INFANT FEEDING PRACTICES IN KHARTOUM PROVINCE

By

DR. Maha Ibrahim Gad-Alla

M. B. B. S University of Khartoum

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SUPERVISOR

DR. MOHAMMED SIR K. HASHIM

FRCP, FRCPI, DTCH, DCH
DEDICATION

Dedicated with utmost love

To my parents, the essence of love and high principles,

without them I wouldn't be where I am now

To my wonderful, beloved sisters and brother

for helping me every step of the way

To my husband for his patience and endless

support, I can't thank him enough

To my precious, precious Aalaa for

having to endure my

three years preoccupation from her
Many colleagues, friends and sympathizers have contributed generously to the preparation of this study, but I feel I must express my gratitude to the following:

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ABSTRACT

Infant feeding the most beneficial form of feeding children in their early life, is of great importance as a determinant of child wellbeing as well as setting roots for better health in adulthood.

The study we have endeavored to perform is a community based, descriptive, comparative, retrospective and randomized study. It was conducted in Khartoum Province in three different areas, Al-Riadh (urban elite), Al-Salama (peri-urban moderate) and Mayo (peri-urban poor) in the period from Jan 2000 to Jun 2000.

The study was designed and conducted in order to evaluate the current infant feeding practices among mothers in Khartoum, to evaluate their knowledge about the optimum infant-feeding practices and to study the effect of different infant feeding practices on children's physical growth and haemoglobin status. 435 children were included in the study, 137 from Al-Riadh, 146 from Al-Salama and 152 from Mayo.

Breast-feeding was practiced by (96.1%) of the population mothers, with no difference in this practice in the three areas of study. Breast-feeding initiation was early in 61.1%, delay being commoner among peri-urban poor population. Colostrum feeding rate was also high being 88.7%. Most mothers (90.2%) fed their children on demand, mothers who practiced scheduled feeding were mainly from the urban elite population where (21.4%) of the mothers there fed their children on hourly schedule.

The main mode of feeding practiced by the mothers during infancy was breast-feeding in (58.6%), (19.1%) were artificially fed while (22.3%) were given mixed feeding.

Exclusive breast-feeding was practiced by only (45.9%) of the population, (78.6%) of urban elite mothers, while in peri-urban moderate and peri urban poor only (32.4%) and (29.7%) practiced it respectively.

Early supplementation before the age of two weeks was a common practice in (34.0%), the practice was commoner among peri-urban moderate and peri-urban poor where they constituted (41.1%) and
respectively. Solid food introduction was initiated in (71.5%) between the age of 4-7 months in the three areas.

Feeding bottles were used by (38.9%) while (61.1%) used cups and spoons in giving fluids. Urban elite mothers used feeding bottles much more (73.7%) than the other two groups. Most mothers in peri-urban moderate and poor areas who used feeding bottles had one bottle only (31.8%) in the former and (70.8%) in the latter, while mothers from urban elite had two or more bottles (79.2%).

Weaning was gradual in most children (63.9%), sudden weaning mostly due to a new pregnancy was practiced by peri-urban mothers. Urban elite mothers weaned their babies earlier, mostly at the age of 12-17 months, while the other two groups weaned their babies at the age of 18-24 months.

The knowledge of mothers was good in (52.2%), while attitude score was good in (72.2%), practice score was good in (80%). Mothers from the peri-urban areas had lower scores, especially so in the knowledge, where only (47.9%) in the moderate and (32.2%) in the poor areas scored good in knowledge. In the urban mothers, good knowledge was scored by (78.8%) of mothers.

The number of diarrhoeal episodes was found to be related to exclusive breast-feeding. (34.3%) of the exclusively breast-fed population had no diarrhoea in the first year of life, while in the supplemented group they were only (3.6%). More diarrhoeal episodes per year were recorded among the supplemented group, the difference being of high significance. However, age at the first episode of diarrhoea did not show significant correlation with mode of feeding.

Growth parameters in relation to mode of feeding showed no statistically significant differences in the three study areas.

Haemoglobin tended to be higher among the breast-fed (mean = 11.5 gm/dl) group in comparison with the artificially fed (10.8 gm/dl) and the mixed fed children (10.9 gm/dl). The variation in haemoglobin in relation to mode of feeding was found to be of statistical significance only in Mayo, where anaemia tended to be less common among breast-fed infants than the other two modes of feeding.
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CHAPTER ONE

1. INTRODUCTION AND LITERATURE REVIEW

Recently there has been much interest in the literature in the role of early life nutrition and its consequent effect on the health of the individual as a child and in adulthood. It is well recognized and agreed on that breast-feeding is the recommended method of infant feeding because it is clearly associated with health benefits for both infants and mothers \(^1\). Psychologically the infant is provided with a close and comfortable relationship with the mother, at the same time the mother is personally involved in the nurturing of her baby, gaining both a feeling of being essential and a sense of accomplishment. Breast-feeding has innumerable practical and psychological advantages that should be considered when the mother selects the method of feeding her infant, yet many women who initiate breast feeding fail to meet their own personal goals or recommended standards for optimum breast feeding for one reason or the other. However, the mother who is unable or does not wish to nurse her infant, need have no less sense of accomplishment or affection for her baby. The quality of attachment
and mothering and the degree of security and affection provided can be identical in both modes of feeding.\(^{(2,3)}\).

