type="checkbox"/> Relatively Advantaged Janajati Upper Caste Group 6. <input type="checkbox"/> Upallow Jati					MCASTE
3.	How many are currently living in this household ?		Age group	Male	Female	total	HHSIZE
		1.	Under 5 years				
		2.	5-15 years				
		3.	16-60 years				
		4.	Over 60 years				
4.	How many people are living in the house?	_____ people					TOTHH
5.	How many children are under 5 years?	_____ children					TOTCHILDUS
6.	What is the father's level of schooling?	1. <input type="checkbox"/> None 2. <input type="checkbox"/> Primary level 3. <input type="checkbox"/> Lower secondary /informal 4. <input type="checkbox"/> Secondary level 5. <input type="checkbox"/> Higher secondary					EDFATHER

		6. <input type="checkbox"/> Intermediate and above		
7.	What is the mother's level of schooling?	1. <input type="checkbox"/> None 2. <input type="checkbox"/> Primary level/Informal education 3. <input type="checkbox"/> Lower secondary 4. <input type="checkbox"/> Secondary level 5. <input type="checkbox"/> Higher secondary 6. <input type="checkbox"/> Intermediate and above		EDMOTHER

B. SOCIO- ECONOMIC INFORMATION OF THE HOUSEHOLD. PART B

No	QUESTIONS AND FILTERS	CODING CATEGORIES	Remarks	SKIP	VARIABLE
8.	What are the main materials of the roof? (<i>observe</i>)	1. <input type="checkbox"/> Thatch/straw 2. <input type="checkbox"/> Wood planks, cardboard 3. <input type="checkbox"/> Finished roof (iron, tin, finished wood, cement, ceramic) 4. <input type="checkbox"/> Earth/ mud 5. <input type="checkbox"/> Other.....			ROOFING
9.	What are the main materials of the walls? (<i>observe</i>)	1. <input type="checkbox"/> Simple wall with mud or local materials 2. <input type="checkbox"/> Bamboo or stone with mud, plywood, cardboard 3. <input type="checkbox"/> Finished walls; cement, brick, stone with cement, wood planks 4. <input type="checkbox"/> No outside walls 5. <input type="checkbox"/> Others.....			WALLS
10.	How many rooms are there in your house?	1. <input type="checkbox"/> 1 room 2. <input type="checkbox"/> 2 rooms 3. <input type="checkbox"/> 3 rooms 4. <input type="checkbox"/> 4 rooms 5. <input type="checkbox"/> 5 rooms 6. <input type="checkbox"/> 6 rooms 7. <input type="checkbox"/> more than 7 rooms			ROOMS
11.	Do you have your own cultivated land?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No	→	Go to 13	LAND
12.	If yes, what is the total area of land owned?	1. ____ Katta 2. ____ Bighas 3. ____ Ropani 4. ____ Aana 5. ____ Paisa 6. ____ Dhur 7. ____ Nali 8. ____ Mana			LANDSIZE

WATER, HYGIENE AND SANITATION: HOUSEHOLD				
19.	Where do you get your main source of drinking water from?	1. <input type="checkbox"/> Piped water available at home 2. <input type="checkbox"/> Tubewell/ Borehole 3. <input type="checkbox"/> Public tap 4. <input type="checkbox"/> Dugwell 5. <input type="checkbox"/> River/stream 6. <input type="checkbox"/> Spring, pond 7. <input type="checkbox"/> Rainwater 8. <input type="checkbox"/> Bought in tanker 9. <input type="checkbox"/> Well (Kuwa) 10. <input type="checkbox"/> Other.....		MAINWATER
20.	Do you treat your water to make it safer?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No 	Go to 22	TREATWATER
21.	If yes, how do you treat it?	1. <input type="checkbox"/> Boil 2. <input type="checkbox"/> Water filter 3. <input type="checkbox"/> Chlorination (waterguard,piyush, aquatablets) 4. <input type="checkbox"/> SODIS 5. <input type="checkbox"/> Strain through cloth 6. <input type="checkbox"/> Let it stand and settle 7. <input type="checkbox"/> Other.....		HOWTREAT
22.	Do you have toilet facility in your home?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No 	Go to 24	TOILET
23.	What type of toilet facility does this household use?	1. <input type="checkbox"/> Flush toilet 2. <input type="checkbox"/> Pit latrine 3. <input type="checkbox"/> Bio gas toilet 4. <input type="checkbox"/> Eco toilet 5. <input type="checkbox"/> Other.....		TOILTYPE
24.	If you have a toilet, does your child use the toilet?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No 	Go to 26	CHILDTOILET
25.	If the child does not use the toilet, where did you dispose your child's feces the last time he/ she defecated?	1. <input type="checkbox"/> Dropped into toilet facility 2. <input type="checkbox"/> Rinse/ washed away in open area 3. <input type="checkbox"/> Rinsed/ washed away in drainage system 4. <input type="checkbox"/> Disposed somewhere in yard 5. <input type="checkbox"/> Buried 6. <input type="checkbox"/> Did nothing 7. <input type="checkbox"/> Other.....		WHERETOI
26.	What do you use to wash your hands?	1. <input type="checkbox"/> Nothing 2. <input type="checkbox"/> Soap 3. <input type="checkbox"/> Soil 4. <input type="checkbox"/> Plain water 5. <input type="checkbox"/> Ash 6. <input type="checkbox"/> Other.....		WHATWASH

