INFANT FEEDING PRACTICES IN RURAL AND URBAN AREAS OF KATHMANDU DISTRICT IN NEPAL: A STUDY

THESIS

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Dedicated
to
my late parents
Mr. C. B. Rai
Mrs. Jasoda Rai

CERTIFICATE

The work embodied in this thesis ‘ Infant feeding practices in rural and urban areas of Kathmandu district in Nepal: A Study’ has been carried out by me under the guidance of Dr (Mrs.) Seema Puri and Dr(Mrs.) Kumud Khanna. This work is original and has not been submitted by me for the award of any diploma or degree to this or any other university.

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Operational definitions

Breastfeeding: The child has received breast milk direct from the breast or expressed.

Exclusive breastfeeding: The infant has received only breast milk from the mother or a wet nurse, or expressed breast milk, and no other liquids or solids with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines.

Complementary foods included milk, infant formula, gruel or semi-solid foods given in addition to breast milk. The child has received both breast milk and solid or semi-solid food.

Partial breast feeding is defined as when the infant received breast milk in addition to complementary foods.

Predominant breastfeeding: The infant's predominant source of nourishment has been breast milk. However, the infant may also have received water and water-based drinks (sweetened and flavored water, teas, infusions, etc.), fruit juice; oral rehydration salts solution (ORS), drop and syrup forms of vitamins, minerals and medicines, and ritual fluids (in limited quantities). With the exception of fruit juice and sugar water, no food-based fluid is allowed under this definition.

Stunting: Low length-for-age, stemming from a slowing in the growth of the fetus and the child and resulting in a failure to achieve expected length as compared to a healthy, well nourished child of the same age, is a sign of stunting. Stunting is an indicator of **past growth failure.** It is associated with a number of long-term factors including chronic insufficient protein and energy intake, frequent infection, sustained inappro-priate feeding practices and poverty.

Underweight: Underweight, based on weight-for-age, is a composite measure of stunting and wasting and is recommended as the indicator to assess changes in the magnitude of malnutrition over time.

Wasting: Wasting is the result of a weight falling significantly below the weight expected of a child of the same length or height. Wasting indicates current or acute malnutrition resulting from failure to gain weight or actual weight loss. Causes include inadequate food intake, incorrect feeding practices, disease, and infection or, more frequently, a combination of these factors. Wasting in individual children and population groups can change rapidly and shows marked seasonal patterns associated with changes in food availability or disease prevalence to which it is very sensitive.

Z-score: SD or Z-score measure the deviation of the anthropometric measurement from the reference. Formula used for caculating SD score:

$$\text{SD score/Z score} = \frac{\textbf{Individual's value-median value of reference population}}{\textbf{SD Value of reference population}}$$

ABBREVATIONS AND ACRONYMS

AHW	Auxiliary Health Worker
ANM	Auxiliary Nurse Midwive
ARI	Acute Respiratory Infection
CB-IMI	Community Based Integrated Management
CBS	Central Bureau of Statistic, Nepal
CDD	Control of Diarrhoeal Dieseases
DHS	Department of Health Services, Nepal
EPI	Extended Programme of Immunization
FCHV	Female Community Health Volunteer
GoN	Government of Nepal
HAZ	Height for Age
HMG	His Majesty's Government
HP	Health Post
IDA	Iron Deficiency Aneamia
IDD	Iodine Deficiency Disorder
MCHW	Maternal and Child Health Worker
MoHP	Ministry of Health and Population
MUAC	Mid - Upper- Arm Circumference
NAR	Nutrition Adequacy Ratio
NCCP	North Carolina Certified Paralegal
NDHS	National Demographic Health Survey
NID	National Immunization Day
NIP	National Immunization Programme

NLFS	Nepal Labour Force Survey
NLSS	Nepal Living Standard Survey
NMSS	Nepal Micronutrient Status Survey
NPC	National Planning Commission
ORS	Oral Rehydration Solution
ORT	Oral Rehydration Treatment
PEM	Protein Energy Malnutrition
PHCC	Primary Health Care Center
RDA	Recommended Dietary Allowances
RHD	Regional Health Directorate
SHP	Sub- Health Post
UIE	Urinary Iodine Excretion
VAD	Vitamin A Deficiency
VDC	Village Development Committee
VHW	Volunteer Health Worker
WAZ	Weight for age
WHZ	Weight for height
HAZ	Height for age

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ABSTRACT

Breast milk is an ideal food for infants, breast feeding is universal, easily initiated and carried out without effort by all mothers. Early initiation of breast feeding also brings closer bonding of mother and child. Breastfeeding is almost universal in Nepal with 98 percent of children being breastfed and the median duration of breast-feeding is 33 months. The mean duration of breastfeeding is 29 months (NDHS, 2001). The State of World's Children Report (UNICEF, 2004) highlighted that in Nepal, breast-feeding was continued till 24 months among 92 percent of the mothers.

In order to determine urban rural differences in infant feeding practices in Nepal, the present study was designed with the objectives of assess to the anthropometric profile, breast feeding practices, morbidity profile of infants 0-12 months of age in rural and urban areas of Kathmandu district.

The study was longitudinal study with 200 mothers and infants followed up for a whole year from 10-15 days after birth. Infant feeding practices including breast feeding, complementary feeding, feeding during these etc were examined at 0, 3, 6, 9 and 12 months of age. Weight, length, head circumference, chest circumference and mid upper arm circumference were measured at birth after 10-15 days, 3, 6, 9 and 12 months. Using standard deviation and Z-score WAZ, HAZ and WHZ techniques were calculated by WHO 2006 standard.

Both the urban and rural pregnant women were between 19-34 years of age. The number of younger aged women i.e. 19-26 years was found to be higher among the rural group. Mean age of urban pregnant women was 25.4 years and that of rural was 23.3 years respectively. Urban women were comparatively more educated than rural women 23 percent and 31 percent of the urban pregnant women were post graduates,

and graduates respectively. Urban mothers (47%) was working outside the home. Whereas most of the rural women (80%) were housewives and only 20 percent were working in different sectors mainly in private service.Sample comprised of Brahmin, Chhetri, Newar, Janjati (indigenous people) and Dalit groups.

All most all the deliveries were in the hospital only 4 deliveries were at home in rural areas. Most of the delivery cases were normal. Only four and nine were cesarean cases in urban and rural areas, respectively. Out of 200 births, 105 were girls and 95 boys.

Initiation of breast feeding within an hour of birth found to be quite high (69.5%) in both urban and rural areas of Kathmandu district. The colostrum feeding practices among the mothers were 100 percent in both urban and rural areas.

In case of caesarean delivery, glucose water was given to infant at the hospital. It seems that practices of antenatal check up services in both urban and rural areas helped to change the attitude of mothers towards prelacteal feeds.

Among the 200 mothers, 28 percent of the urban mothers and 64 percent rural mothers reported exclusively breast feeding up to 6 months. Over 16.66 percent mothers of both urban and rural area were found giving formula milk to their infant as breast milk substitute.

Sixty one percent of urban and 58 per cent of rural infants were receiving complementary food at age of 5-6 months respectively and 33 per cent urban infants and 39 per cent rural infants respectively were receiving complementary food by age at 6-7 months. Popular complementary food given to infant were jaulo, mashed rice/dal/vegs and home made flour and commercial (Sarbottam pitho) food respectively.

At 10-15 day after birth At 10-15 days of birth the mean weight of rural girls was lowest and urban boys was the highest. The mean length of rural boys was lowest and urban boys were the highest. This urban rural differences was significant as tested by ANOVA and Tukey HSD ($P<0.05$). There was no significant difference between in the mean head and chest circumference of urban and rural areas.

At 3 months: Mean weight of urban boys at 3 months was higher (4.7kg) than rural boys (4.64kg). The rural urban difference in weight at 3 months for girls was significant as tested by ANOVA Tukey HSD ($p<0.01$). No significant difference was found to be mean length of urban rural boys and girls

At 6 months: All the infants had more than doubled their birth weight at 6 months. Rural boys had significantly lower mean length as compared to urban girls and boys. Mean chest circumference was found significantly higher in both rural boys and girls compared to urban girls There was no difference in mean mid upper arm circumference in rural and urban boys and girls.

At 9 months: Urban boys had significantly higher weight than rural boys. Mean length of rural boys was lowest compared to urban boys and girls and rural girls were found to be the lowest length. The mean head circumference of rural boys and girls was found to be higher than the urban boys and girls. Rural boys and girls had significantly higher chest circumference compared to urban boys and girls. There was no difference between the rural, urban, boys and girls mid upper arm circumference.

At 12 months: At 12 months all the infants had tripled their birth weight which indicated a normal pattern of growth. No significant difference has seen mean length between urban and rural boys at 12 months. Rural boys and urban girls had higher mean head circumference. Mean upper arm circumference was found to be higher in rural boys than urban boys though not significant.

WAZ

At 3 months significantly higher number of urban boys were stunted (-2SD) compared to rural boys. At 6 and 9 months significantly higher number of rural boys were stunted (-2SD) compared to urban boys and significantly higher number of urban girls were under weight (-2SD) compared to rural girls. Number of infants in -2SD category were lowest compared to at 3, 6 and 9 months.

HAZ

At 3 months only small number of urban boys and rural girls were in underweight (-2SD) category. But, from 6 months onward number of stunted has been seen in urban boys, urban girls and rural girls. At 9 months urban girls and rural boys' numbers has been increased substantially. Urban boys were stunted compared to rural boys, whereas among girls significantly higher number of rural girls were stunted compared to urban girls.

Number of infants in the stunted (-2SD) category were lowest compared to 3, 6 and 9 months.

WHZ

No wasting was seen till 6 months in any of four groups. It has seen only in small number of wasted at 9 months. Till 6 months the urban boys and girls as well as rural boys and girls did not shown any wasting. The wasting started only from 9 months onwards, only 2 percent of girls both rural and rural and 12 percent of rural boys were wasted. More infants i.e. 5 percent and 6 percent of urban and rural boys respectively and 12 percent and 9 percent of urban and rural girls respectively were wasted at 12 months.

Mean consumption of cereal ranged between 82.04±30.37g in urban boys to 79.01g in rural girls. The mean consumption of pulses was more in boys both urban and rural

compared to girls. Fruits such as banana, apple, mango, papaya and orange were found to be given to the infants. The urban infants had higher mean intake of fruits compared to rural infants.

Mean daily consumption of milk ranged between 23 to 26g. Cow's milk was preferred by mothers compared to formula milk. Added fat was found to be widely given to the infant in both urban and rural areas. The mean daily intake of energy of the infants ranged between 740 to 874 kcal in urban and rural areas infants. The mean daily protein intake ranged between 17 to 24g in rural and urban areas. The infants had mean daily intake of riboflavin varying between 0.19 to 0.48mg in urban and rural areas respectively. The riboflavin intake was found significantly lowest in rural girls than urban girls.

The mean daily intake of calcium ranged between 110 to 272 mg in both urban and rural infants. Intake of calcium among the infants the rural girls had found lowest as tested by ANOVA and Tukey HSD ($P<0.05$).

Girls performed certain developmental milestones earlier than boys such as social smile, hold neck upright, crawling and started to stand.

Prevalence **diarrhea** in the study was found to be lower i.e. 375/1000 in urban areas compared to rural areas 448.97/1000. No diarrheal deaths were reported in both urban and rural areas. Total cases of **fever** were found higher in rural areas and lower in urban areas at different age. Prevalence rate of **Pneumonia** was higher in rural areas (102.04/1000) than urban areas (62.5/1000).

Immunization

In the present study 93.87 percent infants received all the vaccination. . Coverage of immunization was found satisfactory in both urban and rural areas.

CHAPTER 1
INTRODUCTION

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INTRODUCTION

Nepal is one of the least developed countries where about 25 .4 percent of the people are below poverty line (MDG report, 2010). Poverty has fallen by about five percent in last five years. Nepal has recorded significant achievements in improving health status of its population, particularly in infant and maternal mortality over the years. Maternal mortality rate has fallen dramatically from 850 per 100,000 live births in 1987 to 229 in 2010. Similarly, the infant mortality rate has been reduced from 93 to 64 per 1,000 live births between 1996 and 2001. Furthermore, under- five mortality has been reduced from 139 per 1,000 live births to 91. In addition, the neonatal mortality has reduced to 39 deaths per 1000 births from 58 in 1996 (MDG report, 2010).

Figure: 1

Source: Annual Report -2008/09, MOH, Kathmandu.

According to preliminary report (Census, 2011) majority of the population resides in the Terai (50.15%) and the Hills (43.1%) and remaining population reside in the mountains (6.75%). Over 85.8 percent of the population live in rural areas and most of them depend on agriculture for their livelihood.

Both the chronic and transitory food-security situation has improved. However, there is a declining trend in production of some staple crops, and some geographic areas are still facing chronic hunger. Estimated per capita income GDP for the year 2002/2003 is $383 per annum (CBS, 2007).

The under-five mortality rate has decreased significantly in recent years and the target is likely to be met earlier than 2015. Under-five mortality rate is 50 per 1,000 live births. The maternal mortality ratio also has dropped significantly, pointing to a reduction by three-quarters by 2015. However, disparities between rural and urban areas and between different regions still persist (MDG report, 2010).

1.1 MALNUTRITION AMONG CHILDREN IN NEPAL

Malnutrition remains a serious obstacle to child survival, growth and development in Nepal. Malnutrition takes a variety of forms. The most common forms are protein-energy malnutrition. Malnutrition is also closely associated with impaired physical and mental development of children. In addition, malnutrition constitutes a serious threat especially to young child survival and is associated with one third of child mortality. An important cause of PEM in Nepal is low birth weight as weight below2.5 kg, which is sign of poor maternal nutrition. Low birth weight also leads to an intergenerational cycle of malnutrition.

Birth weight of infants is the best single predictor of malnutrition. Birth weight below 2500 grams has been found very closely associated with poor growth, not just in infancy but also throughout childhood. High prevalence rate of low birth rate indicates that the infant was malnourished in the womb and or that the mother was malnourished during her pregnancy. At the time of birth, 21 percent infants had low weight in Nepal (UNICEF, 2004). Underweight children aged under five years is 38.6 percent (MDG, 2010)

The probability of dying is higher during infancy, particularly during first year of live birth. The Age Specific Death Rate (ASDR) for developing countries is usually U shaped indicating larger death in early period on infancy. Many empirical studies had established that higher infant death is one of the probable cause of higher fertility.

Annual Report (MoHP, 2004/2005) indicated that underweight and wasting were found more common in Terai than mountain areas of Nepal. An important cause of PEM in Nepal is low birth weight as 30- 50 percent of children have birth weight below 2.5kg. It leads to an intergenerational cycle of malnutrition. The proportion of underweight and stunted children had only fallen from 60 to 45 percent and 43 percent respectively, by 2006 (UN country team Nepal, 2007).

The age of 0-12 months of a child is very critical. The total population under 1-year children is 4, 94,813 and the infant mortality rate is 64 per 1000 live birth (CBS, 2003). Malnutrition found in this age is most common in Nepal. Adequate complimentary food is necessary to the children at this stage which can be one of the most significant factors for the child survival. Faulty infant feeding practices and poor hygiene and sanitation may contribute to increased childhood mortality.

The major nutritional problem in Nepal is protein energy malnutrition, which are the cause and effect of low food intake. In Nepal, 31 percent of the total population is below poverty line. This figure indicates the scarcity of food in Nepal. One of the major causes of malnutrition is inadequate food. In this regard, NMIS (1995) indicated that children were not getting sufficient food. The problem of malnutrition is universal in Nepal. Different factors such as geographical disparities, poverty, social, cultural and economic influences are the determinants of the nutritional status of the children.

Two most important and outstanding characteristics of young children are growth and development. Regarding this Nelson (1975) stated that growth is defined as physical maturation i.e. increase size of the body and its parts while development in defined as functional maturation i.e. acquisition of skills etc. Growth of child is exclusively interrelated with energy injected in him/her through balanced and nutritious foods.

The probability of dying is higher during infancy, particularly during first year of live birth. Annual Report (MoHP, 2004/2005) indicated that underweight and wasting were found more common in Terai than mountain areas of Nepal. An important cause of PEM in Nepal is low birth weight as 30- 50 percent of children have birth weight below 2.5 kg. It leads to an intergenerational cycle of malnutrition. Malla (2001) reported that 60 percent of the total malnourished children severe malnutrition was found in 22.2 percent, 44.4 percent and 33.3 percent children 0-2 years old in Kathmandu, Lalitpur and Bhaktapur, respectively.

Among the several malnourished children 55.6 percent were from joint families and 44.4 percent from nuclear families. Further, more male children were severely malnourished than female children i.e. 55.6 percent vs. 44.4 percent.

Poverty, poor hygiene and sanitation, lack of knowledge about nutrition and food intake pattern can increase susceptibility of the infant to infections. Introduction of complementary foods represents a critical stage in the child's nutritional progress. Seventy three percent urban and 22 percent rural population were using adequate sanitation facilities. Similarly, 94 percent of urban population and 87 percent of rural population were using improved drinking water. This data shows the real picture of the rural area. Due to these causes child morbidity, infant mortality and infectious diseases could occur. Comparatively, urban people have more facilities than rural people (UNICEF, 2004).

The nature of the young is to grow and mature, and growth cannot take place without nutritionally balanced food. During intra-uterine life, the umbilical vessels supply nutrients for growth and development of a foetus. A remarkable change takes place at birth when the circulation is re-routed: the lungs instead of the umbilical vessels become responsible for ventilation. The young have comparatively higher nutritional requirements than adults, because they have to develop body tissues rapidly. There is relatively more need for protein and other nutrients to prevent themselves from infectious diseases because young children are prone to many health problems specially infections and malnutrition.

The nutritional knowledge is also very poor among the Nepalese people .The woman who serves food for the whole family is unaware about nutrition. Poor awareness level may have a direct impact on care. However, the general malnutrition has been an enduring problem and with limited improvement over past two decades trapping Nepali peoples in vicious poor growth and development reduction of anaemia in women also remains a major challenge. Over all women's social, health and

nutritional status is poor, which is resulting in high maternal and neonatal mortality. Furthermore, the prevalence of low birth weight births is very high, and is contributing to an intergenerational cycle of malnutrition.

Protein energy malnutrition is basically a problem of poverty, resulting from inadequate diets, poor environment and high incidence of infections. The families do not have enough income to purchase the necessary nutritious foods. Ignorance of the relation of foods to health and nutritional wellbeing is another possible cause of protein energy malnutrition. Unhygienic feeding habits are also a predisposing factor which leads to diarrhoea and other intestinal disorders.

Protein Energy Malnutrition (PEM) continues to be a major public health problem in many developing countries. It affects mostly children under 5 years of age belonging to the poor underprivileged communities. The terms 'Malnutrition' and under nutrition are often used as synonyms of 'Protein Energy Malnutrition'. Severe malnutrition is associated with increased risk of morbidity and mortality. These include stunted growth, poor learning ability and reduced work efficiency. Thus malnutrition has serious repercussions on human development and national productivity (Bamji et al., 2009).

Various surveys, carried out in developing countries including Nepal, have shown that etiology of malnutrition is complex. Nevertheless, few investigations revealed that the prime causes of malnutrition are poverty, ignorance and infection, which are often inter-linked with socio-economic complex. Apart from economic status and availability of food, factors such as family size, cultural and religious consideration have often determined the food consumption practice of the people. Food consumption practice is also influenced by the inter-family distribution of the

available food at the household level. In this regard Gokulanathan et al (1969) stated that nutritional deprivation, growth retardation and ill health among apparently normal children due to socio-economic factors may be known as socio-economic malnutrition. The syndrome of socio-economic malnutrition arises from factors such as lack of knowledge, customs, taboos and faulty feeding practices. Moreover in this regard, Hulse (1982) stated that for the poorest, malnutrition is a condition close to starvation. Malnutrition, in its broadest sense, results from diet inadequate to maintain satisfactory physical and mental development. Malnutrition impairs the capacity for work output and lowers resistance to infection.

Those nine months in the womb and 24 months of infancy mark the period of greatest growth. The devasting consequences of undernourishment include stunting, chronic illness and disability, mental impairment and death. Nutrition experts say intervention during the 1,000 days can save many of the 3.5 million children who die each year from chronic hunger and illness (David, 2011). The 1,000-day window from pregnancy to age 2 is a critical time in a child's life. Malnutrition during this period can cause irreversible damage to children, resulting in diminished intellectual capacity, impaired immune function and shorter height and impaired. This damage reduces a child's ability to achieve in school and be productive throughout his or her life.

The most recent estimates of the global burden of malnutrition in under five children are that 178 million (one-third of all children are stunted, 112 million are underweight, 55 million are wasted (19 million having severe acute malnutrition) and 13 million children are born each year with intrauterine growth retardation (Black et al, 2008). Together they account for 21 per cent of all under-5 deaths. Besides

increased risk of mortality and morbidity, recent reviews have also provided compelling evidence for links between stunting and reduced cognition and economic productivity, trans-generational effects resulting in small babies, and increased risk of childhood under nutrition when accompanied by rapid weight gain with chronic diseases such as high blood pressure, metabolic and cardiovascular disorders. There is, therefore, sufficient reason to both prevent and appropriately manage malnutrition in early childhood if both the short-and long- term consequences are to be avoided.

Being a developing country, Nepal has been facing the problem of malnutrition. Malnutrition remains a serious obstacle to survival, growth and development in Nepal. In Nepal, the most common forms are Protein Energy Malnutrition (PEM), Iodine Deficiency Disorder (IDD), Iron Deficiency Anaemia (IDA) and Vitamin A Deficiency (VAD). In Nepal, 49 percent of the children below 5 years of age are affected by stunting (short for age), which can be a sign of early chronic under nutrition. 39 percent of the children are under weight (low weight for age) and 13 percent of the children below 5 years of age are wasted (low weight for height) (NDHS, 2006). Malnutrition is not evenly distributed throughout Nepal; it varies both ecologically and regionally. Mid and far west hills and mountain areas are more prevalent in stunting, underweight and wasting than other parts of the country.

There are so many causes of protein energy malnutrition. But one of the important causes is low birth weight (below 2500 gm). An intergenerational cycle of malnutrition i.e. small girls-small mothers-small babies is one of the main reasons for high prevalence of low birth weight in Nepal. Despite low birth weights, most children grow adequately during the first 6 months of life mainly because

breastfeeding is universal in Nepal. After 6 months of age begins malnutrition. At this stage, breast milk alone cannot fulfil the nutritional requirements of the babies.

Micronutrient deficiencies are also prevailing in Nepal. One of the major micronutrient deficiencies is iron deficiency. Prevalence of anaemia is 81 percent in 6-11 months old infants and 71 percent among 12-23 months (MoHP, 2009/2010).

Diarrhoeal disease is one of the most common causes of childhood morbidity and mortality in Nepal. Incidence of diarrhoea /1000 below 5 years is 598/1000 at national level. Similarly, proportion of severe dehydration among total new cases is 0.38 at national level. Diarrhoeal death rate among the under 5 years population has decreased i.e. 91 per 1000 and fatality rate/1000 below 5 years children is 0.04 (MoHP, 2009/2010). Trend of incidence of diarrhoea has been increasing as compared to last fiscal year. It was 488/1000 in fiscal year 2008/2009.

Acute Respiratory Infection is one of the major public health problems in Nepal among children less than 5 years of age. National coverage of Immunization is 94.48 percent for BCG (<1year), 81.6 percent for DPT3 (<1year), 83.3 percent for 5 doses of Polio (<1year), 86.4 percent for measles (<1year) (MoHP, 2009-2010).

1.2 INFANT FEEDING PRACTICES

1.2.1 Exclusive breastfeeding

Exclusive breastfeeding is feeding infants breast milk only, with no other foods or fluids. Exclusive breastfeeding is sufficient to meet the nutritional needs of infants up to age 6 months of age. It protects the infant against diarrhea, acute respiratory infections (ARI) and other diseases. It is recommended that babies should be exclusively breastfed for the first 6 months of their lives. Exclusive breastfeeding is

ideal nutrition and sufficient to support optimal growth and development for approximately the first six months after birth (Cohen et al, 1994). In Nepal overall, 70 percent of children under six months are exclusively breastfed. This is a remarkable improvement since 2006, when only 53 percent of children of the same age were exclusively breastfed.

Exclusive breastfeeding for 6 months not only reduces the risk of diseases for children, but also provides 98 percent protection against pregnancy for mothers who do not menstruate in six months (Lancet, 1988). Exclusively breastfed babies were less likely to experience diarrhea and respiratory illness with the relative increasing age for those given solid foods (Brown et al, 1989). To reduce the risk of allergies in young children parents are recommended to introduce complementary foods no sooner than 6 months (Halken et al, 1992).

Magnitude of the malnutrition problem is very high in Nepal. Child nutrition problem is widely observed in many parts of the country. Faulty feeding practice among the young children was one of major cause of malnutrition in Nepal (JNSP, 1986). Complementary feeding practices among the young children have been found very critical in the urban cities of the country. Nutritionally unbalanced complementary food may cause nutrition deficiency disease. Timely initiation of complementary feeding practices among young children helps to promote their nutritional status minimizing the chances of nutrition deficiency disease. consumed staple foods like grains, root and tubers (99%), over 80% consumed dairy products other than breast milk, and 65% consumed vitamin A- rich fruits and vegetables. However, very few children consumed animal source foods such as eggs (21%) or meat, fish, poultry, etc

(4.4%)., vegetables, legumes and nut consumption was also rather low (Helen keller, 2010).

1.2.2 EARLY INITIATION OF BREAST FEEDING AND COLOSTRUM FEEDING

Immediately after delivery breast milk is yellowish and sticky. This breast milk is termed as "**Colostrum**". It is rich in protein, minerals, carbohydrate, fats and immunoglobin and lactoferrin as well as white blood cells, which are of great importance for protection against dangerous neonatal infections. Despite attempts to increase the awareness about the benefits of colostrum a substantial number of mothers do not breast fed for the first two or three days after birth. Human breast milk is primarily colostrum immediately following birth. Colostrum gradually changes to mature milk over the next several days. The role of colostrum in fighting infections and promoting growth and development of the newborn is widely acknowledged.

A nutrition survey for Save the Children (US) in Siraha district, eastern Terai in 1994 included focus group discussions) which revealed that none women in Terai district give colostrum and breastfeeding was started only after about two and a half days (Robertson, 1994). Similarly, Akole Kapfo (1996) indicated that 40 percent mothers of Mesulumi village of Nagaland discarded colostrum.

A household survey (Malla, 2000) conducted in Chitwan reported that a very high percentage of mothers (33.4%) did not feed colostrum to their babies. Many felt that it was not good for the baby. Only 45 percent of the women reported the feeding of colostrum in the Terai district of Nawalparasi. Pradhan (1996) stated that only 18 percent of babies were fed within one hour of birth compared to 22 percent in the earlier Nepal Family Health Survey (1991), and 40 per cent of the babies were fed

later than one day after birth. However, data from the Baseline survey (New Era, 1986) revealed encouraging figures for the feeding of colostrum. Over 90 percent mothers gave colostrum to the babies in the Mountain and Hill districts of Sindhupalchowk (94%), Makawanpur (93%), Gorkha (92%) and Syangja (90%). New Era survey (1997) of Kavrepalanchowk district found literate women were less likely to feed colostrum to their babies than illliterate women. Thus, trend of modernization, urbanization and increasing education among women seemed to have a negative effect on feeding colostrum.

According to Malla (2001), 88 percent of the mothers initiated breastfeeding immediately after child's birth and 12 percent were not feeding breast milk immediately after birth. Another studies shows that the introduction of complementary foods before age of 6 months neither enhances growth nor nutritional status of infants and that these foods replace breast milk in breast fed infants (Ann and Maclean, 1980).

1.2.3 BREAST FEEDING

Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process with important implications for the health of mothers. As a global public health recommendation, infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health. Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond. Exclusive breastfeeding from birth is possible except for a few medical conditions, and unrestricted exclusive breastfeeding results in ample milk production.

Breast feeding offers many benefits to your baby. Breast milk contains the right balance of nutrients to help your infant grow into a strong and healthy toddler. Some of the nutrients in breast milk also help protect your infant against some common childhood illnesses and infections. It may also help your health. Certain types of cancer may occur less often in mothers who have breastfed their babies (Susane, 2011).

Breast milk is a complete food for infants and contains all the nutrients needed for the first 6 months of life (Sachdev, 1994). Breast milk contains a wide range of anti-infective substances including white cells (lymphocytes) and antibodies (secretory immunoglobulins). It protects the absorbing surfaces of the infants intestines (intestinal mucosa) against such deadly bacterial infections as E.Coli, Shigella and Salmonella, and Rota Virus infections, which are mostly responsible for infantile diarrhoeas and deaths (Gopalan, 1984). Thapa et al (1988) stated that breast-feeding practice could help to reduce the risk of breast cancer. According to them, the risk of cancer was reduced nearly by half for the mothers who breastfed their child compared to those who bottle fed. Some research studies found that breastfeeding and the birth spacing save lives of the mothers.

1.2.4 COMPLEMENTARY FEEDING

Around the age of six months, an infant's need for energy and nutrients starts to exceed what is provided by breast milk and complementary foods are necessary to meet those needs. At about six months of age, an infant is also developmentally ready for other foods. If complementary foods are not introduced when a child has reached six months, or if they are given inappropriately, an infant's growth may falter. Guiding principles for appropriate complementary feeding are:

- continue frequent, on demand breastfeeding until two years old or beyond;
- practice responsive feeding (e.g. feed infants directly and assist older children feed slowly and patiently, encourage them to eat but do not force them, talk to the child and maintain eye contact);
- practise good hygiene and proper food handling;
- start at six months with small amounts of foods and increase gradually as the child gets older;
- gradually increase food consistency and variety;
- increase the number of times that the child is fed, 2-3 meals per day for infants 6-8 months of age, and 3-4 meals per day for infants 9-23 months of age, with 1-2 additional snacks as required;
- feed a variety of nutrient rich foods;
- use fortified complementary foods or vitamin-mineral supplements, as needed; and increase fluid intake during illness, including more breastfeeding, and offer soft, favourite foods (IFCY, 2010).

Nutrition has a great impact in child's life and feeding practices has direct impact on the nutritional status and well being of a child. It was indicated that nutrition has direct impact in social, educational, mental and physical development of young children (Acharya S, 1981). Feeding practices like other forms of behaviour is reset of complex personal, social, cultural and economic influences, which is one of the determinants of the nutritional status of the children (Adrain J et al, 1986).

1.3 DEVELOPMENTAL PLANS AND PROGRAMMES

Before 1975, people of Nepal were not aware about the nutritional problems existing in the country. His Majesty's Government with the aid of the Center for Diseases Control, Atlanta, conducted the First National Nutrition Survey in 1975. It aimed to give statistically valid national data, representing both rural and urban population of Nepal. This survey found that 50 per cent of the children, 6 months to 6 years of age were mildly to moderately malnourished and 5 per cent were severely affected according to weight- for-age classification, 52 per cent of the children 6 month to 6 years of age were stunted and nearly 3 per cent were wasted. Another 4 per cent suffered both from stunting and wasting. The problem of underweight (low weight-for- age) was highly prevalent under the age of one.

In Nepal, the first time that a strategy on food and nutrition was incorporated was in the Eighth Development Plan for 1992-1997. It accorded priority to food production, nutrition education programmes, and nutrition promotion activities for women and children. In the Ninth Five-Year Plan (1997-2002), nutrition was introduced as an important component of human resource development. The Ninth plan's plan of action for nutrition was to prevent and control micronutrient deficiencies through food-based approaches and supplementation, regular growth monitoring of children

and adults (specially adolescent girls of child bearing age, pregnant and lactating mothers) nutrition education and school feeding programmes; and nutritional awareness through mass media campaigns; nutritional research and the inter-sectoral co-ordination.

The Tenth Developmental Plan (2002-2007) focuses on strengthening and extending the existing nutrition programmes i.e. iron deficiency anaemia, national vitamin A, universal salt Iodization, growth monitoring and infant and young child feeding programmes. Besides these, the plan also includes nutrition education and food assistance to reduce PEM among pregnant women and children, production and distribution of IEC materials in local languages, initiatives to strengthen growth monitoring and promotion of school health programmes for providing nutrition and environmental sanitation related education.

The Ministry of Health, His Majesty's Government of Nepal has developed a Twenty Years Second Long Term Health Plan for 1997-2017. Interventions in the second long term plan include the recommended areas of nutritional supplementation, enrichment, nutrition education and rehabilitation, addressing health problems such as PEM, IDD, VAD, IDA, cardiovascular diseases, diabetes, rickets, perinatal mortality, diarrhoeal diseases, ARI etc. Nepal has established a Subcommittee for Macroeconomics and Health under the Sustainable Development Committee. This committee has developed a pro-poor District Investment Plan whereas maternal and child nutrition is one of the components, which will be implemented in the select districts of Nepal.

So, to fulfil these objectives Ministry of Health, Nepal child nutrition section (2004/05) recently formulated specific strategies to promote "Infant and Young Child Feeding (IYCF)" as follows:

- Provide growth-monitoring services at out reach clinics, sub-health posts, health posts and primary health care center.
- Integrate breast-feeding training with growth monitoring promotion and link breastfeeding promotion with childcare programmes.
- Increase awareness among medical professional through advocacy efforts, such as by including sessions on breastfeeding in seminars/workshops held by various associations.
- Establish mother's support groups to protect existing good practices regarding breast-feeding at the community level.
- Celebrate breastfeeding week (Aug 1-7) as an advocacy tool for the protection and promotion of breastfeeding.

1.4 PROGRAMMES TOWARDS MILLENNIUM DEVELOPMENTAL GOALS IN NEPAL

At the Millennium summit of September 2000, the member states of the United Nations adopted the Millennium Declaration with the aim of bringing peace, security and development priorities to all the people. The MDGs, drawn from the Millenium Declaration, are ground breaking international development agenda for the 21st century to which all nations are committed. The MDGs outline major development priorities to be achieved by the year 2015. Numerical targets are set for each goal and are to be monitored through 48 indicators. The MDGs are given in Table

Table 2.1 Millennium Development Goals

Goal No.1	Eradicate extreme poverty and hunger
Goal No.2	Achieve universal primary education
Goal No.3	Promote gender equality and empower women
Goal No.4	Reduce child mortality
Goal No.5	Improve maternal health
Goal No.6	Combat HIV/AIDS, Malaria and other diseases
Goal No.7	Ensure environmental sustainability
Goal No.8	Develop a global partnership for development

Since Government of Nepal endorsed the Millennium Declaration, Nepal has been committed to achieving the MDGs goals and the targets laid down are as follows:

Target 1	Halve between 1990 and 2015, the proportion of people whose income is less than one dollar a day;
Target 2	Halve between 1990 and 2015, the proportion of people who suffer from hunger;
Target 3	Ensure that, by 2015, children everywhere, boys and girls alive, will be able to complete primary schooling;
Target 4	Eliminate gender disparity in primary and secondary education, preferably by 2005, and at all levels of education no later than 2015;
Target 5	Reduce by two-thirds between 1990 and 2015 the under 5 mortality rate;
Target 6	Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio;
Target 7	Have halted by 2015 and begun to reverse the spread of HIV/AIDS;
Target 8	To have halted by 2015 and begun to reverse the incidence of malaria and other diseases;
Target 9	Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources;
Target 10	Halve by 2015, the population without sustainable access to safe drinking water and basic sanitations;
Target 11	This target is related to “Develop a global partnership for development”;

Target 12	Develop further an open, rule based, predictable, non-discriminatory trading and financial system, includes a commitment to good governance, development and poverty reduction both nationally and internationally;
Target 13	Address the special needs of the LDCs, includes: tariff and quota-free access for LDC exports; enhanced programme of debt relief for HIPC; and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction;
Target 14	Address the special needs of landlocked developing countries and small island developing states;
Target 15	Deal in comprehensive manner with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term;
Target 16	In cooperation with developing countries, develop and implement strategies for decent and productive work for youth;
Target 17	In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries;
Target 18	In cooperation with the private sector, make available the benefits of new techniques, especially information and communications.