Although little if any difference exist in mortality rates in formula-fed and breast-fed infants receiving good care, among the lower socioeconomic groups and those living in unsanitary conditions, the breast fed infant is much more likely to survive\(^{(3)}\). In the face of such knowledge, the fact that artificial feeding has become so widespread throughout the world, and even among lower socioeconomic groups, is perhaps an indictment of the apathy of doctors, nurses and others who are in a position to give advise and education to future parents. The trend is encouraged by the changes in society and our way of life, which seems to make artificial feeding more convenient and more fashionable\(^{(4)}\).

Discussion of infant feeding is beset with difficulties that are largely created by the use of fixed systems. No system will ever meet the needs of every infant, for each baby is an individual with his own idiosyncrasies from the moment of birth; if a baby does not thrive it may be that the error lies in the system of feeding rather than on the infant. However, some rules can be stated as to the quantity and quality of food needed, and these rules can do no harm so long as they are adjusted to meet the requirements of each baby.
In almost all discussions about infant feeding it is assumed that the process is solely concerned with supplying the infant with adequate nutrition, whereas an important part of the process is to help the mother fall in love with her baby. In this way the mother-infant attachment is made secure so that she will not wish to be parted from her baby in the early months, and her continuous presence will give the baby security and the mother a proper understanding of his needs throughout his early development (4).

1.1. INFANT FEEDING PATTERNS:

A number of patterns of infant feeding are seen in clinical practice. The spectrum goes from exclusive breast-feeding for at least 4 months, through varying periods of feeding infant formula, to the early introduction of supplemental foods and cow's milk. These patterns are constantly changing and are probably influenced by many different trends in the society, both medical and non-medical.

The most important thing to note is that, while it is difficult to state with any degree of accuracy what is the worldwide proportion of mothers who cannot breast-feed; it is unlikely to exceed 10%. It is in the other aspects of infant feeding that variations have been quite considerable over the last half-century or so and from one culture to the other, the duration of breast-feeding and the point at which additional foods are introduced. These variations in patterns of infant
feeding were already discernible by the end of the 19th century. Knodel & van de Walle suggested that in central Europe and especially in parts of Germany, there were considerable changes in the frequency and duration of breast-feeding at that period

In the early parts of this century, semi solids and solid supplements were generally recommended for infants of about 12 months, and quite a stir was created in 1921 when Jundel presented evidence that infants would accept, tolerate and benefit from supplements introduced from the age of six months. With time, it even became common for the health professionals to recommend supplements from the age of three months. As the idea of early supplementation became more accepted, however, it became increasingly apparent that many mothers were introducing other foods considerably earlier than the third month, and this practice was rightly criticized as not only unnecessary, but indeed physiologically inappropriate.

Because of growing concern about the practice of early supplementation, statements were issued by a number of bodies to the effect that, given a favorable environment, the appropriate time for the introduction of supplementary foods was around 4 months.

In order to influence the feeding of infants positively, paediatricians and other professionals are making greater efforts to
understand and then utilize the cultural and historical patterns that result in such diverse patterns of infant feeding at the same time that they are demonstrating which ones will promote optimal health in the population\(^6\).

1.1.1. Ancient evidence of breast-feeding patterns:

Historical evidence relevant to breast-feeding and "mothering" is found engraved on the great monuments, like the temples in Egypt, and on the ruins found in Babylon, Phoenicia and Arabia, as well as in the texts of sacred religious books and of leading physicians, philosophers and writers.

Early methods of infant feeding were mostly handed down by word of mouth and few written accounts are available. Present knowledge is therefore, to a great extent, a matter of speculation, combined with such archaeological clues as are occasionally found in the form of terracotta relief's, rock carvings, figurines and especially the presence or absence of feeding bottles\(^9,10\).

In pre-Ptolemaic Egypt, prolonged breast-feeding up to the age of three years was practiced. This is emphasized by the absence of feeding bottles from excavated ruins during this period.

In the pre-Islamic era, Egypt and other countries in the western part of the region falling under the Graeco-Roman influence were affected by the feeding practices of the Hellenic culture where
the custom of feeding infants with specially prepared bottles or farming them out to wet-nurses appears to have been common. On the other hand, countries in the eastern part, such as present day Afghanistan, Iran, Pakistan and in the Arabian Peninsula, were influenced by practices introduced via India.

The value of human milk in infant feeding has been appreciated for thousands of years in India, as is emphasized by the "Caraka Samhita", an encyclopaedic collection of Ayurvedic beliefs antedating Buddha, which devotes twenty stanzas to the properties of milk and its products \(^{(10)}\).

In the Islamic era, breast-feeding followed the tenets of the sacred book the Holly Quran for many centuries, with little apparent change prior to the middle of this century. The Quran provides the followers of Islam with special instructions regarding the duration of lactation, weaning and rearing of infants, and forbids marital relationships between the adult male and the mother who has suckled him (biological mother or wet-nurse) and his sister, natural or sister in milk \(^{(9)}\).

In ancient Babylon, the vital significance of breast-feeding was appreciated, this is indicated by the fact that the Great Mother Goddess (the moon Diety), who embodied the reproductive energies of nature and was the giver of growth and fertility, the destroyer of
life, Ishtar, and the Mourning Aphrodite of Lebanon, who exerted her influence throughout the neighboring countries, were all depicted as suckling a baby \(^{(10)}\).

During the earlier stage of Greek civilization, breast-feeding seems to have been carried out largely by the infant's mother, while later on the babies of the well to do were wet-nursed for about six months and then artificially fed cow's milk for some eighteen months. The commonness of artificial feeding is indicated by the widespread presence of feeding bottles in excavations dating from this period \(^{(11)}\).