27.	Do you have soap in the house? (CHECK IT!)	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		SOAP
C: FOOD SECURITY: HOUSEHOLD				
No	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP	
28.	What is the household's two main source of income?	1. <input type="checkbox"/> Crop farming 2. <input type="checkbox"/> Livestock farming 3. <input type="checkbox"/> Fishing 4. <input type="checkbox"/> Casual wage labour 5. <input type="checkbox"/> Remittance 6. <input type="checkbox"/> Trade/ business 7. <input type="checkbox"/> Assistance programmes (pensions, development aid programmes, etc) 8. <input type="checkbox"/> Regular employment 9. <input type="checkbox"/> Forest products collection 10. <input type="checkbox"/> Other.....		HINCOME
29.	Have you borrowed money or food in past 6 months?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		BORROW
30. How many days in the past WEEK has your HOUSEHOLD eaten the following food items, and what was the main source of each food item consumed?				
	Food item	Number of days when the food was eaten last week 0 to 7	Main food source (where did you get it from?) Insert code from below	Variable
01	Rice	<input type="text"/>	<input type="text"/>	HRICE
02	Maize	<input type="text"/>	<input type="text"/>	HMAIZE
03	Millet/ Wheat/ Barley/ Chino	<input type="text"/>	<input type="text"/>	HFLOUR
04	Potato/ yam/ taro	<input type="text"/>	<input type="text"/>	HPOTATO
05	Fish/ poultry	<input type="text"/>	<input type="text"/>	HFISH
06	Meat	<input type="text"/>	<input type="text"/>	HMEAT
07	Egg	<input type="text"/>	<input type="text"/>	HEGG
08	Pulses/ lentil	<input type="text"/>	<input type="text"/>	HPULSES
09	Green vegetables	<input type="text"/>	<input type="text"/>	HVEG
10	Fruits	<input type="text"/>	<input type="text"/>	HFRUIT
11	Milk (including powder milk), yogurt, cheese etc.	<input type="text"/>	<input type="text"/>	HMILK
12	Ghee/ oil/ butter	<input type="text"/>	<input type="text"/>	HOIL
13	Sugar/ honey/ sweets	<input type="text"/>	<input type="text"/>	HSUGAR

Food source codes				
1= Own production (crop, animals) 2= Purchase on market, shop etc. 3= Hunting, fishing, gathering 4= Received in- kind against labour or against other items 5= Borrowed 6= Gift of food from family/ relatives 7= Food aid (NGOs, WFP)				
31.	In the past 4 weeks, did you or any household member have to eat a smaller meal than you felt needed because there was not enough food?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 33	SMALLMEAL
32.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past months) 3. <input type="checkbox"/> Often (more than ten times the last month) 4. <input type="checkbox"/> Everyday		SMALLMEAL2
33.	In the past 4 weeks, did you or any other household member have to eat fewer meals a day because there was not enough food?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 35	PASTFOODSHO
34.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past months) 4. <input type="checkbox"/> Everyday		PASTFOODSHO2
35.	In the past 4 weeks, did you or any household members go a whole day without eating anything because there was not enough food?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 37	NOFOOD
36.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past month) 4. <input type="checkbox"/> Everyday		NOFOOD2
37.	In the past 4 weeks, did your household spend savings on food?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 39	SAVINGS
38.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past month) 4. <input type="checkbox"/> Everyday		SAVINGS2