Among the above targets, the targets 5, 6, 7 and 8 their respective indicators which are directly related to MoHP.

The MDG 2 target of reducing the percentage of underweight and stunted children from around 60 percent in 1990, to 30 percent by 2015 remains a big challenge. The proportion of underweight and stunted children had only fallen from 60 percent to 45 percent and 43 percent respectively by 2006 (UN Country Team Nepal, 2007).

1.4.1 NUTRITION SPECIFIC MDGs GOAL

The following Nutrition Specific Goals are to be achieved by the end of 2015 (MDGs):

- Reduce sub-clinical VAD to 7 percent
- Reduce anaemia in pregnant women to 43 percent
- Reduce anaemia in all age women to 42 percent
- Reduce anaemia in children to 43 percent
- Increase consumption of adequately iodized salt (≥ 15 PPM) at HHs level to 88 percent
- Reduce prevalence of night blindness in pregnant women to 1 percent
- Reduce worm infestation rate in children (Pre-school) to 16%

1.4.2 PROTECTION AND PROMOTION OF BREASTFEEDING

To promote exclusive breastfeeding till the age of six completed months. Thereafter, introduce complementary foods along with breast milk till the child completes 2 years or more.

1. To reduce the Infestation of intestinal worm among Children and Pregnant Women to less than 10% by 2017**.**

1.4.3 MAJOR ACTIVITIES CARRIED OUT IN FISCAL YEAR 2009/2010

1.4.3.1 PREVENTION OF MALNUTRITION

1.4.3.2 PROTECTION AND PROMOTION OF INFANT AND YOUNG CHILD (IYCF) COUNSELLING;

- Celebrated Breastfeeding Week (August 1-7) in all districts with rallies, talk program, adolescent orientation and School health program etc;
- Promotional messages broadcasted for exclusive breastfeeding through mass media and distributed booklets on breastfeeding for health workers;
- IYCF promotion linked with micronutrient supplementation program

1.4.3.3 NUTRITION OBJECTIVE

- To reduce PEM in children under 5 years of age and reproductive aged women to half of the 2000 level by the year 2017
- To reduce the prevalence of anemia among women and children less than 40% by 2017.
- To virtually eliminate IDD and sustain the elimination by 2017
- To virtually eliminate vitamin A deficiency and sustain the elimination by 2017
- To reduce the infestation of intestinal worms among children and pregnant women to less than 10 percent by 2017.

1.5 IMPLICATIONS OF POLICY

The National Nutrition Programme under Department of Health Services in Nepal has laid the vision that "All Nepali people will live with adequate nutrition, food safety and food security for adequate physical, mental and social growth and development and survival". The mission of the Nutrition Programme is to improve the overall nutritional status of children, pregnant women, women of child bearing age and all ages through the control of general malnutrition and the prevention and control of micronutrient deficiency disorders.

The most recent Nepal Demographic and Health Survey (New Era, 2011) reported that Children whose height-for-age is below minus two standard deviations from the median of the reference population are considered stunted or short for their age. Stunting is the outcome of failure to receive adequate nutrition over an extended period and is also affected by recurrent or chronic illness. Forty-one percent of children under five are short for their age, and 16 percent are severely stunted.

Children whose weight-for-height is below minus two standard deviations from the median of the reference population are considered wasted or thin. Wasting represents the failure to receive adequate nutrition in the period immediately before the survey, and typically is the result of recent illness episodes, especially diarrhoea, or of a rapid deterioration in food supplies. In Nepal, 11 percent of children are wasted and 3 percent are severely wasted.

Children whose weight-for-age is below minus two standard deviations from the median of the reference population are considered underweight. The measure reflects the effects of both acute and chronic undernutrition. Nearly three in ten children (29 percent) are underweight and 8 percent are severely underweight.

Malnutrition is not evenly distributed throughout Nepal; there is wide variation both ecologically and regionally. Stunting, underweight and both mild and severe wasting are more common in the mid and far western hills and mountain areas than in other part of the country.

Besides, all three indicators are poor in the central Terai; in addition, urban children are less stunted (36 percent) than rural counterparts (51 percent). Nutrition Strategy has been implicated to control the Protein Energy Malnutrition through creating awareness regarding growth monitoring and exclusive breast feeding up to 6 months of age and timely introducing complementary food, celebrating Nutrition Week (Poush 10-16) to raise awareness about nutrition and conducting the national advocacy and social mobilization campaigns. Nutrition rehabilitation centers will be also extended to all regional and zonal Hospitals.

Micronutrient deficiencies are also a major public health problem in Nepal. One of the major micronutrient deficiencies is iron deficiency disorder. Due to some effective

interventions like de-worming, iron supplementation and vitamin A supplementation found a drastic reduction of anemia both under 5 children (48 percent) and pregnant women (42 percent). But the survey has also shown a remarkable amount of anemia, i.e., 81.0 percent among children aged 6-11 months and 71 percent among 12-23 months of age (NDHS, 2006).

All pregnant women and postpartum are supplied iron and folic acid tablets (225 days in total) containing 60 mg of elemental iron and 100 mg of folic acid free of cost as per the government policy. Government of Nepal /MoHP and World Food Programme (WFP) has implemented the Mother and Child Health Care (MCHC) activity in remote food deficit districts of Nepal The programme aimed to reduce the prevalence of underweight among young children.

Iron deficiency anaemia among pregnant women, nursing mothers and young children to raise the awareness and knowledge on their health and nutrition. MCHC is operated through health facilities such as Health Post, Sub-health Post and Primary health Center-Out Reach Clinics. MCHC has launched to promote ANC check-ups, Growth monitoring of less than 5 year of children, de-worming during pregnancy and nutritious food supply of 7 kg of fortified blended food (Nutrimix) every months. Nutrimix has been provided to 6 months age of children to expectant and nursing mothers (starting from their 1st ANC visit until 6 month after delivery).

Safe Delivery Incentives Program (SDIP) launched in 2005 by the Ministry of Health and Population (MoPH), as a nationwide priority programme, is providing financial cost of child birth and encourages the use of professional delivery care through the provision of financial incentives. The main goal of this programme is to reduce maternal mortality and morbidity. Free of cost delivery in government hospital has

been started by the government of Nepal since 2009. Some incentives such as cash payment to women have been given at the time of discharge from government health institution. The amounts are NRs.1, 500, NRs.1, 000 and NRs. 500 in mountain, hill and the Plain (Terai) respectively. Similarly, some incentives have been given to health worker for attending deliveries at home or in institution at the cash payment of NRs. 300 for each delivery (MoH, Annual Report, 2010).

1.6 SIGNIFICANCE OF THE STUDY

Being a developing country, Nepal has been facing the problem of malnutrition. Malnutrition remains a serious obstacle to survival, growth and development in Nepal. The majority of the population resides in the Terai, hills and remaining population reside in the mountains. In Nepal, the most common forms are Protein Energy Malnutrition (PEM). There are so many causes of protein energy malnutrition. But one of the important causes is low birth weight (below 2500gms). An intergenerational cycle of malnutrition i.e. small girls-small mothers-small babies is one of the main reasons for high prevalence of low birth weight in Nepal. Despite low birth weights, most children grow adequately during the first 6 months of life mainly because breastfeeding is universal in Nepal. After 6 months of age begins malnutrition. At this stage, breast milk alone cannot fulfill the nutritional requirements of the babies.

In Nepal, the present scenario of maternal and child nutrition seems to be of mixed picture. The general nutritional status of children has improved a little. Children below under five are underweight 44.8 percent, stunted 42.8 percent and wasted 11.7 percent (CBS, 2007). The problem is mainly attributed to inadequate care and feeding practices-linked to inadequate dietary intake and a very high disease load, exclusive

breast feeding complementary feeding practices, especially among the young children. Besides these, different morbidity diarrhoea and acute respiratory infections are the two major diseases affecting young children also lead to malnutrition in infant.

According to Jason (2011) reported that Nepal has modestly improved in child health status. Mortality of children under 5 dropped from 61 to 54 per 1,000 since the last survey, while infant mortality scarcely changed (48 to 46 per 1,000), and neonatal mortality remained flat at 33 per 1,000. Stunting (defined as height-for-age more than 2 standard deviations below a healthy reference population) fell form 49 percent to 41 percent of children, and wasting (low weight-for-height) dipped slightly from 13 percent to 11 percent, which is the same level it was measured at in 2001. Acute malnutrition, or wasting, remains a significant problem, particularly in rural areas and for children of women without formal education (13% compared with 7% among women with secondary school education or above).

Urban people have more facilities i.e. hygiene and sanitation, drinking water, health facilities, transportation, road and education than rural people. Lack of education, lack of nutritional knowledge, existing traditional belief, socio-economic and cultural differences among the people have been attributed as cause of malnutrition. Though, fewer studies have been done in previous years in Nepal.

Hence, this study will be fruitful for the community and nation as well. It will be helpful in formulating plans, programmes and policies directed toward promoting infant and child health and maternal health. Keeping this in mind, a study has been planned on “Infant Feeding Practices in Rural and Urban areas of Kathmandu District in Nepal: A Study.

1.7 OBJECTIVES

1. To assess anthropometric profile of the infants after birth of 10-15 days to 12 months in rural and urban areas Kathmandu district.
2. To study the breast feeding and infant feeding practices adopted for these infants.
3. To study the morbidity profile and immunization status of these infants.
4. To compare the infant feeding practices and anthropometric profiles of 0-1 years old infants in rural and urban areas of Kathmandu district.

CHAPTER 2
REVIEW OF LITERATURE

Chapter 2

REVIEW OF LITERATURE

Infancy is the period from birth to the end of the first year of life. “Infant “is derived from the Latin word, “infans”, meaning unable to speak. Emotional and physical needs at this time include love and security, a sense of trust, warmth and comfort, feeding, and sucking pleasure. The baby needs love, attention, and care as he adjusts to the world around him (Novella, 2011).

2.1 GROWTH OF INFANTS

Growth may be defined as an increase in body size. Biologic growth of an organism occurs through cell multiplication and cell enlargement. Development is the associated process by which growing tissues and organs take on a more complex function.

Physical growth refers to the increases in height and weight and other body changes that occur as a child matures (Your child’s growth, 2011). Normal growth in infants is the progression of changes in height, weight, and head circumference that are compatible with established standards for a given population. The progression of growth is interpreted within the context of the genetic potential for a particular child. Normal growth is a reflection of overall health and nutritional status.

Development is a continuous process, and each child progresses at his own rate. There is a developmental sequence, which means that the changes leading to maturity are specific and orderly. The various types of growth and development and the accompanying changes in appearance and behavior are interrelated; that is, physical,

emotional, social, and spiritual developments affect one another in the progress towards maturity.

In infancy and childhood, growth is categorized according to the approximate age at which distinctive physical changes usually appear and at which specific developmental tasks are achieved. Such stages include the prenatal period, infancy, early childhood (including the toddler and the preschool periods), middle childhood, and adolescence.

There are two periods of accelerated growth: the first 12 months, in which the infant triples in weight, increases the height at birth by approximately 50 percent, and undergoes rapid motor, cognitive, and social development, and the months around puberty, when the child approaches adult height and secondary sexual characteristics emerge.

The growth in nutritional outcomes of children is dependent on a complex relationship between the intrinsic characteristics of the child and the competence of the mothers in providing food to the child. Zentlin et al (1990) views that healthy, adaptable children may grow well even in the absence of good care, while extremely good care is required for the smallest and weakest children (low birth weight, those with poor appetites).

Understanding the normal patterns of growth enables the early detection of pathologic deviations (eg. poor weight gain due to a metabolic disorder, short stature due to inflammatory bowel disease) and can prevent the unnecessary evaluation of children with acceptable normal variations in growth (Boom, 2011). Most healthy infants and children grow in a predictable fashion, following a typical pattern of progression in weight, length, and head circumference. Normal human growth is pulsatile; periods of

rapid growth ("growth spurts") are separated by periods of no measurable growth. Growth is also seasonal, with growth velocities increased during the spring and summer months (Thalange et al., 1996).

Somatic growth and biologic maturation are influenced by several factors that act independently and in concert to modify a child's genetic growth potential. The influence of maternal nutrition and intrauterine environment are reflected primarily in the growth parameters at the time of birth and during the first month of life, whereas genetic factors have a later influence (Touwslager et al, 2011). The correlation coefficient between length and adult height is only 0.25 at birth, but increases to 0.8 at two years of age (Tanner, 1989).

Although primarily reflected in the growth parameters at birth, long- term influences of maternal nutrition and intrauterine environment on subsequent growth and pubertal development have been described. Studies in various populations have demonstrated a association between catch-up growth or rapid growth in infancy or early childhood and subsequent obesity, suggesting that mechanisms that signal and regulate catch-up growth in the postnatal period may play a role in the development of obesity (Boom, 2011).

The growth and development of infant is characterized by are periods of rapid change in the child's size, senses, and organs. Each change brings about new abilities. An infant's development in motor coordination, forming concepts, learning and using language and having positive feelings about self and others prepares them to build upon new abilities that will be needed for each change in a new stage of development (Ruffin, 2011)

In the normal adequately nourished child rapid growth takes place during the first year of life. An average weight increment at 0-3 months is 200 g, 4-6 months 150 gm, 7-9 months 100gm and 9-12 months 50-75 gm per week. The increment of length at 1 year is 25 cm per year (Ghosh, 1988).

Poor maternal nutrition and prenatal care, along with pregnancy complications affecting nutrient delivery to the fetus contribute to intrauterine growth retardation (Innis SM, 2003). Adequate nourishment is important for infant's physical growth. Adequate nourishment is important for infant's mental development. Maximum brain development takes place in the first year of life. Insufficient food would therefore stunt the baby not only physically but also mentally. The damage caused to the brain is irreversible. The child's learning ability is lowered and even in later years mental performance is affected (VHAI, 1998).

2.2 ETIOLOGY OF MALNUTRITION

Protein energy malnutrition results from the interaction of several factors of which, inadequate diets and infectious diseases are the most important. Infant and young children are most seriously affected because their nutritional requirements are relatively higher than those of adults and infections occur more frequently in this group.

2.2.1 DIET

It has long been held that kwashiorkor and marasmus are two separate entities arising from variation in the protein energy ratio in the diets. A diet predominantly deficient in protein leads to kwashiorkor while a diet deficient in energy results in protein-energy malnutrition has three forms: dry (thin, desiccated), wet (edematous, swollen),

and a combined form between the two extremes. The form depends on the balance of protein or nonprotein sources of energy, such as carbohydrates or milk respectively. Each of the three forms can be graded as mild, moderate, or severe.

The dry form, marasmus, results from near starvation with deficiency of protein and nonprotein nutrients. The marasmic child consumes very little food often because his mother is unable to breastfeed and is very thin from loss of muscle and body fat.

The wet form is called kwashiorkor, an African word literally meaning first child-second child. It refers to the observation that the first child develops protein-energy malnutrition when the second child is born and replaces the first child at the breast of the mother. The weaned child is fed a thin gruel of poor nutritional quality (compared with breastmilk) and fails to thrive. The protein deficiency is usually more marked than the energy deficiency, and edema results. Children with kwashiorkor tend to be older than those with marasmus and tend to develop the disease after they are weaned.

The combined form of protein-energy malnutrition is called marasmic kwashiorkor. Children with this form have some edema and more body fat than those with marasmus (Protein energy malnutrition, 2011).

2.2.2 CULTURE AND RELIGION

Due to cultural practices and religion may affect the nutrients value of diet. Non availability of protein rich and protective foods may be due to inadequate production, lack of insufficient production, lack of knowledge or facilities to process and preserve foods, lack of means of quick distribution in fresh condition from areas of plenty to areas of scarcity and above all lack of financial resources to buy protective foods.

2.2.3 POVERTY

Poverty affects most severely those who can not grow their own food. Poverty may endanger the infant's health from the start; if the mother's nutritional status is poor. In a majority of families both parents are wage earners and the mother may have to wean her child early and leave him/her inadequately fed in the home during day time under the care of older children.

2.2.4 IGNORANCE AND SUPERSTITION

Failure to use the available foods for the feeding of infants and pre school children due to lack of adequate knowledge of the nutritional needs of the children, is an important factor in causes of malnutrition.

2.2.5 INFESTATION AND INFECTION

Bamji, (2009) stated that majority of young children in developing countries carry a heavy load of intestinal, parasites, especially round worms. One of the harmful effects of roundworms is the interference in the absorption of nutrients. The poor malnourished child is heavily infested as he/she lives under unsanitary conditions where the water and food are likely to be contaminated.

Bacterial infections tend to occur frequently as a majority of infants live under unhygienic surroundings in the developing countries. Intestinal disorders due to bacterial infections are quite common and often precipitate the development of kwashiorkor or marasmus in malnourished child. Diarrhoea is relatively more common among the children aged 6 to 11 months and 12 to 23 months because babies are usually weaned off breast milk at this age.

2.3 INFANT FEEDING PRACTICES

Grummer-Strawan et al (2008) found that although 83 percent of survey respondents in the United States initiated breast feeding , the percentage who breastfed declined rapidly to 50 percent at 6 months and 24 percent at 12 months. Additionally nearly half of the all breastfed infants were supplemented with infant formula in the hospital and nearly half of all infants were fed solid foods before four months of age. Those who were fed solids at this age were more likely to discontinue breast feeding at 6 months of age.

Shealy et al (2008) found that more US mothers reported exclusive breastfeeding at three months than at any other time, after which exclusive breastfeeding declined. Similarly, more than half of the breastfeeding mothers fed their infants nothing other than breast milk until four months of age. Additionally, the authors found slightly more than one third of breastfeeding mothers supplemented with infant formula from three to seven months. The percentage of breastfed infants whose diets were supplemented with infant formula declined from 42 percent in the hospital to 34 percent at age three months, and remained at this level until age of nine months.

A study on infant feeding practices among the low-income rural mothers of southeastern Kentucky done by Barton (2001) stated that at birth 52 percent of mothers chose to use formula, 41.2 percent chose breastfeeding, and 8 percent were using both breast feeding and formula feeding. By 1 month, 71 percent of mothers were formula feeding and only 29 percent were breastfeeding. At 4 to 6 months postpartum 80 percent of mothers were formula feeding and 20 percent were breastfeeding. Mothers with more children, higher family income, and more education were more likely to breastfeed.

Almost all mothers began solid foods before the infant was 4 months old. Infants were fed table foods including mashed potatoes and gravy, and beverages such as apple juice, fruit juices, and soda.

Worldwide research shows that for the vast majority of infants, there is no physiological or biological reason to recommend the introduction of complementary foods before the end of the sixth month of life.

A review article by Ramji (2009) on impact of infant and young child feeding caring practices on nutritional status and health indicated that the exclusive breastfeeding rates in India at 6 months is about 46 percent. At 6-8 months only 54 percent of breastfed and 75 percent of non breastfed infants are initiated into complimentary feeds. At the start of the second year of life only about 42 percent of infants receive the recommended appropriate foods at appropriate frequency.

ubba et al (2007) reported that almost 40 percent of the mothers started complementary feeding before the recommended age of 6 months and 22.5 percent of the mothers delayed introduction of complementary feeding beyond the recommended age. In Nepal, 69 percent infants were reported to be exclusively breastfed for less than six months (UNICEF, 2004).

2.4 EXCLUSIVE BREAST FEEDING

Exclusive breast feeding is defined as feeding infant only breast milk from the mother or a wet nurse, or expressed breast milk but no other only breast milk liquid or solid with exception of drops or syrup consisting of vitamin, mineral supplement or medicine. Water is not permitted.

Breastfeeding was initiated within the first hour after birth is 35.4 percent, 99.5 percent were ever breastfed, 98.1 percent were currently breastfed, and 3.5 percent were bottle-fed. The rate of exclusive breastfeeding among infants under 6 months of age was 53.1 percent, and the rate of timely complementary feeding among those 6 to 9 months of age was 74.7 percent.

Mothers who made antenatal clinic visits were at a higher risk for no exclusive breastfeeding than those who made no visits. Mothers who lived in the mountains were more likely to initiate breastfeeding within 1 hour after birth and to introduce complementary feeding at 6 to 9 months of age, but less likely to exclusively breastfeed (Tiwari et al, 2011).

The full breast-feeding rate at hospital discharge was 93 percent but declined to 41 percent at 4 months. Any breast-feeding rates were high among Maldivian mothers: 100 percent at 1 month and 85 percent were still breast-feeding at 6 months. The median duration of breast-feeding was 24 months. Breast-feeding rates are high and the average duration of breast-feeding is more than 2 years in the Maldives. Health promotion activities should be directed towards maintaining the already high 'any breast-feeding' rates and increasing the proportion of infants exclusively breast-fed to 6 months (Abdulraheem et al, 2007).

Baseline Survey Report (2003) showed that about half of the children under five age were suffering from severe and moderate stunting indicating chronic malnutrition in Tanahu District of Nepal, and 90 percent of the mothers continue breastfeeding their children along with other supplementary food even after24 months). However, more than one third of infants were not exclusively breastfeed and almost 20 percent mothers reported to breastfeed their newborn baby after 10-12 hours of their birth.

A base line survey conducted by New Era (2001) in Nepal reported that most of the respondents of all categories (Currently expectant women, mothers of children less than six month and mothers of children aged 6 to less than 36 months) were not aware of the importance of necessity of antenatal care. The utilization of modern health facilities during pregnancy was found to be very low in both districts. Moreover, almost all the deliveries in both Dadeldhura and Doti districts took place either at home or in a cowshed and the assistance of trained personnel at the time of delivery were also very low.

All in mothers had breastfed their babies, although only one fifth of them had fed colostrum to their newborns. The practice of squeezing out the colostrum was greater in Dadeldhura district than in Doti District. They have a traditional concept that the colostrums may make child sick.

In a study carried out in India by Gupta and Gupta (2003), only 11.4 percent of the infant had been exclusively breast fed from birth till 6 months of age.

A study carried out in Delhi reported that 51.8 percent between 1-23 months of age and 17.1 percent between 3 to ≤6 months had been exclusively breast fed. In the same study, it was also noted that after the age of 6 months exclusive breast feeding was almost nonexistent (Paintal, 2006).

Babies who are exclusively breast fed and have unrestricted access to breast do not require water. Giving additional water can lead to increase risk of diarrhoea (Gupta et al, 2001).

Kramer and Kakuna (2002) highlighted that exclusive breast feeding for six months does not show baby's growth but instead reduces gastrointestinal infection, delays the return of fertility and helps the mother to lose weight.

Breast milk gives infants all the nutrients they need, is safe, and contains antibodies that help protect infants from common childhood illnesses. Exclusive breastfeeding up to six months of age prevents deaths from pneumonia, diarrhoea and neonatal sepsis; it has been estimated to avert about 13 percent of all under-five deaths. Exclusive breastfeeding among infants less than six months of age shows global coverage as low as 36 percent. Coverage is particularly low in Sub-Saharan Africa, where only one out of three infants less than six months old is exclusively breastfed. Moreover, data from 29 African countries show that among infants aged 4-5 months only 18 percent are still exclusively breastfed (WHO, 2011).

To enable mothers to establish and sustain exclusive breastfeeding for six months, WHO and UNICEF (2001) recommend:

- Initiation of breastfeeding within the first hour of life;
- Exclusive breastfeeding - that is, the infant only receives breastmilk without any additional food or drink, not even water;
- Breastfeeding on demand - that is, as often as the child wants, day and night

Breast milk is considered babies' perfect food. In this regard Lauran Neergaard (2000) reported that yet, despite a decade of encouraging more American mothers to breast-feed their infants, not enough do. And among black women, breast-feeding is "alarmingly low,'But only 29 percent of all mothers, and 19 percent of black mothers, breast-feed until their babies are 6 months old by 2010, for at least half of mothers to

breast-feed exclusively until age 6 months, when solid foods are added, and for at least 25 percent to continue breast-feeding until the baby's first birthday.

As a global public health recommendation, infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health. Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond. Exclusive breastfeeding from birth is possible except for a few medical conditions, and unrestricted exclusive breastfeeding results in ample milk production.

While breastfeeding is a natural act, it is also a learned behaviour. An extensive body of research has demonstrated that mothers and other caregivers require active support for establishing and sustaining appropriate breastfeeding practices. WHO and UNICEF launched the Baby-Friendly Hospital Initiative (BFHI) in 1992, to strengthen maternity practices to support breastfeeding. The BFHI contributes to improving the establishment of exclusive breastfeeding worldwide and, coupled with support throughout the health system, can help mothers sustain exclusive breastfeeding.

WHO and UNICEF developed the 40-hour Breastfeeding Counselling: A Training Course and more recently the five-day Infant and Young Child Feeding Counselling: An Integrated Course to train a cadre of health workers that can provide skilled support to breastfeeding mothers and help them overcome problems. Basic breastfeeding support skills are also part of the Integrated Management of Childhood Illness training course for first-level health workers.

2.4.1 EXCLUSIVE BREAST FEEDING UP TO 6 MONTHS

Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process with important implications for the health of mothers. Review of evidence has shown that, on a population basis, exclusive breastfeeding for 6 months is the optimal way of feeding infants. Thereafter infants should receive complementary foods with continued breastfeeding up to 2 years of age or beyond. WHO and UNICEF recommended ; initiation of breastfeeding within the first hour of life, exclusive breast feeding up to 6 months and breast feeding on demand (WHO/NHD, 2001).

2.5 BREAST FEEDING PRACTICES

There are so many several NGOs working in Nepal who are promoting breastfeeding. Exclusive breastfeeding is higher in Nepal compared to some other countries in South Asia (Acharya S, 2006).

A study on Breast Feeding Status in Rural and Urban Areas of Central Development Region, Nepal (Neupane S, 1992) reported that 89 percent and 73 percent of rural and urban infants aged 0 to less than 4 months were found exclusively breast-fed.

Breast feeding is nearly universal in children less than two months of age in Nepal, and 89 percent of them are exclusively breastfed (MOH, 1997). The proportion of children exclusively breastfed declines sharply for children aged 6 months and older, when solid and mushy food became an important part of the diet. By 6-7 month of age, 64 percent of children are given breast milk, complementary foods and water, whereas by 14-15 months the proportion of children eating foods rises up to 95 percent. Many of the ethnic groups begin weaning a child at the time of rise feeding

ceremony which takes place at 5 months for girls and at 6 months for boys. The variety of foods given during the first year of weaning is very limited (mainly cereals). As a supplement to milk, children aged 24 months and over are traditionally given: grain/ flour/cereals (97 percent), potatoes/ jams/ tubers (about 75 percent) meat/ fish/ egg (about 25 percent) and other types of milk (around 45 percent) (MOH, 1997).

According to NDHS (2006), breastfeeding is almost universal in Nepal with 98 percent of children being breastfed and the median duration of breast-feeding is 34 months. The mean duration of breastfeeding is 30 months (NDHS, 2006). However, only one in three children is breastfed within one hour of birth while two out of three babies are breast fed within one day after birth. Although, there is some indication of bottles being used, particularly in urban area, breast milk is a complete and unparalleled way of providing the ideal food for the healthy growth and development of young infants.

Despite attempts to increase the awareness about the benefits of colostrums, a substantial number of mothers do not breast fed for the first two or three days after birth. The State of World's Children Report (UNICEF, 2004) highlighted that in Nepal, breast- feeding was continued till 24 months among 92 percent of the mothers.

Some research works done in Nepal had found that the practice of breastfeeding differs when we look in terms of ethnic groups. Shakya (1984) found in a study of Techo village that the practice of breastfeeding was longer for Newars compared to Chhetris though both the ethnicities had a significant number of infants who were breast fed up to 2 years. Besides a few of them continued breast feeding for 4 years and above too but there is not a marked difference between them. Similarly, Thapalia,

(1987) stated that 64 percent Chhetri mothers breast-fed their children up to 2 years on average whereas Newar women breast-fed the children for more than 3 years.

Pradhan (1996) stated that only 18 percent of babies were fed within one hour of birth compared with 22 percent in the earlier Nepal Family Health Survey (1991). And 40 percent of the babies were fed later than one day after birth. Data from the baseline survey (New Era, 1986) revealed that over 90 percent mothers gave colostrum to the babies in the mountain and hill districts of Sindhupalchowk (94 percent), Makwanpur (93 percent), Gorkha (92 percent), and Syangja 90 percent. However, only 45 percent of the women reported the feeding of colostrum in the Terai district of Nawalparasi. New Era survey (1997) of Kavrepalanchowk district found literate women were less likely to feed colostrum to their babies than illiterate women. Thus, trend of modernization, urbanization and increasing education among women seemed to have a negative effect on feeding colostrum.

According to Malla (2001), 88 percent of the respondents initiated breastfeeding immediately after birth and only 12 percent were not feeding breast milk immediately after birth. Duration of breastfeeding is 56 percent and 82 percent of the mothers used commercial complementary food.

Base line survey report Tanhu, Nepal (2003) showed that about half of the children fewer than five ages were suffering from severe and moderate stunting indicating chronic malnutrition in Tanahu district of Nepal, and 90 percent of mothers continue breastfeeding to their children along with supplementary food even after 24 months. However, more than one third of infants were not exclusively breastfeed and almost 20 percent mothers reported to breastfeed their newborn baby after 10-12 hours of their birth.

One of the reasons breastfeeding is nearly universal and prolonged, especially in the rural areas, is because of the widespread belief that it is effective in postponing the next pregnancy. Contemporary literature shows that ovulation is likely to return sooner in women who partially breastfeed than those who exclusively breastfeed (Van Ginneken, 1974).

CEDPA (2002) reported that 95.3 percent of the women had breastfed this last child. Only 63.8 percent gave colostrums, and 56.9 percent gave their babies something else to drink before the breast milk . After one month, only about half of there babies were exclusively breastfed.

2.6 EARLY INITIATION OF BREASTFEEDING

Early initiation of breastfeeding contributes to reducing overall neonatal mortality. It is estimated that 16 percent of neonatal deaths could be saved if all infants were breastfed from day one, 22 percent of neonatal deaths could have been prevented if breastfeeding started within the first hour of birth. Current coverage of early breastfeeding initiation remains low with an estimated 44 percent of newborns in the developing world put to the breast within one hour of birth.

Promotion of both the early initiation of breastfeeding and exclusive breastfeeding of infants for six months has the potential to make a major contribution to the achievement of the child survival Millennium Development Goal.

Studies from Africa show that initiation of breast feeding is almost universal (Rogers et al, 1997). A large majority of infants are breastfed into their second year of life and in Sudan this is true even for the ‘Urban Elite’ group. Surveys carried out between 1984-1990 (Perez-Escamilla, 1993 a; Perez-Escamilla 1993b) indicate that the rate of

breastfeeding initiation in each country of Africa ranged from 92-99 percent whereas in Latin America and the Caribbean the range was much wider (77-94%).

In most of Asia, the levels of breastfeeding are high. Data summarized by WHO for the period of 1980-1989 (Saadeh et al,1993) in the Western Pacific Region and 73-94 percent in Hongkong found extremely low breastfeeding initiation rates of 30 percent (Leung et al, 1994).

In India breastfeeding initiation rate is almost universal, especially in the rural areas. However, breastfeeding patterns and practices vary considerably among populations and areas and exclusive breastfeeding is not common.

The United Nations Children's Fund (UNICEF) and WHO recommend that children be exclusively breastfed during the first six months of life and that they be given solid or semisolid complementary food in addition to continued breastfeeding from six months until 24 months or more when the child is fully weaned. Exclusive breastfeeding is recommended because breast milk is uncontaminated and contains all the nutrients necessary for children in the first few months of life. In addition, the mother's antibodies in breast milk provide immunity to disease.

Early supplementation is discouraged for several reasons. First, it exposes infants to pathogens and Breast milk is an ideal food for the baby up to age of 6 months. Mother secretes about 450 – 600 ml milk daily during the first year of lactation. If breast milk is supplemented with weaning food at the age of 5 – 6 months, it prevents malnutrition (Facts of life, 1989). WHO estimates that more than 9 million children's life could be saved every year if all mothers gave their babies nothing but breast milk for the first 4 – 6 months. Breast feeding is the best and safest method of feeding a young infant with numerous nutritional, immunological, psychological and economic

advantages. Alternatives to maternal milk are often inadequate, both from nutritional and hygienic point of view, in developing and developed countries, more so in the former.

In addition to being highly nutritious, breast milk also contains high levels of antibody rich proteins, especially immunoglobulin A and lactoferrin, which offer anti-infective protection to the newborn (Bernshaw, 1991). The maternal antibodies found in human breastmilk protect the baby against respiratory infections (Feachem and Koblinsky, 1984; Victora et al, 1987). Epideminological evidence shows that breastfeeding protects the infant against gastrointestinal and to a lesser extent, respiratory infections and the protective effect increases with duration of exclusive breastfeeding (Cunningham et al, 1991; Beaudry et al, 1995; Raisler et al, 1999).

Prolonged and exclusive breastfeeding is suggested to be associated with reduced risk of atopic disease (Saarian et al,1997; Oddy et al, 1999), protection against long term chronic diseases like Diabetes Mellitis (Gerstein, 1994), Crohn's disease (Koletzko et al, 1989) and possibly lymphoma (Davis, 1988) in the infant. Breast feeding also plays a preventive role against paralytic poliomyelitis during the first six months of life (Pisacane et al, 1992).

Some studies suggest that breastfeeding accelerates neurocognitive development (Lucas et al, 1992; Lanting et al, 1994). Preterm babies who consumed breastmilk were seen to have a substantial advantage in IQ at 7.5-8 years over those who did not receive breast milk (Lucas et al, 1992). Exclusive breast feeding through six months is associated with enhanced neuromotor maturation than partial breastfeeding (Anderson et al, 1999).

Breast feeding is also reported to reduce risk of breast cancer (Davis et al, 1988; Yoo et al,1992; Newcomb et al, 1994) and plays an important role in fertility regulation (Vitzthum, 1994) in the mother. Each additional month of breastfeeding increases the average birth interval by 0.25 – 0.50 month, thereby leading to reduced fertility (Smith, 1985). In populations that do not use modern contraception, breastfeeding for two years or more is thus related to a longer average birth interval which has a positive impact on child's health (Mudhadkar and Shah, 1976).

Every year one million infants die and millions of others are impaired, because they are not adequately breastfed. Breast milk gives the best form of nutrition and protect ion from infection for the baby (Safe motherhood, 1994). Expert in child nutrition, health and development agree that breast feeding is the most effective way to provide a baby with complete food, which gives protection against malnutrition and infection (Bwibo, 1981).

WHO reports that one of the best way of assessing the adequacy of breast milk is to determine how well it sustains the infant's growth rate along standardized growth curve (WHO, 1985). One infant may consume 600 ml or less and another nearly one litre over a 24 hours period indicate two infants' growth differ at the same rate. Consumption during few feeds and many feeding vary considerably (Cameron, et al 1983). Frequently suckling through the day and night, infant may suckle up to 12 -15 times during 24 hours which provides sufficient milk to meet their needs. Small infants should be given the breast milk whenever they cry. Most mothers and babies, however soon settle down to a routine in which the infant suckles about 5 -10 times during the day (WHO, 1981). Continuation of breast feeding after 6 months provides important protein supplement to the infant's diet. Similarly, a study in one of the

African countries found that children were well nourished who were on breast feeding and found poor who were on bottle feeding (Schanler, 1995).

In Maldives the full breast-feeding rate at hospital discharge was 93 percent but declined to 41 percent at 4 months. Breast-feeding rates were high among Maldivian mothers: 100 percent at 1 month and 85 percent were still breast-feeding at 6 months. The median duration of breast-feeding was 24 months. Breast-feeding rates are high and the average duration of breast-feeding is more than 2 years in the Maldives. Hence, according to (Abdulraheem et al, 2007) health promotion activities should be directed towards maintaining the already high 'any breast-feeding' rates and increasing the proportion of infants exclusively breast-fed to 6 months.

Sharma et al, (2003) conducted research in Kangra, Himanchal Pradesh reported that 96 percent mothers breastfed their infants, whereas, only 4 percent of the mother did not breastfeed their infants due to breast/medical problems and insufficient milk. Similarly, 34 percent of mothers knew about importance of feeding colostrums while 66 percent of mothers did not know about the importance of feeding colostrums.