**1.1.2. Background to the unique practice of infant-feeding:**

The rate of growth during the first year of life is greater than at any other stage of life after birth. The normal baby double his weight in five-month time trebles it in 12 months and quadruples it in 24 months. To achieve this, the intake of food must be relatively great and of a quality that allows easy digestion. Human breast-milk is therefore ideal for baby nutrition for it contains in liquid form a reasonably balanced mixture of protein, fat, carbohydrate, minerals and vitamins. Supplementary feeding should be avoided for the first four months of life, since the disadvantages of early introduction of supplementary feeds include the risk of diarrhoeal diseases and
subsequent malnutrition and the impairment of gut maturation leading to an increase in food sensitivity disorders \(^{(3,12)}\).

Toward the end of the first year of life and during the second year, because of the constantly decelerating rate of growth, there is a gradual reduction in the infant's caloric intake per unit of body weight. In addition, it is not unusual to have temporary periods of lack of interest in certain foods or even in food in general. Failure to recognize these features, especially the decreasing caloric needs, results in attempts to force feed. The child naturally rebels and feeding problems ensue\(^{(4)}\).

Zodpey and etal emphasized that mothers' knowledge about the key breast-feeding indicators as recommended by the WHO, is the most valuable factor that explains breast-feeding duration and other modalities of infant feeding \(^{(13)}\). These indicators cater for the changing pattern of the infant's food habits during the first two years of life and they should be explained to the new mothers and would be mothers. It is important to note that most infants naturally adapt themselves to a schedule of three meals /day by the end of the first year of life \(^{(14)}\).

Though considerable latitude in the diet of each infant should be permitted to allow for personal idiosyncrasies and family habits, it is however necessary that the mother should know the
outline of the daily basic dietary needs \(^{(13)}\). So far there is almost a universal agreement among pediatricians, nutritionists and other health care professionals about the optimal feeding practices for infants and young children. This include the agreement on the benefits of feeding of colostrum, the benefits of exclusive breast feeding for the 1\(^{st}\) four months of life, appropriate age for supplementation, age at which solids should be introduced and benefits of gradual weaning as well as disadvantages of artificial feeding \(^{(13)}\).

1.1.3. Factors affecting infant-feeding practices:

Many factors intervene and influence infant feeding practices of mothers; these factors are mostly consistent with the social cognitive theory, both internal personal and socio-environmental as well as the psychosocial variable \(^{(12)}\).

The adolescent mother is much less likely to breast-feed her infant. Still struggling to establish her identity, she often finds the constant physical and emotional demand of her infant so difficult that she is psychologically unable to make a commitment of such magnitude to her child. Also, woman's breasts are an important part of her body image and attractiveness, her feelings about them may affect her decision to breast-feed or bottle-feed. For example some women with unusually large breasts, affected by adolescent trauma, choose to bottle-feed because the prospect of their breasts being even larger
during lactation is abhorrent. In some societies exposure of the breasts is socially taboo, and simple modesty or shame accounts for at least some women's shying away from breast-feeding\(^{(15)}\).

Many other factors influence the duration of breast-feeding negatively; these include early use of supplementary formulae, use of oestrogen-containing oral contraceptives, parents with high incomes and mothers with high education levels. In contrast, the mother's religious attitude to breast-feed and her insistence have a positive impact on breast-feeding\(^{(16)}\).

Lots of these factors interact and affect infant feeding, but typically the practice of infant feeding in any society constitutes an integral part which is determined by the multiplicity of interrelated factors in the ecological context, including: type and organization of social institutions, economy and means of livelihood, population structure and movement, cultural and religious beliefs, customs and life styles.

The changing patterns in breast-feeding in relation to the major factors of influence are clarified by figure (A) below:

**Fig. (A) Major factors affecting breast-feeding**
Work
"Modernization" of health services

Modification of social changes *

Tradition **

Training Of health workers

Education ***

Legislative Measures

Reorientation Of health services organization

* Urbanization, nuclear families, socioeconomic conditions, psychological changes, imitation of reference groups, progress in milk substitutes and advertising for bottle-feeding.

** Corresponds to breast-feeding as the infant's only food source.

*** Motivation, participation of population and access to scientific information.

Source: Pechevis, M.(1975)

In collaboration with M. Bonnal.

(From Breast-feeding patterns, a review of studies in the EMA)

Occasionally interventions at appropriate ventures modified situations to the advantage of breast-feeding for example some advances were achieved by some hospitals in favor of breast-feeding, and this was mainly achieved by following simple measures such as
the rooming-in practice, whereby mothers have unlimited access to their children, this facilitates early initiation of feeding, encourages feeding on demand and strengthens mother-child bonding \(^{(17)}\).

1.1.4. *Historical background of infant-feeding patterns:*

- **The ancient societies:**

Ancient patterns of breast-feeding have important implications for today. The transition of human society from the ways of the tribal hunter-gatherer to agricultural-rural living and ultimately to a predominantly industrial-urban society has been gradual.

However, the cumulative impact of these changes on mothers and infants has been profound and sudden; indeed, taking place almost entirely within three generations. Always before, breast-feeding has been the norm in all cultures; intrusion of the bottle followed hard on urbanization.

In the era of time when women had to trek toward distant better lands looking for seeds and berries, swaddled securely, her baby is carried on her body and gently rocked by the mothers movements as she gathers her food at the side of the other members of her tribe. He breast-feeds often, gazing into his mother's eyes, and responding to the loving cadences of her voice, even then there is evidence that during this period, some thousands of years ago; artificial feedings were attempted, most often quite unsuccessfully \(^{(18)}\).
Feeding vessels have been found in Egyptian graves as long ago as 2500bc. Other feeding vessels found in Europe appear to have been in use about 500 years later. A pair of spouted feeding cups from the grave of premature twins, circa 600 B.C, was discovered in Sudan, in these vessels it is believed that milk from goats, donkeys, and other animals have been used. Direct suckling of animals must have been occasionally resorted to, for reference to this practice is found in Egyptian etchings and Greek myths.