39.	In the past 4 weeks, did your household collect wild food due to the shortage of food?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 41	WILD
40.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past month) 4. <input type="checkbox"/> Everyday		WILD2
41.	In the past four weeks, did your household restrict consumption by adults in order for small children to eat?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 43	RESTRICT
42.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past month) 4. <input type="checkbox"/> Everyday		RESTRICT2
43.	In the past four weeks, did your household consume seed stocks held for the next season?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 45	SEEDSTOCK
44.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past month) 4. <input type="checkbox"/> Everyday		SEEDSTOCK2
45.	In the past four weeks, did your household take children out of school to work?	1. <input type="checkbox"/> Yes → 2. <input type="checkbox"/> No	Go to 47	CHILDLABOUR
46.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past month) 4. <input type="checkbox"/> Everyday		CHILDLABOUR2
47.	In the past four weeks, have you begged for food?	1. <input type="checkbox"/> Yes → 2. <input type="checkbox"/> No	Go to 49	BEGGING
48.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past month) 4. <input type="checkbox"/> Everyday		BEGGING2
49.	In the past four weeks, have you borrowed food?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 51	BORROWFOOD

50.	How often did this happen?	1. <input type="checkbox"/> Rarely (once or twice in the past month) 2. <input type="checkbox"/> Sometimes (three to ten times in the past month) 3. <input type="checkbox"/> Often (more than ten times in the past month) 4. <input type="checkbox"/> Everyday	BORROWFOOD2
51.	In the past four weeks, did any of your household members out migrate?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No	MIGRATE
52.	In the past four weeks, did your household sell land?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No	SELLLAND
53.	In the past four weeks, did your household sell your household assets (e.g. jewellery, kitchen, utensils)?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No	SELLHHASSETS
54.	In the past four weeks, did your household sell agricultural assets (e.g. tools, seeds, livestock's)?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No	SELLAGASSETS
55.	What is the main reason for the food shortage?	1. <input type="checkbox"/> Drought/ irregular rains/ hailstorm 2. <input type="checkbox"/> Floods 3. <input type="checkbox"/> Landslide/ erosion 4. <input type="checkbox"/> Crop pest/ disease 5. <input type="checkbox"/> Livestock disease 6. <input type="checkbox"/> Lack of loss of employment 7. <input type="checkbox"/> Human disease/ illness or accident household (HH) member 8. <input type="checkbox"/> Death of working HH member 9. <input type="checkbox"/> Food price increase 10. <input type="checkbox"/> No supply in relevant market 11. <input type="checkbox"/> Theft/ kidnapping/ fraud 12. <input type="checkbox"/> Conflict/ bandha/ threatening/ intimidation 13. <input type="checkbox"/> Fire 14. <input type="checkbox"/> Failure of HH business 15. <input type="checkbox"/> Low price of HH business products 16. <input type="checkbox"/> No beeds to plant 17. <input type="checkbox"/> Other	SHORTWHY
56.	Do you expect food shortage for the coming months?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No	FUTURESHORTAGE
57.	Do you expect the upcoming harvest to be lower than last year?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No	FUTUREHARVEST

D: CARE				
Infant and young child feeding practices: ONLY FOR A CHILD AGED 0-23 months				
No.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP	VARIABLE
58.	Child name			CHILDNAME
59.	Birth date of the child(dd/mm/year)			CHILDAGE
60.	Age in months			AGEMONTH
61.	Sex of the child? (F= female, M= male)	1. <input type="checkbox"/> M 2. <input type="checkbox"/> F		GENDER
62.	Did you feed the child anything else than breastmilk immediately after birth?	1. Yes 2. No →	Go to 64	BORNFOOD
63.	If yes , what?	1. <input type="checkbox"/> Honey 2. <input type="checkbox"/> Sugar water 3. <input type="checkbox"/> Water 4. <input type="checkbox"/> Ghee 5. <input type="checkbox"/> Others.....		WTBFOOD
64.	Have you ever breastfed your child?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 70	EVERBF
65.	Is the child still breast fed?	1. <input type="checkbox"/> Yes → 2. <input type="checkbox"/> No	Go to 68	NOWBF
66.	If not currently breastfeeding, for how long did you breastfeed?	_____ Months		DURBF
67.	For how long did you exclusive breast fed you child?	_____Months		DUREXBF
68.	How long after birth did you start breast feeding?	1. <input type="checkbox"/> 0- 1 hour 2. <input type="checkbox"/> 2-6 hours 3. <input type="checkbox"/> 7-12 hours 4. <input type="checkbox"/> Within 12 hours 5. <input type="checkbox"/> After 2 days 6. <input type="checkbox"/> After 3 days 7. <input type="checkbox"/> Other.....		STARTBF
69.	Did the child receive breast milk yesterday?	1. <input type="checkbox"/> Yes → 2. <input type="checkbox"/> No	Go to 71	STILLBF
70.	If you didn't breast fed your child, what was the reason? (multiple answers)	1. <input type="checkbox"/> Workload 2. <input type="checkbox"/> New pregnancy 3. <input type="checkbox"/> Not enough breast milk 4. <input type="checkbox"/> Start using contraception 5. <input type="checkbox"/> Child ill/ weak 6. <input type="checkbox"/> Mother ill/ weak		WHYNOBF