Breast feeding is highly protective against Xeropthalmia (Sommer and West, 1996). This may be partly due to the regular supply of preformed vitamin A in the milk. Breast milk provides retinol in a readily absorbable form. Saleema (2001) stated that if the duration of breast feeding was less than four months, the risk of stunting was increased two fold at six months of age.

One of the reasons breastfeeding is nearly universal and prolonged, especially in the rural areas, is because of the widespread belief that it is effective in postponing the next pregnancy. Literature shows that ovulation is likely to return sooner in women who partially breastfed than those who exclusively breastfed (Van Ginnken, 1974).

Nepal et al (2009) reported that 32 percent of mothers initiated early initiation of breast feeding (within one hour of delivery), 28 percent of mothers initiate breast feeding within first 12 hours, 75 percent of mothers were counseled for the early initiation of breast feeding, where as 7 percent mothers never received breast feeding counseling till the time of interview.

2.7 COLOSTRUM FEEDING

A new born is birthed into our environment sterile. Immediately, bacteria begin colonization on the baby's skin and in his mucosal membranes, which are located throughout his body (Hanson, 2004). Immediately after delivery breast milk is yellowish and sticky. This breast milk is termed as "colostrum". It is rich in protein, minerals, carbohydrate, fats and immunoglobulin and lactoferrin as well as white blood cells, which are of great importance for protection against dangerous neonatal infections.

A new born baby who is fed colostrum has an enormous advantage over the artificially fed baby because of the protective immunities that are offered. Colostrum's qualities are uniqe. It is species specific and designed for the development of human infants (Lawrence and Lawrence, 1999).

The newborn's stomach at birth is the size of a marble, which means that it holds less than a quarter of an ounce of milk (Scammon and Doyle, 1990). Colostrum's small doses are designed for the human infant. These early feeds are easily digestible. The laxative qualities of colostrum encourage the passage of meconium, the baby's first stool. As meconium is expelled from the baby's intestines, his stomach grows to the size of his fist. This growth occurs rapidly during the first three days of life.

Frequent breastfeeding should be encouraged. It is common for newborns to "wake up" on the second day of life and want to go the breast often. They may exhibit cluster feeding behavior, nursing on and off for hours, and then sleeping for a few hours. This is normal newborn behavior. This may timetable of breastfeeding frequently encourages the meconium to be expelled from the baby and greatly reduces any potential difficulties the baby may have with jaundice. Frequent feeding also encourage the transition to a mature milk supply to begin as soon as possible (ILCA, 2000).

Colostrum is a living fluid, resembling blood in its composition. It contains over 60 components, 30 of which are exclusive to human milk. It is species-specific designed for human babies (Neville and Neifert, 1985).

This fluid is rich in immunoglobulins, which protect infants from virus and infections (Lucas, 1998). The main immunoglobulin in human milk is secretory IgA (sIgA). The antibodies produced are specific to the mother's environment and are targeted against the pathogens in the infant's surroundings. It is also responsible for continuing the passive immunities that were provided in utero by the placenta, such as polivirous and rubella.

The main function of sIgA, along with other immunoglobulins, is to "paint" the lining of the infant's stomach and intestines. These surfaces are then able to defend the baby against virus and bacteria by not allowing pathogens to adhere to them (Alm et al., 2002). Some of these incredible immunoglobulin actually attack pathogens and kill them. These components are important in fighting and preventing necrotizing entercolitis (NEC) in premature infants, which can be fatal (Hanson and Korotkova, 2002). These defensive actions provide the newborn with optimal protection.

There are many others qualities of colostrum that make it truly unique. Colostrum contains high amounts of sodium, potassium, chloride, and cholesterol. This combination is believed to encourage optimal development of the infant's heart, brain, and central nervous system (Rivers, 2003; Oddly, 2002). This may account for the prolonged secretion of colostrums in mothers who deliver their babies prematurely. All these components offer premature infants the best chance for the optimal development of their fragile organs.

Colostrum is also high in protein, about three times more than is in mature human milk. These important proteins assist in providing adequate nutrition to breastfed infants. They aid in the defense against infection and facilitate the baby's development of important physiologic functions (Lonnerdal, 2003). Proteins are also responsible for maintaining the baby's blood sugar. This is particularly important for babies whose mothers are diabetic or have experienced gestational diabetics during their pregnancy.

The color of colostrums varies. It may be clear, bright yellow, white, orange, pink, green, and light brown (Wilson-Clay and Hoover, 2002). Foods or beverages that a mother may ingest could be the cause of these different colors. The vitamins or medicines that he/she takes also may affect the color. Colostrums is saturated with fat-soluble vitamins and minerals. It is often yellow or orange color, reflecting the high levels of beta-carotene, one of the many antioxidents present. Antioxidents act as cell protectors in the infant's body and enhance his immune system (Hanson and Korotkova, 2002).

Sharma et al (2003) conducted research in Kangra, Himanchal Pradesh and reported that 96 percent mothers breastfed their infants whereas only 4 percent of the mother

did not breastfed their infants due to breast/medical problems and insufficient milk. Similarly, 34 percent of mothers knew about importance of feeding colostrum and 66 percent of mothers did not know about importance of feeding colostrums.

Colostrum is rich in protein, minerals, carbohydrate, fats, immunoglobulin and lactoferrin as well as white blood cells which are of great importance for protection against dangerous neonatal infections. Despite attempts to increase the awareness about the benefits of colostrum a substantial number of mothers do not breast fed for the first two or three days after birth.

Another study carried out by Save the Children and CEDPA in Siraha district in Nepal stated that 95.3 percent of the women had breastfed their last child. However, 63.8 percent gave colostrums and 56.9 percent gave their babies something else to drink before breast milk. After one month, only about half of the babies were exclusively breastfed (CEDPA, 2002).

A household survey (Malla, 2002) conducted in Chitwan district reported that a very high percentage of mothers (33.4percent) did not feed colostrum to their babies. Many of them felt it was not good for the babies.

A base line survey conducted by New Era in (2001) reported that all Mothers had breastfed their babies, although only one fifth of them had fed colostrums to their newborns. The practice of squeezing out the colostrums was greater is Dadeldhura district than in Doti District. They have a traditional concept that the colostrum may make child sick.

Barton, Sharon (2001) reported that 52 percent of mothers choose to use formula, 41 percent chose breast feeding, and 8 percent were both breast feeding and formula

feeding, By 1 month, 71 percent of mothers were formula feeding and only 29 percent were breast feeding, At 4 to 6 months postpartum 80 percent of mothers were formula feeding and 20 percent were breast feeding. Mothers with more children, higher family income, and more education were more likely to breast feed. Almost all mothers began solid foods before the infant was 4 months old. Infants were fed table foods including mashed potatoes and gravy and beverages such as apple juice, fruit juice and soda. Mothers relied on health professionals for support for feeding decisions at the first interviews; however, they relied more on the grandmother for support at the time of the second interview.

Breastfeeding is almost universal in Nepal with 98 percent of children being breastfed and the median duration of breast-feeding is 33 months. The mean duration of breastfeeding is 29 months (NDHS, 2001). The State of World's Children Report (UNICEF, 2004) highlighted that in Nepal, breast- feeding was continued till 24 months among 92 percent of the mothers.

According to Nepal demographic health survey preliminary report stated that 88 per cent less than 2 months of age are exclusively breastfed and overall 70 percent children under 6 months are exclusively breastfed (NDHS, 2011).

A study on "Breast feeding status in Rural and Urban Areas of Central Development Region, Nepal" (Neupane S, 1992) reported that 89 percent and 73 percent of rural and urban infants aged 0 to less than 4 months were found exclusively breast-fed.

However, only one in three children is breastfed within one hour of birth while two out of three babies are breast fed within one day after birth. Although, there is some indication of bottles being used, particularly in urban area, breast milk is a complete and unparalleled way of providing the ideal food for the healthy growth and

development of young infants. The basic food in the diet of the infant, of course, is breast milk. Some research work done in Nepal had found that, the practice of breastfeeding is differed according to ethnic groups. Such as Shakya (1984) found in a study of Techo village that the practice of breastfeeding was longer for Newar ethnicity compared to Chhetri ethnicity though both ethnicity had a significant number of infants who were breast fed up to 2 years. Besides, a few of them continued breast feeding for 4 years and above too, but there is not a marked difference between them. Similarly, Thapalia, (1987) stated that 64 percent Chhetri mother breast-fed their children up to 2 years on average whereas Newar women breast-fed the children for more than 3 years.

2.8 ADEQUACY OF ENERGY AND PROTEIN CONTENT OF BREAST MILK

2.8.1 ENERGY

Recommended energy requirements for infants are 116 Kcal/kg body wt. for 0-3 months and 98 kcal/kg 6-12 months (ICMR 1990). These recommendations are based on the energy intakes through breast milk by infants of well nourished Indian mothers. RDA for infants based on FAO/WHO (1985) are 520 Kcal/day at 0-2 months and 662 Kcal/day at 3-5 months. These recommendations were based on energy intakes by healthy infants' affluent countries and also included a 5 percent for an assumed underestimation of breast milk intake (WHO 1985b). Lately it has been seen that the early figures overestimate true requirements in infancy and efforts have been made to estimate energy requirements using the factorial approach method (Butte et al, 2000a). The mean energy content of human milk ranges from 0.62 Kcal/g to 0.80 Kcal/g (Jensen, 1995). Mean human milk intakes of exclusively breastfed infants,

reared under favorable environmental conditions, increases gradually throughout infancy from 699g/day at one month to 854g/day at six months (Butte, 1996). Energy requirements derived from the sum of the total energy expenditure and energy deposition were used to evaluate the adequacy of breast milk to support the energy requirements of exclusively breastfed infants (Butte 2000a: Butte, 1996b). Energy intakes based on mean milk intakes of exclusively breastfed infants appeared to meet energy requirements during infancy and positive correlations between energy intake and infant weight gain have been reported (Heinig et al, 1993; Butte et al, 2000b).

2.8.2 PROTEIN

Protein requirements of infants as given by ICMR (1990) are 2.3g/kg body weight for infants 0-3 months and 1.8g/kg body weight for infants 3-6 months of age. These recommendations are computed on the basis of protein content of breast milk and volume of breast milk consumed by healthy infants whose growth rates are normal.

It has been argued that the growth rate of exclusive breastfeeding may be limited by their protein intake (Formon et al, 1993). Dietary proteins provide approximately 7-11 percent of the exclusively breastfed infants energy requirement and the essential amino acids necessary for protein synthesis. The concentration of protein changes as lactation progresses. By the second postpartum week, when the transition from colostrum to mature milk is nearly complete, the concentration of protein is approximately 1.3g/dl. This value drops by about 30 percent by the second month and remains at that level until weaning. The protein content of mature human milk is approximately 0.9g/dl (Jensen, 1995).

In a study by Akeson et al (1998) growth of exclusively breastfed Swedish infants was compared to infants receiving formulas with varying protein concentrations (1.3,

1.5 and 1.8 g/dl). Healthy infants exclusively breastfed for 3 months were randomly assigned to one of the three protein groups. Infants breastfed and mixed fed formed the fourth and fifth groups. Breastfed infants from the DARLING study (Dewey et al, 1992) were used as the comparison groups. Although energy intakes were similar in all groups, protein intakes were significantly lower in breastfed group as the compared to the formula groups. Length and weight increments from 4-8 months were similar in formula and breastfed groups.

Similar results were seen in a previous study from Honduras. Despite higher protein intakes in supplemented infants as compared to exclusively breastfed infants from 4-6 months, no difference between length or weight was noted between groups (Dewey et al, 1996b). Essential amino acid concentrations and total amino acids were similar at six months of age between exclusively and predominantly breastfed Swedish infants (Akeson et al, 1996). The lack of any impact on growth, even when a wide range of protein intakes were compared, shows that protein is not a limiting nutrient. Thus, with limited data, it appears that protein requirements of the infant are met by exclusive breast feeding for the first six months.

Based on factorial approach and balance studies, the mean protein requirements have been determined and the protein provided by milk appears to be sufficient to meet the mean protein requirements for the first 3-4 months of most infants (Dewey et al, 1996a).

A more precise estimate of proportion of infants whose needs are met at all ages requires more understanding of efficiency of human milk nitrogen utilization, better functional measures of nitrogen adequacy and improved methods for estimating obligatory needs.

2.8.3 IRON

Factoral, balance and stable isotop methods have been used to estimate iron requirement in infants. Daily iron requirements of Indian infants aged 0-6 months are 70μg/kg body weight (ICMR, 1990). Iron requirements estimated from non Indian studies are 0.5mg/d for infants 0-6 months of age and 0.9mg/d for infants 6-12 months of age (Stekel, 1994; Dallman, 1988; Forman, 1993).

Iron content of human milk declines from about 0.4-0.8 mg/L in colostrum to about o.2-0.4mg/L in mature milk. The estimated iron requirement can not be met by human milk alone during the entire infancy because human milk is a poor source of iron and can not be altered by material iron supplementation. The iron stores at birth take care of the infants' needs during the first half of infancy, but exclusively breastfed infants may be at risk during the later part of infancy.

Pisacane et al (1995) reported that iron status was adequate in Italian infants up to 9-12 months of age on exclusive breastfeeding. Similarly, Simes et al (1984) reported that not supplementing iron to exclusively breastfed infants could result in these infants becoming iron deficient in the later half of infancy.

Controlled trials from Honduras (Dewey et al 1985a; Lonnerdal and Hornell, 1984b) suggest that at least in developing countries where maternal iron and newborn iron stores are suboptimal, exclusive breastfeeding without iron supplementation may comprise hematologic status during the second half of infancy. The risk of iron deficiency is greater in lo birth weight infants because their iron stores are much smaller. Therefore, in developing countries, the likelihood of iron deficiency during the first six months of life is increased. Other factors such as maternal iron deficiency during pregnancy (Colomor et al) and premature clamping of the umbilical cord at the

time of delivery (Fairweather et al, 1992) may also contribute to iron deficiency among young infants in developing countries.

2.8.4 ZINC

The concentration of zinc in human milk declines from 4-5mg/L in early milk to 1-2mg/L at three months and to about 0.5mg/L at six months postpartum; consequently the zinc intake of the breastfed infant steadily declines (Jensen, 1995). However, infants born to women who have low zinc concentrations in their milk are high risk of zinc deficiency in early infancy. There is some evidence that chronically low intakes of zinc in diet are associated with lower milk zinc concentration (Krebs, 1998).

2.8.5 CALCIUM

The calcium requirement of young infants is computed from calcium intakes of healthy infants who are exclusively breastfed. ICMR (1990) has recommended 500 mg per day for infant.

Human milk contains 250-300mg/L of calcium with no pronounced changes throughout lactation (Jensen, 1995). The concentration of calcium in human milk, in general, has not been found to be varying with maternal intakes. However, poorly nourished women from Gambia on low calcium diets produced milk with lower than normal calcium levels (Laskey et al, 1990) which did not increase with calcium supplementation (Prentice et al, 1997). Though, calcium requirements are affected substantially by genetic variability and other factors (Lonnerdal, 1997).

2.8.6 VITAMIN A

Food and Nutrition Board, USA, 2001 reported that a well nourished mothers, mature milk contains approximately 1.7 umoles/L vitamin A. In addition, human milk contains carotene that may be transferred to the infant (Formon and Olson, 1993). ICMR (1990) recommended daily intake of Vitamin A (Retinol 350µg/l and β-carotene 1400µg/l) for the infants up to 6-12 months. The breast milk of Indian lactating mother contains approximately137 IU retinol/100ml. In the same study has shown that a daily intake of vitamin A by Indian infants through breast milk is about 140µg during the first six months.

2.8.7 VITAMIN D

Human milk contains low levels of vitamin D (about 0.55µg/L) and is depend on maternal vitamin D status (Specaker et al, 1985) as reflected by the maternal serum 25 hydroxyl vitamin D status. Since preformed vitamin D is found in a very few foods, it is not easy to obtain preformed vitamin D from the diet. Hence, maternal vitamin D status often reflects maternal sun exposure.

Vitamin D is now considered more as a pro-hormone as a vitamin. Vitamin D can be synthesized in the body in sufficient amounts by simple exposure to sunlight even for 5 minutes per day. In prescribing medicinal vitamin D under certain situation where there is minimal exposure to sunlight, a specific recommendation of a daily supplement of 400µg is made (ICMR, 1990).

2.8.8 VITAMIN B6

The vitamin content of human milk varies with maternal B_6 status and intake. Mean vitamin B_6 concentration in human milk of women with vitaminB_6 intakes below 2.5mg/d is 0.13mg/L whereas it is substantially higher (0.24mg/L) in milk of women with vitamin B_6 intakes between 2.5-5.0mg/d (West and Kirsey, 1976). Thus, the daily vitamin B_6 intakes of infants 1-6 months of age who consume at least 780ml of breast milk per day with a vitamin B_6 concentration of 0.13mg/L should meet the estimated requirements for this age group (Food and Nutrition Board, 2000).

In the absence of precise data, ICMR (1990) has based its recommendation in the levels of pyridoxine in breast milk of mothers from developed countries and has suggested an amount of 0.1mg/d for infants up to six months of age. It thus appears that human milk provides sufficient energy, protein and calcium for the first 6 months of life but provision of vitamin A and B_6 depends on the maternal status and will vary in different individuals. Iron and zinc are low in human milk and since there is not enough literature on their adequacy in the first six months after this period these may have to be added to the infants' diet.

There is no available literature on exclusive breastfeeding and protection from mortality between 4 and 6 months. No reduction in morbidity has also been documented with prolonged exclusive breastfeeding versus introduction of complementary foods between 4-7 months with the limited evidence available.

From the literature available, except zinc and iron, breast milk appears to sustain the infant's nutritional requirements during the first half of infancy, at least in the developed countries. There is paucity of data from developing countries on nutritional

adequacy of breast milk during the first six months. Large randomized trials are needed in developing countries to rule out the adverse effect on growth if any and confirm health benefits of exclusive breast feeding beyond six months of age.

2.9 ADVANTAGES OF BREAST FEEDING

The World Health Organization recommends that children be breastfed for up to two years and beyond, as do UNICEF and the Canadian Paediatric Society (NCCP, 2005). The American Academy of Pediatrics advises breastfeeding for at least one year, and thereafter for as long as both mother and child desire. In another study, breastfeeding for at least two years reduced a woman's risk for rheumatoid arthritis by 50 percent (Karlson, 2004).

Breastmilk is the natural first food for babies, it provides all the energy and nutrients that the infant needs for the first months of life, and it continues to provide up to half or more of a child's nutritional needs during the second half of the first year, and up to one-third during the second year of life.

Breastmilk promotes sensory and cognitive development, and protects the infant against infectious and chronic diseases. Exclusive breastfeeding reduces infant mortality due to common childhood illnesses such as diarrhoea or pneumonia, and helps for a quicker recovery during illness.

Breastfeeding contributes to the health and well-being of mothers; it helps to space children, reduces the risk of ovarian cancer and breast cancer, increases family and national resources, is a secure way of feeding and is safe for the environment.

Women who don't have health problems should try to give their babies breast milk for at least the first six months of life. There are some cases when it's better not to

breast feed. If the mother has HIV or active tuberculosis, she should not breast feed because she might transmit the infection to the baby. Certain medicines, illegal drugs, and alcohol can also pass through the breast milk and cause harm to the baby (NIH, 2011).

One of the reasons breastfeeding is nearly universal and prolonged, especially in the rural areas, is because of the widespread belief that it is effective in postponing the next pregnancy. Contemporary literature shows that ovulation is likely to return sooner in women who partially breastfeed than those who exclusively breastfeed (Van Ginneken, 1974).

A subanalysis of the Ghana data included in the WHO analysis demonstrated that delayed breast-feeding initiation time was a crucial risk factor for neonatal mortality and authors estimated that up to 16% of neonatal deaths could be prevented by increasing the proportion of infants that receive breast milk within 24 h of birth (Edmond et al, 2006).

According to Becky (2001) advantages of breast feeding are as follows;

For the baby:

1. Due to the anti-infective properties of breastmilk, breastfed babies tend to have less incidence of ear infections, respiratory illness, allergies, diarrhoea and vomiting.
2. Due to the digestibility of breastmilk , breastfed babies are rarely constipated.
3. The stools of breastfed babies are mild-smelling.
4. Sudden Infant Death Syndrome (SIDS) is less common in breastfed babies.

5. Breastmilk has exact combination of protein, fats, vitamins, minerals, enzymes, and sugars needed for the human infant at various stages of his /her growth.
6. Breastfed babies are constantly exposed to a variety of tastes through their mother's milk.
7. Breastfed children are at less risk of chrohn's diseases and juvenile diabetes.
8. Children who were breastfed are less likely to need orthodontic work such as braces due to the unique sucking action required with breastfeeding.
9. IQ levels are an average of 8 points higher in children who were breastfed.
10. Adults who were breastfed have a lower risk for high cholesterol and asthma.
11. The bond between mother and child seems to be enhanced with breastfeeding.

For Mother

1. Nursing immediately following delivery causes the uterus to contract lessening the risk of postpartum hemorrhage.
2. The uterus of a breastfeeding mother shrinks to its pre-pregnancy size more quickly.
3. Calories are burned while breastfeeding it takes approximately 20 calories to produce an ounce of milk.
4. Women who nurse their babies for at least 6 months lessen their chances of premenopausal breast cancer.
5. Osteoporosis and cervical cancer less common in women who breastfed.
6. The return of fertility is delayed with breastfeeding.
7. Breastfeeding is more economical than formula feeding.
8. Breastmilk is always available, clean, and the right temperature.

9. Many mothers feel a special satisfaction in knowing that they alone are meeting According to Shrestha (1981), child-feeding practices were found to be influenced by food fads and superstition in Baitadi district. A few mothers were even found using Cerelac, a commercial baby food even in the remote part of the district.

A study in Kathmandu of infant feeding practices found that children were not frequently given green vegetables (Pahari, 1983). Benister et al (1989) indicated that 53 percent of the households fed green vegetables to the young children. About 22 percent household did not feed green vegetables to the children and 98.9 percent also avoided serving yellow fruits and vegetables to their children. During illness like diarrhoea, 50.8 percent children were not given solid food and not even water. Child feeding practices were found to be influenced by the mother's knowledge and the traditional belief in many communities.

Malla (1991) reported that 80 percent of the mother breast- fed to their children up to 2 years because they believed that the breast milk was sufficient for children. Among the sample 58 percent of the children were receiving supplementary food whereas 42 percent of the children were not fed such foods. Lito (rice flour) was found the most preferred complementary food in Walling Village Development Committee. Pulse/rice (dal/bhat) and Jaulo (semi liquid rice) were other common foods given to the children in addition to breast milk.

A study of breast-feeding practices conducted by Acharya (1985) in 4 districts, Tanahu, Siraha, Bajhang and Nuwakot revealed that breast-feeding was the normal way of feeding infants and it continued up to two years or more. The length of breastfeeding varied slightly between urban and rural areas. Further more, the same

study indicated that while breastfeeding was well practiced by all lactating mothers, nothing was given to the child except breast milk before "Annaprasan"(feeding solid foods) ceremony. This ceremony is normally held at 5th month for girls and 6th month for boys. In Nuwakot, feeding practices were found to be slightly different. If breast milk was not sufficient, the mothers give Lito (rice flour) to the child. In Tanahu, semi-solid salted food like pulse (dal) was given after Annaprasan. Generally, "Dal-Bhat" is the main weaning food and green leafy vegetables are not given (Malla, 2001).

2.10 WEANING

At birth, the infant of a well nourished mother enters the second stage of the healthiest time of him/her existence. This period continues until he/she is given only breast milk. UNICEF and WHO encourage breast feeding till the 6 months of age. Breast milk is sufficient for that period. After that period breast milk alone cannot fulfill the child's nutritional requirement for its rapid growth and development. Thus, other foods need to be given along with breast milk. This is called the beginning of the weaning period.

Weaning is a gradual process of starting additional food along with breast milk. Six months from birth is an appropriate age to introduce other foods along with breast milk to a baby. After the age of six months, in most cases mother's milk is not adequate both in terms of quantity and quality to meet the nutritional requirements of the baby.

Introduction of supplementary food at too early an age (before 4 months) increase the risk of diarrhea and other illness. Similarly, food at too late on age causes malnutrition (MOH, UNICEF, 1995).

A good weaning diet must have enough energy, protein, essential vitamins and minerals. Starchy staple food supplies energy but the semi liquid starchy porridges gruels are sometimes diluted to meet child's full energy needs. If energy needs are not met, growth is retarded and the body breaks down its own protein to supply energy resulting in protein energy malnutrition (Krantz et al, 1987). Early supplement can lead to adequate nutrient intake but the child will be instead in danger because he/she is exposed to infection (Rowland et al, 1978).

Breast fed infants self-regulate their total energy intake when other foods are introduced. Therefore, there is no advantage of introducing these foods before 6 months. There is however, a distinct disadvantage if the child is exposed to increased pathogenic contamination (Heining, 2003). Malnutrition among young children can be greatly reduced by educating parents regarding the preparation of safe and adequate local weaning foods. It more importantly decreases mother's milk production (Malek et al, 1996) due to decreased prolactin, a hormone, which is responsible for milk production, depends on suckling stimulation by the baby.

Nepal reported the lowest bottle feeding rate 3.5 percent; the highest rates were in Srilanka 27.2 percent and Bangladesh 22.4 percent. The timely complementary feeding rates were lowest in India 56.7 percent, Bangladesh 62.3 percent and highest in Nepal 74.7 percent and Srilanka 93.4 percent. Almost all of the infants in the four countries had been breastfed at least once ("ever breastfed"), and the proportion of infants who were currently being breastfed (during the previous 24 hours) was also very high. It is interesting to note that breastfeeding was continued to the end of the first year by a majority (86-98%) of the mothers in these countries. By the end of the second year, the rates dropped by about 16 percent in India and 10 percent in

Srilanka. However, there were only marginal declines in Nepal and Bangladesh, where the rates were sustained above 90 percent to the end of the second year (SAIFRN, 2011).

In many cultures a baby is breastfed for two or three years. Western culture is accustomed to viewing breastfeeding in terms of months. This is not the norm the world over. While weaning is a personal decision, nutritionists and physicians advise breastfeeding for at least one year because by that time most infants have outgrown most of their food allergies and will thrive on alternative nourishment.

In Nepal, weaning traditionally begins with the rice feeding ceremony where the infant receive their first meal. The ceremony is performed at five months of age for a girl and six months for a boy.

2.11 COMPLEMENTARY FEEDING PRACTICES

Food habits have a significant role in nutrition management. Due to unawareness, the population of Nepal is suffering from different types of nutritional deficiency diseases. According to Shrestha (1981), child-feeding practices were found to be influenced by food fads and superstition in Baitadi district. A few mothers were even found using Cerelac, a commercial baby food even in the remote part of the district.

A study in Kathmandu of infant feeding practices found that children were not frequently given green vegetables (Pahari, 1983). Malla (1991)) reported that 80 percent of the mothers breast feed their children up to 2 years because they believed that the breast milk was sufficient for children. Among the sample, 58 percent of the children were receiving supplementary food whereas 42 percent of the children were not fed such foods. Mothers expressed that breast milk was enough for young children

up to 2 years of age. Lito (rice flour) was found the most preferred complementary food in Walling Village Development Committee. Pulse/rice (dal/bhat) and Jaulo (semi liquid rice) were other common food given to the children in addition to breast milk.

"Annaprasan" (feeding solid foods) ceremony is normally held at 5th month for girls and 6th month for boys. Generally, "Dal-Bhat" is the main weaning food and green leafy vegetables are not given (Malla, 2001).

Home prepared vegetable, fruits, mixed food contains nutrients needed for the healthy growth of small children. Majority of the babies were given weaning food starting at the age of 6 months in Nepal. Pasni (rice feeding ceremony) at about 6 months of age is the time for starting solid food. The other supplementary foods given are cow's, buffalo's and goat milk. Types of semi solid foods are jaulo, breads, lito, sarbottam pitho, vegetables, dal, eggs, meat, fruits etc (Angove et al., 1986).

2.11.1 IMPACT ON GROWTH

Nutrition, feeding and growth problems are interrelated and are unique features of the pediatric age group in health and disease. Under-nutrition or poor growth is commonly due to inadequate intake of nutrients in our country, but more recent work has focused attention on interaction between nutritional and disease factors as they are related to child's social environment (Mehta, 1998).

As many as 43 percent (230 million) of the children in the developing countries have low birth weight for height that is stunting and 9 percent (50 Million) children have low weight for height (Wasting). The rate of low height for age reflects the cumulative effects of under nutrition and infections since birth or even before birth.

High rates are often suggestive of bad environmental conditions and early malnutrition. On the other hand, a greater frequency of low weight for height for height often reflects current severe under or disease (Park, 2002).

In the first few years of life most kids gain weight and grow much more quickly than they will later on. Sometimes, however kids don't meet expected standards of growth.

Although it's been recognized for more than century, failure to thrive lacks a precise definition, in part because it describes a condition rather than specific diseases. Kids who fail to thrive don't receive or are unable to take in, retain or utilize the calories needed to gain weight and grow as expected.

Most diagnoses of failure to thrive are made in infants and toddlers in the first few years of life-a crucial period of physical and mental development. After birth, a child's brain grows as much as in the first year as it will grow during the rest of life poor nutrition during this period can have permanent negative effects on mental development (Dowshen, 2011).

1.11.2 FEEDING DURING ILLNESS

During illness a child may be too weak to eat, have trouble swallowing, or find it difficult to breastfeed because of a cough or blocked nose. Inefficient absorption of nutrients, loss of energy stores, and dehydration due to vomiting or diarrhea must be overcome. Even during a short illness, child growth often falters.

Recommendations for feeding have been established based on data collected in the United States and other western societies; these recommendations stress that breastfeeding is the preferred method of infant feeding.

Common health benefits associated with breastfeeding initiation and duration include protection against childhood infections and disease. Despite the benefits of breastfeeding, many infants also receive formula and solid foods at young ages (Nina et al, 2009).

2.12 MORBIDITY PROFILE

2.12.1 DIARRHOEA

Diarrhoea is a major cause of morbidity and mortality among infants and children world wide. In developing countries, diarrhoel disease accounts for an estimated 17.5-21 percent of all death in children under the age 5 years, equivalent to 1.5 million deaths per year (Boschi-Pinto et al, 2008). Of all child deaths from diarrhoea, 78 percent occur in the African and South-East Asian regions which are also disproportionately burdened with infant and childhood HIV infections (Boschi-Pinto et al, 2008; UNAIDS, 2007).

Save the Children UK's Report on Saving Children's Lives (2008) points out that infants who are exclusively breast fed for the first six months after birth are ten times less likely to die of diarrhoea and 15 times less likely to die of pneumonia (Alex George, 2011).

Research on childhood diarrhoea is a priority of WHO for achieving the united nations' Millenium Development Goal of reducing childhood mortality by two thirds between 1990 and 2015 (UNICEF/WHO, 2008). While diarrhoeal control strategies developed in the 1980s reduced the number of child deaths from diarrhoea, coverage with these effective interventions is low. Data from 29 countries in 2005 indicated

that ORS was being used for only 30-40 percent of children with diarrhoea (Ram et al, 2008).

2.12.2 PNEUMONIA

Pneumonia is also a main causes of increase mortality in infants. Pneumonia is an inflammation or infection of the lungs most commonly caused by a bacteria or virus. In all cases, the lungs' air sacs fill with pus, mucous, and other liquids and can not function properly. This means oxygen can not reach the blood and the cells of the body. Most pneumonias are caused by bacterial infections. The most common infectious cause of pneumonia in the United states is the bacteria Streptococcus pneumoniae. Other bacteria, as well as certain viruses, may also cause pneumonia. Since these infections may not cause all of the classic pneumonia symptoms, they are often called "a typical pneumonias"(Guy Slowik, 2011).

Pneumonia is the single biggest killer of children world wide, accounting for nearly one in five deaths among young children, with an estimated 1.8 million deaths annually (Thea Qazi, 2008). Most of the deaths occur in resource- constrained countries, with 50 percent in sub-Saharan Africa and 20 percent in South-east Asia, where an estimated 151 million cases of childhood pneumonia occur each year. 11-20 million of which may require hospitalization (Rudan et al, 2008).

2.12.3 COMMON COLDS AND FEVER

A common cold is a viral infection of the upper respiratory tract especially baby's nose and throat. Nasal congestion and a runny nose are the primary signs of common cold in babies. Babies are especially susceptible to the common cold, in part because they are often around other older children who do not always wash their hands in fact.

Within the first year of life, most babies have up to seven colds. Younger babies have immature immune systems, and have had limited time to acquire immunity to common viruses.

An infant with a fever has an abnormally elevated body temperature over 100.4^0 degrees F (38^0 C). Fever can be caused by variety of conditions. In most cases, fever in infants is due to a viral or bacterial infection. The evaluation of fever varies with the age of the patient. Neonates with a fever and younger infants with a high fever should be managed with special consideration.

Symptoms of fever in infants depend on the underlying causes for the fever. Common symptoms include poor feeding in infants, fussy infants, vomiting, nasal congestion, cough and diarrhea. Other systems include lethargy and febrile seizures.

2.12.4 MEASLES

Measles is a very infectious illness caused by virus-a viral infection caused by the rubella virus. It is an endemic disease; meaning it is continually present in a community and many people develop resistance. If measles enters an area where the people have never been exposed the result can be devasting.

Symptoms are; high fever (105^0 F) it may drop and rise again. Koplik's spots- a very small grayish spots in mouth inside of cheeks and throat. Ach all over the body and after 3-4 days reddish brown spots appears. Usually starts behind the ears and spread over the neck and head. After couple of days spread all over the body (Measles, 2011).

Measles continues to cause high morbidity and mortality among children worldwide, despite the availability of safe and effective vaccine. Although, a preventable disease,

it cotributes as being one of the greatest burdens in developing countries with low vaccine coverage (Duke, 2003).

2.13 IMMUNIZATION STATUS IN NEPAL

National Immunization Programme (NIP) is a high priority programme (PI) of government of Nepal. Immunization is considered as one of the most cost effective health interventions. It has significantly contributed to reduce the burden of vaccine preventable diseases and child mortality.

Nepal is one of the countries on track to achieve the millennium developmental goal on child mortality reduction. National immunization services cover all the districts, municipalities and village development committees (VDCs) of the country and is provided free of cost. National Immunization programme under the Child Health Division has led role in all immunization related activities at the national level. The Regional Health Directorate (RHD) acts as a facilitator between the central and district levels. It is the responsibility of the D(P)OH to ensure that a successful immunization programme is implemented at the district and below level. Primary Health Care Centers (PHCs), Health Posts (HPs), and Sub Health Post (SHPs) implement immunization programmes in their respective municipalities and village development committees by extending the Extended programme of immunization (EPI) clinics.

2.13.1 IMMUNIZATION STATUS SCHEDULE

All infants (under one year) are immunized for BCG, DPT-HepB-Hip., OPV, and Measles vaccines as shown in Table 2.2.

Table 2.2 Immunization Schedule

Type of vaccine	Number of doses	Recommended age
BCG	1	At birth or on first contact with health institution
OPV	3	6, 10, and 14 weeks
DPT-HepB-Hib	3	6, 10, and 14 weeks
Measles	1	9 months

Source: Annual Report (MoHP, 2009/2010 (2066/2067).

2.14 ACHIEVEMENT, FY 2009/2010(2066/2067)

The Nepal immunization programme has targeted under one year old infants with 8 antigens, 2 doses of TT immunization. The achievement made during the fiscal year 2009/2010 (2066/2067) against the target is shown below:

Table 2.3 Achievement of immunization at fiscal year 2010

S.N.	Activities	Unit	Targets	Achievement	% Achieved
1	BCG vaccination	Infants	648,855	613,032	94.48
2	DPT-HepB hib 1 vaccination	Infants	648,855	550,719	84.88
3	DPT-HepB hib 2 vaccination	Infants	648,855	521,958	80.44
4	DPT-HepB hib 3 vaccination	Infants	648,855	529,310	81.58
5	Polio 1 vaccination	Infants	648,855	563,153	86.79
6	Polio 2 vaccination	Infants	648,855	535.541	82.54
7	Polio 3 vaccination	Infants	648,855	540,276	83.27
8	Measles vaccination	Infants	648,855	560.558	86.39

Source: Annual Report 2009/2010 (2066/2067), Department of Health Services.