Throughout the centuries, during periods of great wealth and luxury many women turned to artificial feeding or wet-nursing for their babies. Such practices moved Spartan royal lawmakers in 4 BC to dictate that all mothers should breast-feed, and Emperor Caesar Augusts ridiculed mothers who retained wet nurses for their infants (18).

Ibn Sina (Avicena) laid down principles, which govern infant feeding and weaning, as early as the eleventh century, in his "Canon of Medicine". He stipulated that whenever possible mother's milk should be given by suckling. According to him the baby should be put to the breast twice or three times a day, and should continue on breast milk for no less than two years. When supplementation is required this should be undertaken gradually and not to wean the infant abruptly. As for introduction of solids he stated that this should be after the
eruption of the first two teeth. Ibn Sina principles influenced infant feeding positively throughout the Middle Ages in Europe\(^{(19)}\).

**1600 to 1850:**

Although the life threatening potential of feeding babies with animal milks was well recognized, the eighteenth century marked a major decline of breast-feeding, specially in urban Europe, and resorting to artificial feeding with breast-milk substitutes.

Along with the social change, the rapid development of scientific technology during the industrial revolution and the spectacular advances in medical science, all this provided a complex matrix that encouraged the trend toward artificial feeding. Mechanized transportation and improved agriculture made urbanization possible. Immigration from farms to cities led family units to become more fragmented and dependent on cash economy. As a result, women were frequently forced to work soon after giving birth, having no alternative but feeding their babies with human milk substitutes. Records indicate that pap gruel, the forerunners of modern baby foods, was first used in1600's. Pap was a liquid, usually cow or goat milk, combined with bread, rice, or flour. Its use often led to under nutrition, since it had to be diluted to pass through the opening of the container\(^{(20,21)}\).
The literature is replete with references to the high mortality level of artificially fed infants from infection, especially diarrhea, during the eighteenth and nineteenth century. In colonial America the mortality of children under the age of two years was very high- 50% by conservative estimate. When the milk of cows and goats had to be used for feeding, mortality rose to 65%. As might be expected, physicians strongly urged women to breast feed for as long as possible.

To avoid the dangers of artificial feeding during this era, affluent mothers employed wet nurses. In Greek and Roman societies and later in mediaeval Europe, recourse to wet-nurses became relatively popular among economically advantaged women, along with the avoidance of dangers of artificial feeding, it permitted them to have fewer responsibilities (20). Such was the importance attached to wet-nursing in this era that in Rosen Von Rosenstein's textbook of 1764, no fewer than 14 pages were "on nurses". Almost 150 years later, Von Pfauendlr & Scholossmann's Handbuch der Kinderheilkunde still contained five pages on the subject.

Late 1894, Jefferis instructed mothers of that era: "breast milk is the only proper food for infants until after the second summer. If the supply is small, keep what you have and feed the child
in connection with it, for if the babe is ill this breast milk may be all that will save its life \(^{(21)}\).

**Late 19\textsuperscript{th} and early 20\textsuperscript{th} century:**

This century is noted for three important trends in the developed countries:

- The virtual extinction of wet-nurses and their replacement, in some hospitals, by the "breast-milk" banks for the feeding of premature infants.

- A definite and progressive decline in breast-feeding in general at the beginning of the nineteenth century.

- A resurgence of breast-feeding among the highly educated urban elite (who were originally the pace setters of bottle feeding) as of late 1950s, with a continuing decline among the lower-income groups.

Interestingly enough, although the domestication of cattle goes back 10,000 years in some areas of the world, animal milks were, with few exceptions, not perceived as an alternative to mother's milk until relatively recently. This was later followed by the introduction of breast milk substitutes, which became an important product of the food industry in the technologically advanced countries.

In the 1970s, the decline in breast-feeding spread from the developed countries to the developing world, accelerated by over enthusiastic marketing practice. At the same time, this development
was paralleled by the increase in number of women taking up jobs outside the home to augment family income, making it difficult for them to adopt a proper regimen of breast-feeding and hence resorting to artificial feeding. The use of artificial feeds in unhygienic circumstances by illiterate mothers resulted in tragedies among infants of alarming proportions during this period (19). In Bavaria and Austeria, for example in the late nineteenth century, infant mortality rates were between 300 and 400 per five thousand births in areas where breast-feeding has been abandoned, in contrast to rates well below 200 in neighboring districts where breast-feeding was the usual practice. In Boston, in 1911, infant mortality rates were almost ten times higher for bottle-fed infants than for breast-fed babies (22).

During the past two decades there has been resurgence in breast-feeding, especially among the more educated segments of the population, and it is not clear to what extent paediatricians either individually or as a group have been responsible. Nor is it clear to what extent advertising has negatively influenced the actual practices of various groups within the population (23).

**1.1.5. Cross cultural influences:**

The practice of breast-feeding is sensitive to cultural and social changes and the methods of infant feeding are not of sudden development but rather the result of numerous, continuous and
changing socio-cultural, technical and economic influence, leading to changes in maternal behavior.