		7. <input type="checkbox"/> Nipple/breast problem 8. <input type="checkbox"/> Child refused 9. <input type="checkbox"/> Weaning age/ age to stop 10. <input type="checkbox"/> Other.....		
71.	If you breast fed the child yesterday, how many times did you breastfeed yesterday during the daylight hours? Times		FREQDAY
72.	If you breast fed the child yesterday, how many times did you breastfeed last night between sunset and sunrise? Times		FREQNIGHT
73.	Did you exclusive breast feed (give no other liquid or food) your child yesterday?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		EXCBF
74.	Did he/ she drink anything from a bottle with a nipple yesterday or last night?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		BOTTLE
75.	Since yesterday, has the child received anything to drink other than breast milk?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No 	Go to 77	LIQUID
76.	If yes, what was given to drink?	1. <input type="checkbox"/> Milk (other than breast milk) 2. <input type="checkbox"/> Plain water 3. <input type="checkbox"/> Sugar or glucose water 4. <input type="checkbox"/> Gripe water 5. <input type="checkbox"/> Sugar- salt- water solution 6. <input type="checkbox"/> Fruit juice 7. <input type="checkbox"/> Infant formula 8. <input type="checkbox"/> Tea/ infusions 9. <input type="checkbox"/> Honey 10. <input type="checkbox"/> Other.....		LIQUIDWHAT
77.	How old was the child when he/ she was introduced to solid, semi- solid or soft solid food (complementary feeding) for the first time?	——Months		AGECF
78.	Did your child receive solid, semi-solid or soft solid food during the previous day?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No 	Go to 80	INTROCF
79.	If yes , how many times did the child eat solid, semi- solid, or soft foods?	1. <input type="checkbox"/> 1 time 2. <input type="checkbox"/> 2 times 3. <input type="checkbox"/> 3 times 4. <input type="checkbox"/> 4 or more		FREQCOMPL

80. Dietary diversity: ASSESS CHILD 6- 23 MONTHS					
Did the child eat the following the previous day?					
NO.	FOOD GROUPS	EXAMPLES	1.YES	2.No	VARIABLE
01.	Grains, roots and tubers	Bread, chivada, rice, porridge, maize, wheat	1.YES	2.No	GRAINROTU
02.	Legumes and nuts	Beans, peas, lentils, nuts, seeds or food made from these	1.YES	2.No	LEGNUT
03.	Dairy products	milk, curds, cheese or other milk products	1.YES	2.No	DAIRY
04.	Flesh foods	Pork, lamb, goat, rabbit, wild game, chicken, duck or other birds. Fresh or dried fish. Poultry, liver, kidney, heart and other organ meats or blood based food.	1.YES	2.No	FLESH
05.	Eggs		1.YES	2.No	EGG
06.	Vitamin A rich fruits and vegetables	Ripe mangoes, dried amla, Pumpkin, carrots, squash, or sweet potatoes that are orange inside	1.YES	2.No	VITA FRUIT
07.	Other fruits and vegetables	Other fruits including wild fruits	1.YES	2.No	FRUIT
Responsibility of child 0- 59 MONTHS					
81.	Do you do any paid work?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		Go to 84	PAIDWORK
82.	If yes, where do you work?	1. <input type="checkbox"/> On the farm belonging to the household 2. <input type="checkbox"/> On another farm in the area 3. <input type="checkbox"/> Office 4. <input type="checkbox"/> Market/ streets 5. <input type="checkbox"/> Own business (please specify)..... 6. <input type="checkbox"/> Other business 7. <input type="checkbox"/> Other.....			WHEREWORK
83.	How long do you work?	1. <input type="checkbox"/> 0.5- 3.5 hours 2. <input type="checkbox"/> 4- 7.5 hours 3. <input type="checkbox"/> > 8 hours			HWORK
84.	When you leave your home to take off to daily activities (work, market, water etc.), what do you usually do with this child?	1. <input type="checkbox"/> Child comes with me every time 2. <input type="checkbox"/> Child stays at home alone 3. <input type="checkbox"/> Child stays with mother in law/ grandmother 4. <input type="checkbox"/> Child stays at home with siblings older than 15 5. <input type="checkbox"/> Child stays at home with siblings younger than 15 6. <input type="checkbox"/> Child stays at home with father 7. <input type="checkbox"/> Other.....			CARECH