CHAPTER 3
METHODOLOGY

Chapter 3

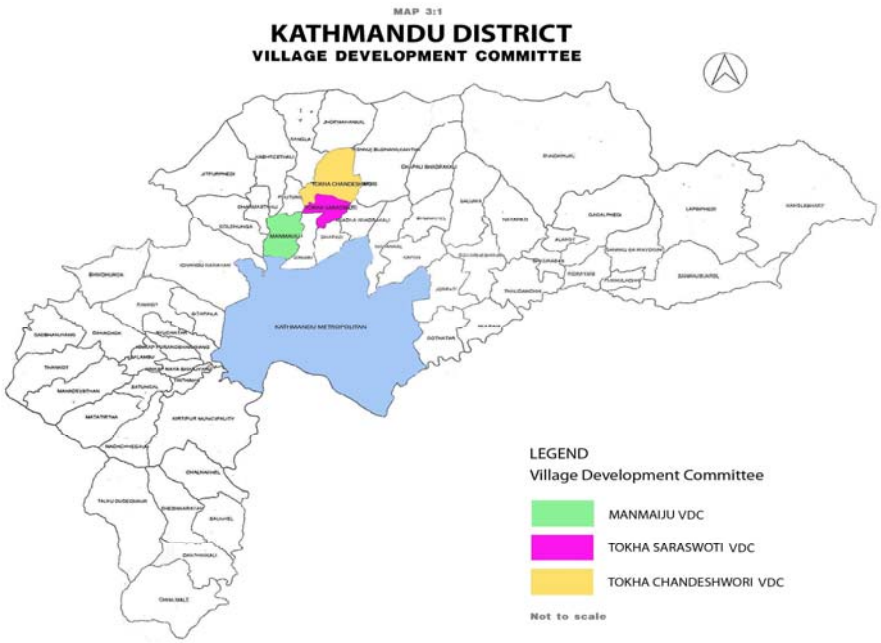
METHODOLOGY

This research study was designed to evaluate existing Infant feeding practices in rural and urban areas of Kathmandu district in Nepal: Rural urban differences on these parameters were also examined.

3.1 SAMPLE SELECTION

Kathmandu is the capital and the largest city of Nepal. Total population of Kathmandu district is 10, 63, 861 (Census, 2001) and the coverage area is 395 sq. km. Kathmandu district is divided into two areas; one is the rural area and the other is the urban area. In the rural area, Kathmandu district consists of 58 (CBS, 2009) Village Development Committee (VDC). Each Village Development Committee consists of 1-9 wards. In the urban area, there are two municipalities which consist of 1-35 wards, the-Kathmandu metropolitan city and the Kritipur metropolitan city.

Figure 2



Source: Village development committee profile of Nepal, Intensive Study & Research Centre, Kathmandu.

Three Village Development Committees (VDC) representing the rural area and three wards from the urban area were selected purposively for the research. Due to political unrest at the time of data collection, areas which were accessible and safe were chosen as the ease in follow up and monitoring was also considered. The chosen areas are located in the northern and eastern part of the Kathmandu metropolitan city.

Three Village Development Committees from the rural areas and three wards from urban areas identified for data collection were:

3.1.1 VILLAGE DEVELOPMENT COMMITTEES OF RURAL AREA

3.1.1.1 Manmaiju Village Development Committee which is located on the north side of the Kathmandu metropolitan city. In 2002, out of a total population of 10959, the number of females and males were 5307 and 5652 respectively and the total number of households were 2539 (CBS, 2002). Total agricultural land in village development committees is 499 sq km. Literacy rate of males was 91 per cent and females in this area was 68 per cent (NLSS, 2004).

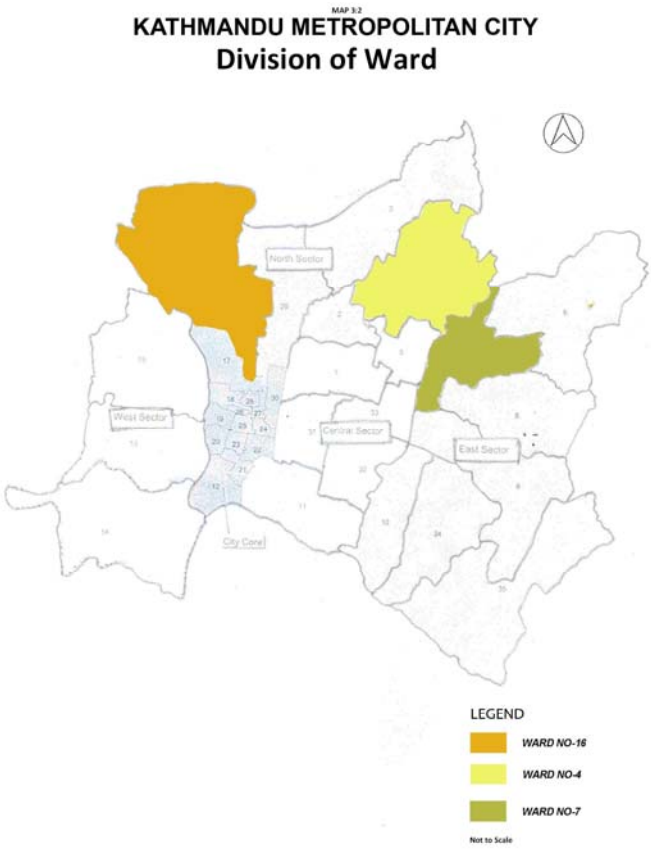
It is surrounded by ward No.16 Kathmandu metropolitan city on the south, Gongabu on the east, Dharmasthali Village Development Committee on the west and Tokha Chandeswori and Futung on the north.

3.1.1.2 Tokha Saraswoti Village Development Committee is also located on the northern side of the Kathmandu Metropolitan city. It is 5 kms away from Kathmandu metropolitan city. Tokha Saraswoti is surrounded by Jhor Mahankal on the north west, Dhapasi and Gongbu in the south, Kadga Bhadrakali on the east and Futung Village Development Committee on the west.

Total households of this Village Development Committee in 2002 were 470 and the total population was 2681, with 1284 males and 1397 females (CBS, 2002). Total agricultural land is 89 sq km. Total literacy rate of males is 76 percent and females 47 percent (NLSS, 2002).

3.1.1.3 Tokha Chandeswori Village Development Committee is located on the north of the Kathmandu metropolitan city. In 2002, total households of this Village Development Committee were 570. Total population of this Village Development Committee was 3542, with 1712 males and 1830 females (CBS, 2002). Total literacy rate of males was 77 percent and females was 55 per cent .Total agricultural land of this Village Development Committee is 111 hectares (NLSS, 2004). This Village Development Committee is surrounded by eight VDCs such as Budanilkantha on the east , Jhor Mahankal, Sangla and Futung on the north west and Tokha Saraswoti, in the south. Main occupation of the residents of this Village Development Committee was agriculture.

Figure: 3



Source : Kathmandu Metropolitan City, Ward Profile, Kathmandu Sector Map.

3.1.2 WARD NO. OF URBAN AREA

Similarly, 3 wards have been chosen from Kathmandu Metropolitan City namely ward no.4, ward no. 7 and 16 represent urban area.

3.1.2.1 Ward No. 4 of Kathmandu metropolitan city is located on the northern sector. Total population of this ward was 29539 . Of the total population in 2001, 15329 were males and 14210 females. Total households were 6768 (Census, 2001). This ward is surrounded by ward No. 7 on the east, ward No. 3 and 2 on the north west and ward No. 2 and 5 on the south.

3.1.2.3 Ward No 7 is located on the east sector of the Kathmandu metropolitan city. According to census 2001, total households and total population were 7689 and 36396, respectively. Men were 19017 in number and women were 17379. Neighbouring wards are 6 and 8 in the east , 4, 5 and 33 in the west and 8and 9 in the south.

3.1.2.4 Ward No.16 is also located in the north sector of Kathmandu city. Borders of this ward are 17 and 29 in the east, Ichangu Village Development Committee in the west, Manmaiju Village Development Committee in the north and ward no. 15 is in the south. Total households in this ward in 2001 were 10789 and total population was 45450 (Census, 2001).

3.2 SAMPLE

The sample comprised of 200 mothers i.e. 100 from the rural and 100 from the urban areas of Kathmandu district. The pregnant women were enrolled only if they were willing to participate in the study for the entire study period.

Hundred pregnant women in the 3rd trimester were enlisted from the ANC units of government hospitals, private hospitals and from the selected wards in the urban areas of Kathmandu district. Whereas, in rural areas enlisting of 100 pregnant women was done at primary health care centers, health posts and sub health posts from the selected wards of rural areas of Kathmandu district.

At the time of enrollment of the pregnant women, their expected date of delivery as well as their contact details was recorded. Telephonic contact was made with all the pregnant women near their due date of delivery and the date of delivery was reconfirmed. Then the mother was contacted within 10-15 days of delivery.

The infants were enrolled in the study 10-15 days after the birth. Anthropometric measurements of the infant were taken at beginning and at subsequent home visits. The researcher thus stayed in close contact with the subjects throughout the year. Hence, a total of 200 mother-infant dyads were enrolled in the study (100 rural, 100 urban).

However, in urban area there were 4 dropouts, 2 each at 9th and 12th month. In rural area there were only 2 dropouts at 12th month. Hence, only 194 subjects completed the study.

3.3 RESEARCH DESIGN

This study is a longitudinal research wherein the mother and infant pairs have been followed up from the time of the infant's birth to when he/she is one year old. At the time of enrollment, the mother was interviewed using a semi structured interview schedule to collect information on her socio demographic, health and nutrition profile.

The first contact with the mother and infant was within 10-15 days after delivery. At this visit the infant's weight, length, head circumference and chest circumference were measured. The mother was interviewed about the type of delivery, place of birth, initiation of breast feeding and colostrum feeding.

Subsequently, the researcher visited the mother and infant pair when the infant was1, 2, 3, 4, 5, 6, 9 and 12 months old. At all these visits a checklist was used to gather information on breast feeding practices such as exclusive breast feeding, introduction of complementary feeds, developmental mile stones, immunization and morbidity profile.

At the visit in the third month, the infant's weight, length, head circumference, chest circumference was recorded. After completion of the sixth month, besides these anthropometric measurements, mid upper arm circumference was also measured. At 9 and 12 months, the infant's anthropometric assessments were repeated.

In addition, at the 12 month visit the mother was asked to recall the infant's food consumption so as to assess the adequacy of the infants' supplementary diet.

3.4 TOOLS AND TECHNIQUES

The following tools and techniques were used for the research.

3.4.1 INTERVIEW SCHEDULE CUM-QUESTIONNAIRE

A semi structured interview schedule was designed to collect information from the pregnant women. The interview schedule was designed to obtain information on family details; type of family, age of mother, age of father, education, occupation,

family income, parity and ethnicity. This interview schedule English questionnaire are given in Annex I.

After the birth of the infant, the mother were interviewed regarding place of delivery, type of delivery and breast feeding practices, colostrum feeding, reasons for feeding/not feeding colostrum, using a second interview schedule questionnaire in Nepali is given in Annex II.

3.4.2 CHECKLIST

A checklist was developed to collect information about the feeding practices, breast feeding/exclusive breast feeding, immunization status, morbidity profile and developmental mile stones of the infants. This was administered at 1, 2, 3, 4, 5, 6, 9 and 12 months. The final English checklist given in Annex I and translated checklist (Nepali) is given in Annexure II.

3.4.3 PRE-TESTING OF THE INTERVIEW SCHEDULE

The interview schedules were translated into Nepali language and were pretested on 20 subjects and suitable modifications were made in terms of language and sequence of questions and subsequently finalized.

3.5 ANTHROPOMETRIC ASSESSMENT

Anthropometric assessment is a reliable tool to assess nutritional status of an individual. Therefore, anthropometric measurements were taken to assess nutritional status of infant 0-1 years old in this study. Following measurements were taken:

3.5.1 WEIGHT

A portable spring weighing scale (Crown) with a capacity of 10 kg was used to weigh infant who were not able to sit alone. The infant was made to lie down on the tray while taking the weight. This scale read up to a minimum of 0.5kg.

Another portable weighing scale (Camrey) with a capacity of 120 kg was used to weigh the infants who could sit without support. This scale also read up to a minimum of 0.5 kg. At the time of weighing the infant, the weighing scale was kept on a plain hard surface. The weighing scale was calibrated and the sensitivity checked by taking repeated measurement of the same child and ensuring that the same weight was recorded each time. The infant was weighted with minimal clothing.

3.5.2 LENGTH

A portable wooden board (infantometer) was used to measure the length of infant. Head was positioned firmly against the fixed headboard, with the eyes looking vertically. The knees were extended and feet were flexed at right angle to the lower legs. The upright sliding foot piece was moved to contact with the heels and the length read to the nearest 0.1cm.

3.5.3 HEAD CIRCUMFERENCE

A non- stretchable tape was used to measure head circumference of the infant. The tape was kept just above the level of the infant's eye brows, passing it around the head at the same level on each side and laying it over the maximal prominence at the back of the head and measurement taken to the nearest 0.1cm.

3.5.4 CHEST CIRCUMFERENCE

A non-stretchable tape was used to measure chest circumference of the infant. The tape was kept at the level of nipples in front and inferior angle of the scapula at the back. Measurement was taken to the nearest 0.1cm.

3.5.5 MID-ARM CIRCUMFERENCE

MUAC is the circumference of the left upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow (olecranon process and the acromium). In children, MUAC reflects the nutritional status of infants. MUAC is used for children ages 6-59 months.

This measures the muscle mass of subcutaneous tissues in the upper arm. After completion of 6 months infant's MUAC was taken by non stretchable tape. Measurement was taken to the nearest 0.1cm. The tape was kept neither lose nor pressed. When completed to measure the child's arm should then be relaxed, falling alongside his/her body.

3.6 ANTHROPOMETRIC INDICES

Anthropometric indices provide one of the most important indicators of children's nutritional status. The height and weight data are used to compute three summary indices of nutritional status: weight-for-age, height-for-age and weight-for-height. These three indices are expressed as standard deviation units from the median for the international reference population recommended by the World Health Organization.

These anthropometric indices can be interpreted as follows:

3.6.1 WEIGHT FOR AGE (UNDERWEIGHT)

Weight for age reflects body mass relative to chronological age. Low weight for age described is as “lightness” and reflects a pathological process referred to as “underweight” arising from gaining insufficient weight relative to age, or losing weight (WHO 1995a).

3.6.2 HEIGHT FOR AGE (STUNTING)

Height for age is a measure of achieved linear growth that can be used as an index of past nutritional or health status. Low height for age is defined as “shortness” and reflects either a normal variation or a pathological process involving failure to reach linear growth potential. The outcome of the latter process is termed “stunting,” or the gaining of insufficient height relative to age (WHO, 1995a). Children whose height-for-age is below -2SD standard deviations from the median of the reference population are considered stunted or short for their age. Stunting is the outcome of failure to receive adequate nutrition over an extended period and is also affected by recurrent or chronic illness.

3.6.3 WEIGHT FOR HEIGHT (WASTING)

Weight for height measures body weight relative to height. Low weight for height in children is described as “thinness” and reflects a pathological process referred to as “wasting”. It arises from a failure to gain sufficient weight relative to height or from losing weight. High weight for height in children is termed “overweight” and arises from gaining excess weight relative to height or from gaining insufficient height relative to weight (WHO, 1995a).

3.7 CALCULATION OF Z-SCORE

The distribution of each anthropometric index can be compared using percentile and or standard deviation scores derived from the reference data. The use of standard deviation (SD) score has been recommended by Waterlow et al (1997) for evaluating anthropometric data for less industrialized countries. This method measure the deviation of the anthropometric measurement from the reference interms of SD or Z scores. Consequently individual with indices below extreme percentile of reference data can be classified accordingly. Formula used for calculating SD score:

$$\text{SD score/Z score} = \frac{\textbf{Individual's value-median value of reference population}}{\textbf{SD Value of reference population}}$$

The reference limit used with SD varies; often scores below -2.0 SD are designed as severly malnourished while scores above + 2 SD indicate risk of obesity.

Z-score were obtained through WHO Anthro (2006) software and less than -2SD were catagorized under nutrition,-2SD to +2SD as normal and more than +2SD as overweight. The height and weight data of a child is rated against the median height/weight data of a reference population of the same age. The three indices of physical growth of children are computed and expressed as standardized (Z-score) deviation units from the median of a reference population recommended by World Health Organization (WHO). Children who fall below two standard deviations from the reference median are regarded as malnourished. Where as, children who fall three standard deviation below the reference median are regarded as severely malnourished.

Children are categories as three most commonly used anthropometric indices to assess their growth status are weight-for-height, height-for-age and weight-for-age. These anthropometric indices as follows:

1) - 2 SD (underweight): infants who fall more than two standard deviations (-2 SD) below the reference median were regarded as underweight, wasted or stunted.
2) -3SD infants who are more than 3SD (-3SD) below the reference median are considered severely undernourished, stunted or wasted.
3) -2 SD to +2 SD as normal.
4) +2 SD infants who are more than two standard deviations (+2SD) above the reference median are considered over nourished (WHO new growth standard, 2006).

WHO growth standard (2006) chart is given in Annex III.

3.8 DIETARY ASSESSMENT

To evaluate the diet of the infant a one day 24-Hour recall of the infant's dietary intake was taken mother of infant. This method was used as it is quick, less expensive and can be easily used with illiterates. It places very little burden on the interviewee and therefore co-operation from families is better (Gibson, 1990).

This method has various advantages as below;

- 24- Hour recall is an easy and quick method.
- A large sample can be covered by 24- Hour dietary recall and it can be used in illiterate people.
- The respondents are less likely to modify their eating pattern in this method.

- The success of the 24-hour recall depends on the subject's memory and the ability of the respondent to convey accurate estimated portion sizes consumed.
- The degree of motivation of the respondent and persistence of the interviewer (Acheson et al, 1980).

Dietary intake of the infant was recorded at 12 months. The mothers of infants were asked to recall the infants 'exact food intake during the previous twenty- four hour period or the preceding day. Detailed descriptions of all the foods consumed were recorded. The quantities of foods consumed were noted in terms of household measures. Various types of utensils (kalories, spoons and small glasses) were used to assist in recalling and assessing the portion size of the food consumed.

A format was developed to take 24 hours dietary recall. Details of foods such as what types of foods , how many times and how much (quantity) food they have given to the infant were mentioned in the form. Twenty four hour dietary recall form was filled up in the presence of mother when the infant completed 12 months. Recipe of complementary food is given in Annexure IV.

3.8.1 Standardization of Household Measures

Standardized household measures like katori, spoons, glasses, etc were shown to the facilitate the estimation on serving size. The foods recorded were then converted into their raw ingredients and amounts on the basis of standardized recipes. These standardized recipes were taken from Adhikary et al (2001) and Khanna et al (1998). The standardized household measures given in Annex V.

3.8.2 Calculation of Nutrients

With the help of standardization, cooked quantities were converted to corresponding amounts of raw food stuffs and total amount of each food stuff consumed that day was estimated by using the Nutritive Value of Indian Foods (1991), the energy and nutrients protein, carbohydrate, iron, calcium, fat, Vitamin A, vitamin C, thiamin, riboflavin, niacin and folic acid were calculated.

For each subject, the daily nutrient intake was calculated. Then, the mean daily nutrient intake of infant age 12 months was compared with the Recommended Dietary Allowances (RDA) given by Indian Council of Medical Research (1990).

Mean daily intake of energy and nutrients protein, fat, calcium, iron, vitamin A, thiamin, riboflavin, niacin, folic acid, and vitamin C were compared for rural infants as well as boys and girls using ANOVA.

3.9 DATA ANALYSIS

The profiles of the sample population (infants & mothers) were presented in two way table to have a perception of the sample. In this table socio-demographic profile of pregnant women were depicted. Socio-demographic data covered age of mother, education of mother, occupation of mother, parity and mother's age at birth of first child. Similarly, data on family profile of the subjects covered ethnicity, types of family, occupation of the husband, education of father, age of husband and monthly income of the family.

Data on breast feeding covered initiation of breast feeding, colostrum feeding, prelacteal feeding, reasons for delaying breast feeding, caring and rearing of the

infants, exclusive breast feeding, breast feeding sufficiency, reasons for giving additional milk along with breast feeding, types of milk, dilution with water, frequency of feeding during day and feeding during night. Complementary feeding practices data covered on types of complementary food given to the infants, feeding frequency of complementary food and giving fruits to baby.

Infants' anthropometric parameters were also collected and analyzed. Anthropometric data covered infants' weight, length, head circumference, chest circumference and mid upper arm circumference.

24 hour dietary recall was also carried out for nutrients adequacy of complementary food. Food data was carried out by a programme to convert food to nutrients using ICMR Nutritive Value of Indian food and seen the difference between urban and rural areas. Nutrients analysis was done by dietsoft software .

Data analysis was done by Microsoft excel for data entry, data cleaning and tables. Further analysis was done in SPSS 17 (Statistical Package for Social Sciences) version. Frequency distribution of general characteristics was done; range, mean and standard deviation were calculated as needed. Chi-square has been computed to see difference between rural and urban areas as well as boys and girls. ANOVA was also computed for significant differences between rural and urban in their anthropometric parameter.

CHAPTER 4

RESULTS AND DISCUSSION

Chapter 4

RESULTS AND DISCUSSION

The present study was undertaken to compare the anthropometric profile, breast feeding practices, infant feeding practices and morbidity profile of infants 0-1 year from urban and rural areas of Kathmandu district. The study was conducted on 200 mother-infant dyads.

4.1 SOCIO DEMOGRAPHIC PROFILE OF MOTHERS

The mothers were enrolled in their last trimester of pregnancy and the data on socio demographic profile documented**.** Information on mothers profile i.e. age of mother, education, occupation, parity etc and family profile such as on ethnicity, type of family, occupation of husband, education and age of father and monthly income was collected.

4.1.1 AGE OF MOTHER

Hundred pregnant women each were enrolled from the urban and rural areas respectively, Kathmandu district. As evident in Table 4.1 both the urban and rural pregnant women were between 19-34 years of age. The number of younger aged women i.e. 19-26 years was higher among the rural group. On the other hand, more urban pregnant women were between 23-30 years. In both rural and urban areas, pregnant mother over 30 years of age were very less (4 %). This reflects that the practice of early marriage is more prevalent in rural areas than in urban areas. The Government of Nepal advocates that the child bearing age should be 20 years and older. Mean age of the urban pregnant women was 25.4 years and that of rural women was 23.3 years. There was significantly difference between the rural urban age of mother as tested by chi square ($p<0.05$).A study in Karnataka , India revealed that the

majority of the mothers were between the ages of (60%) 21 and 25 years old (Madhu et al, 2008))

Table 4.1: Socio demographic profile of the mothers

Parameters	**Urban (n=100)**	**Rural (n=100)**	**Total (n=200)**
Age of Mother (years)			
19-22	23	47	70(35.0)
23-26	38	42	80(40.0
27-30	33	9	42(21.0)
31-34	6	2	8(4.0)
Education			
Illiterate	-	14	14(7.0)
Literate	-	16	16(8.0)
<Primary	3	32	35(17.5)
Lower secondary	9	11	20(10.0)
SLC	-	21	21(10.5)
Intermediate	32	5	37(18.5)
Graduate	31	1	32(16.0)
Post graduate	23	-	23(11.5)
Occupation			
Government Service	14	4	18(9.0)
Private Service	33	10	43(21.5)
Business	10	4	14(7.0)
Labourer	-	2	2(1.0)
House wife	43	80	113(56.5)
Parity			
First	43	76	129(14.5)
Second	56	21	77(38.5)
Third	1	3	4(2.0)
Age at birth of first child (Years)			
19-24	71	97	168(84.0)
25-30	29	3	32(16.0)

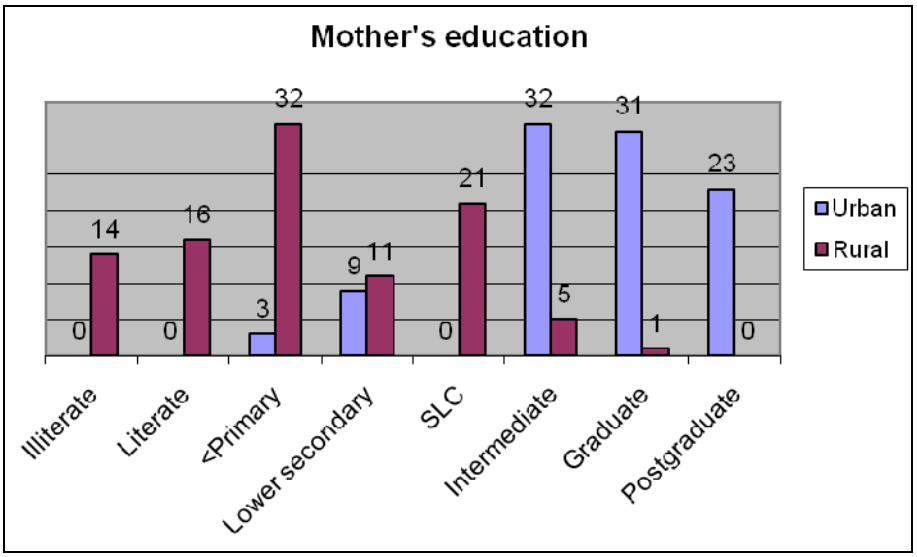
Figure in parenthesis indicate percentage

Note: indicates no data

4.1.2 MOTHER'S EDUCATION

Mother's education is of great importance and has a positive effect on the child's nutritional status and dietary intake (Kunwar and Pillai, 2002). The present study shows that the urban women were comparatively more educated than rural women and 23 per cent and 31 percent of the urban pregnant women were post graduates and graduates respectively. Whereas, the rural pregnant women had less qualifications; only one woman from the rural area was a graduate. The rural pregnant women mostly had education up to primary level. In Nepal, the literacy rate for females is 53.1 per cent according to the NLFS survey (CBS, 2008), where as in the present study, only 7 percent were illiterate and the rest had varying degrees of education. Rural urban differences was significant as tested by chi square ($P<0.05$).

Figure: 4

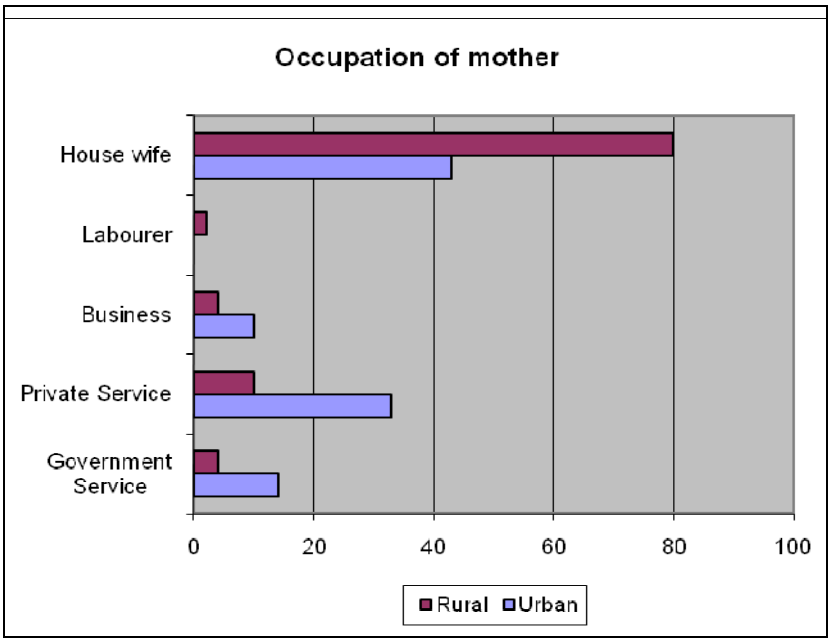


4.1.3 OCCUPATION

Occupation of women plays a vital role in enhancing quality of life of the entire family. As compared to rural mothers higher number of urban mothers (57%) was working outside the home, employed in government service (14%), private service

(33%) and business (10%). Most of the rural mothers (80%) were housewives with only 20 percent working in different sectors. Madhu et al (2008) in her study in Karnataka has reported that the majority of mothers were housewives (69%) and only 22 percent mothers were employed.

Figure: 5



4.1.4 PARITY

In the urban area, 43 percent were premigravida, 56 percent were expecting the second child and only one percent was expecting the third child. On the other hand, in the rural areas 76 percent were premigravida, 21 percent were expecting the second child and 3 percent the third child and significant as tested by chi square ($P<0.05$).

This difference could be attributed to the greater number of younger subjects in the rural group as compared to the urban group. This data also shows that the two child norms were being practiced in both rural and urban areas.

4.1.5 AGE AT BIRTH OF FIRST CHILD

Majority of the women in both rural and urban areas gave birth to their first child between 19-34 years of age.

4.2 FAMILY PROFILE OF THE SUBJECTS

The family structure is usually build on the relationship between children and parents and between husband and wife, or may be both. In matrifocal families, a mother and her children are the primary members. The children are biologically born to the women. This type of family is usually found in societies where the mother are more capable of rearing their children or their husbands are often away from home.

Table 4.2: Family profile of the subjects

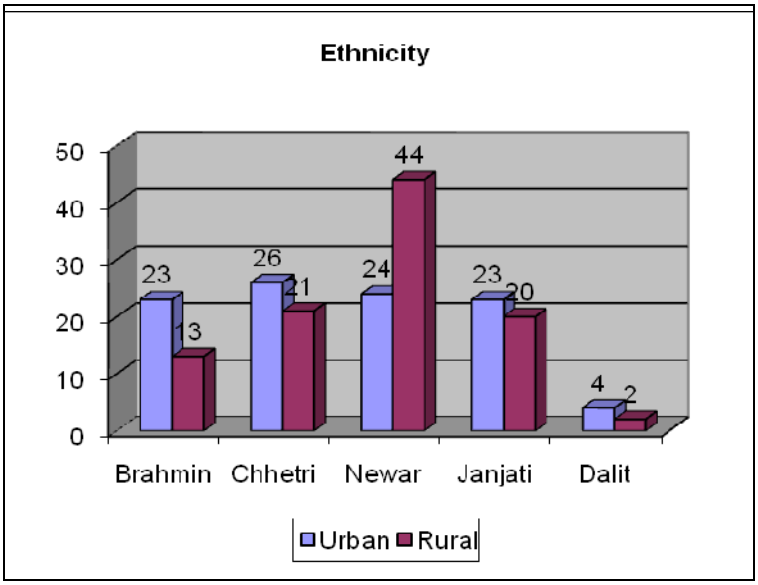
Parameters	**Urban (n=100)**	**Rural (n=100)**	**Total (n=200)**
Ethnicity			
Brahmin	23	13	36(18.0)
Chhetri	26	21	47(23.5)
Newar	24	44	68(34.0)
Janjati	23	20	43(21.5)
Dalit	4	2	6(3.0)
Types of family			
Joint	54	77	131(65.5)
Nuclear	46	23	69(34.5)
Occupation of husband			
Government Service	38	18	56(27.0)
Private Service	28	17	45(22.5)
Foreign service	19	9	28(14.0)
Business	15	11	26(13.0)
Laborer	-	5	5(2.5)
Farming	-	40	40(20.0)
Education of husband			
< Lower secondary	-	41	2(1.0)
SLC	6	30	36(18.0)
Intermediate	29	21	51(25.5)
Graduate	45	7	52(26.0)
Post graduate	20	1	21(10.5)
Age of husband (Years)			
19-22	-	4	4(2.0)
23-26	27	44	71(35.5)
27-30	32	31	63(31.5)
31-34	41	21	62(32.0)
Monthly household Income			
4000	2	8	10(5.0)
4000-8000	11	32	43(21.5)
8000-12000	47	53	100(50.0)
>12000	40	6	46(23.0)

Figure in parenthesis indicate percentage Note:- indicates no data

4.2.1 ETHNICITY

Nepal is a multilingual country with different indigenous groups of people. According to Census (2001), 103 ethnic groups were listed in Nepal. In the present study the sample comprised of Brahmin, Chhetri, Newar, Janjati (indigenous people) and Dalit groups. In urban areas, the Brahmin, Chhetri and Janjati groups were slightly higher while in rural areas the Newar group was highest (44%) (Table 4.2).

Figure: 6



4.2.2 TYPE OF FAMILY

While most of the respondents were living in joint families (65.5%), the numbers were higher in the rural areas (77%) as compared to urban areas (54%). The trend of splitting joint family system into nuclear was slowly increasing in urban areas more than in rural areas. 46 per cent of pregnant women in urban and 23 percent in rural areas belonged to nuclear families.

According to Rai (2011), nuclear families are rapidly emerging in Nepali society like never before, signaling an end to the era of joint families. If the recent preliminary

report of the census 2011 is anything to go by, joint families, one of unique characteristics of oriental society, are breaking down in Nepal, resulting in the rise of nuclear families.

4.2.3 OCCUPATION OF HUSBAND

Most husbands were employed in government or private offices in the urban area (66%), 15 percent were engaged in their own business and 19 percent of them had gone out of the country for employment. Whereas in rural areas, 40 percent of the husbands were engaged in farming (40%), 35 percent were working in private and government offices, and 11 percent were engaged in their own business or skilled jobs like carpentry and masonry.

4.2.4 EDUCATION OF HUSBAND

Both in urban and rural areas none of the fathers were illiterate. A very clear differentiation was seen with the fathers in urban areas having higher education levels than those in the rural areas. As evident in Table 4.2, 40 percent of the rural men had only studied up to lower secondary level, whereas in urban areas 65 percent were graduates or postgraduates.

4.2.5 AGE OF HUSBAND

Since the women in rural areas were younger, the husbands were also younger with 48 percent being within the range of 19-26 years.

4.2.6 MONTHLY HOUSEHOLD INCOME:

Income is self reported; hence the responses may be socially desirable. The subjects were asked to report their household monthly income. The husband's income was the

main source of the income for the family. Majority (87%) of the urban household reported the monthly income of over NPR.8,000 while majority (85%) of the rural households reported a monthly income of NPR. 4000-12,000.

4.3 BIRTH DETAILS OF INFANTS

The pregnant women were contacted regularly to determine their date of delivery. The researcher then visited them within 10- 15 days of the delivery to gather information regarding the delivery as well the newborn.

Table 4.3: Birth details of infants

Parameters	**Urban (n=100)**	**Rural(n=100)**	**Total(n=200)**
Place of delivery			
Government hospital	87	91	178 (89)
Private hospital	23	5	28 (14)
At home	-	4	4 (2)
Types of delivery			
Normal	96	91	187 (93.5)
Cesarean	4	9	13 (6.5)
Gender			
Boy	43	52	95 (47.5)
Girl	57	48	105 (52.5)

Figure in parenthesis indicates percentage Note:- indicates no data

4.3.1 PLACE OF DELIVERY

Due to the process of urbanization, rural areas of Kathmandu metropolitan city are getting more accessible because of better facilities of road and transportation. The rural area has close proximity to Kathmandu city, hence the rural pregnant women came to the government hospital in the city, and hence the rural pregnant women

came to the government hospital in the city for delivery. Primary Health Care Center/Health Post/ Sub Health Post do not provide delivery services they only provide antenatal services in the study area.

Hence, both rural and urban women went to Indra Rajya Laxmi Maternity Hospital at Thapathali, Kathmandu metropolitan city or the Teaching Hospital Maharajgunj, under the Tribhuwan University for their delivery. Most of the pregnant women in both rural and urban areas preferred to deliver at the government hospital. Different private hospital and nursing homes also provided maternity services which were availed by more urban women than rural women.

Only few pregnant women in rural areas gave birth at home due to emergency labour pain during the night and lack of transportation available at that time. At the time of delivery at home the mother in law, elder women in the neighborhood or and TBA helped in the delivery.