In looking at breast-feeding cross-culturally, the values, customs, beliefs and traditions of people must be examined and understood. The term culture can be a blue print for human behavior and can help in gaining a clearer understanding about the cultural health-care practices of people, without which intervention could possibly do more harm than good, therefore health-care programs are beginning to emphasize cross-cultural awareness in its curricula. Recent knowledge of the psychophysiology and endocrinology of lactation clearly endorse certain practices, often already used in many traditional cultures, as being most likely to lead to success in breast-feeding \(^{(20)}\).

Jelliffe (1976) has classified infant feeding practices, observed on a universal scale into four major patterns according to the changing maternal behavior in different cultures and socioeconomic conditions, and Pellet (1977) has suggested a fifth one, this classification was as follows \(^{(24)}\):-

- Traditional pre-industrial - Total breast-feeder.
- Recently urbanized poor - Emerging bottle feeder.
- Urban educated well-to-do - Elite bottle-feeder.
- Naturalist urban educated - Neo-elite breast feeder.
1.1.6. Breast-feeding, some religious considerations:

Islam has specified two years term of breast-feeding, it urges for the completion of these two years unless there are solid bases, and if weaning should take place earlier it should be after due consultation between both parents. The Holy book, Quran mentions rules governing breast-feeding, for example it says

"The mothers shall give suck to their offspring for two complete years, for those who desire to complete the term." Sura II, Al-Baquarah, verse 233

From the previous verse, it is apparent that it is the duty of the mother to breast-feed her child and not to deny it the right of benefiting from and enjoying breast milk for two years.

It is also mentioned in the Quran:

"If they both decide on weaning, by mutual consent and after due consultation, there is no blame." Sura II, Al-Baquara, verse 233

Thus, weaning is allowed earlier on condition that this decision is taken by mutual parental agreement.

It is also mentioned in the Quran:
"And we have enjoined on man the doing of good to his parents. His mother bears him with trouble and brings him forth in pain, and the bearing of him and the weaning of him is thirty months" Surat Alahqaf verse 15.

The Quran provides its followers with special instructions regarding wet-nursing:

"And if you wish to engage a wet-nurse for your children, there is no blame on you so long as you pay what you promised according to usage. And keep your duty to Allah and know that Allah is seer of what you do" Surat Al-Baquara verse 233

1.1.7. The need for a national policy:

There is a general agreement that there should be a national policy for the promotion of breast-feeding without which set measures well remain uncoordinated and might cease at any moment due to pressures of other activities and setting of other priorities.

For this goal to be realized, all partners concerned need an opportunity to come together, confer, collaborate and coordinate activities so that their combined efforts lead to sustained success (25).

Traditionally, the health care system is considered the main participant in issues related to breast-feeding. However, the role of
other partners has become increasingly important to promote, protect and support breast-feeding, especially when maintenance of breast-feeding behavior is required. In fact, experience from countries around the globe amply indicates the need of making national inter-sectoral alliances to protect, promote and support breast-feeding (25).

1.1.8. Role of the Non Governmental Organizations (NGOs):

During the last decade and in view of the stormy controversy over bottle-feeding, intensive campaigns have been mounted at global and national levels promoting breast-feeding and highlighting the dangers of artificial feeding. As a result a number of non-profit organizations were founded.

Some of these organizations are committed to oppose formula sales in the under developed areas of the world. Two such groups are the Infant Formula Action Coalition (INFACT) and the Interfaith Center on Corporate Responsibility (ICCR). These organizations, with increasing concern, are demanding stronger regulations and codes of ethics for formula advertising in the Third World countries.

Efforts of these organizations were not in vain, for in 1979 in Geneva, in a meeting sponsored by the WHO & UNICEF, representatives of the baby food industry joined medical experts and NGO members and agreed that breast-feeding, should be "protected
and encouraged" every where and that promotional advertising of formula to the consumer should be stopped. Participants formulated a draft code of ethics recommending ethical international sales and marketing practices. In May 1981, following several revisions, the World Health Assembly passed the code. This was immediately followed by several countries governmental support, e.g. the government of Colombia announced the prohibition of all advertising of milk products in hospitals, health posts and medical centers, and the Ministry of Health resolved to specify measures that aid breast-feeding that were to be used by physicians and nurses in Colombia. In Papua New Guinea, the selling of formulae, bottles and nipples is no longer possible without a prescription (26).

Other NGO's deal directly with women in order to "protect and promote" breast-feeding. Without question the largest and most effective self-care group for breast-feeding help is La Leche League International (LLLI). Founded in the United States in 1956 by seven women, the organizational base are small neighbourhood groups, in each of which 6-20 women attend monthly meetings in the homes of members and volunteer leaders. Leaders are regarded as local authorities on breast-feeding, and have various socioeconomic backgrounds, they are carefully chosen and become certified leaders after completing a period of training.
The corner stone of the organization is personal mother-to-mother warmth and caring. Evidence of this organization success is that (LLLI) has grown over the last two decades into a worldwide, internationally recognized authority on breast-feeding, with more than 3500 groups in 46 countries (27).

1.2. INFANT FEEDING TRENDS:

Under close scrutiny a number of discrepancies are apparent in demographic studies of breast-feeding, but mostly the trend now among most population groups is towards breast-feeding as shown by several studies.

Studies carried out in upstate New-York USA, and in Nottingham, England showed that failure to breast-feed is more marked in lower social groups. Conversely, increased awareness of the importance of breast-feeding for mother-child relationships has become evident in highly educated segments of the population (20).

This current trend in breast-feeding may be a part of a greater social movement towards the natural. The convenience, economy, nutritional superiority and personal satisfaction of breast-feeding certainly expresses the philosophy of naturalism (28).
1.2.1. *Global infant feeding trends:*

The information on the global breast-feeding situation shows great variability, but generally the prevalence of breast-feeding, especially after 3 months, is highest in Africa and lowest in Europe and the Americas.