85.	Who is looking after the child most of the time?	1. <input type="checkbox"/> Mother 2. <input type="checkbox"/> Mother in law/ grandmother of the baby 3. <input type="checkbox"/> Father 4. <input type="checkbox"/> Grandfather 5. <input type="checkbox"/> Siblings older than 15 years old 6. <input type="checkbox"/> Siblings younger than 15 years old 7. <input type="checkbox"/> Other women in the village 8. <input type="checkbox"/> Other.....		MOSTCARE
86.	Who is normally feeding the child?	1. <input type="checkbox"/> Mother 2. <input type="checkbox"/> Mother in law/ grandmother of the baby 3. <input type="checkbox"/> Father 4. <input type="checkbox"/> Grandfather 5. <input type="checkbox"/> Siblings older than 15 years old 6. <input type="checkbox"/> Siblings younger than 15 years old 7. <input type="checkbox"/> Other women in the village 8. <input type="checkbox"/> Other.....		CAREFEEDING
87.	Who usually gives advice to the caretaker on caring for this child?	1. <input type="checkbox"/> Mother 2. <input type="checkbox"/> Mother in law/ grandmother of the baby 3. <input type="checkbox"/> Father 4. <input type="checkbox"/> Grandfather 5. <input type="checkbox"/> Siblings older than 15 years old 6. <input type="checkbox"/> Siblings younger than 15 years old 7. <input type="checkbox"/> Other women in the village 8. <input type="checkbox"/> Other.....		ADVICECHILD
E: PREVENTION AND CONTROL OF DISEASES: CHILD 0- 59 MONTHS				
88.	Has the child been sick the last two weeks?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No	Go to 98	SICK
89.	If yes, what type of illness was it? (Multiple answers)	1. <input type="checkbox"/> Diarrhea 2. <input type="checkbox"/> Cough 3. <input type="checkbox"/> Pneumonia 4. <input type="checkbox"/> Difficult breathing 5. <input type="checkbox"/> Fever 6. <input type="checkbox"/> Other.....		SICKWHAT
90.	Was the child given <u>drinks</u> during the illness?	1. <input type="checkbox"/> More than usual 2. <input type="checkbox"/> Same as usual 3. <input type="checkbox"/> Less than usual 4. <input type="checkbox"/> Didn't give 5. <input type="checkbox"/> Not eaten anything 6. <input type="checkbox"/> Don't know		ILLDRINK
91.	Did the child receive any <u>food</u> during the illness? (how much?)	1. <input type="checkbox"/> More than usual 2. <input type="checkbox"/> Same as usual 3. <input type="checkbox"/> Less than usual 4. <input type="checkbox"/> Didn't give		ILLFOOD