4.3.2 TYPES OF DELIVERY

Among the 200 subjects of the urban and rural areas most of the delivery cases were normal. Only four and nine were cesarean cases in urban and rural areas, respectively.

4.3.3 GENDER OF INFANT

Out of 200 births, 105 were girls and 95 boys. According to Census 2011, numbers of males in Nepal are 1, 29, 27,431 and females are 1, 36, 93,378.

4.4 BREAST FEEDING PRACTICES

Breast feeding is nature's way of nurturing the child, creating a strong bond between the mother and the child, stimulating development of all the five senses of the child

and providing emotional security and affection, with a lifelong impact on psychosocial development. Breast feeding enhances the capacities and capabilities of a child for the whole of his/her life.

Breast milk is an ideal food for infants, breast feeding is universal, easily initiated and carried out without effort by all mothers. Early initiation of breast feeding also brings closer bonding of mother and child. Arifeen (2001) reported the Breast-feeding has been shown to reduce the risk of respiratory infections, diarrhea.

4.4.1 INITIATION OF BREAST FEEDING

Initiation of breast feeding within 1 hour of birth was slightly higher among the urban mothers (71%) than the rural mothers (68%). Whereas, initiation of breast feeding within 2 hours of birth and more than 2 hours of birth were higher among rural mothers than urban mothers. However, this difference between urban and rural mothers was not significant as tested by chi-square (Table 4.3). A study in western Nepal indicated that initiation rates of breast-feeding were 57.9 percent within one hour and 85.4 percent within 24 hours (Chandrasekhar et al., 2006). The NDHS (2006) stated that only 35 percent of infants were breastfed within 1 hour of birth. However, in the present study, a much higher number of infants were initiated to breast feeding within 1 hour of birth (69.5%). This could be due to the fact that majority of the infants were delivered at hospitals where the medical personnel ensured early initiation to breast feeding.

4.2.2 REASONS FOR DELAYING BREAST FEEDING

Main causes of delaying breast feeding were complications during childbirth such as excess bleeding, delaying in coming out of placenta, and the cesarean birth. Tiwari et

al. (2011) also reported that Cesarean deliveries were associated with delay in timely initiation of breastfeeding. Besides these reasons it was found that some babies were sleeping and some babies did not wanted to suck the breast.

4.4.3 COLOSTRUM FEEDING

Immediately, after delivery breast milk is yellowish and sticky and is called "Colostrum". It contains more protein, immunoglobulin A, lactoferrin and also white blood cells which are all of great importance for the infant's defence against dangerous neonatal infections. Table 4.4 presents the data on colostrum feeding after birth of infant. The colostrums feeding practices among the mothers were found to be 100 percent in both urban and rural areas. Increased awareness on health and nutrition of mothers as well as greater access to antenatal services, institutional deliveries may be the main reasons for increased feeding of colostrums to infants.

Table 4.4: Initiation of breast feeding and colostrums feeding

Parameter	**Urban (n=100)**	**Rural (n=100)**	**Total (n=200)**
Initiation of breast feeding:			
Within 1 hour	71	68	139(69.5)
Within 2 hour	22	28	50(25.0)
Within 3 hour	7	14	21(10.5)
Reasons for delaying breast feeding:			
Case of cesarean	4	9	13(6.5)
Complication of mother	13	11	24(12.0)
Baby does not want to suck	9	14	3(11.5)
Baby was sleeping	11	6	17(8.5)
Colostrum feeding:			
Yes	100	100	200(100)
Prelacteal feed:			
Glucose Water	4	9	13(6.5)

Figure in parenthesis indicate percentage

4.4.4 PRELACTEAL FEED

Increased awareness of mothers on health, hygiene and education, plays vital role to changing attitudes towards breast feeding and colostrums feeding practices. In the present study most of in cases of cesarean delivery of infant, glucose water was given to infant by the hospital. It seems that practices of antenatal check up services in both urban and rural areas helped to change the attitude of mothers towards prelacteal feeds, though traditionally honey, ghee and sugar etc were commonly given.

4.5 EXCLUSIVE BREAST FEEDING

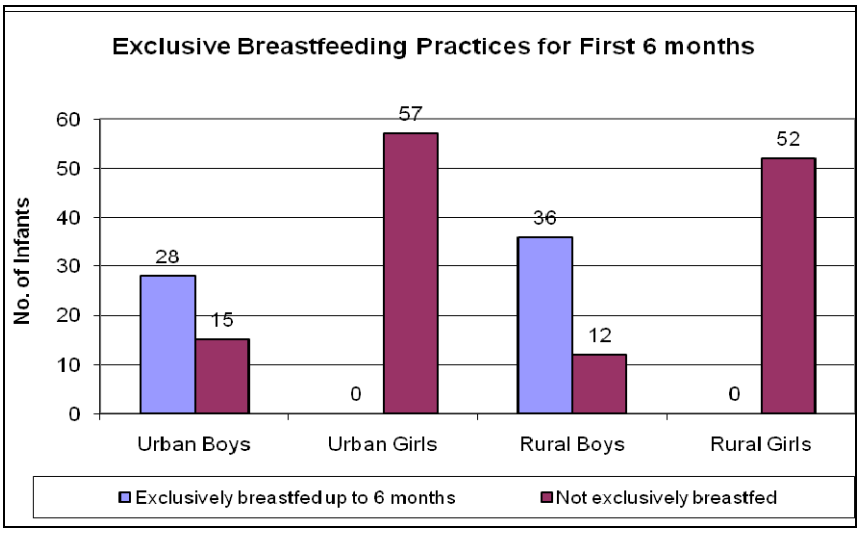
Exclusive breast feeding is termed as breast feeding without giving any other liquid up to six months of age. Breast feeding is nature's way of nurturing the child, creating a strong bond between the mother and the child, stimulating development of all the five senses of the child and providing emotional security and affection, with a lifelong impact on psychosocial development. Breast feeding enhances the capacities and capabilities of a child for the entire. Exclusively breast-fed infants are at substantially lower risk for infant mortality than non-breast-fed infants (Bhal et al, 2005).

Table 4.5: Exclusive breast feeding for first 6 months

Parameters	**Urban (n=100)**		**Rural (n=100)**	
	Boys	**Girls**	**Boys**	**Girls**
Exclusively breastfed up to 6 months	28	-	36	-
Not exclusively breastfed	15	57	12	52

Figure in parenthesis indicate percentage Note:- indicates no data

Figure: 7



4.6 GIVING ADDITIONAL MILK ALONG WITH BREAST FEEDING

Among the 200 mothers, 57 percent of the urban mothers and 52 percent rural mothers reported not having exclusively breast fed their girl infants up to 6 months. While all mothers breast fed their boy infants up to 6 months. Among boys 15 percent urban and 12 percent rural were not exclusively breast fed. Exclusive breastfeeding at 6 months is not a common practice in developed countries and appears to be rarer still in developing countries (Kramer et al, 2001). NDHS (2011) revealed that 70 percent of children under six months are exclusively breastfed. Kramer et al (2002) highlighted in their study that exclusively breastfed for six months does not show baby's growth but instead reduces gastrointestinal infection, delays the return of fertility and helps the mother lose weight.

Table 4.6: Giving additional milk along with breast feeding

	2nd months		3rd months		4th months		5th months		6th months	
	Boy	**Girl**	**Boy**	**Girl**	**Boy**	**Girl**	**Boy**	**Girl**	**Boy**	**Girl**
Urban	1	1	4	9	4	7	5	7	4	4
Rural	1	-	3	4	3	5	3	2	2	2
Total	3	4	7	13	8	14	8	11	6	7

Figure in parenthesis indicate percentage

The practice of giving additional milk along with breast milk was higher among the urban mothers as compared to the rural mothers. It was initiated by some in the 2nd month and gradually increased till the infant was 6 months old. Of the total 46 percent urban and 26 percent rural mothers were practicing giving additional milk along with breast milk by the sixth month of age.

4.7 REASONS FOR GIVING ADDITIONAL MILK ALONG WITH BREAST FEEDING

The main reason for giving additional milk as reported by mothers and she was not producing sufficient breast milk, the mother had to go to work. Since the Nepal government gives only 2 months maternity leave, therefore going to back to work was

Table 4.7: Reasons for giving additional milk along with breast feeding

Reasons	Urban				Rural			
	0-3 (n=100)	4-6 (n=100)	9 (n=98)	12 (n=96)	0-3 (n=100)	4-6 (n=100)	9 (n=100)	12 (n=98)
Illness of mother	3	1	1(1.02)	-	2	3	-	-
Child did not like to suck breast milk	1	2	2(2.04)	3(3.09)	-	-	2	-
Mother has to go to work	9	23	18(18.36)	7(7.29)	4	12	2	2(2.04)
Insufficient breast milk	2	5	5(5.10)	3(3.09)	1	4	2	2(2.04)

Figure in parenthesis indicate percentage
Note: - indicates no data

applicable more to urban mothers than rural mothers. Mothers in the rural areas also had to go for field work outside the home.

Another reason for giving additional milk to the child was maternal illnesses like cold, cough and fever etc, where in temporarily the mother stopped breast feeding the child.

4.8 TYPES OF MILK GIVEN

Table 4.8 shows that different types of milk were given to the infants by the mothers of both urban and rural areas. The mothers gave top milk such as commercial formula milk, fresh cow/buffalo's milk and dairy milk. It was interesting to note that formula milk was introduced by the mothers very early both in rural and urban areas. Fresh cow and buffalo's milk, was introduced after 4 months of age, and only a few were giving dairy milk to their infant. Formula milk is gradually replaced by these milk after 6 months of age.

Table 4.8: Types of milk given

Types of milk	**Urban**				**Rural**			
	Months				**Months**			
	0-3 (n=100)	**4-6 (n=100)**	**9 (n=98)**	**12 (n=96)**	**0-3 (n=100)**	**4-6 (n=100)**	**9 (n=100)**	**12 (n=98)**
Formula milk	15	23	8	13	7	12	2	-
Cow/buffalo's milk	-	8	9(9.18)	7	-	5	1	1(1.02)
Other milk	-	-	5(5.10)	6	-	2	3	1(1.02)

Figure in parenthesis indicate percentage
Note: - indicates no data

The mothers who were feeding cow/buffalo's milk to their infants usually diluted it with water in ratio of 1:1 and 2:1 up to the age of 9 months. After this period they did not dilute the milk with water.

4.9 FREQUENCY OF FEEDING DURING DAY

The frequency of breast feeding the baby varied from 1-2 hour interval, 2-3 hour interval or on demand i.e. whenever baby cried. It was observed that more number of mothers was feeding infants on demand as the age of infant increased (Table 4.5.4).

Table 4.9: Frequency of feeding during day

Feeding times	Urban				Rural			
	Months				Months			
	0-3 (n=100)	4-6 (n=100)	9 (n=98)	12 (n=96)	0-3 (n=100)	4-6 (n=100)	9 (n=100)	12 (n=98)
Every 1-2 hours	30	31	26(26.5))	17(17.7)	25	26	21	19(19.3)
Every 2-3 hours	31	28	27(27.5)	32(33.3)	27	25	33	26(26.5)
Demand feeding	39	41	45(45.9)	47(50.0)	48	49	46	53(54.0)

Figure in parenthesis indicate percentage

4.9.1 FEEDING DURING NIGHT

Frequency of feeding during night varies depending on the age of infants. Table 4.9.1. presents the feeding schedule during night. General trend of feeding at night was found gradually decreasing along with infant's age. As the infant's age increased, the mother was able to recognize the child's hunger and accordingly change the feeding schedule from fixed scheduled interval feeding to on demand feeding.

All the infants both in urban and rural were being breast fed during the night even up to the age of 1 year. Feeding 2-3 times was widely practiced during night in both urban and rural areas. But feeding 3-4 times during the night was higher in rural areas as compared to urban areas.

Table 4.9.1: Feeding during night

Feeding times	Urban				Rural			
	Months				Months			
	0-3 (n=100)	4-6 (n=100)	9 (n=98)	12 (n=96)	0-3 (n=100)	4-6 (n=100)	9 (n=100)	12 (n=98)
3-4 times	33	19	15(15.30)	21(21.4)	30	19	18	12(12)
2-3 times	44	60	63(64.3)	62(64.6)	42	47)	49	54(55.1)
1-2 times	23	21	20(20.4)	21(21.4)	30	19	18	12(12.2)

Figure in parenthesis indicate percentage

4.10 ANNAPRASAN CEREMONY

The 'Annaprasan' ceremony (Rice feeding ceremony) is usually performed at the age of five months for girls and 6 months for boys at an auspicious hour on a particular day determined by an astrologer. The reason for this difference in age is not clear, but it has been suggested that it is because girls mature earlier than boys (Singh, 1998).

Different varieties of foods are prepared for Annaprasan, but "Kheer" is the most important dish for the ceremony. Kheer is made of milk, rice, ghee, sugar and dry nuts. It has sweet taste. The baby is dressed in new special cloths (Nepali Dhaka, velvet or Brocade) and Jewellery (earrings, bangles on hands, and "anklets").

Then, senior most members from the paternal side give the first spoon of rice wherever with a silver spoon or coin to the baby. All the relatives then take turn to feed the baby, after which the baby is blessed at nearby temple. Earlier certain ethnic groups did not celebrate such a ceremony, but due to greater exposure to cultural practices of the ethnic groups even those who did not celebrate this ceremony earlier reported that they celebrated this ceremony now both in urban and rural areas.

Table 4.10: Annaprasan Ceremony

Parameter	Urban		Rural		Total (n=200)	
	Boys (n=43)	Girls (n=57)	Boys (n=48)	Girls (n=52)	Boys (n=91)	Girls (n=109)
Celebrate Annaprasan ceremony						
On 5 months	-	57	-	52	-	109(54.5)
On 6 months	43	-	48	-	91(45.5)	-
Start to give water						
Before Annaprasan	19 (44.18)	28 (49.12)	12 (32.55)	14 (24.56)	32 (16.0)	42 (21.0)
After Annaprasan	25 (58.13)	29 (50.87)	34 (59.64)	38 (66.66)	59 (29.5)	67 (33.5)

Figure in parenthesis indicate percentage
Note: - indicates no data

Table 4.10 presents the rice feeding ceremony celebrated by the subjects. Where, 54.5 percent girls were fed rice on 5 months and 45.5 percent boys on 6 months. So, it was found that girls were fed earlier than boys in both urban and rural areas.

Most of the mothers were found giving plain water after introducing supplementary foods. Highest number was found giving plain water to the babies after "Annaprasan" ceremony in both urban and rural areas.

4.11 INTRODUCING SUPPLEMENTARY FOOD

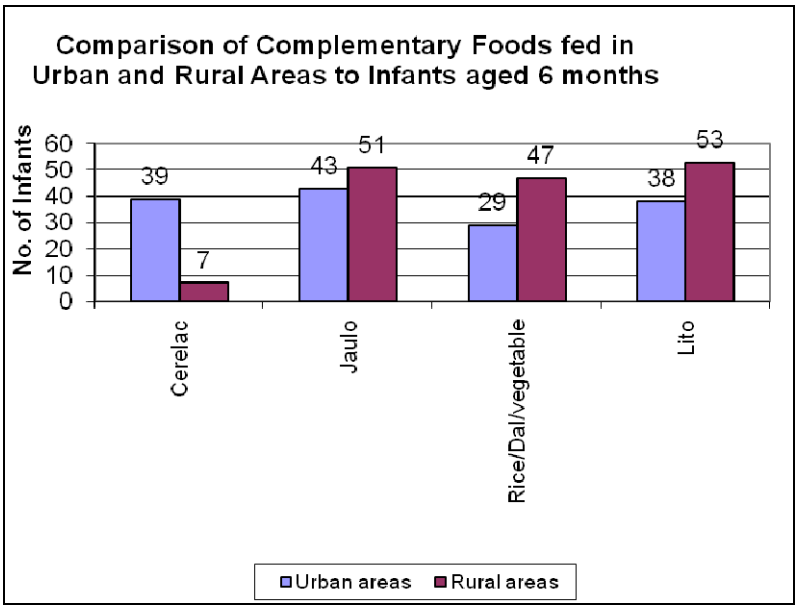
UNICEF and WHO recommended that children be exclusively breastfed during the first six months of life and after six months the child should be given semisolid complementary food in addition to continued breastfeeding. After the first solid food introducing ceremony or "Annaprasan" to the infant is performed complementary feeding is started. Table 4.11 shows the age of infant at introduction of the complementary food.

Table 4.11: Time of introducing complementary food

Time	Urban(n=100)		Rural(n=100)		Total(n=200)	
	Boys	Girls	Boys	Girls	Boys	Girls
5 - 6 months	4	57	6	52		109(54.5)
6- 7 months	33	-	39	-	72(36)	-
7- 9 months	6	-	3	-	9(4.5)	-

Figure in parenthesis indicate percentage
Note: - indicates no data

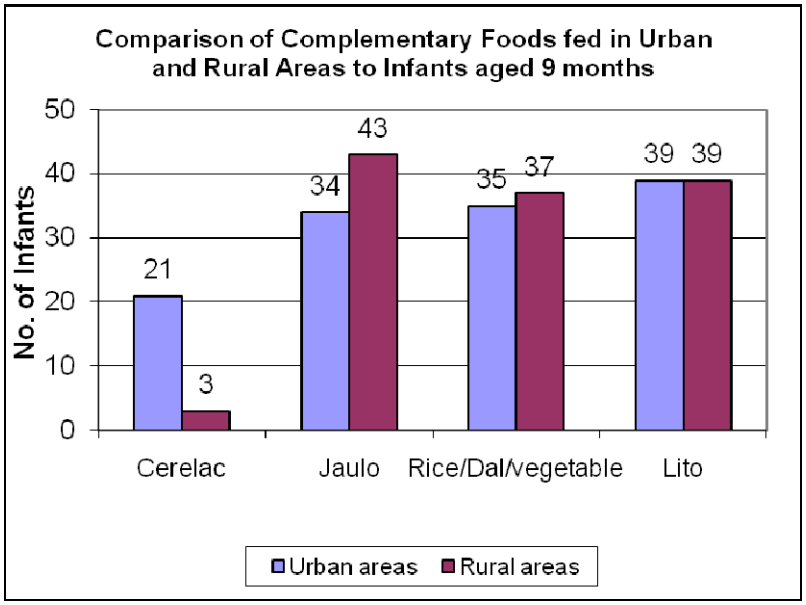
Figure: 8



In the present study, 57 per cent of urban and 52 percent of rural infants were found to be receiving complementary food at age of 5-6 months respectively and 33 per cent urban infants and 39 per cent rural infants respectively were found to be receiving complementary food by age at 6-7 months. Only a very small percent (4.5%) of the infants were introduced complementary food after the age of 7 months. Most of the mothers introduced complementary feeding between the ages of 6-7 months. NDHS

(2011) revealed that most children 9-11 months (91%) were given complementary foods.

Figure: 9



4.12 COMPLEMENTARY FEEDING PRACTICES

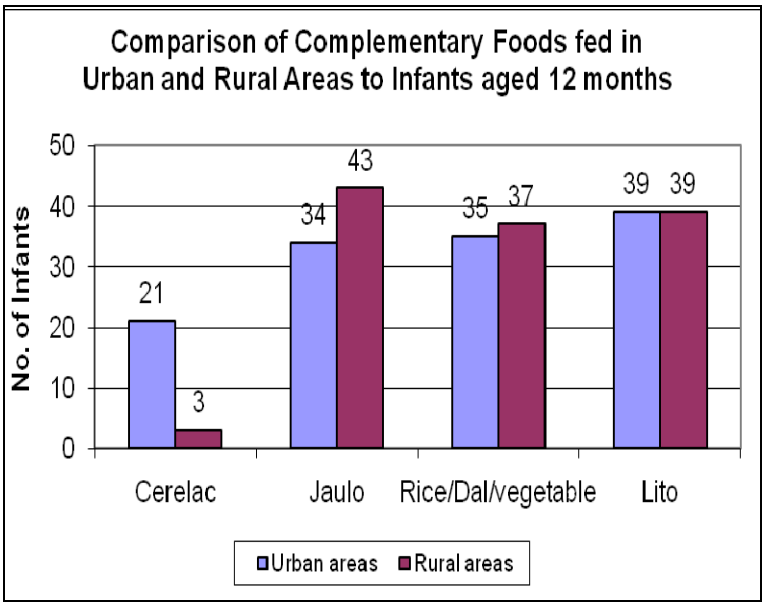
Popular complementary foods given to the infants were jaulo, mashed rice/dal/vegetables and home made flour and commercial (Sarbottam pitho) food respectively. Receipe for these foods are given in Annexure V. Among the supplementary foods, "Jaulo" was found to be more popular in both urban and rural areas as it is soft, semi solid and easy to swallow and easy to cook as well. There was no difference between the type of foods given to boy or girl.

Table 4.12: Type of Complementary Food given to the Infant

Complementary foods	Urban(n=100)			Rural (n=100)		
	Months			Months		
	6 (n=100)	9 (n=98)	12 (n=96)	6 (n=100)	9 (n=100)	12 (n=96)
Cerelac	39	21	13	7	3	2
Jaulo	43	34	36	51	43	45
Rice/dal/vegetable	29	35	38	47	37	61
Sarbottam /home made pitho (lito)	38	39	40	53	39	54
Give fruit to your baby:						
Every day	38	59	66	21	36	43
Some times	53	29	30	45	53	55
Don't give	19	-	-	34	9	-

* Multiple responses Note:- indicates no data

Figure: 10



4.12.1 TYPE OF COMPLEMENTARY FOOD

Table 4.12.1 shows the different types of complementary food given to the infants as an introductory food by the urban and rural mothers. As compared with rural mothers, it was found that urban mothers used Celerac more often than rural mother at all age. Locally available home cooked foods such as Jaulo or lito, mashed rice/dal/vegetables were more frequently given to the infants in rural areas as compared to urban areas.

Fruits like mashed banana and fruit juice were some of the foods which were given to majority of the infant. Gradually, stewed apple, mashed mango and papaya are also introduced onto the infants' diet.

4.12.2 GIVING FRUITS TO BABY

However at 6 months of age, fewer rural infants were introduced to fruits as compared to urban infants. One of the reasons was that the rural mothers were housewives and could devote time to preparation of home made feeds while urban mothers reported to feeding mashed fruits due to paucity of time.

4.13 FEEDING FREQUENCY OF COMPLEMENTARY FOOD

Table 4.13: Feeding frequency of complementary food

Feeding frequency	Urban			Rural		
	6 months (n=100)	9 months (n=98)	12 months (n=96)	6 months (n=100)	9 months (n=100)	12 months (n=98)
Not given complementary foods	4	-	-	-	3	-
1-2 times	58	14(14.28)	-	54	23	-
2-3 times	29	54(55.10)	51(53.12)	32	59	61(62.24)
3-4 times	9	25(25.51)	42(3.75)	11	14	28(28.57)
Above 4 times	-	5(5.20)	3(3.12)	-	4	9(9.18)

Figure in parenthesis indicate percentage
Note: -indicates no data

Table 4.13 shows the feeding frequency of complementary foods. At 6 months a few mothers in both rural and urban areas were not given complementary foods, while others were feeding mostly 1-2 times/day. At the age of 9 and 12 months the feeding frequency was increased to 2-times/day for over 50 percent of the infants. By the age of 12 months only about 30 percent of the infants were fed 3-4 times/day. Frequency of feeding gradually increased with the age.

4.14 CARING AND REARING OF THE INFANTS

Caring and rearing is one of the most important factors which affect the growth and development of a new born baby. The researcher enquired who was the major caregiver of the infant till one year of age. Most of the mothers had a joint family system i.e.77 per cent and 54 per cent in rural and urban areas respectively, they did not face any serious problem among those who were living in joint family. Among those who were living in nuclear families, some family member either the mother, mother in law, sister in law or the sister came to care for both the infant and the mother after delivery. Very few households kept paid care givers for the infants and these were more in urban areas (27.9%) than in rural areas (3.7%) because of less family support.

Table 4.14 Caregivers of the infant

Taking care for baby	Urban(n=96)	Rural(n=98)	Total(n=194)
Mother	17(17.7%)	18 (18.7%)	35(17.5%)
Paid care giver	26 (27.9%)	3 (3.7%)	29(14.5%)
Other family members	55 (57.3%)	77 (78.6%)	132(66.0%)

Figure in parenthesis indicate percentage

In this regard, Kissa et al., (2006) reported in his study conducted in urban Dar-es-Salaam, Tanzania reported that most of the psychosocial practices e.g., caregiver attention, affection, and involvement in child feeding, hygiene, health care, and

training were performed by the mothers. Except for cooking and feeding the children and child training which were done mostly by alternative caregivers.

4.15 COOKING OF INFANT'S FOOD

Good food plays vital role to growth of infants. Impact of food affects the health of the child. Table 4.15 indicates the practices of cooking food for infants by mothers.

It was found that regular and frequent cooking of food separately for the child is higher in urban areas than in rural areas. Whereas, most of the rural mother (87%) reported that they only cooked sometimes separately for their infant. It seems that the consciousness of mother towards child feeding was better among urban mothers than the rural mothers.

Table 4.15: Cooking of infants' food

Cooking food separately	Urban(n=96)	Rural(n=98)	Total(n=194)
	12 months	12 months	
Regularly	32(33.33)	19(11.22)	43(21.5)
Frequently	33(34.37)	21(21.44)	54(27)
Sometimes	31(32.29)	56(57.14)	87(43.5)

Figure in parenthesis indicate percentage

4.16 ANTHROPOMETRIC MEASUREMENTS OF THE CHILDREN

The term anthropometry refers to comparative measurements of the human body. The anthropometric measurements commonly used as indices of growth and development for infants include length, weight, head and chest circumference.

Growth and development of children are widely used as indicators of their overall health and nutritional status. When data on these aspects are collected and interpreted carefully, they can serve as pointers to the nutritional status (Gopalan, 1989). For this

reason the age, weight and height was used to evaluate the nutritional status of the infants.

In the present study, weight, height, mid upper arm circumference, head and chest circumference of the infant was measured and is represented in Table 4.16.

An attempt was made by the researcher to document the birth weights and lengths of the infants. However since most of the mothers went to the hospitals distantly located for the delivery it was difficult to trace the record. In some cases birth weight and length was not even determined. The researcher was only able to make her first contact with the mothers at 10-15 days after the delivery, when she recorded the anthropometric data herself.

4.16.1 WEIGHT

Body weight represents the sum of protein, fat, water and bone mineral mass. It is an indicator of current nutritional status. Weight is a sensitive index for assessing the current nutritional status of an individual.

4.16.2 HEIGHT

Height or length is less sensitive to changes over a short period of time. It is affected I there is prolonged nutritional deficiency. The height gained can not decrease but further gain does not occur if there is a significant nutritional problem over a long duration.

4.16.3 HEAD CIRCUMFERENCE

Head circumference is related mainly to brain size and to a small extent to the thickness of scalp tissues and the skull. At birth head circumference is about 3 cm more than chest circumference.

4.16.4 CHEST CIRCUMFERENCE

Chest circumference is related to the growth of rib cage, muscle mass, subcutaneous fat and the lung tissues. At birth, the chest circumference is about 3 cm less than head circumference. By the age of 9 months chest circumference becomes equal.

4.16.5 MID UPPER ARM CIRCUMFERENCE

Mid upper arm circumference was taken at 6 months. Mid-upper-arm-circumference

(MUAC) is a rapid way of assessing nutritional status, especially applicable to children The MUAC measurements for under five children were classified using David Moorley's classification. > 13.5 cm is considered as normal. The MUAC between 12.5-13.5 cm is considered as moderate malnutrition and at risk of developing severe malnutrition. If the MUAC is <12.5 cm then the child is considered to be severely malnourished.

Table 4.16: Anthropometric Profile of infants 10-15 days after

Mean	**Urban**		**Rural**	
SD/Range	**Boys**	**Girls**	**Boys**	**Girls**
At 10-15 days after birth				
Weight(kg)	2.88±0.24[a] (2.5-3.5)	2.87±0.28[a] (2.5-3.2)	2.76±0.16[ab] (2.5-3.2)	2.72±0.28[b] (2.5-3.2)
Length(cm)	48.57±1.19[a] (46-51)	48.37±1.00[a] (46-50)	47.43±1.11[b] (46-50)	48.27±0.89[ab] (46-50)
Head circumference	34.66±0.67 (33-36)	34.42±0.68 (33-36)	34.35±0.56 (33-36)	34.34±0.63 (33-36)
Chest circumference	32.00±0.86 (30.4-33.5)	31.83±0.81 (30.4-33.6)	31.51±0.73 (30.4-33.5)	31.60±0.71 (30.4-33.5)

Figures with different superscript are significantly difference as tested by ANOVA and post hoc Tukeys HSD (P< 0.05).

Figure: 11

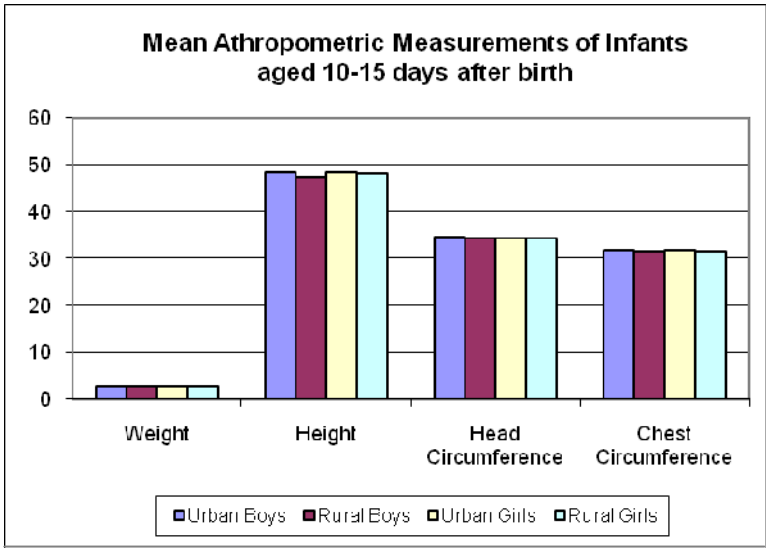


Figure: 12

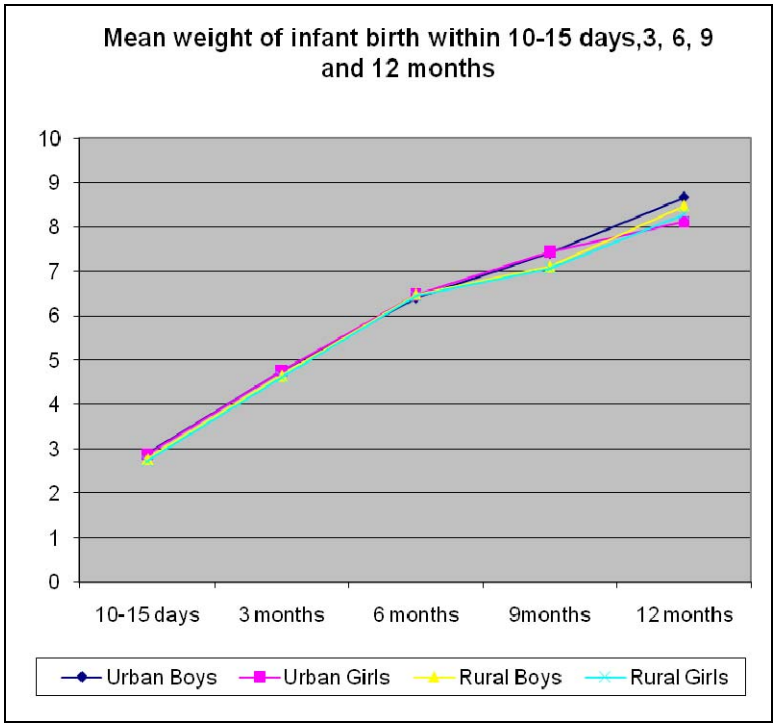
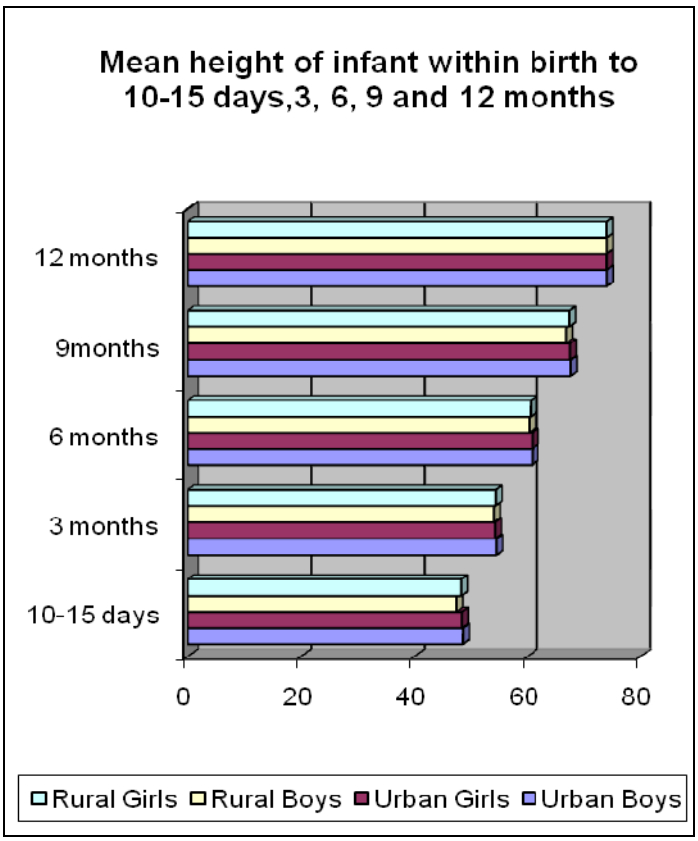


Figure: 13



AT 10-15 DAY

Table 4.17 gives the anthropometric profile of urban and rural boys and girls from 10-15 days after birth. At 10-15 days of birth the mean weight of rural girls was lowest and urban boys was the highest. Mean weight of urban boys and rural boys was 2.88 kg and 2.76 kg respectively ranging between 2.5-3.5 kg and 2.5-3.3 kg. The mean weight of urban girls (2.87 kg) was also higher than rural girls (2.72 kg) and ranges between 2.5-3.2 kg respectively. This difference between the mean weight of urban and rural girls and urban boys and rural girls was significant as tested by ANOVA and Tukey HSD ($P<0.05$).

At 10-15 days of birth the mean length of rural boys was lowest and urban boys were the highest. Mean length of urban boys and rural boys was 48.57cm (46-51 cm) and

47.43cm (46-50 cm) respectively. The mean height of urban girls was also higher than mean height of rural girls 48.37cm (46-50 cm) and 48.27cm (46-50cm) respectively. Generally, the height of an infant is 45- 50cm at 10-15 days after birth. All infants' height was between 46-51cm. This urban rural differences was significant as tested by ANOVA and Tukey HSD ($P<0.05$).

At 10-15 days of birth it was observed that the mean head circumference of urban boys was 34.66±0.67 cm (33-36 cm) and rural boys had 34.35±0.56 cm (33-36 cm). There was no significant difference between in the mean head circumference of urban boys and rural boys. Similarly, the mean head circumference of rural and urban girls was not different. The mean head circumference of urban boys and urban girls and mean head circumference of rural boys and rural girls was almost same.

At 10-15 days of birth infants chest circumference is about 3 cm less than head circumference. But it equals to head circumference at 9 months. After this period head grows slowly and the chest expands rapidly (Adhikari et al, 2001). Table 4.6.4.1 presented the mean chest circumference of the infants at 10-15 days of birth. There was no difference in the mean chest circumference of urban boys, rural boys and rural girls.

4.17 ANTHROPOMETRIC PROFILE OF INFANTS AT 3 MONTHS

AT 3 MONTHS

Mean weight of urban boys at 3 months was higher (4.7kg) than rural boys (4.64kg). Similarly, mean weight of urban girls 4.76kg was higher than that of rural girls (4.61kg). The rural urban difference in weight at 3 months for girls was significant as tested by ANOVA Tukey HSD ($p<0.01$).