Global trends show a decline in breast-feeding among the disadvantaged in the developing world, for whom breast-feeding can make a life or death difference. In industrialized countries, extended breast-feeding is more common among educated, economically advantaged mothers, whereas in developing countries it is greatest among the rural poor \(^{(29)}\).

In many developing countries, a large proportion of the population is becoming urbanized, traditional family structures are breaking down, and an increasing number of women are entering the labor force. All of these circumstances seem to result in a decline in breast-feeding similar to that observed in the industrialized countries earlier this century.

In summary, global trends show reasonably high initiation rates of breast-feeding in all regions. However, exclusive breast-feeding, which is considered the optimal breast-feeding pattern for the first 4-6 months of life is rarely practiced, and supplementation is started far too early \(^{(29)}\).
1.2.2. Patterns of infant feeding in the Eastern Mediterranean area (EMA):

The prevalence of breast-feeding in the (EMA) is similar to that reported for the African region. Initiation of breast-feeding is high, but there is a decline in breast-feeding prevalence with a marked shift from exclusive to partial breast-feeding in the first 3 months.

While breast-feeding practices differ greatly among populations and socioeconomic groups in the region, differences are not seen in the initiation of breast-feeding but are marked at 3, 6 and 12 months of infant's life. Various data from Morocco, Pakistan and Tunisia show that only 46%, 12% and 13% of infants respectively were receiving exclusive breast-feeding at four months although initiation at birth was almost in all cases \(^{(19)}\).

1.2.3. Patterns of infant feeding in the Sudan:

The Sudan is the largest country in Africa, its population comprises two distinct major cultures, each comprising a vast number of ethnic groups with great ethnic diversity. Thus far, the breast-feeding patterns of all these ethnic groups have not been well studied, and some variations can be expected to occur which would make it rather difficult to refer to a universal breast-feeding norm in the country.
Studies showed that breast-feeding was initiated very early among majority of population groups in Sudan (within the 1st half-hour), the mean duration of breast-feeding ranged between 14.2-16.7 months. The proportion of breast-feeding was high during the first year of the infant's life but then dropped abruptly, especially among urban groups (30).

Weaning started between six and twelve months, a bottle was commonly used to feed the baby. About 20% of mothers did not supplement their infants diet during the first year, the majority started supplementary foods between seven and twelve months while 25% started during the first six months. The main foods provided for the children are milk and cereals (31). In a study carried out by Salih, M.A.M., El-Bushra, H. M. and etal, in 1990, attitudes and practices of breast-feeding in Sudanese urban and rural communities were closely looked upon. In a representative sample of 1039 Sudanese women, corresponding influencing factors in urban and rural communities in six states were documented. Almost all mothers (99.9%) initiated breast-feeding mostly in the first day, between 1-5 hours following delivery (83.2%), delay of six or more hours was practiced mainly by rural mothers. The breast-feeding rate was 92.0% at seven months and 65.0% at one year, 4% still breast-fed at two years.
Urbanization affected frequency of breast-feeding adversely where as the presence of sore or retracted nipple had a negative effect on its duration. The majority (89.2%) thought that a new pregnancy contradicted the continuation of breast-feeding and 67.1% reduced or stopped it. There was a tendency towards short duration of breast-feeding in urban affluent mothers in comparison to others (32).

Another study, evaluating nutrition and child feeding patterns in the Sudan was conducted by Harrison, Gail G., university of Arizona, Tucson, Arizona, U.S. He analyzed most of the factors related to infant-feeding including breast-feeding, weaning practices, use of supplements to breast milk, frequency of sucking and transition to household diet, it also looked upon feeding during illness and during the month of Ramadan as well as food taboos during pregnancy. The study was concluded by regional, political, ethnic and cultural considerations for targeting of programs for the nutrition communication projects (33).

1.3. **THE UNIQUE QUALITIES OF BREAST-MILK:**

As early as 1947 Platt and Moncrieff emphasized the well-known advantages of breast-milk, such as its cheapness, freedom from bacterial contamination, steady composition and easy availability. They also agreed that, provided the mother's diet is adequate, the
breast-fed baby is less likely to suffer from scurvy, rickets or iron deficiency anaemia than the infant fed on cow's milk alone \(^{(34)}\).

The configurations of elements in the milk are like computer information with reciprocal fitness between the mother and the infant. Moreover, even in special cases such as the accelerated energy needs of the premature infant, this adaptability is seen in the greater availability of energy in the milk of the pre-term mother milk \(^{(35)}\).

1.3.1. *The mammary glands structure and function:*

The mammary glands are modified exocrine glands, which undergo numerous anatomical and physiological changes in pregnancy and immediately following birth.

The breast grows during puberty develop further in pregnancy, secrete minimally in late pregnancy and achieve major secretory activity after childbirth.

Many hormones are necessary for full mammary gland development. In general oestrogens are primarily responsible for proliferation of the mammary ducts and progesterone for the development of the lobules. During pregnancy, prolactin levels increase steadily until term, and under the influence of this hormone plus the high levels of oestrogens and progesterone, full lobulo-alveolar development of the breasts take place \(^{(20,36)}\).

1.3.2. *Physiology of lactation:*

This is basically a function of four overlapping stages, namely (36):

- **MILK INITIATION (LACTOGENESIS):**

  This is a function of placental lactogen, a prolactin like responsible for colostrum and early milk secretion.