		5. <input type="checkbox"/> Not eaten anything 6. <input type="checkbox"/> Don't know		
92.	If currently breastfeeding, was breastfeeding continued during the time with illness?	1. <input type="checkbox"/> More than usual 2. <input type="checkbox"/> Same as usual 3. <input type="checkbox"/> Less than usual 4. <input type="checkbox"/> Didn't give 5. <input type="checkbox"/> Not eaten anything 6. <input type="checkbox"/> Don't know		ILLBREAST
93.	Did you seek advice or treatment for the illness from any source?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 95	TREATDIS
94.	If yes, where did you <i>first</i> seek advice for treatment	1. <input type="checkbox"/> Private hospital 2. <input type="checkbox"/> Government hospital 3. <input type="checkbox"/> Health Post/SHP 4. <input type="checkbox"/> PHC 5. <input type="checkbox"/> Traditional healer 6. <input type="checkbox"/> FCHVs 7. <input type="checkbox"/> Medical 8. <input type="checkbox"/> Others.....		HEALTHADVICE
95.	Did you take the child for treatment?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No →	Go to 97	TREATMENT
96.	Where did you take for the treatment	1. <input type="checkbox"/> Private hospital 2. <input type="checkbox"/> Government hospital 3. <input type="checkbox"/> Health Post/SHP 4. <input type="checkbox"/> PHC 5. <input type="checkbox"/> Traditional healer 6. <input type="checkbox"/> FCHVs 7. <input type="checkbox"/> Medical 8. <input type="checkbox"/> Others.....		TREATMENTWHERE
97.	If you did not bring the child for treatment, why?	1. <input type="checkbox"/> Distance to treatment 2. <input type="checkbox"/> No staff at HF 3. <input type="checkbox"/> No drugs 4. <input type="checkbox"/> Facility staff refuse to treat some patients 5. <input type="checkbox"/> Facility staff are rude 6. <input type="checkbox"/> Facility was closed 7. <input type="checkbox"/> Have to wait too long for treatment at the facility 8. <input type="checkbox"/> FCHV handled the treatment adequately 9. <input type="checkbox"/> Price of treatment 10. <input type="checkbox"/> No belief in the health facility 11. <input type="checkbox"/> Other.....		NOHEALTHFACI

98.	Did your child receive vitamin A capsule (red capsules) within the last 6 months(for children over 6 months)	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No 3. <input type="checkbox"/> Don't know		VITACHILD
99.	Did the child receive de worming tablet within the last 6 months? (for children above 12 months)	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No 3. <input type="checkbox"/> Don't know		WORMCHILD
100.	Is two child logo salt (iodized salt) used for cooking? (<i>Observe!</i>)	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		SALT
101.	Did the child ever receive any vaccinations to prevent her/ him from getting diseases, including vaccinations received in a national immunization campaign?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No → 3. <input type="checkbox"/> Don't know →	Go to 105	VACCINATE
102.	If yes, did the child receive a DPT- HepB, that is, an injection given in the left thigh, sometimes given at the same time as polio drops?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No → 3. <input type="checkbox"/> Don't know →	Go to 104	DPHEPB
103.	If yes, how many times was a DPT- HepB vaccination given?	_____Times		DPTHPTIMES
104.	If yes, did the child receive a measles injection, that is, a shot in the arm at the age of 9 months or older, to prevent him/ her from getting measles?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No 3. <input type="checkbox"/> Don't know		MEASLES

F: ANTHROPOMETRIC MEASUREMENTS: ASSESS CHILD AGED 0- 59 months

No	QUESTION	CODING CATEGORIES		VARIABLE
105.	Child name			CNAME
106.	Does (name) have a birth certificate? May I see?	1. <input type="checkbox"/> Yes, seen 2. <input type="checkbox"/> Yes, not seen 3. <input type="checkbox"/> No → 4. <input type="checkbox"/> Don't know →	Go to 108	BIRTHCER
107.	Has (name's) birth registered with the civil authorities?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No → 3. <input type="checkbox"/> Don't know →	Go to 109	BIRTHREG
108.	Why is (name's) birth not registered?	1. <input type="checkbox"/> Costs too much 2. <input type="checkbox"/> Must travel too far 3. <input type="checkbox"/> Did not know it should be registered 4. <input type="checkbox"/> Did not want to pay fine 5. <input type="checkbox"/> Does not know where to register 6. <input type="checkbox"/> Don't know 7. <input type="checkbox"/> Other.....		NOBIRTH
109.	Do you know how to register your child's birth?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		HOWREG
110.	The child's birth date(dd/mm/yy)			CAGE
111.	Age in months			CAGEMONTH
112.	Child's sex	1. <input type="checkbox"/> M 2. <input type="checkbox"/> F		CSEX
113.	Oedema	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		OEDEMA
114.	MUAC1	___ __. ___ cm		MUAC1
115.	MUAC2	___ __. ___ cm		MUAC2
116.	Weight 1	___ __. ___ kg		WEIGHT1
117.	Weight 2	___ __. ___ kg		WEGHT2
118.	Height 1	___ __. ___ cm		HEIGHT1
119.	Height 2	___ __. ___ cm		HEIGHT2
120.	Is height measured lying down or standing up?	1. <input type="checkbox"/> Lying down 2. <input type="checkbox"/> Standing up		HEIGHTHOW
121.	How many miscarriages have you had the last 5 years?	_____ children		CHILDDDEATHS