At 3 months infants lengths were measured but no significant difference was found to be mean length of urban rural boys and girls.

At 3 months urban boys mean head circumference was 38.19±0.83 cm (35.3-39.5 cm) and urban girls had 37.94±0.85 cm (35.5-40 cm). However, the mean head circumference of rural boys and rural girls was 38.15±0.66 cm (36.5-39 cm) and 38.18±0.67 cm (36.5-40 cm) respectively at three months. There was no difference in the mean head circumference of rural and urban boys and girls.

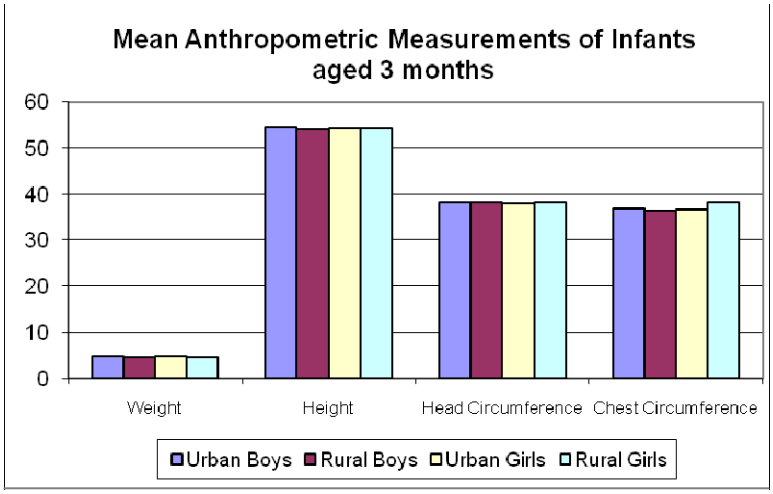
Mean chest circumference of urban boys and urban girls was 36.76±1.02 cm (33.5-38 cm) and 36.53± 1.08 cm (34-39 cm) and rural boys and rural girls mean chest circumference was 36.44±0.96 cm (34-39 cm) and 38.18±0.67 cm (36.5-40 cm) at the age of 3 months. It was observed that there was no difference in the mean chest circumference of urban boys and rural girls.

Table 4.17: Anthropometric Profile of infants at 3 months

Mean	**Urban**		**Rural**	
SD/Range	**Boys**	**Girls**	**Boys**	**Girls**
At 3 months				
Weight(kg)	4.75±.277[a] (4.3-5.3)	4.76±.342[a] (4.2-5.2)	4.64±0.17[ab] (4.3-5.3)	4.61±0.34[b] (4.4-5)
Length(cm)	54.47±1.13[d] (52-57)	54.24±1.25 (51-56)	54.02±1.15 (52-56)	54.35±0.89 (51-56)
Head circumference(cm)	38.19±0.83 (35.3-39.5)	37.94±0.85 (35.5-40)	38.15±0.66 (36.5-39)	38.18±0.67 (36.5-40)
Chest circumference(cm)	36.76±1.10 (33.5-38)	36.53±1.08 (34-39)	36.44±0.96 (34-38)	38.18±0.67 (36.5-40)

Means with different superscript are significantly difference as tested by ANOVA and post hoc Tukeys HSD ($P< 0.05$).

Figure: 14



4.18 ANTHROPOMETRIC PROFILE OF INFANTS AT 6 MONTHS

AT 6 MONTHS:

No significant difference was found between the mean weight of rural and urban boys and girls at 6 months of age. All the infants had more than doubled their birth weight at 6 months.

Again at 6 months infants length of infants were measured and the rural boys had significantly lower mean length as compared to urban girls and boys as tested by ANOVA and Tukeys HSD ($P<0.05$).

The mean head circumference of urban boys and rural boys was 42.20±0.65 cm (41-43 cm) and 42.19±0.71 cm (40.5-43.5 cm) respectively and the mean head circumference of urban and rural girls was 42.09±0.67 cm (41-43.5 cm) and 42.15±0.68 cm (40.5-44 cm).

There was no difference in the mean head circumference of urban, rural, boys and girls.

At the age of 6 months mean chest circumference of urban boys and urban girls, rural boys and rural girls was 40.87±1.02 cm (42-51.2cm), 40.56±0.96 cm (39-42.5 cm), 41.14±1.0 cm (39-43cm) and 41.29±0.86 cm (39-43.5 cm) respectively. Mean chest circumference was found significantly higher in both rural boys and girls compared to urban girls as tested by ANOVA and Tukeys HSD ($P<0.05$).

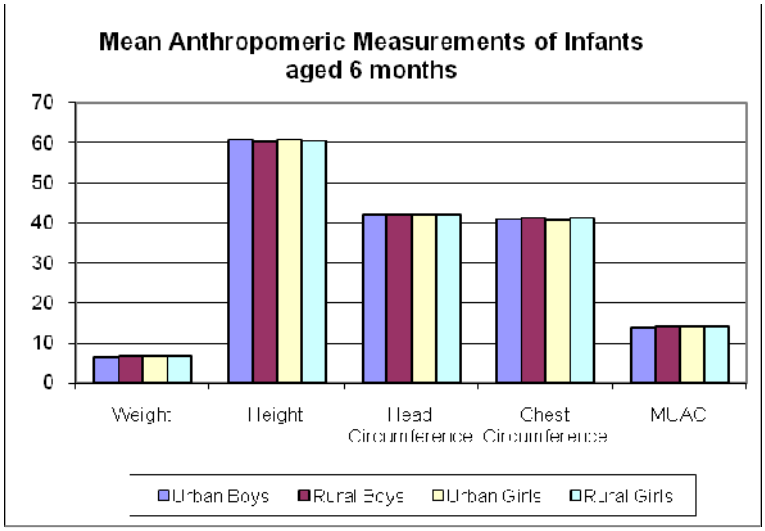
Table 4.18 depicts the mean mid upper arm circumference of the urban and rural infants. Mean mid upper arm circumference of urban boys and rural boys was 13.97±0.34 cm (13.6-15 cm) and 13.84±0.22 cm (13.5-14 cm). The mean mid upper arm circumference of rural boys and rural girls was 13.99±0.33 cm (13.5-14 cm) and 13.90±0.34 cm (13.5-15 cm) respectively. No difference in rural and urban boys and girls.

Table 4.18: Anthropometric Profile of infants at 6 months

Mean	**Urban**		**Rural**	
SD/Range	**Boys**	**Girls**	**Boys**	**Girls**
Weight(kg)	6.40±0.33 (6-7.4)	6.47±.397 (5.8-7.7)	6.48±.193 (6-7.3)	6.48±.193 (6-7.3)
Length(cm)	60.85±0.96[a] (59-62.5)	60.87±1.709[a] (58-62.5)	60.30±1.11[b] (59-64)	60.56±1.04 [ab] (58-62.5)
Head circumference(cm)	42.20±0.65 (41-43)	42.09±0.67 (41-43.5)	42.19±0.71 (40.5±43.5)	42.15±0.68 (40.5-44)
Chest circumference(cm)	40.87±1.02[ab] (38-43)	40.56±0.96[a] (39-42.5)	41.14±1.0[b] (39-43)	41.29±0.86[b] (39-43.5)
Mid Upper arm circumference	13.97±0.34 (13.6-15)	13.99±0.33 (13.5-14)	13.84±0.22 (13-14)	13.90±0.34 (13.5-15)

Means with different superscripts are significant difference as tested by ANOVA and Tukey HSD ($P<0.05$).

Figure: 15



4.19 ANTHROPOMETRIC PROFILE OF INFANTS AT 9 MONTHS

AT 9 MONTHS

At 9 months mean weight of urban girls (7.44 kg) was seen highest and that of rural girls (7.4 kg) the lowest. The rural urban difference in girls was significant as tested by ANOVA. Similarly, the urban boys had significantly higher weight than rural boys as tested by ANOVA and post hoc Tukey HSD ($P<0.05$).

At 9 months mean length of rural boys was lowest compared to urban boys and girls also compared with urban girls, rural girls were found to be the lowest length. This urban rural difference was significant as tested by ANOVA and Tukey HSD ($P<0.05$).

The mean head circumference of rural boys and girls was found to be higher than the urban boys and girls.

According to the age at 9 months mean chest circumference of urban boys and urban girls was 43.22±6.79 cm (42-51.1 cm) and 43.27±5.88 cm (42-45.4 cm) whereas the

mean chest circumference of rural boys and rural girls was 44.22±0.66 cm (43-45.4 cm) and 44.08±0.71 cm (42-45.5 cm). The rural boys and girls had significantly higher chest circumference compared to urban boys and girls as tested by ANOVA and Tukey HSD ($P<0.01$).

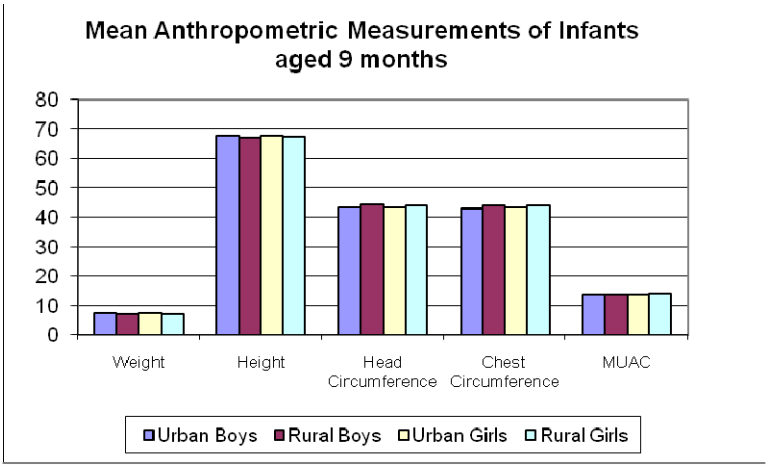
Mean upper arm circumference of urban boys, urban girls, rural boys and rural girls was 13.66±2.17 cm (13.1-15 cm), 13.87±1.97 cm (13-16 cm), 14.05±0.47 cm (13.3-15 cm) and 14.08±0.48 cm (13.4-15 cm), respectively. There was no difference between the rural, urban, boys and girls mid upper arm circumference at 9 months.

Table 4.19: Anthropometric Profile of infants at 9 months

Mean	**Urban**		**Rural**	
SD/Range	**Boys**	**Girls**	**Boys**	**Girls**
Weight(kg)	7.40±0.45[a] (6.6-8.7)	7.44±0.52[a] (6.5-9.5)	7.10±0.31[b] (6.5-7.6)	7.06±0.52[b] (6.4-7.7)
Length(cm)	67.77±1.15[a] (66-70)	67.67±1.06[a] (65-70)	66.98±1.29[b] (65-69)	67.56±1.20[b] (65-69)
Head circumference(cm)	43.38±6.80[a] (43-45.6)	43.48±5.92[a] (42-46.5)	44.32±0.64[b] (43-45.5)	44.20±0.63b (43-46)
Chest circumference(cm)	43.22±6.79[a] (42-51.1)	43.27±5.88[a] (42-45.4)	44.22±0.66[b] (43-45.4)	44.08±0.71[b] (42-45.5)
Mid Upper arm circumference	13.66±2.17 (13.1-15)	13.87±1.97 (13-16)	14.05±0.47 (13.3-15)	14.08±0.48 (13.4-15)

Figures with superscripts are significantly difference as tested by ANOVA and post hoc Tukeys HSD ($P < 0.05$).

Figure: 16



4.20 ANTHROPOMETRIC PROFILE OF INFANTS AT 12 MONTHS

AT 12 MONTHS

At 12 months all the infants had tripled their weight which indicated a normal pattern of growth. The mean weight of urban girls was significantly lower than the mean weight of rural boys as tested by ANOVA and Tukeys HSD ($P<0.05$).

No significant difference has seen mean length between urban and rural boys at 12 months. All the infants has normal length range between 74-75 cm.

At 12 months on comparing the urban boys and rural boys it was found mean head circumference of rural boys was higher 46.28±0.67 cm (45-47 cm) than urban boys 45.38±7.11 cm (45-47 cm). As compared with urban and rural girls it was the mean head circumference of urban girls was higher 44.26±9.34 cm (44.4-47 cm) than urban girls' 44.26±10.45 cm (44.3-47 cm) at 12 months. But these differences were not significant. Head circumference should be 35 cm at birth and 47 cm at the age of one year (Elizabeth, 2002). In this regard the normal growth of head circumference was observed in the infants. It was observed that head circumference has been equal with

chest circumference at age of 9 months and it became more after 9 months than head circumference.

At 12 months mean chest circumference was found higher in rural boys and rural girls than urban boys and urban girls though not significant. It was 46.57±0.79 cm (45-48 cm), 44.62±9.43 cm (44.8- 48.3 cm), 45.72±7.16 cm (45-48 cm) and 44.15±10.52 cm (44.6-48 cm) respectively. It was seen that mean chest circumference of rural boys and rural girls was higher than urban boys and urban girls.

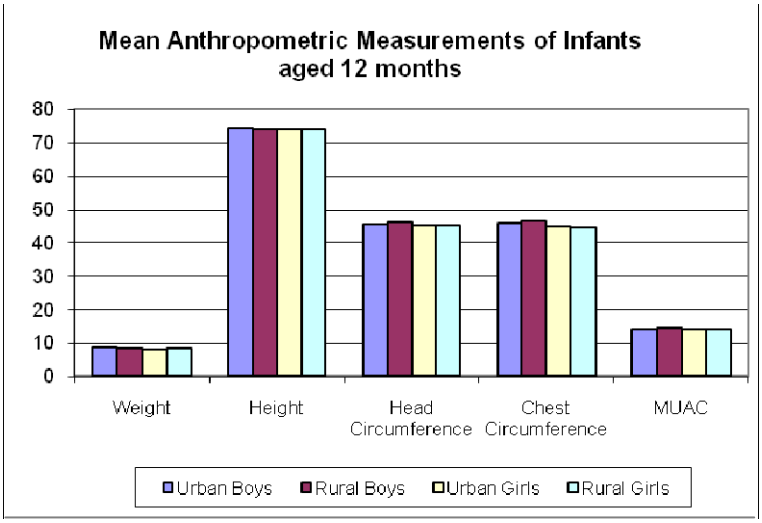
At 12 months mean upper arm circumference was found to be higher in rural boys than urban boys though not significant. It was 14.32±0.79 cm (12.5-16.4 cm) and 14.12±2.39 cm (12.5-17 cm). However, the mean upper arm circumference of urban girls was 13.85±3.41cm (12.5-17 cm) and rural girls had 13.99± 3.07 cm (12.5-16.2 cm). Highest mid upper arm circumference was found in rural boys among the urban boys, urban girls and rural girls.

Table 4.20: Anthropometric Profile of infants at 12 months

Mean	**Urban**		**Rural**	
SD/Range	**Boys**	**Girls**	**Boys**	**Girls**
Weight(kg)	8.66±0.70[ab] (6.9-10.5)	8.11±2.09[a] (7-11)	8.48±0.60[b] (7-10)	8.29±0.90[ab] (6.8-9.7)
Length(cm)	74.17±0.94 (73-76)	74.13±0.09 (72-76)	74.14±1.07 (72-76)	74.11±0.76 (72-75)
Head circumference(cm)	45.38±7.11 (45-47)	45.26±10.45 (44.3-47)	46.28±0.67 (45-47)	45.23±9.34 (44.4-47)
Chest circumference(cm)	45.72±7.16 (45-48)	44.15±10.52 (44.6-48)	46.57±0.79 (45-48)	44.62±9.43 (44.8-48.3)
Mid Upper arm circumference (cm)	14.12±2.39 (12.5-17)	13.95±3.41 (12.5-17)	14.32±0.79 (12.5-16.4)	13.99±3.07 (12.5-16.2)

Figures with the same superscript are significantly difference as tested by ANOVA and post hoc Tukeys HSD ($P< 0.05$).

Figure 17



4.21 THREE INDICES OF MEASURING CHILD GROWTH

Three indices for measuring a child's physical growth are generally used to describe children's nutritional status. These three indices are height-for age (stunting), weight-for-height (wasting) and weight –for- age (underweight).

Z-score were obtained through WHO Anthro (2006) software. The infants were classified as under nourished -2SD, -2SD to +2SD normal and overweight with more than +2SD. The height and weight data of a child is rated against the median height/weight data of a reference population of the same age. The three indices of physical growth of children are computed and expressed as standardized (Z-score) deviation units from the median of a reference population recommended by World Health Organization (WHO). Children who fall below two standard deviations from the reference median are regarded as malnourished. Where as, children who fall three standard deviation below the reference median are regarded as severely malnourished.

4.21.1 WEIGHT FOR AGE (WAZ)

Prevalence of child malnutrition (weight for age) is the percentage of children under five whose weight for age is more than two standard deviations below the median reference standard for their age as established by the World Health Organization, the U.S. Centers for Disease Control and Prevention, and the U.S. National Center for Health Statistics

Table 4.21.1: WAZ (Weight for age)

Parameters		3 Months			6 Months			9 Months			12 Months		
		U	N	O	U	N	0	U	N	O	U	N	O
		-2SD	+2SD to -2SD	+2SD	-2SD	+2SD to -2SD	+2SD	-2SD	+2SD to -2SD	+2SD	-2SD	+2SD to -2SD	+2SD
Urban	Boys	11 (25..5)	32 (74.4)	-	-	43 (100)	-	-	42 (100)	-	-	42 (100)	-
	Girls	11 (19..2)	46 (80.7)	-	22 (38..5)	35 (61.4)	-	16 (28.0)	40 (70.1)	-	3 (5.2)	51 (94.4)	-
Rural	Boy	-	48 (48.0)	-	16 (33.0)	32 (66.6)	-	25 52..5)	23 (41.6)	-	8 (16.6)	40 (83.3)	-
	Girl	21 (40..30)	31 (54..3)	-	-	52 100.0)	-	-	52 100.0)	-	1 (2.0)	49 (98.0)	-

Figure in parenthesis indicate percentage
Note: - indicates no data
U=underweight, N=normal, O=overweight

Table 4.21.1 shows the underweight (-2SD) status of (weight for age) the infant 0-1 years old. It has seen that improvement on urban boys from third months to 6 months onward found underweight. Nutritional status of urban girls especially weight for age (WAZ) was detorioted from 3 to 6 and 9 months. Some improvement has seen from 9 months onward. As compared to rural boys, urban boys found to be underweight (-

2SD) at 3 months (25.5%). At 3 months rural girls were found largest number of underweight (-2SD) but, improvement has seen from 3 months onward.

At 3 months significantly higher number of urban boys were underweight (-2SD) compared to rural boys, there was no significant difference between urban boys, urban girls and rural girls as tested by chi square ($P<0.05$).

At 6 and 9 months significantly higher number of rural boys were under weight (-2SD) compared to urban boys and significantly higher number of urban girls were under weight (-2SD) compared to rural girls as tested by chi square ($p<0.05$).

At 12 months the number of infants in -2SD category were lowest compared to at 3, 6 and 9 months as tested by chi square ($P<0.05$).

4.21.2 HEIGHT FOR AGE (HAZ):

Low length-for-age, stemming from a slowing in the growth of the fetus and the child and resulting in a failure to achieve expected length as compared to a healthy, well nourished child of the same age, is a sign of stunting.

Prevalence of child malnutrition (height for age) is the percentage of children under five whose height for age is more than two standard deviations below the median for the international reference population ages 0 to 59 months. For children up to two years of age, height is measured by recumbent length.

Table 4.21.2: HAZ (Height for age) STUNTING

Parameters		3 Months			6 Months			9 Months			12 Months		
		-2SD	-2SD to +2SD	+2SD	-2SD	-2SD to +2SD	+2SD	-2SD	-2SD to +2SD	+2SD	-2SD	-2SD to +2SD	+2SD
Urban	Boys	7 (16.2)	36 (83.7)	-	14 (32..5)	29	-	3 (7.14)	38 (90.47)	1 (2.38)	2 (4.76)	39 (92.85)	-
	Girls	-	57 (100.0)	-	2 (3..5)	55 (96.49)	-	24 (42.85)	32 (57.14)	-	3 (5.55)	49 (90.74)	2 (3.70)
Rural	Boy	-	48 (100.0)	-	-	48 (100.0)	-	29 (60.41)	19 (39.58)	-	2 (6.25)	44 (91.66)	2 (6.25)
	Girl	4 (7.6)	48 (92.3)	-	12 (23.0)	40 (76.9)	-	4 (7.69)	48 (92.30)	3 (5.76)	4 (8.0)	45 (90.0))	1 (2.0)

Figure in parenthesis indicate percentage
Note: - indicates no data

Table 4.21.2 presents the HAZ (height for age) of the infants at different age. At 3 months only small number of urban boys and rural girls were in underweight (-2SD) category. But, from 6 months onward number of stunted has been seen in urban boys, urban girls and rural girls. At 9 months urban girls and rural boys' numbers has been increased substantially.

At 3 months significantly higher number of urban boys were stunted (-2SD) compared to rural boys, there was no significant difference between urban boys, urban girls and rural girls as tested by chi square ($P<0.05$).

At 6 months, again significantly higher numbers of urban boys were stunted compared to rural boys, whereas among girls significantly higher number of rural girls were stunted compared to urban girls as tested by chi square ($P<0.05$).

At 9 months the situation was reversed and significantly higher number of rural boys were stunted compared to urban boys and significantly higher number of urban girls were stunted compared to rural girls as tested by chi square ($P<0.05$).

At 12 months the number of infants in the stunted (-2SD) category were lowest compared to 3, 6 and 9 months.

4.22 WEIGHT FOR HEIGHT (WHZ)

Child's weight against the average weight for a child of that height, showing whether they are being adequately nourished for growth.

Table 4.22.1: WHZ (Weight for height) WASTING

Parameters		3 Months			6 Months			9 Months			12 Months		
		-2SD	+2SD to -2SD	+2SD	-2SD	+2SD to -2SD	+2SD	-2SD	+2SD to -2SD	+2SD	-2SD	+2SD to -2SD	+2SD
Urban	Boys	-	38 (88..3)	5 (11.6)	-	40 (93.0)	3 (6.9)	-	42 (97.6)	-	2 (4.6)	40 (93.0)	-
	Girls	-	46 (80.7)	11 (19.2)	-	54 (94.7)	3 (5.2)	1 (1.7)	55 (96.4)	-	7 (12.2)	46 (80.7)	1 (1.7)
Rural	Boy	-	44 (91.6)	4 (8.3)		47 (97.9)	1 (2.0)	6 (12.5)	42 (87.5)	-	3 (6.2)	45 (93.7)	-
	Girl	-	49 (94.2)	3 (5.7)	-	47 (90.3)	5 (9.6)	1 (1.9)	51 (98.0)	-	5 (.9.6)	45 (86.5)	-

Figure in parenthesis indicate percentage
Note: - indicates no data

Table 4.22.1 shows the wasted number of (weight for height) infants. No wasting was seen till 6 months in any of four groups. It has seen only in small number of wasted at 9 months. But, it has seen number of increment at 12 months. The stunting and wasting starts after rice feeding ceremony from 6 months onward. Generally, after the period of exclusive breast feeding weaning started.

Of the total 200 infants both from urban and rural areas were found to be normal (+2SD to -2SD) at 3 months. As compared to urban boys, rural boys had seen (91.6 per cent) normal than urban boys (88.3 per cent) and rural girls also seen normal than urban girls. The percentage of normal was higher in (94.2 per cent) rural girls.

Till 6 months the urban boys and girls as well as rural boys and girls did not shown any wasting. The wasting started only from 9 months onwards, only 2 percent of girls both rural and rural and 12 percent of rural boys were wasted.

At 12 months, more infants i.e. 5 percent and 6 percent of urban and rural boys respectively and 12 percent and 9 percent of urban and rural girls respectively were wasted.

4.23 NUTRITIONAL ASSESSMENT OF SUPPLEMENTARY FOOD OF THE SUBJECTS

A 24 hour recall of the supplementary food given to the infant at the age of 12 months was done and information was obtained from the mother. The amounts of cooked food items consumed by infant obtain in the household measures were converted to raw ingredients in quantitative amounts.

From this data the mean consumption of various foods items/day was calculated and is presented in Table No.4.14 This does not including the breast milk that the infants were still taking.

Table 4.23.1: **Mean consumption of various food items by the infants at 12 months**

Food consumption Mean/SD	**Urban**		**Rural**	
Amount in g.	Boys(n=42)	Girls (n=54)	Boys (n=48)	Girls (n=50)
Cereals	82.04±30.37	81.90±28.27	79.42±30.04	79.01±35
Pulses	24.87±17.27	23.95±16.21	24.36±16.74	23.67±16.37
Green leafy vegetables	9.64±15.094	8.24±12.02	8.33±11.42	9.63±11.53
Roots& tubers	20. 54±26.08	17.33±23.99	20.20±24.43	19.84±24.54
Other Vegetables	6.21±9.76	6.44±9.79	6.041±10.049	6.61±9.17
Fruits	15.10 ± 14.65^{ab}	17.77 ± 19.16^{a}	14.82 ± 15.01^{b}	15.37 ± 13.59^{ab}
Meat	10.43 ± 19.69^{a}	13.80 ± 24.73^{b}	10.60 ± 19.61^{ab}	10.57 ± 18.57^{ab}
Milk	23.57 ± 38.34^{b}	26.44 ± 37.62^{a}	25.49 ± 37.50^{a}	25.20 ± 36.02^{ab}
Food fat(visible fat)	35.06 ± 8.66^{a}	34.22 ± 22^{ab}	33.69 ± 9.61^{b}	33.3 ± 31^{b}
Sugar	14.92±15.43	2.751±14.45	14.52±14.39	14.43±14.35

Figure with different superscripts are significantly difference as tested by ANOVA and Tukeys HSD ($P<0.05$)

4.23.1. CEREALS

Cereal was the main food given to the infants in both urban and rural areas. Mean consumption of cereal ranged between 82.04±30.37g in urban boys to 79.01g in rural girls. This difference was not found significant as tested by ANOVA.

4.23.2 PULSES

Different types of pulses like lentil, black gram, green gram and red gram dals were consumed by the infant. The mean consumption was more in boys both urban and rural compared to girls, although it was not significant as tested by ANOVA.

4.23.3 GREEN LEAFY VEGETABLES

A practice of giving green leafy vegetables was found to be very low in both urban and rural area which was only 6g/day. It was found the mothers were mostly giving spinach and mustard leaves to the infants as green leafy vegetables.

4.23.4 ROOTS & TUBERS

The roots & tubers mostly given to infant were potato and carrot in both urban and rural areas. The mean daily consumption of roots and tubers ranged between 20 to 17g and was higher in rural areas than urban areas although not significant.

4.23.5 OTHER VEGETABLES

Pumpkin, field bean and cauliflower was mainly found to be given to the infants in both urban and rural areas. The mean daily consumption of other vegetable was very low i.e. only around 6g/day.

4.23.6 FRUITS

Fruits such as banana, apple, mango, papaya and orange were found to be given to the infants. The urban infants had higher mean intake of fruits compared to rural infants. The urban girls had significantly higher intake compared to rural boys as tested by ANOVA and Tukey HSD ($P<0.05$).

4.23.7 MEAT

Some of the mothers being vegetarians were not giving non vegetarian foods. The average daily consumption was reported ranging from 10 to 14g mostly from eggs. The urban girls had significantly higher mean intakes than rural boys as tested by ANOVA and Tukey HSD.

4.23.8 MILK

Mean daily consumption of milk ranged between 23 to 26g. Cow's milk was preferred by mothers compared to formula milk. The urban girls and rural boys had significantly higher mean daily intake of milk compared to urban boys as tested by ANOVA and Tukey HSD ($P<0.05$).

4.23.9 VISIBLE FAT

Added fat was found to be widely given to the infant in both urban and rural areas. The mean daily consumption of fat ranged between 33g to 35g. The urban boy had significantly higher mean daily intake compared to rural boys and rural girls as tested by ANOVA and Tukey HSD ($P<0.05$).

4.23.10 SUGAR

Mean daily consumption of sugar ranged between 12g to 14g in both urban and rural areas. Sugar was usually added to super flour (lito), tea and milk.

The mean daily intake of energy and nutrients such as protein, fat, calcium, iron, thiamin, riboflavin, niacin, folic acid, vitamin C and vitamin A were calculated from the raw foods using nutritive value of Indian foods (ICMR,1990).

Table 4.24: Mean intake of nutrients by infants at 12 months

Nutrient Mean/SD	**Urban**		**Rural**	
	Boys (n=42)	**Girls (n=54)**	**Boys (n=48)**	**Girls (n=50)**
Energy (kcal)	771±15.094[a]	874±202.56[b]	845±200.56[b]	740±142.48[a]
Protein (g)	20.69±8.10[ab]	24.69±10.65[a]	21.27±11.79[ab]	17.024±6.511[b]
Fat (g)	32.02±13.62[a]	40.281±13.15[b]	41.06±10.92[b]	34.76±10.094[ab]
Calcium (mg)	205.78±179.34	272.08±290.56	208.33±275.56	95.34±122.17
Iron (mg)	2.99±1.00	3.19±1.05	3.025±1.253	3.06±1.426
Thiamin (mg)	0.28±0.531	0.29±011	0.268±0.124	0.229±0.077
Riboflavin (mg)	0.36±0.360[ab]	0.484±0.439[a]	0.377±0.420[ab]	0.196±0.177[b]
Niacin (mg)	2.89±0.531	2.899±0.570	2.839±0.420	2.623±0.477
Folic acid (µg)	45.65±26.66	47.51±27.29	43.042±25.002	39.115±21.541
Vitamin C (mg)	24.92±22.91	21.70±19.82	23.04±17.76	19.529±16.104
Vitamin A (µg)	459.84±258.03	503.58±246.69	481.928±206.38	383.375±170.004

Figure with different superscripts are significantly difference as tested by ANOVA and Tukeys HSD ($P<0.05$)

4.24.1 ENERGY

The mean daily intake of energy of the infants ranged between 740 to 874 kcal in urban and rural areas infants. The urban girls and rural boys had significantly higher energy intake than urban boys and rural girls as tested by ANOVA and Tukey HSD

4.24.2 PROTEIN

More protein is required for the growing infants during infections and illness. Beside animal protein combination of cereals and pulses provides most of the amino acids. The mean daily protein intake ranged between 17 to 24g in rural and urban areas. The urban girls had the highest intake and rural girls the lowest. This difference was significant as tested by ANOVA and Tukey HSD.

4.24.3 FAT

Oils and fat such as butter and ghee constitute fats. Fats are concentrated source of energy and provide 9 kcal/g. Sources of dietary fat are from both plant and animal foods as invisible fat and added fats and oils as visible fat. Practices of giving added fat was seen popular in both urban and rural areas. The urban girls and rural boys had significantly higher fat intake compared to urban boys as tested by ANOVA and Tukey HSD.

4.24.4 CALCIUM

Calcium is important minerals in human nutrition. The mean daily intake of calcium ranged between 110 to 272 mg in both urban and rural infants. Milk is the rich source of calcium. However, in developing countries where milk intake is low, most dietary

calcium comes from cereals. Intake of calcium among the infants the rural girls had found lowest as tested by ANOVA and Tukey HSD.

4.24.5 IRON

The mean daily iron intake was around 3mg in both urban and rural boys and girls. It has seen that the iron intake was very low. It may be because of low consumption of green leafy vegetables.

4.24.6 THIAMIN

Mean daily intake of thiamin ranged between .23 to .29mg in urban and rural infants. Mean intake of thiamin was higher in urban infant than rural infant, though not significant.

4.24.7 RIBOFLAVIN

The infants had mean daily intake of riboflavin varying between 0.19 to 0.48mg in urban and rural areas respectively. The riboflavin intake was found significantly lowest in rural girls than urban girls as tested by ANOVA and Tukey HSD.

4.24.8 NIACIN

Mean daily intake of niacin for the infants was ranged between 2.6 to 2.89 mg in both urban and rural infants respectively.

4.24.9 FOLIC ACID

The mean daily intake for folic acid ranged between 39 to 47 µg in urban and rural infants.

4.24.10 VITAMIN A

The mean daily intake of vitamin A ranged between 383µg to 503µg in urban and rural infants. Intake of dark green leafy vegetables, yellow and red vegetables and fruits in the diets of infants contributed to vitamin A intake.

4.24.11 VITAMIN C

The mean daily intake of vitamin C in both urban and rural infants ranged between 19-25mg. Both the urban and rural mothers were giving green leafy vegetables and citrus fruits to their infants which contribute to vitamin C intake.

4.25 IMMUNIZATION

Immunization is the process of protecting a child from a disease by introducing killed or relatively in activated organisms which causes the diseases. Infectious diseases are responsible for a majority of the illness and death among children in Nepal.

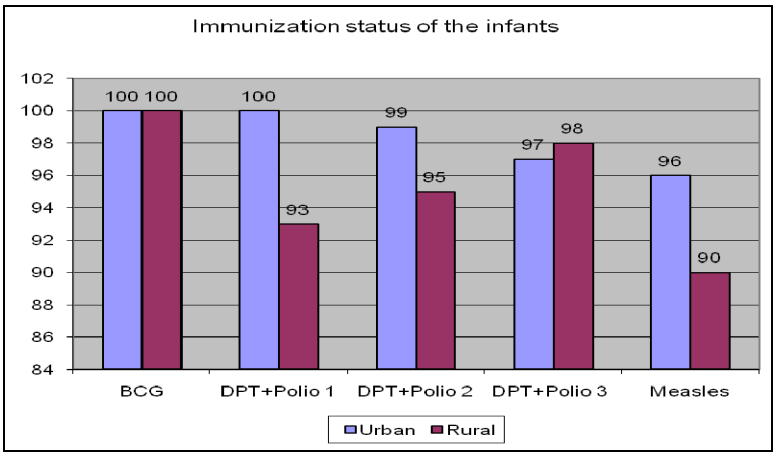
Because of extending program of immunization of Ministry of Health of Nepal is trying to reach immunization services every part of the country through outreach clinics and campaigns also. According to WHO guidelines, children are considered fully immunized when they have received one dose of the vaccine against tuberculosis (BCG), three doses each of the DPT and polio vaccines, and one dose of measles vaccine.

Table 4.25: Immunization Status 0-12 months old infants

Immunization	Urban(n=96)	Rural(n=98)	Total(n=194)
BCG	96(100.0)	98(100.0)	194(100)
DPT I + Polio I	96(100.0)	97(93.0)	193(8.46)
DPT 2 + Polio 2	92(99.0)	95(95.0)	187(95.40)
DPT 3 + Polio 3	96(96.0)	98(98.0)	194(100)
Measles	94(96.0)	90(90.0)	184(93.87)

Figure in parenthesis indicate percentage

Figure: 18



Information on vaccination (NDHS, 2011) coverage for children 12-23 months, who should have been fully immunized against the major preventable childhood illnesses. Nearly nine in ten children (87 percent) were fully immunized and 96 percent of the children received BCG, DPT 1, and polio 1. The proportion of children receiving the third dose of DPT and polio is slightly lower (91 percent and 92 percent, respectively), as is the proportion receiving the measles vaccination (88 percent). A study in Benglore total of 93% of the children received all vaccinations needed according to the national immunization schedule (Madhu et al, 2008). Present study

93.87 percent infants received all the vaccination. . Coverage of immunization was found satisfactory in both urban and rural areas.

4.25.1 VITAMIN A SUPPLEMENTATION

Infants and young children need vitamin A for optimal health, growth and development. Almost all young children are born with low stores of vitamin A. During the first six months of life, mothers need to breastfeed exclusively to increase their infants vitamin A stores. Vitamin A-rich foods and supplements should be starting at six months of age. As a prophylaxis the infants are given massive dose of vitamin A from the age of 6 months. The status of the vitamin A supplementation record by the infants presented in Table 4.25.1.

Table 4.25.1: Massive dose of Vitamin A Supplementation

Received Vitamin A	Urban (n=96)	Rural (n=98)	Total(194)
At 6^{th} months	96(96%)	89(90.81%)	185(92.5)
Missing	4(4%)	11(11.22%)	15(7.5)
At 12^{th} months	92(92%)	91(92.85%)	183(94.32)
Missing	4(4%)	5(5.10%)	9(4.63)

Figure in parenthesis indicate percentage

It was observed that both urban and rural infants had received vitamin A supplementation according to their age, but it was found higher in urban and rural areas.