- **MILK SECRETION (GLACTOPOEISIS):**

  This is under the control of the anterior pituitary hormone, prolactin.

- **MILK EJECTION OR"LET DOWN" PROCESS:**

  This is a function of oxytocin.

- **MILK INGESTION:**

  This is mother-newborn interaction dependent.

1.3.3: Biochemical and physiological characteristics of human milk:

- **Nutritional and energy values:**

  Milk from the well-nourished mother is eminently capable of providing sufficient energy in the form of calories to permit normal growth and development. During the first month, the breastfeeding mother's normal yield approaches 600ml/day. In the third month after delivery this becomes 700-750ml/day, during the sixth month it reaches 750-800ml/day. Thereafter there is a steady decline in volume as the baby's diet is supplemented by additional foods.
Each 100ml of milk yields 75kcal of energy, the variable volumes produced at different stages of the infant's life correlate appropriately with the needs imposed by age and weight \(^{(20)}\).

- **Fat:**

  The largest source of calories is fat. The fat content of human milk has a diurnal variation, being lowest at 6 am and gradually increasing to its highest level at 2 p.m. During a single nursing, the highest concentration of fat is found at the end of the feed in the "hind milk" \(^{(37)}\).

  The fat content of human milk varies according to maternal diet therefore dietary counseling should be an important aspect of teaching care when the milk composition is critical, as with the pre-term infant \(^{(38)}\).

  In the 1960s and with the discovery of prostaglandin in human milk, it has been proposed that they may play an important role and affect many physiologic functions including local circulation, gastric and mucous secretion, electrolyte balance, zinc absorption, and release of brush border enzymes. Moreover they confer "cytoprotection" to the gastrointestinal tract against many harmful toxins \(^{(39)}\).
Lactose:

Lactose is found in great quantities in human milk (6.5%-7%). It accounts for most of the carbohydrate in human milk, galactose and fructose in small quantities.

Lactose enhances calcium absorption and metabolizes readily to galactose and glucose, which supply energy to the rapidly growing brain of the infant. Lactose also promotes the growth of lactobacilli, thus increasing intestinal acidity and stemming the growth of pathogenic organisms\(^{(40)}\).

Protein:

The proteins of milk are casein and whey. Whey proteins, largely lactalbumens and lactoglobulins, predominates (60%) in human milk while the casein forms about 40%. As a result soft flocculent curds form and are quickly and easily digested, supplying a continuous flow of nutrients to the baby.

Two amino acids specific to human breast milk are cystiene and taurine. The former is essential to somatic growth while the latter is needed for early brain development and maturation. Both these substances are found in abundance in human milk and are of obvious importance to the newborn who lacks the enzymes necessary to convert tyrosine to cystine and cystine to taurine. Although the blood of breast-fed infants contains ample
cystine and taurine, that of infants fed breast milk substitutes contains very little of these essential proteins \(^{(41)}\).

- **Iron:**

  Although iron is found in small quantities in human milk (0.5-1 mg/L), the healthy breast-feeding infant of a mother who maintained a reasonably adequate diet during pregnancy rarely needs iron supplementation before six months of age. This is mainly because the full-term newborn has ample iron stores that do not begin to be depleted until 4-6 months of age. Iron in the human milk is used with a superior degree of efficiency (49%) because of the high lactose and vitamin C levels that facilitate absorption. Also, breast fed infants do not risk loss of iron as do cow's milk-fed infants, who can experience micro-haemorrhages of the bowl as a result of mucosal damage by the milk.

  Iron supplementation is therefore not needed in breast fed infants and may indeed be detrimental to their health during the first 6 months after birth. Excess iron tending to saturate lactoferrin and thereby diminishing its anti-infective properties \(^{(42)}\).

- **Vitamins:**

  The direct consumption of breast milk ensures that all the vitamins present in the milk are transferred to the infant, whereas
in formula-feeding vitamins are frequently lost in collecting, processing, reconstituting and heating.

The levels of vitamins in breast milk, especially water-soluble vitamins, are influenced to some extent by the mother's diet, it is therefore of great importance that to satisfy the vitamin and trace element requirements of her infant, she should eat a variety of nourishing foods.

**Vitamin D:** The amount of vitamin D in human milk once thought to be 22IU/L is currently being reevaluated since the discovery of a water soluble variant of the vitamin.

Although rickets is rarely seen in breast-fed infants, especially if their mothers are well nourished, some recent reports of rickets have led to the recommendation of vitamin D supplements for children subject to certain conditions.

However, the breast-fed infant who is adequately exposed to the sun and thus to the radiant precursors of vitamin D and whose mother consumes adequate nutrients does not need routine vitamin D supplementation\(^{(43)}\).

**Vitamin K:** Required for the synthesis of blood clotting factors. Vitamin K is present in human milk (15ug/L) and is absorbed efficiently, but administration of vitamin K to an infant who is to be breast-fed may be justified, since the infant usually receives only a
small amount of breast milk during the first 2 days after birth. And as far as is known, during the first few weeks of life vitamin K is not manufactured in the infant's gut \(^{(44)}\).

**Vitamin E:** Human colostrum is particularly rich in vitamin E (2mg/L), and mature breast milk levels, too are higher than in cow's milk (0.4mg/L). Like vitamin K, vitamin E is absorbed in sufficient amounts when given orally \(^{(45)}\).