Vitamin A deficiency disorders have received considerable attention from the Ministry of Health (MOH) and effective measures of control have been taken through the National Immunization Day (NID) programme since December, 1996. Under this

programme, MOH has aimed to distribute high–dose Vitamin 'A' capsules to the children 6-60 months on a twice in a year basis as a preventative measures.

4.26 MORBIDITY

The communicable diseases and parasitic infestations are widely prevalent throughout the country. Accordingly, three morbidity indicators have been chosen for the study. They are acute respiratory infections (ARI), fever/common cold and diarrhea.

A checklist was developed to check the common morbidity profile of the infants. One to six months period was continuously followed at the end of the every month. When infant completed 9 and 12 months again, follow up was done. Because, children in these groups are most vulnerable to infectious diseases.

Table 4.26: Morbidity profile of the Infants

Types of illness	Urban				Rural			
	Months				Months			
	0-3 (n=100)	4-6 (n=100)	9 (n=98)	12 (n=96)	0-3 (n=100)	4-6 (n=100)	9 (n=100)	12 (n=98)
Cough & cold	6 (6.0)	7 (7.0)	8 (8.16)	7 (7.29)	9 (9.0)	8 (8.0)	7 (7.0)	8 (8.16)
Fever & cold	5 (5.0)	8 (8.0)	6 (6.12)	8 (8.33)	7 (7.0)	9 (9.0)	8 (8.0)	7 (7.14)
Diarrheal episode	3 (3.0)	13 (13.0)	9 (9.18)	11 (11.45)	6 (6.0)	17 (17.0)	12 (12.0)	9 (9.18)
Pneumonia	-	-	4 (4.08)	2 (2.08)	-	1 (1.0)	4 (4.0)	5 (5.10)
Measles	-	-	-	6 (6.25)	-	-	-	7 (7.14)
Total	14	28	27	28	22	34	31	36

Figure in parenthesis indicate percentage
Note: - indicates no data

Figure: 19

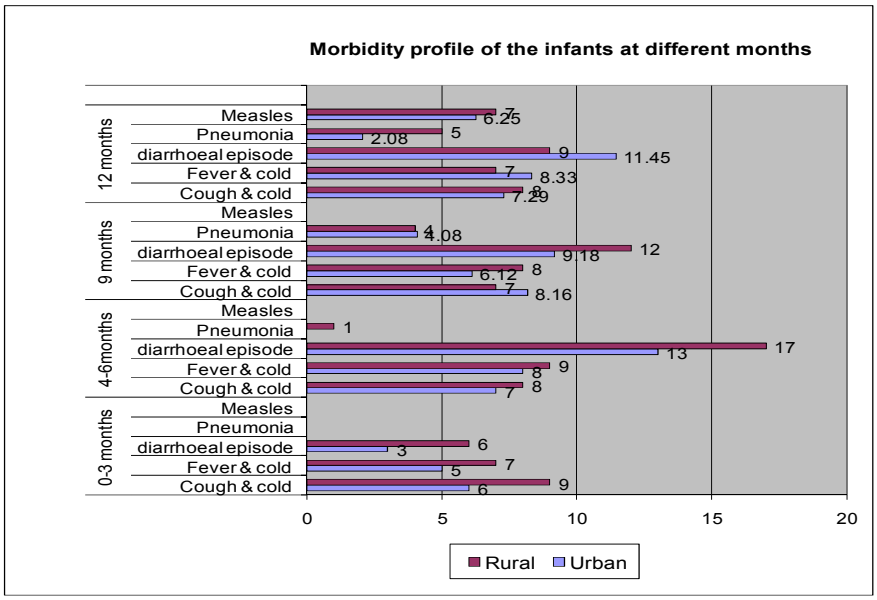


Table 4.26 represents morbidity profile of the infants. Due to availability of health services, education, awareness and advocacy on health and nutrition, very few cases of fever, fever and respiratory problem, and cough and cold were reported in both urban and rural areas of Kathmandu.

4.26.1 COUGH AND COLD

A common cold is a viral infection of the upper respiratory tract of infant nose and throat. Nasal congestion and a runny nose are the primary signs of common cold in babies. Babies are especially susceptible to the common cold. In fact, within the first year of life, most babies have up to seven colds (Mayo, 2011). Younger babies have immature immune systems, and have had limited time to acquire immunity to common virus.

Treatment for the common cold in babies involves taking steps to ease their symptoms, such as providing plenty of fluids and keeping the air moist. Very young

infants must see a doctor at the first sign of the common cold, because they're at greater risk of complications such as pneumonia.

Table 4.26.1.1 Symptoms during cough and cold

Symptoms	Urban				Rural				Total
	0-3 (n=100)	3-6 (n=100)	9 (n=98)	12 (n=96)	0-3 (n=100)	3-6 (n=100)	9 (n=98)	12 (n=96)	(n=194)
Cough & cold	2(2.0)	3(3.0)	1(1.02)	5(5.20)	3(3.0)	2(2.0)	4(4.0)	3(3.12)	23(11.85)
Fever/coughing/cold	1(1.0)	2(2.0)	1(1.02)	2(2.08)	2(2.0)	3(3.0)	2(2.0)	2(2.08)	15(7.73)
Blocked/running nose	1(1.0)	1(1.0)	2(2.04)	3(3.12)	1(1.0)	2(2.0)	3(3.0)	1(1.02)	14(7.21)
Breathing fast/ Breathing difficult	1(1.0)	1(1.0)	-	2(2.08)	1(1.0)	2(2.0)	1(1.0)	2(2.04)	10(5.15)

Figure in parenthesis indicate percentage Note:- indicates no data

Common symptoms seen are fever/cough/cold, blocked and running nose , fast and difficult breathing in infants. Compared to urban infants, of rural infants were found having symptoms of fever/coughing/cold, blocked and running nose, fast and difficult breathing.

4.26.2 FEVER

An infant with fever has an abnormally elevated body temperature over 100.4 degrees (38 C). Fever can be caused by a variety of conditions. In most cases, fever in infants is due to a viral or bacterial infection. The evaluation of fever varies with the age of the patient. Neonates with a fever and younger infants with a high fever should be managed with greater consideration.

Fever is a major manifestation of malaria and other acute infections in children. Malaria and fever contribute to high levels of malnutrition and mortality. Since malaria is a major contributory cause of death in infancy and childhood in many

developing countries, presumptive treatment of fever with anti malarial medication is advocated in many countries where malaria is endemic.

Table 4.26.2.1 Symptoms during fever

Symptoms	Urban				Rural				Total
	0-3 (n=100)	3-6 (n=100)	9 (n=98)	12 (n=96)	0-3 (n=100)	3-6 (n=100)	9 (n=98)	12 (n=96)	(n=194)
Fever	7(7.0)	4(4.0)	5(5.10)	3(3.12)	6(6.0)	4(4.0)	9(9.0)	7(7.14)	45((23.19)
Fever/coughing	3(3.0)	6(6.0)	4(4.08)	5(5.20)	5(5.0)	5(5.0)	5(5.0)	5(5.20)	38(19.58)
Fever/breathing fast	2(2.0)	3(3.0)	5(5.10)	3(3.12)	4(4.0)	5(5.0)	3(3.0)	4(4.08)	29(14.94)

Figure in parenthesis indicate percentage Note:- indicates no data

Table 4.26.2.1 indicates the reported cases of fever and its symptoms. Total cases of fever were found higher in rural areas and lower in urban areas at different age. Whereas NDHS reported that the number of fever cases was found higher in urban areas than rural areas (NDHS,2006). During fever different symptoms were seen like fever, fever and coughing and fever and fast breathing.

Table 4.26.2.2 Feeding during fever

Type of feeding	Urban				Rural				Total (n=194)
	Months				Months				
	0-3 (n=100)	4 -6 (n=100)	9 (n=98)	12 (n=96)	0-3 (n=100)	4-6 (n=100)	9 (n=100)	12 (n=98)	
Breast milk	12(12.0)	7(7.0)	6(6.12)	2	15(15.0)	9(9.0)	7(7.0)	6(6.120	64(32.98)
Rice/dal/jaulo	-	4(4.0)	3(3.06)	6(6.25)	-	2(2.0)	5(5.0)	5(510)	25(12.88)
Fruit juices	-	-	2(2.04)	1(1.02)	-	-	1(1.0)	-	4(42.06)
Cereal/pulse based gruel (Soup)	-	2(2.0)	3(3.06)	2(2.08)	-	3(3.0)	4(4.0)	5(5.10)	19(9.79)

Figure in parenthesis indicate percentage Note:- indicates no data

Practices of feeding breast milk were higher in both urban and rural areas during fever. During fever or illness infant does not want to eat other foods willingly. Therefore, infant wanted to more breast milk than supplementary food. And it was found that practices of giving cereals and fruits were higher in urban areas than rural areas. Giving fruits and juices was not common in rural areas during fever and cold.

Increase breastfeeding frequency during and after illness. Breastmilk is extremely important during illness. Children often continue breastfeeding even when they have no appetite and refuse other foods.

4.26.3 DIARRHOEA

Table No. shows the prevalence of illness during different ages. It was observed that the cases of diarrheal episodes were higher at 6 months in both urban and rural areas. Regarding this NDHS, 2006 revealed that diarrhea is relatively more common among young children aged 6–11 months and 12–23 months, presumably because babies are usually weaned off breast milk around that age.

As in many developing countries, diarrhea is a common sickness among the children in Nepal. Annual report (2009) reported that incidence of diarrhoea > 5 was 488/1000 and diarrhoel death > 5 was 147/1000.

Table 4.26.3.1: Prevalence of diarrhea among urban and rural infants

Areas	Number	0-12 months	Prevalence rate
Urban	96	36	375/1000
Rural	98	44	448.97/1000

Prevalence diarrhea in the study was found to be lower i.e. 375/1000 in urban areas compared to rural areas 448.97/1000. This prevalence rate was lower than the government for Nepal and it may be due to awareness on health and hygiene, health facilities and electronic media. No diarrheal deaths were reported in both urban and

rural areas. According to Gupta et al (2001) babies who are exclusively breast fed and have unrestricted access to breast, do not require water. Giving additional water can lead to increase risk of diarrhoea.

Table 4.26.3.2 presents the feeding practices during diarrhea. Most of the mothers were giving the breast milk, Jeevan Jal (ORT) cereal based gruel, boiled water and fruit juices to the infants during diarrhoea.

Children under six months of age are least likely to be given ORT, water or food during diarrhea, but this is probably because these children may not have started complementary feeding yet. No urban rural differences were seen in the feeding practices of infants during diarrhoea. Now a day's majority of the diarrheal cases are treated at community level. This is a positive impact of Community Based Integrated Management (CB-IMI).

Table 4.26.3.2: Feeding during diarrhea

Type of feeding	**Urban**				**Rural**			
	Months							
	0-3 (n=100)	**4 -6 (n=100)**	**9 (n=98)**	12 (n=96)	**0-3 (n=100)**	**4-6 (n=100)**	**9 (n=100)**	**12 (n=98)**
To control diarrhea:								
Boiled water	-	3(3.0)	1(1.02)	2(2.08)	-	5(5.0)	1(1.0)	1(1.02)
Jeevan Jal (ORS)	-	3(3.0)	2(2.04)	5(5.20)	-	1(1.0)	5(5.0)	4(4.08)
Breast milk	3(3.0)	5(15.0)	4(4.08)	2(2.08)	6(6.0)	11(11.0)	4(2.0)	2(2.04)
Fruit juices	-	2(2.0)	1(1.02)	2(2.08)	-	-	-	-
Cereal/pulse based gruel (Soup)	-	-	1(1.02)	-	-	-	2(4.0)	2(2.04)

Note: - indicates no data
Figure in parenthesis indicate percentage

It was encouraging to find both urban/rural mothers were continue normal feeding of children with diarrhea and also giving extra fluids. It was reported that Jeevan Jal (ORT), boiled water, cereal/pulse based gruel (Soup), and fruit juices given to the infants along with breast and bottle milk.

Attitude toward feeding practices during diarrhoea was found positive in both urban and rural areas Oral rehydration treatment is also increasing at national level (Annual Report, 2011).

4.26.4 ARI (Acute Respiratory tract infection)

WHO guidelines classified ARI as very severe disease, severe pneumonia, pneumonia and no pneumonia. Acute respiratory infection (ARI): is a serious child health problem in Nepal and has been recognized as a major killer of infants and children.

Table 4.26.4.1 depicts the prevalence rate of severe pneumonia. Prevalence rate was higher in rural areas (102.04/1000) than urban areas (62.5/1000). But, nationally the percentage of pneumonia cases has decreased gradually over the three fiscal years 2006/07 to

Table 4.26.4.1: Prevalence of Pneumonia among Urban and Rural infants

Area	Number	0-12 months	Prevalence rate
Urban	96	6	62.5/1000
Rural	98	10	102.04/1000

Figure in parenthesis indicate percentage

2008/09 (32.2% and 31.0%). Similarly, the percentage of severe pneumonia cases has also decreased in all the regions of Nepal (MOH, 2008/09). This positive indication of a reduction in ARI-related mortality and morbidity due to better management of ARI

cases by the health workers as well as by Volunteer Health Worker (VHW), Maternal and Child Health Worker (MCHW) and Female Community Health Volunteer (FCHV) in Community-based Integrated Management of Childhood Illness in district. NDHS (2011) shows that 5 percent of children under five years had symptoms of ARI.

Table 4.26.4.2 presented the symptoms during Pneumonia. The highest number of Pneumonia cases (10) was seen in rural areas. At the time of Pneumonia different symptoms were seen like coughing, fever/coughing, blocked and running nose, breathing difficult/fast and concave chest. Highest cases of pneumonia were found at 6 months

Table 4.26.4.2: Symptoms during Pneumonia

Place	**Urban**			**Rural**			**Total**
	6 (n=100)	**9 (n=98)**	**12 (n=96)**	**6 (n=100)**	**9 (n=100)**	**12 (n=98)**	**(n=196)**
Coughing	1(1.0)	-	-	2(2.0)	-	-	3(1.54)
Fever/coughing	-	-	-	2(2.0)	1(1.0)	1(0.51)	4(2.06))
Blocked & running nose	1(1.0)	1(0.51)	-	1(1.0)	-	-	3(1.54)
Breathing difficult/fever	1(1.0)	-	-	1(0.51)	-		2(1.03)
Concave chest	1(1.0)	1(0.51)	-	-	1(1.0)	1(0.51)	4(2.06)

Figure in parenthesis indicate percentage
Note: - indicates no data

Compared to 9 and 12 months. In comparison to urban infants, rural infants reported higher number of Pneumonia cases than urban infants.

Table 4.26.4.3 shows the feeding practices during pneumonia. Most of the mother were found giving breast milk and cereal/pulse based gruel (soup) in both urban and rural areas. The number of mothers giving fruit juices was found only in urban areas

during pneumonia. A possible attitude toward feeding liquid or soft diet was found in both urban and rural areas.

Table 4.26.4.3: Feeding during pneumonia

Types of food	Urban			Rural			
	Month			Month			
	4 -6 (n=100)	9 (n=98)	12 (n=96)	4-6 (n=100)	9 (n=100)	12 (n=98)	Total (n=194)
Breast milk	2(2.0)	1(1.0)	-	4(4.0)	2(2.0)	-	9(4.63)
Cereal/pulse based gruel (Soup)	1(1.0)	1(1.0)	-	2(2.0)	1(1.0)	1(1.0)	6(3.09)
Fruit juices	-	1(1.0)	-	-	-	-	1(0.51)

Figure in parenthesis indicate percentage
Note: - indicates no data

4.27 DEVELOPMENTAL MILE STONES

Infant and children can do certain tasks at certain age. These activities in relation to particular age are known as developmental mile stones. This information can help such persons to detect any abnormality in a child (Adhikari, et.al 2001). Some children achieve the mile stone earlier than others, but as long as they do it within the time range given, their development is considered normal, and there is nothing to worry (Ghosh,1985). Naturally, such babies fail to develop and acquire milestones like normal children. These conditions, in which there is a significant deficit or delay in the development of various mental functions from early childhood, are called developmental disabilities.

Some physical milestones were observed in the infants and comparisons made between the boys and girls are given in Table No. 4.27.

Table 4.27: Developmental mile stones of boys and girls (urban/rural)

Parameters	Urban		Rural		Chi-square	Significance
	Boys (n=43)	Girls (n=57)	Boys (n=48)	Girl (n=52)		
Started to laugh at:						
On 7 weeks	16(37.20)	35(61.40)	19(39.58)	30(57.69)	9	0.002
On 8 weeks	27(62.79)	22(38.59)	29(60.41)	22(42.30)	0.34	0.559
Started to hold head at:						
3-4 months	14(32.55)	22(38.59)	15(31.25)	27(51.92)	5.128	0.023
4-5 months	29(67.44)	35(61.40)	33(68.75)	25(48.07)	0.125	0.729
Started to sit with support at:						
5-6 months	13(30.23)	23(40.35)	19(39.58)	23(44.23)	1	0.112
6-7 months	30(69.76)	34(59.64)	29(60.41)	29(55.76)	0.781	0.375
Started to sit without support at:						
8 months	27(62.79)	38(66.66)	25(52.08)	34(65.38)	8.828	0.002
9 months	15(34.88)	18(32.14)	23(47.91)	18(34.61)	0.439	0.507
Started to crawl at:						
9 months	17(39.53)	34(60.71)	21(43.75)	35(67.30)	8.9810	0.003
10 months	25(58.13)	22(39.28)	27(56.25)	17(32.69)	0.505	0.477
Started to teething at:						
7months	12(27.90)	22(38.59)	17(35.41)	19(36.53)	0.071	0.789
8 months	22(51.16)	27(47.36)	28(58.33)	23(44.23)	4	0.045
9 months	8(18.60)	7(12.5)	13(27.08)	10(19.23)	0.421	0.516
Started to stand with support at:						
10-11 months	14(32.55)	31(55.35)	17(35.41)	35(67.30)	12.629	0.003
11-12 months	28(66.66)	25(44.64)	31(64.58)	17(32.69)	1.131	0.287
Started to walk without support at:						
12 months	15(35.71)	29(53.70)	22(45.83)	32(61.53)	5.878	0.015
Can't walk	27(64.28)	25(46.29)	26(54.16)	20(38.46)	0157	0.691
Started to speak two words at:						
10-11 months	18(41.86)	43(76.78)	33(68.75)	39 (75.0)	7.266	0.007
11-12 months	24(57.14)	11(20.37)	15(31.25)	13 (25.0)	3.571	0.058

Figures in parenthesis indicate percentage

4.27.1 STARTED TO LAUGH

According to early child hood developmental stage the age at which children begin to smile and track people and objects with eyes in between birth and 3 months. They prefer faces and bright colors (Early child development-development stages, 2010). Similarly, the age at which infants start laugh as between 7 – 8 weeks. In the present study both urban and rural infants were found normal for this milestones. As compared to urban/rural boys, urban/rural girls (65%), gave social smile significantly earlier as at 7 weeks as tested by chi-square ($P<0.05$).

4.27.2 Started to hold head

Generally, infant's development of the skill to hold their head was found at the age of 3-4 months and rest of the infants hold their neck at the age of 4-5 months. At 3-4 months girls were significantly higher percent of girls held their neck earlier than boys as tested by chi square ($p<0.05$).

4.27.3 Started to sit with support

Development of the skill to sit with support was found at the age of 5-7 month. Again the girls achieved this milestone earlier than boys in both urban and rural areas. Although this differences was no significant difference as tested chi-square ($P<0.05$).

4.27.4 Started to sit without support

According to developmental skill the infants start to sit without support at the age of 32 weeks (Adhikari et al, 2001). In the present study it was found the higher number of both urban and rural infant started sit without support at the age of 8 months. There

was no significant difference between the boys and girls in both urban and rural areas as tested by chi square ($P<0.05$).

4.27.5 Started to crawl

Generally, most of the infants of both urban and rural areas were found to start crawling at the age between 9 months and 10 months. Higher numbers of infants started to crawl at 9 month compared to 10 months. As compared to boys, more numbers of girls started to crawl at 9 months and it was significant as tested by chi-square ($P<0.05$).

4.27.6 Teething

Dentition is not a very reliable indicator of adequacy of growth. Delay in the appearance of teeth may occur in normally growing child. Similarly, both urban and rural infants were found to cut their first tooth at the age between 7-9 months. But it was significantly earlier in girls compared to boys. This difference was significant as tested by chi square ($P<0.05$).

4.27.7 Stand with support

Most of the infants started to stand with support at 10-12 months. As compared with boys the girls started to stand with support earlier and it was significant as tested by chi square ($P<0.05$).

4.27.8 Walk without support

According to Molla (1999) all most all infants are able to walk without support by the age of 13 months. In the present study the majority of the infants could not walk without support at the age of 12 months. The percentage of infants walking without

support was 35.7 percent among boys and 53.7 percent among girls in urban areas and 45.83 percent boys and 64 percent girls in rural areas. This data indicated that girls started walking without support earlier than boys and this difference significant as tested by chi square ($P<0.05$).

4.27.9 Speaking

Most of the infants are able to speak 2-3 single words with meaning by age months (Molla, n.d). Adhikari et al (2001) mentioned that infants started to babblie and cooi. In the present study it was found that all most all of the infants of both urban and rural areas started to speak single words by the age of 11-12 months. The girls started speaking earlier than boys and this difference was as tested by chi square ($P<0.05$).

CHAPTER 5
SUMMARY AND CONCLUSIONS

Chapter 5

SUMMARY AND CONCLUSIONS

Breast milk is an ideal food for infants, breast feeding is universal, easily initiated and carried out without effort by all mothers. Early initiation of breast feeding also brings closer bonding of mother and child. Breastfeeding is almost universal in Nepal with 98 percent of children being breastfed and the median duration of breast-feeding is 33 months. The mean duration of breastfeeding is 29 months (NDHS, 2001). The State of World's Children Report (UNICEF, 2004) highlighted that in Nepal, breast-feeding was continued till 24 months among 92 percent of the mothers.

According to Subba et al (2007) prevalence of breast feeding was 99.4 percent. Only 43.5 percent of the mothers initiated breast feeding within one hour of birth and 60.5 percent were practicing exclusive breastfeeding at 5 months. Almost 40 percent of the mothers started complementary feeding before the recommended age of 6 months and 22.5 percent of the mothers delayed introduction of complementary feeding beyond the recommended age.

In order to determine urban rural differences in infant feeding practices in Nepal, the present study was designed with the objectives of assess to the anthropometric profile, breast feeding practices, morbidity profile of infants 0-12 months of age in rural and urban areas of Kathmandu district.

The study was longitudinal study with 200 mothers and infants followed up for a whole year from 10-15 days after birth. Infant feeding practices including breast feeding, complementary feeding, feeding during day and night etc were examined at

0, 3, 6, 9 and 12 months of age. Weight, length, head circumference, chest circumference and mid upper arm circumference were measured at birth after 10-15 days, 3, 6, 9 and 12 months. Using standard deviation and Z-score WAZ, HAZ and WHZ techniques were calculated by WHO 2006 standard.

The results are presented below:

5.1 SOCIO DEMOGRAPHIC PROFILE OF MOTHERS

Both the urban and rural pregnant women were between 19-34 years of age. The number of younger aged women i.e. 19-26 years was found to be higher among the rural group. Mean age of urban pregnant women was 25.4 years and that of rural was 23.3 years respectively.

Urban women were comparatively more educated than rural women 23 percent and 31 percent of the urban pregnant women were post graduates, and graduates respectively.

As compared to rural mother, higher number of urban mothers (47%) was working outside the home. Whereas most of the rural women (80%) were housewives and only 20 percent were working in different sectors mainly in private service.

Forty three pregnant women were expecting babies for the first time, 56 were expecting the second baby and only one was expecting the third baby. On the other hand, in the rural areas 76 percent were expecting for the first time, 21 percent were expecting second baby and 3 per cent the third baby.

Eighty two percent of the women in the first pregnancy were between 19-24 years of age. However, in the urban areas, higher numbers of women were older than 25 years at the birth of their first child.

5.2 FAMILY PROFILE OF THE SUBJECTS

Sample comprised of Brahmin, Chhetri, Newar, Janjati (indigenous people) and Dalit groups. However, in urban areas, the Brahmin, Chhetri and Janjati groups were slightly higher while in rural areas the Newar group was highest (44%).

Most of the respondents were living in joint families (65.5%) the numbers were higher in the rural areas (77%) as compared to urban areas (54%).

Most husbands in the urban area were in service (66%), 15 percent were engaged in their own business and 19 percent of them had gone out of the country for employment. Where as in rural areas most of the husbands were engaged in farming (40%), 35 percent were working in private and government offices, and 11 percent were engaged in their own business or skilled work like carpentry and masonry.

Both in urban and rural areas none of the fathers were illiterate. A very clear differentiation has been seen with the fathers in urban areas having higher education levels than those in the rural areas. Graduates and post graduates were lower in number in rural area.

Since the women in rural areas were younger, the husbands were also younger with 48 percent being within the range between of 19-26 years.

Maximum range of income was Rs.10,000-14,000 (NPR) and Rs. 8,000-10,000 (NPR) in urban areas and rural areas respectively.

5.3 BIRTH DETAILS OF INFANTS

All most all the deliveries were in the hospital only 4 deliveries were at home in rural areas. Among the 200 subjects of the urban and rural areas most of the delivery cases were normal. Only four and nine were cesarean cases in urban and rural areas, respectively. Out of 200 births, 105 were girls and 95 boys.

5.4 INFANT FEEDING PRACTICES

Initiation of breast feeding within an hour of birth found to be quite high (69.5%) in both urban and rural areas of Kathmandu district.

The colostrum feeding practices among the mothers were 100 percent in both urban and rural areas.

In case of caesarean delivery, glucose water was given to infant at the hospital. It seems that practices of antenatal check up services in both urban and rural areas helped to change the attitude of mothers towards prelacteal feeds.

Among the 200 mothers, 28 percent of the urban mothers and 64 percent rural mothers reported exclusively breast feeding up to 6 months.

Main causes of delaying breast feeding were complications during childbirth such as excess bleeding, delaying in coming out of placenta, and the cesarean birth. Tiwari et al. (2011) also reported that Cesarean deliveries were associated with delay in timely initiation of breastfeeding. Besides these reasons it was found that some babies were sleeping and some babies did not wanted to suck the breast.

There were many reasons for giving additional milk along with breast feeding. The reasons were illness of mother, insufficient breast milk, and child did not like to suck

breast milk and mother had to go to office or work. Yet another reason to give additional milk to the child is illness of mother. At the 3rd months visit it was reported that when the mother has high fever or cough & cold, so they had given formula milk to their children for certain period. The later was applicable more in urban mothers than rural mothers. Mother in the rural areas also has to go for field work outside the home.

Over 16.66 percent mothers of both urban and rural area were found giving formula milk to their infant as breast milk substitute. Next in order of preference by the mothers was fresh cow and buffalo's milk, and only a few were giving dairy milk to their infant.

The frequency of breast feeding the baby varied from 1-2 hour interval, 2-3 hour interval or on demand i.e. whenever baby cried. It was observed that more number of mothers was feeding infants on demand as the age of infant increased.

All the infants both in urban and rural areas were being fed during night even up to the age of 1 year. Feeding 2-3 times was widely practiced during night in both urban and rural areas. Number of mother feeding 2-3 times daily was higher in urban areas than rural areas.

The Anna Prasan ceremony (Rice feeding ceremony) is performed at an auspicious hour on a particular day determined by an astrologer. It is usually performed at the age of five months for girls and 6 months for boys. Since all girls had the ceremony at 5 months, exclusive breast feeding up to 6 months were not practiced.

Most of the mothers were found giving plain water after introducing supplementary foods. Highest number was found giving plain water to the babies after “Annaprasan” ceremony in both urban and rural areas.

Sixty one percent of urban and 58 per cent of rural infants were receiving complementary food at age of 5-6 months respectively and 33 per cent urban infants and 39 per cent rural infants respectively were receiving complementary food by age at 6-7 months. Only a very small percent (4.5%) of the infants were introduced to complementary food after the age of 7 months.

Popular complementary food given to infant were jaulo, mashed rice/dal/vegs and home made flour and commercial (Sarbottam pitho) food respectively.

At 6 months feeding frequency was mostly 1-2 times/day. It was gradually increased with the age. At the age of 9 months feeding frequency was mostly increased 2-3 times/day and by the age of 12 months, the infants were fed 3-4 times/day.

Rural mother (87%) reported only sometimes cooking separately for the infant. It seems that the consciousness of mother towards child feeding was better among urban mothers than the rural mothers.

Hence, colostrum was fed to all infants in both rural and urban areas. Early initiation of breast feeding was also practiced in both rural (68%) and urban (71%) areas. However exclusive breast feeding up to 6 months was only prevalent in 28 percent and 36 percent infants in rural and urban areas respectively. Complementary feeding was initiated as early in 5-6 months. Complementary fed preparation was initiated include cerelac, Jaulo, rice/dal/vegetables and Sarbottam or home made flour.

5.5 ANTHROPOMETRICS PROFILE OF INFANTS

At 10-15 day after birth: At 10-15 days of birth the mean weight of rural girls was lowest and urban boys was the highest. This difference between the mean weight of urban and rural girls and urban boys and rural girls was significant as tested by ANOVA and Tukey HSD ($P<0.05$).

At 10-15 days of birth the mean length of rural boys was lowest and urban boys were the highest. This urban rural differences was significant as tested by ANOVA and Tukey HSD ($P<0.05$).

At 10-15 days of birth it was observed that the mean head circumference of urban boys was 34.66±0.67 cm (33-36 cm) and rural boys had 34.35±0.56 cm (33-36 cm). There was no significant difference between in the mean head circumference of urban and rural areas.

At 10-15 days of birth infants chest circumference is about 3 cm less than head circumference. There was no difference in the mean chest circumference of urban boys, rural boys and rural girls.

Among the urban boys/girls and rural boys, it was observed that rural girls mean chest circumference of rural girls was highest.

At 3 months: Mean weight of urban boys at 3 months was higher (4.7kg) than rural boys (4.64kg). The rural urban difference in weight at 3 months for girls was significant as tested by ANOVA Tukey HSD ($p<0.01$).

At 3 months infants lengths were measured but no significant difference was found to be mean length of urban rural boys and girls as tested by ANOVA and Tukey HSD ($P<0.01$)

At 3 months there was no difference in the mean head circumference of rural and urban boys and girls.

It was observed that there was no difference in the mean chest circumference of urban boys and rural girls.

At 6 months: No significant difference was found between the mean weight of rural and urban boys and girls at 6 months of age. All the infants had more than doubled their birth weight at 6 months.

Again at 6 months length of infants were measured and the rural boys had significantly lower mean length as compared to urban girls and boys as tested by ANOVA and Tukeys HSD ($P<0.05$).

There was no difference in the mean head circumference of urban, rural, boys and girls at 6 months.

Mean chest circumference was found significantly higher in both rural boys and girls compared to urban girls as tested by ANOVA and Tukeys HSD ($P<0.05$).

There was no difference in mean mid upper arm circumference in rural and urban boys and girls.

Hence, all the infants doubled their weight and both rural boys and girls had higher mean chest circumference. There was no difference in chest and head circumference.

At 9 months: At 9 months mean weight of urban girls (7.44 kg) was seen highest and that of rural girls (7.4 kg) the lowest. Urban boys had significantly higher weight than rural boys as tested by ANOVA and post hoc Tukey HSD ($P<0.05$).

At 9 months mean length of rural boys was lowest compared to urban boys and girls also compared with urban girls, rural girls were found to be the lowest length. This urban rural difference was significant as tested by ANOVA and Tukey HSD ($P<0.05$).

The mean head circumference of rural boys and girls was found to be higher than the urban boys and girls.

At 9 months the rural boys and girls had significantly higher chest circumference compared to urban boys and girls as tested by ANOVA and Tukey HSD ($P<0.01$).

There was no difference between the rural, urban, boys and girls mid upper arm circumference at 9 months.

It was concluded that the mean weight of urban boys had highest weight among the urban girls rural boys and rural girls had lowest mean length. There was no difference between mid upper arm circumference among the rural urban infants.

At 12 months: At 12 months all the infants had tripled their birth weight which indicated a normal pattern of growth. The mean weight of urban girls was significantly lower than the mean weight of rural boys as tested by ANOVA and Tukeys HSD ($P<0.05$).

No significant difference has seen mean length between urban and rural boys at 12 months. All the infants have normal length range between 74-75 cm.

At 12 months rural boys and urban girls had higher mean head circumference. But these differences were not significant.

At 12 months mean chest circumference was found higher in rural boys and rural girls than urban boys and urban girls though not significant. It was seen that mean chest circumference of rural boys and rural girls was higher than urban boys and urban girls.

At 12 months mean upper arm circumference was found to be higher in rural boys than urban boys though not significant. Highest mid upper arm circumference was found in rural boys among the urban boys, urban girls and rural girls.

Hence, at the 12 months all the infants tripled their birth weight. Mean weight of urban girls was significantly lower than rural boys. Although, there was no significant difference between head, chest and mid upper arm circumference.

WAZ

At 3 months significantly higher number of urban boys were stunted (-2SD) compared to rural boys, there was no significant difference between urban boys, urban girls and rural girls as tested by chi square ($P<0.05$).

At 6 and 9 months significantly higher number of rural boys were stunted (-2SD) compared to urban boys and significantly higher number of urban girls were under weight (-2SD) compared to rural girls as tested by chi square ($p<0.05$).

At 12 months the number of infants in -2SD category were lowest compared to at 3, 6 and 9 months as tested by chi square ($P<0.05$).

To summarize, the number of stunted were in both urban and rural boys and urban girls also more stunted than rural girls at 3-9 months. And there were less stunted at 12 months.

HAZ

At 3 months only small number of urban boys and rural girls were in underweight (-2SD) category. But, from 6 months onward number of stunted has been seen in urban boys, urban girls and rural girls. At 9 months urban girls and rural boys' numbers has been increased substantially.

At 3 months significantly higher number of urban boys were stunted (-2SD) compared to rural boys, there was no significant difference between urban boys, urban girls and rural girls as tested by chi square ($P<0.05$).

At 6 months, again significantly higher numbers of urban boys were stunted compared to rural boys, whereas among girls significantly higher number of rural girls were stunted compared to urban girls as tested by chi square ($P<0.05$).

At 9 months the situation was reversed and significantly higher number of rural boys were stunted compared to urban boys and significantly higher number of urban girls were stunted compared to rural girls as tested by chi square ($P<0.05$).

At 12 months the number of infants in the stunted (-2SD) category were lowest compared to 3, 6 and 9 months.

Hence, the number of wasted were higher at 3 and 6 months in urban boys than urban girls, rural boys and rural girls. But in 9 months rural boys were stunted as compared

to urban boys and urban girls were also stunted as compared to rural girls. There was lowest number of stunted category at 12 months.

WHZ

No wasting was seen till 6 months in any of four groups. It has seen only in small number of wasted at 9 months. But, it has seen number of increment at 12 months. The stunting and wasting starts after rice feeding ceremony from 6 months onward.

Of the total 200 infants both from urban and rural areas were found to be normal (+2SD to -2SD) at 3 months. As compared to urban boys, rural boys had seen (91.6 per cent) normal than urban boys (88.3 per cent) and rural girls also seen normal than urban girls. The percentage of normal was higher in (94.2 per cent) rural girls.

Till 6 months the urban boys and girls as well as rural boys and girls did not shown any wasting. The wasting started only from 9 months onwards, only 2 percent of girls both rural and urban and 12 percent of rural boys were wasted.

At 12 months, more infants i.e. 5 percent and 6 percent of urban and rural boys respectively and 12 percent and 9 percent of urban and rural girls respectively were wasted.

Therefore, in the present study no wasting was seen till 6 months in both urban and rural areas. Only 2 percent of rural urban girls and 12 percent rural boys were wasted and number of stunted were lowest at 12 months.

5.6 CONSUMPTION OF COMPLEMENTARY FOODS AT 12 MONTHS

Mean consumption of cereal ranged between 82.04±30.37g in urban boys to 79.01g in rural girls. This difference was not found significant as tested by ANOVA ($P<0.05$).

The mean consumption of pulses was more in boys both urban and rural compared to girls, although it was not significant as tested by ANOVA and Tukey HSD.

Fruits such as banana, apple, mango, papaya and orange were found to be given to the infants. The urban infants had higher mean intake of fruits compared to rural infants. The urban girls had significantly higher intake compared to rural boys as tested by ANOVA and Tukey HSD ($P<0.05$).

The average daily consumption was reported ranging from 10 to 14g mostly from eggs. The urban girls had significantly higher mean intakes than rural boys as tested by ANOVA and Tukey HSD ($P<0.05$).

Mean daily consumption of milk ranged between 23 to 26g. Cow's milk was preferred by mothers compared to formula milk. The urban girls and rural boys had significantly higher mean daily intake of milk compared to urban boys as tested by ANOVA and Tukey HSD ($P<0.05$).

Added fat was found to be widely given to the infant in both urban and rural areas. The mean daily consumption of fat ranged between 33g to 35g. The urban boy had significantly higher mean daily intake compared to rural boys and rural girls as tested by ANOVA and Tukey HSD ($P<0.05$).

5.7 MEAN CONSUMED FOOD ITEMS BY THE INFANTS AT 12 MONTHS

Cereals:

Cereal was the main food given to the infants in both urban and rural areas. Mean consumption of cereal ranged between 82.04±30.37g in urban boys to 79.01g in rural girls. This difference was not found significant as tested by ANOVA.

Pulses:

Different types of pulses like lentil, black gram, green gram and red gram dals were consumed by the infant. The mean consumption was more in boys both urban and rural compared to girls, although it was not significant as tested by ANOVA.

Green leafy vegetables:

A practice of giving green leafy vegetables was found to be very low in both urban and rural area which was only 6g/day. It was found the mothers were mostly giving spinach and mustard leaves to the infants as green leafy vegetables.

Roots & tubers:

The roots & tubers mostly given to infant were potato and carrot in both urban and rural areas. The mean daily consumption of roots and tubers ranged between 20 to 17g and was higher in rural areas than urban areas although not significant.

Other vegetables:

Pumpkin, field bean and cauliflower was mainly found to be given to the infants in both urban and rural areas. The mean daily consumption of other vegetable was very low i.e. only around 6g/day.

Fruits:

Fruits such as banana, apple, mango, papaya and orange were found to be given to the infants. The urban infants had higher mean intake of fruits compared to rural infants. The urban girls had significantly higher intake compared to rural boys as tested by ANOVA and Tukey HSD ($P<0.05$).

Meat:

Some of the mothers being vegetarians were not giving non vegetarian foods. The average daily consumption was reported ranging from 10 to 14g mostly from eggs. The urban girls had significantly higher mean intakes than rural boys as tested by ANOVA and Tukey HSD.

Milk:

Mean daily consumption of milk ranged between 23 to 26g. Cow's milk was preferred by mothers compared to formula milk. The urban girls and rural boys had significantly higher mean daily intake of milk compared to urban boys as tested by ANOVA and Tukey HSD ($P<0.05$).

Visible fat:

Added fat was found to be widely given to the infant in both urban and rural areas. The mean daily consumption of fat ranged between 33g to 35g. The urban boy had significantly higher mean daily intake compared to rural boys and rural girls as tested by ANOVA and Tukey HSD ($P<0.05$).

Sugar:

Mean daily consumption of sugar ranged between 12g to 14g in both urban and rural areas. Sugar was usually added to super flour (lito), tea and milk.

The mean daily intake of energy and nutrients such as protein, fat, calcium, iron, thiamin, riboflavin, niacin, folic acid, vitamin C and vitamin A were calculated from the raw foods using nutritive value of Indian foods (ICMR,1990).

5.8 MEAN INTAKE OF NUTRIENTS BY INFANTS AT 12 MONTHS

The mean daily intake of energy of the infants ranged between 740 to 874 kcal in urban and rural areas infants. The urban girls and rural boys had significantly higher energy intake than urban boys and rural girls as tested by ANOVA and Tukey HSD ($P<0.05$).

The mean daily protein intake ranged between 17 to 24g in rural and urban areas. The urban girls had the highest intake and rural girls the lowest. This difference was significant as tested by ANOVA and Tukey HSD ($P<0.05$).

Practices of giving added fat was seen popular in both urban and rural areas. The urban girls and rural boys had significantly higher fat intake compared to urban boys as tested by ANOVA and Tukey HSD ($P<0.05$).

The infants had mean daily intake of riboflavin varying between 0.19 to 0.48mg in urban and rural areas respectively. The riboflavin intake was found significantly lowest in rural girls than urban girls as tested by ANOVA and Tukey HSD ($P<0.05$).

The mean daily intake of calcium ranged between 110 to 272 mg in both urban and rural infants. Intake of calcium among the infants the rural girls had found lowest as tested by ANOVA and Tukey HSD ($P<0.05$).

Hence, the data of the infants at 12 months comprised of cereals, pulses, green leafy vegetables, root and tubers, other vegetables, fruits, meat, milk, food fat and sugar. The intakes also showed a gender as well as rural urban difference.

5.9 DEVELOPMENTAL MILE STONES

As compared to urban/rural boys, urban/rural girls (65%), gave social smile at 7 weeks were significantly earlier as tested by chi-square ($P<0.05$).

There was no significant difference between at 8 weeks as tested by chi square.

At 3-4 months significantly more girls held their neck upright earlier than boys as tested by chi square.

Sit with support at the age of 6 months. There was no significant difference between boys and girls at 5 and 6 months in both urban and rural areas as tested by chi-square.

Both urban and rural infant started sit without support at the age of 8 months and small number of infant started sit without support at the age of 9 months.

Most of the infants of both urban and rural areas were found started to crawl at the age between 9 months and 10 months. As compared to boys, girls were significantly started to crawl earlier at 9 months than urban boys.

Dentition is not a very reliable indicator of adequacy of growth. Both urban and rural infants found teething at the age between 7-9 months. But it was significantly higher in girls at 8 months than boys. This difference was tested by chi square. The numbers were lowest at 9 months in both urban and rural areas.

Most of the infants started to stand with support at in between 10-12 months. As compared with boys and girls, girls were significantly started to stand with support earlier at 8 months than boys as tested by chi square.

Girls started walk without support earlier than boys. No significant differences were seen in urban and rural girls as tested by chi square.

Therefore, in the present study it was evident that girls performed certain milestones earlier than boys.

5.10 MORBIDITY PROFILE

Prevalence **diarrhea** in the study was found to be lower i.e. 375/1000 in urban areas compared to rural areas 448.97/1000. No diarrheal deaths were reported in both urban and rural areas. Most of the mothers were giving the breast milk, Jeevan Jal (ORT) cereal based gruel, boiled water and fruit juices to the infants during diarrhoea..

Fever

Total cases of fever were found higher in rural areas and lower in urban areas at different age. During fever different symptoms were seen like fever, fever and coughing and fever and fast breathing. Practices of feeding breast milk were higher in both urban and rural areas during fever.

Pneumonia prevalence rate was higher in rural areas (102.04/1000) than urban areas (62.5/1000). The highest number of Pneumonia cases (10) was seen in rural areas. Highest cases of pneumonia were found at 6 months compared to 9 and 12 months infants.

Immunization

In the present study 93.87 percent infants received all the vaccination. Coverage of immunization was found satisfactory in both urban and rural areas.

The occurrence of infection fever, cough and cold, pneumonia was very high but more in rural than in urban areas. Immunization coverage was 93.9 percent, vitamin supplementation coverage was higher in urban than rural areas.

It was observed that both urban and rural infants had received vitamin A supplementation according to their age, but it was found higher in urban and rural areas.

From the above discussion, it is understand that there is not much difference between the rural and urban areas of Kathmandu district regarding the growth pattern of infants although the limitation of research being the chosen study area. Different conditions exist in different areas mainly caused by infrastructure, thus, we can see

that in urban areas, mothers are more educated and older than in rural areas, where as, in rural areas they were less educated and younger in age. Similarly, the babies had more weight in urban areas because in nuclear families, mothers and family members get time and chance to cook separately for babies, so, the babies get good diet. In rural areas, there are other members of family to look and care after the baby due to joint family system and closely built houses belonging to extended family or clan members. In urban areas, the babies also get a good medical care in time then in rural areas because hospitals are mostly located in urban areas. The growing trend of urbanization and the influence of globalization have brought the rural and urban areas closer to each other, so, much difference is not seen between the two areas in this research.

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ANNEXURES

ANNEX I

QUESTIONNAIRE

ON

INFANT FEEDING PRACTICES OF RURAL AND URBAN AREAS OF KATHMANDU DISTRICT IN NEPAL: A STUDY

Name of Mother : …… SERIAL NO.

Address: ……..

SECTION I

GENERAL BACKGROUND OF RESPONDENTS

S.NO.	QUESTION	CODING CATAGORY
1.1	How old are you & your husband?	Age in completed years. Wife …….. Husband …….
1.2	What is your & your husband education?	Wife Husband Illiterate 1 …… . ……. Literate 2 ……. ……. <Primary 3 .... Lower Secondary 4 ..... …… S.L.C 5 ……. ……. Intermediate 6 …… ……. Graduate 7 …….. ……. Post graduate 8 ……. …….
1.3	What is your and your husband occupation?	Wife Husband Housewife 1 ……. ……. Govt.service 2 ……. ……. Pvt.service 3 ……. …… Business 4 …….. ……. Foreign service 5 ……. …… Labourer 6 ……. …… Farming 7 ……. ……. Any others 8 ……. ……

1.4	What is your Family income?	State total Income …… < Rs.4000 1 … Rs. 6000-8000 2 … Rs. 8000-10000 3 … Rs. 10000-12000 4 … Rs. 12000-14000 5 … Rs. 14 000 and above 6 …
1.5	Which ethnic group do you belong?	Brahamin 1 … Chhetri 2 … Newar 3 … Janajati 4 … Dalit 5 …
1.6	Type of family you are living in?	Joint 1 … Nuclear 2 …

SECTION II

BREAST FEEDING PRACTICES

1.1	Did you give prelacteal feeds to the infant before starting breast feeding?	Ghee/honey 1 … Honey 2 … Glucose water 3 … Nothing 4 …
1.2	Did you feed colostrum to your infant?	Yes 1 … No 2 …
1.3	What are the reasons for feeding colostrum?	Nutritious 1 … Traditional practices 2 … Don't know 3 …
1.4	What are the reasons for not feeding colostrum?	Harmful 1 … Indigestible 2 … Superstition/Myth 3 …
1.5	When did you start breastfeeding after delivery?	Immediately after 1 … Within 2 hours 2 … More than 2 hours 3 …

DELIVERY DETAILS III

1.1	Where did you go for delivery/	Government hospital 1 … Private hospital 2 … At home 3 …
1.2	What type of delivery was?	Normal 1 … Caesarean 2 …
1.3	What is your gender of new born?	Boy 1 … Girl 2 …

Checklist

Name of mother: VDC:_____Municipality:_____

Infant's date of birth:____DD___MM_____YY Ward No. _____Sex: Male/female

Information		Month							
S.N	A. Breast feeding/exclusive breast feeding practices:	1	2	3	4	5	6	9	12
1.	Who is looking after your baby? 1 Family members 2 Care giver 3 Mother itself								
2.	Is your breast milk sufficient for your infant? 1 Yes 2 No 3 Stop to breast feed If yes go to no.4								
3.	If no, which milk is given to the infant? 1 Lactogen 2 cow/buffalo milk 3 Other milk								
4.	How much water do you mix into the cow/buffalo's milk? 1 1:1 2 2:1 3 3:1 4 Not mixed								
5.	How many times do you breastfed/ bottlefed in a day? 1 Every 1- 2 hours 2 Every 2- 3 hours 3 After every crying								
6.	Did you give additional milk along with breast milk? Reasons: 1 Illness of mother 2 Insufficient breast milk 3 Child did not like to suck breast milk 4 Mother has to go to work								
7.	Which additional milk did you give to your child? 1 Lactogen 2 Cow's/buffalo's milk 3 Other milk								
8.	How many times did you breastfeed your infant during night? 1 1-2 times 2 2-3 times 3 3-4 times								
	B. Complementary food								
9.	Did you celebrate Rice feeding ceremony? 1 Yes 2 No								
10.	When did you start giving solid/semi food to your baby? 1 By 5-6 month 2 By 6-7 months								
11.	Which major complementary food is given to your baby? 1 Cerelac 2 Jaulo 3 Rice/Dal(mashed) 4 Sarbottam Pitho/home made flour								

12.	How many times did you feed complementary food to your baby? 1 1-2 times 3 3-4 times 2 2-3 times 4 4-5 times								
13.	Did you give fruit to your baby? 1 Everyday 2 Sometime 3 Don't give								
14.	Do you cook food separately? 1 Regular 2 Frequent 3. Sometimes								
15.	Did you start to give water to your baby? 1 On 5 months 2 On 6 months 3 On 7 months								
	C. Developmental mile stones								
16.	Your baby started to laugh at? 1 7 weeks 2 8 weeks								
17.	Your baby start to hold his/her head at? 1 3-4 months 2 4-5 months								
18.	Your baby started to sit with support at? 1 5 months 2 6 months 3 7 months								
19.	Your baby started to sit without support at? 1 8 months 2 9 months								
20.	Your baby started to crawl at? 1 9 months 2 10 months								
21.	Baby started teething at? 1 On 7 months 2 On 8 months 3 On 9 months								
22.	Your baby started to stand with support at? 1 On 10-11 months 2 On 11-12 months								
23.	Your baby starts to walk without support at? 1 On 12 months 2 Can not walk								
24.	Has your baby start to speak two words sentences? 1 On 10-11 months 2 On 11-12 months								
	D. Immunization status								
25.	Did your baby receive Vitamin A supplement? 1 On 6 months 2 On 12 months								
26.	Has your child received? 1 BCG 2 DPT I+Polio I 3 DPTII+Polio II 4 DPT III+Polio III 5 Measles								
	E. Morbidity Profile:								
27.	If your child had fever in last two weeks what symptoms did you notice? 1 fever/coughing 2 Fever/breathing fast								
28.	If your child had cough and cold in last two weeks what symptoms did you notice? 1 Fever/coughing/cold								

	2 Blocked and running nose 3 Breathing fast 4 Breathing difficult								
29	Was there blood in stool? 1 Yes 2 No								
30	What did you give to control Diarrhea? 1 Boiled plain water 2 Jeevan Jal(ORS) 3 Breast milk 4Other milk 5Cereal based gruel 6 Friut juices								
31.	If your child had pneumonia what symptoms did you notice? 1 Coughing 2 Fever/coughing 3 Blocked and running nose 4 Breathing difficult/fast								
32.	In pneumonia what did you feed to your baby? 1 Only breast milk 2 Other milk 3 Cereal based gruel								

Anthropometric Measurement

S.N. …….
Name of mother: Sex of Infant:
Date of birth: VDC/Municipality:

Measurement	**Months**				
	10-15 days after birth	**3**	**6**	**9**	**12**
Weight (kg)					
Length (cm)					
Head circumference (cm)					
Chest circumference (cm)					
Mid-Upper-Arm circumference (cm)					

24 Hours Dietary Recall

S.N. ……

Name of mother: Sex of Infant:

Date of Birth: VDC/Municipality:

Time	Food given to the infant	Household measure	Ingredients
Morning 6 AM-10 AM			
Morning 10 AM-2 PM			
Noon 2 PM - 6 PM			
Evening 6 PM- 10 PM`			
Night 10PM- 2 AM			
Morning 2 AM – 6 Am			

प्रश्नावली

काठमाडौ जिल्ला को शहरी र ग्रामीण क्षेत्र मा जन्मेका **०-१२** महिनाका शिशुहरूलाई खुपाउने प्रचलन र यस्ले शिशुको विकासमा पार्ने प्रभाव

आमा को नाम :..... क्रम संख्या.....

ठेगाना..... वार्ड नं. .....

खण्ड 'क'

उत्तरदाता को विवरण

क्र.सं.	प्रश्न	कोड नं.			
१.१	तपाई कति वर्ष पुग्नु भयो अनि तपाई को श्रीमान को उमेर कति हो?	पूरा गरेको वर्ष श्रीमति..... श्रीमान			
१.२	तपाई र तपाई को श्रीमान ले कति संम शिक्षा लिनु मएको छ?			श्रीमति	श्रीमान
		निरक्षर	१	.....	.....
		साक्षर	२	.....	.....
		< प्राथमिक	३	.....	.....
		नि.मा.वि.	४	.....	.....
		एस.एल.सि	५	.....	.....
		आई.ए.	६	.....	.....
		बी.ए.	७	.....	.....
		एम.ए.	८	.....	.....
१.३	तपाई को पेशा र श्रीमान को पेशा के हो?			श्रीमति	श्रीमान
		गृहणि	१	.....	.....
		सरकारी	२	.....	.....
		प्राइवेट	३	.....	.....
		व्यापार	४	.....	.....
		वैदेशिक	५	.....	.....
		मजदूरी	६	.....	.....
		कृषि	७	.....	.....
		अन्य	८	.....	.....

१.४	तपाइ को परिवार को आय श्रोत कति छ?	कूल आय भन्नु होस	
		<रू. ४०००	१
		रू. ६०००-८०००	२
		रू. ८०००-१००००	३
		रू. १००००-१२०००	४
		रू. १२०००-१४०००	५
		रू. १४०००-मन्ढा बढि	६
१.५	तपाई कुन संप्रदाय बाट आउनु भएको हो?	ब्राहम्ण	१
		क्षेत्री	२
		नेवार	३
		जनजाती	४
		दलीत	५
१.६	तपाई कुन परिवार मा बस्नु मएको छ?	संयुक्त	१
		एकल	२

खण्ड 'ख'

स्तन पान

४.१	शिशु जन्मेपछि दुध खुवाउन अघि केही खुवाउनु भयो?	घिउ/मह चिनी/मह ग्लुकोज पानी केही पनि खुवाइन	१..... २..... ३..... ४.....
४.२	शिशुलाई बिगौती दुध (Colostrum) खुवाउनु भयो?	खुवाए खुवाइन	१..... २.....
४.३	बिगौती दुध (Colostrum) खुवाउन का कारण हरू के हुन?	पोणिलो हुने खुवाउने प्रचलन थाहा छैन	१..... २..... ३.....
४.४	शिशु जन्मेपछि कति समय भित्र स्तनपान गराउनु भयो?	एक घण्टा मन्दा अगाड़ी जन्मे को को २ घण्टाभित्र दुई घण्टा भन्दा बढि	१..... २.... ३....

चेकलिस्टः

आमाको नामः

शिशुको का जन्म मितीः_____ वार्ड नं. _____लिंगः पुरूष/महिला

सूचना		महिना							
क्र. सं.	स्तनपान	१	२	३	४	५	६	९	१२
१	शिशुको हेरचार कस्ले गर्नु हुन्छ? १ परिवार का सदस्य २ सहयेागी ३ आमा आफै								
२	आमा को दुध ले पुग्छ? १ पुग्छ २ पुग्दैन ३ स्तनपान बन्द गरेको यदि पुग्छ मने प्रश्न नं. ४ माजाने								
३	यदि, स्तनपान ले पुग्दैन भने शिशुलाई कुन दूध खुवाउनु भयो? १ ल्याक्टोजन २ गाई/भैंसी को दूध ३ अन्य दुध								
४	गाई/भैंसी को दूध मा कति पानी मिसाउन हुन्छ? १ आधा दूध, आधा पानी २ दुई भाग दूध, एक भाग पानी ३ पानी मिसाउदिन								
५	एक दिन मा कति पटक स्तनपान/बोतल को दूध खुपाइनु हुन्छ? १ हरेक १-२ घन्टामा २ हरेक २-३ घन्टामा ३ शिशु रोएपछि ४ पिशाब फेरे पछि								

६	स्तनपान को साथै अर्को दुध पनि खुवाउनु का कारण? १ आमा बिरामी भएर २ आमा को दूध नपुगेर ३ शिशु ले आमा को दूध नचुसेर ४ आमा काममा जाने भएर								
७	अन्य कुन दुध खुवाउनु हुन्छ? १ ल्याक्टोजन २ गाई/भैंसी को दूध ३ अन्य दूध								
८	राती शिशु लाई कति पतक स्तनपान गराउनु हुन्छ? १ दुई पटक २ तीन पटक ३ चार पटक ४ चार पटक भन्दा बढ़ी								
	ख. पूरक खाना								
९	अन्न प्रासन उत्सव मनाउनु भएको हो? १ हो २ होइन								
१०	शिशुलाई कहिले देखि ठोस/गिलो खाना खुवाउँनु भयो? १ ६-७ महिना देखि २ ७-८ महिना देखि								
११	कुन पूरक खाना शिशु लाई खुवाउँनु हुन्छ? १ सेरेलेक २ जाउलो ३ भात/दाल (मिचेको) ४ सर्वोत्तम पिठो ५ घरमा बनाएको पिठो								
१२	शिशु लाई कति पटक पूरक खाना खुवाउँनु हुन्छ? १ १-२ पटक ३ ३-४ पटक २ २-३ पटक ४ ४-५ पटक								

१३	शिशुलाई फलफूल खुवाउँनु हुन्छ? १ संधै खुवाउँछु २ खुवाउँदिन ३ कहिले काँहि खुवाउँछु								
१४	शिशु को लागि खाना बेग्लै पकाउनु हुन्छ? १ पकाउँछु २ पकाउँदिन ३ कहिले काँहि								
१५	शिशुलाई कहिले देखि पानी खुवाउँन थाल्नु भयो? १ अन्न प्रासन पछाड़ी २ अन्न प्रासन अगाड़ी								
	ग. शिशु विकास का पूर्वाधार हरू (Developmental mile stones)								
१६	शिशु कहिले देखि हाँस्न थाल्यो? १ ७ हप्तामा २ ८ हप्तामा								
१७	शिशुले टाउको उठाउँन शुरू गयो? १ ३-४ महीना मा २ ४-५ महिना मा								
१८	शिशु कहिले देखि आड़ दिएर बस्न थाल्यो? १ ५-६ महिना देखि २ ६-७ महिना देखि								
१९	शिशु आफै बस्न शुरूं गयो? १ ८ महिना देखि २ ९ महिना देखि								
२०	कहिले देखि शिशु बामे सर्न थाल्यो? १ ९ महिना देखि २ १० महिना देखि								
२१	शिशु को दाँत कति महिना मा आयो? १ ७ महिना मा २ ८ महिना मा ३ ९ महिना मा								

२२	शिशु समातेर उठन थाल्यो? १ १०-११ महिना मा २ ११-१२ महिना मा								
२३	शिशु हिडन थाल्यो? १ १२ महिना मा २ हिंडेको छैन								
२४	शिशु ले दुई शब्द का वाक्य बोल्न शुरू गयो? १ १०-११ महिना मा २ ११-१२ महिना मा								
	घ. खोप (Immunization)								
२५	शिशु लाई भिटामिन 'ए' कहिले खुवाउँनु भयो? १ ६ महिना पुगेपछि २ १२ महिना पुगेपछि								
२६	शिशु लाई निम्न खोप हरू दिनु भयो? १ बी सी जी २ डी पि टी I + पोलियो I ३ डी पि टी II+ पोलियो II ४ डी पि टी III+ पोलियो III ५ दादुरा								
	ड. बिरामी (Morbidity)								
२७	दुई हप्ता अगाडी शिशु लाई ज्वारो आएको थियो मने कुन लक्षणहठ देख्नु भयों? १ ज्वरो/खोकि २ ज्वरो/श्वाश छिटो छिटो फेर्ने								
२८	दुइ हप्ता अगाडी शिशु लाई रूधा/खोकी लागेको भए कुन लक्षणहरू देख्नु भयो? १ ज्वरो/खोकी/रूघा २ नाक बन्द हुने/नाक बाट पानी बग्ने ३ श्वाश को गति बढ़ने ४ श्वाश फेर्न गाहो हुने								
२९	दुई हप्ता अगाड़ी शिशु लाई पखाला लागेको भए एक दिन मा कति पटक								

	दिशा गयो? १ ३-४ पटक २ ४-५ पटक ३ ५ पटक भन्दा बढ़ी								
३०	दिशा मा रगत थियो? १ थियो २ थिएन								
३१	परवाला लागेको बेला उपचार को लागि शिशु लाई के खुवाउँनु भयो? १ उमाले को सादा पानी २ जिवन जल (ORS) ३ आमा को दूध ४ अन्न/गेडागेडी को झोल ५ फलफूलको रस								
३२	दुई हप्ता अगाडी शिशु लाई निमोनिया भएको भए कस्ता लक्षण हरू पाउनु भयो? १ खोकि लाग्ने २ ज्वरो/खोकि ३ नाक बन्द हुने ४ श्वाश प्रश्वाश मा कठिनाई								
३३	निमोनिया हुँदा शिशुलाई के खुवाउँनु भयो? १ आमा को दुध २ अन्य दुध ३ अन्न/गेडागेडी को झोल ४ फलफूलको रस								
३४	शिशु विरामी हुँदा उपचार को लागि कहाँ कहाँ लानु भयो? १ अस्पताल २ प्राइवेट क्लीनिक ३ मेडिकल पसल ४ PHC/HP/SHP ५ झारफुक ६ कहिं पनि लगिन								

शिशुको शारिरीक नाप

आमा को नाम :　　गा. वि. स.　　न. पा. :

शिशु को जन्म मितीः　　लिंग :　　वा. न.ः

महिना	१०–१५ दिन भित्र	३ महिना	६ महिना	९ महिना	१२ महिना
मिति					
शरिरको तौल (केजी)					
लम्बाई (सेमी)					
टाउको को गोलाई (सेमी)					
छाती को नाप (सेमी)					
पाखुरा को नाप (सेमी)					

२४ घण्टे खाना को विवरण

आमाको नाम :　　गा. वि. स.　　न. पा. :

शिशुको जन्म मितीः　　लिंग :　　वा. न.ः

समय	शिशुलाई खुवाइएको खाना	घरेलू नाप
बिहान ६-१० बजे		
बिहान १०-२ बजे		
दिउंसो २-६ बजे		
सांझ ६-१० बजे		
राती १०-२ बजे		
बिहान २-६ बजे		

ANNEX III

WHO New Child Growth Standards (2006)

Weight for age (0-12months)

Boys				Age	Girls			
-3SD	-2SD	-1SD	Median	months	-3SD	-2SD	-1SD	Median
2.1	2.5	2.9	3.3	0	2.0	2.4	2.8	3.2
2.9	3.4	3.9	4.5	1	2.7	3.2	3.6	4.2
3.8	4.3	4.9	5.6	2	3.4	3.9	4.5	5.2
4.4	5.0	5.7	6.4	3	4.0	4.5	5.2	5.8
4.9	5.6	6.2	7.0	4	4.4	5.0	5.7	6.4
5.3	6.0	6.7	7.5	5	4.8	5.4	6.1	6.9
5.7	6.4	7.1	7.9	6	5.1	5.7	6.5	7.3
5.9	6.7	7.4	8.3	7	5.3	6.0	6.8	7.6
6.2	6.9	7.7	8.6	8	5.6	6.3	7.0	7.9
6.4	7.1	8.0	8.9	9	5.8	6.5	7.3	8.2
6.6	7.4	8.2	9.2	10	5.9	6.7	7.5	8.5
6.8	7.6	8.4	9.4	11	6.1	6.9	7.7	8.7
6.9	7.7	8.6	9.6	12	6.3	7.0	7.9	8.9

WHO New Child Growth Standards (2006)

Height for age (0-12months)

Boys				Age	Girls			
-3SD	-2SD	-1SD	Median	months	-3SD	-2SD	-1SD	Median
44.2	46.1	48.0	49.9	0	43.6	45.4	47.3	49.1
48.9	50.8	52.8	54.7	1	47.8	49.8	51.7	53.7
52.4	54.4	56.4	58.4	2	51.0	53.0	55.0	57.1
55.3	57.3	59.4	61.4	3	53.5	55.6	57.7	59.8
57.6	59.7	61.8	63.9	4	55.6	57.8	59.9	62.1
59.6	61.7	63.8	65.9	5	57.4	59.6	61.8	64.0
61.2	63.3	65.5	67.6	6	58.9	61.2	63.5	65.7
62.7	64.8	67.0	69.2	7	60.3	62.7	65.0	67.3
64.0	66.2	68.4	70.6	8	61.7	64.0	66.4	68.7
65.2	67.5	69.7	72.0	9	62.9	65.3	67.7	70.0
66.4	66.7	71.0	73.3	10	64.1	66.5	69.0	71.5
67.6	69.9	72.2	74.5	11	65.2	67.7	70.3	72.8
68.6	71.0	73.4	75.7	12	66.3	66.3	68.9	71.5

WHO New Child Growth Standards (2006)

Weight for length (0-12months)

Boys				Length	Girls			
-3SD	-2SD	-1SD	Median	(cms)	-3SD	-2SD	-1SD	Median
1.9	2.0	2.2	2.4	45	1.9	2.1	2.3	2.5
2.0	2.2	2.4	2.6	46	2.0	2.2	2.4	2.6
3.8	2.3	2.5	2.8	47	2.2	2.4	2.6	2.8
4.4	2.5	2.7	2.9	48	2.3	2.5	2.7	3.0
4.9	2.6	2.9	3.1	49	2.4	2.6	2.9	3.2
5.3	2.8	3.0	3.3	50	2.6	2.8	3.0	3.4
5.7	3.0	3.2	3.5	51	2.8	3.0	3.3	3.6
5.9	3.2	3.5	3.8	52	2.9	3.2	3.5	3.8
6.2	3.4	3.7	4.0	53	3.1	3.4	3.7	4.0
6.4	3.6	3.9	4.3	54	3.3	3.6	3.9	4.3
6.6	3.8	4.2	4.5	55	3.5	3.8	4.2	4.5
6.8	4.1	4.4	4.8	56	3.7	4.0	4.4	4.8
6.9	4.3	4.7	5.1	57	3.9	4.3	4.6	5.1

Annex IV

SUPER-FLOUR LITO

INGREDIENTS:

1.Two parts pulses – soybeans are best, but other small beans, grams and peas can also be used
2.One part whole grain cereal such as maize or rice
3.One part another whole grain cereal such as wheat, millet or buckwheat.

METHOD

The pulses and grains need are cleaned, roasted well (separately) and ground into fine flour (separately or together). The flour can then be stored in an airtight container for one to three months. The flour is stirred into boiling water and cooked for a short time.

SARBOTTAM PITHO KO LITO

INGREDIENTS:

Sarbottam flour (Pitho)	25gm
Sugar	1 tsp
Clarified ghee	10gm
Water	1 tea glass

METHOD:

1. Heat ghee on karahi.

2. Pour flour into the karahi , stir and fry few minutes.

3. After few minutes add sugar and water. It is better to add boiled water than cold water.

4. Boil 3-5 minutes then keep out from the fire.

VARRIATIONS:

Cooked mashed vegetables can be added to the Lito to improve the nutritional value and vary the flavour. We can add sugar or salt as taste of child.

JAULO:

INGREDIENTS:

Rice	30gm
Moong Dal	15gm
Potato	¼ medium
Spinach	10gm
Clarified ghee	10gm
Salt	¼ tsp
Turmeric powder	A pinch
Water	2 tea glasses

METHOD:

1. Soak rice and moong dal 10-15 minutes and strain.

2. Wash potatoes and fresh spinach . Peel potatoes and chopped into small pieces. Chopped spinach too.

3. Heat ghee on pressure cooker or saucepan.

4. Then pour strain rice and moong dal into the pressure cooker or saucepan.

5. Mix chopped potatoes and spinach. Then stir and fry 4-5 minutes. Add salt and water. Cook until became soft.

ANNEX V

Chart Of Measure Used in Nepal - Approximate Equivalents

Measure	Liquid	Dry	Rice	Corn,	Flours	Pulses	Fresh green	sugar u	Salt
				wheat			leaves	refined	
Litre /kilogram(kg)	100 ml	1000 gm							
1/2litre,1/2 kg	500 ml	500 gm							
mana	596 ml		450 gm	400 gm	250-300 gm	450 gm			
large kachaura(Batuka)	596 ml		450 gm	400 gm	250-300 gm	450 gm			
pound-(16 ounces or 2 cupes)	454 ml	454 gm							
1/4 litere 1/4kg	250 ml	250 gm							
1/2 mana	298 ml		225gm	200gm	150gm				
small kachaura	227 ml		150-160 gm	135-145 gm	100-110 gm	150-160gm			
tea glass(level)	227ml		150 gm	136 gm		150 gm			
pau		200gm							
1/8 litre 1/8kg	125 ml	125 gm							
1/4 mana	149 ml		115 gm	100gm	75 gm	115 gm			
large dadu	90 ml		70-80 gm	60-70 gm	45-50 gm	70-80 gm			
small dadu	45 ml		35-40 gm	30-35 gm	22-25 gm	35-40 gm			
mutthi(closed fistful)			45 gm	40 gm	25-30 gm	45 gm	50 gm	25-30 gm	
half pasar			45 gm	40 gm	25-30 gm	45 gm		20 -25 gm	
pasar(open handful)			100 gm	90 gm	60 gm	100 gm			
anjuli(double open handful)			200 gm	180 gm	120 gm	200 gm		29 gm	
ounce	29 ml	29 gm							
tablespoon	15 ml	15ml						15 gm	15 gm
teaspoon	5 ml	5 gm	2-3 gm					5 gm	5 gm
pinch(3-fingers)									2.5-2.6 gm
	Source : Child Nutrition and Health(2001)								

Weights and Equivalent Measures of Some Commonly Used Food Stuffs

Food Stuff	Measure	Weight (g)
Cereals:		
Rice	1 kachoura	175 gm
Whole wheat flour (Atta)	1 kachoura	125 gm
Semolina (Suji)	1 kachoura	150 gm
Bread (Pau roti)	1 slice	30 gm
Rice flakes (Chiura)	1 kachoura	55 gm
Sweet biscuit		
Salty biscuit		
Pulses:		
Bengal gram dal (Chana dal)	1 kachoura	175 gm
Black gram dal (Kalo dal)	1 kachoura	175 gm
Green gram dal (Moong Chhata dal)	1 kachoura	175 gm
Lentil (Moosur dal)	1 kachoura	175 gm
Red gram dal (Arhar dal)	1 kachoura	175 gm
Bengal gram dal (Chana)	1 kachoura	175 gm
Milk and milk products:		
Milk	1 standard cup	240 ml
Curd	1 kachoura	125 ml
Meats:		
Egg	1	50 gm
Egg yolk	of 1 egg	16 gm
Sausage	1 slice	17 gm
Vegetables and fruits:		
Beans	20 mediums	100 gm
Cabbage	1 medium	300 gm
Carrot	1 medium	90 gm
Cauliflower	1 medium	400 gm
Potato	1 medium	80 gm
peas	20 pods	100 gm
Spinach	1 bunch	250 gm
Bottle guard (Lauka)	1 medium	400 gm
Lady's finger (Ram toriya)	25 small	100 gm
Lemon (Kagati)	1 medium	35 gm
Tomato	1 medium	75 gm
Onion	1 medium	70 gm
Apple	1 medium	150gm
Banana	1 medium	100 gm
Guava	1 medium	125 gm
Mango	1 medium	200 gm
Fats and oils:		
Butter	1 tea spoon	4 gm
Ghee	1 Table spoon	12 gm
Oils	1 Table spoon	11 gm
Sugar & Jaggery:		
Sugar (Chini)	1 tea spoon	5 gm
Jaggery (Sakkar)	1 kachoura	200 gm
Nuts and oils seeds:		
Almonds (Desi badam)	9 in number	10 gm
Cashewnut (Kaju)	8 in number	10 gm
Peanut (Badam)	20 in number	10 gm