**Trace elements:** Many of these are thought to be essential in human development, especially the neonate. There are numerous numbers of trace elements, including arsenic, zinc, chromium, cobalt, selenium, copper, fluorine, silicon, tin, manganese, nickel, vanadium and others. Trace elements have a variety of biochemical functions in all living organisms, and their presence in amounts that are too high or too low can have important consequence. Deficiencies in these elements may result in poor growth, abnormal overall development, skin disorders, bone fractures and increase in neonatal morbidity \(^{(46)}\).

For example, the trace element zinc brings about dramatic improvement in acrodermatitis enteropathica, a serious congenital disorder that manifests itself in part in severe dermatitis. This disease does not usually occur in breast-fed infants. Since levels of zinc are high in both human and bovine milk, it is currently thought that the high bioavailability of zinc in human milk is brought about by a zinc-
binding component that facilitates absorption of the mineral from the intestine\textsuperscript{(47)}.

1.3.4. Colostrum:

This is secreted from the breasts during the latter part of pregnancy and for 2-4 days after delivery. It has a deep lemon yellow color, its reaction is alkaline, and its specific gravity is 1.040-1.060, in contrast to the average specific gravity of 1.030 for mature breast milk.

The total amount of colostrum secreted daily is 10-40 ml. It contains three times the amount of protein as in mature breast milk, this high level is due to the presence of several additional amino acids and antibody rich proteins, especially secretory IgA and lactoferrin. All ten amino acids are present in colostrum and account for approximately 45% of its total nitrogen content. Colostrum also contains more minerals, but less carbohydrate and fat as well as containing some unique immunologic factors\textsuperscript{(3)}.

1.3.5. Immunology and protective qualities of breast-milk:

That breast milk offers the newborn protection against disease has been recognized for hundreds of years.

Protection is due in part to the direct mode of transmission from mother to baby thus eliminating many opportunities for contamination. More important than the external factors are those
intrinsic to the milk itself, these special components, one frequently enhancing the efficacy of the other prevents infantile diarrhoea and numerous other infections during the breast-feeding period and beyond\(^{(48)}\).

These immunological components include:

- **Cellular components:**

  These are mainly macrophages and neutrophils which destroy harmful bacteria by phagocytosis, they may also secrete lysozyme and lactoferon. Abundant also in milk and colostrum are the lymphocytes that produce secretory IgA and interferon, two vitally important anti-infective substances.

- **Immunoglobulins:**

  The immunoglobulins IgA, IgG, IgM, IgD are among the most important protective factors in human milk and supplement the immunoglobulins earlier transferred across the placenta. The most significant of these is secretory IgA, which appears to be both synthesized and stored in the breast itself, it affords protection against a variety of organisms including E.coli, salmonella, shigella, streptococci, staphylococci, pneumococci, poliovirus and the rotavirus\(^{(49)}\).
• **Lysozyme:**

  A well-known anti-infective enzyme that is found in breast milk in concentrations up to 5000 times that found in cow's milk. It is specific in its action against certain micrococci as well as against E.coli and salmonella typhae. Lysozyme may also provide protection against several viruses. Lysozyme activity appears to increase during lactation with the highest levels occurring 6 months after delivery \(^{(50)}\).

• **Lactoferrin:**

  A potent bacteriostatic and iron binding protein, it is abundant in human milk but not present in cow's milk. In combination with secretory IgA, it destroys pathogenic strains of E.coli. Because it is an unsaturated iron-binding protein, it readily absorbs enteric iron, thus preventing pathogenic organisms from obtaining the iron they need for survival.

• **The bifidus factor:**

  Was first recognized by Gyorgy, it promotes the growth of the beneficial gram-positive lactobacilli, which dominate the intestinal flora of breast fed infants, especially lactobacillus bifidus, and discourages multiplication of pathogens. On the other hand formula fed infants have primarily gram-negative, potentially pathogenic intestinal colonization. The low pH of the breast-fed
infant's intestinal contents and the large amount of ingested lactose further enhance the action of the bifidus factor and protect against protozoa and enteropathic bacteria\(^{(51)}\).

### 1.3.6. Breast-feeding and food allergy:

Cow milk proteins are antigenic when taken by mouth by babies. Detectable antibodies to them develop in most babies given a few feeds of cow milk in the first months. An open study was carried out by Y. Vandeplas et al. in 75 infants over a period of four months to assess the allergic effect of cow milk on infants. The infants were at risk of allergy because at least one parent or sibling had confirmed atopy. Atopic disease was confirmed in 40% infants with positive family history who received cow's milk-based formula, an incidence similar to that previously reported in much larger groups.

They concluded that it is justified to strongly suggest exclusive breast-feeding for at least the first four months in newborns from a family with an atopic history. If breast-feeding is impossible, a hypoallergenic formula seems an advisable alternative\(^{(52)}\).

In a number of clinical trials and immunological studies and most of those in the literature, suggest that IgE-mediated disorders in atopy prone families are amenable to prospective prevention or amelioration. The strategy which appears to be effective includes breast-feeding for at least six months, the avoidance of highly
allergenic foods in the mother during the last trimester and while breast-feeding and in the infant during the first year or two of life. Also avoidance of supplemental cow's milk and/or soy-based formulae during the first two years of life is advisable in atopic infants \(^{(53)}\).

1.3.7. Breast-feeding and child spacing:

The inhibition of ovulation in lactation is a well-known physiological process. Continued lactation lengthens the birth interval, thus benefiting the health not only of the mother and child but also of future children \(^{(54)}\).

By inhibiting ovulation, total breast-feeding markedly decrease the incidence of pregnancy during the 1\textsuperscript{st} nine post-partal months and often much longer. It has been found that the level of amenorrhoea at one month was as high as 85\%, at three months 50\% and at five months 25\% \(^{(55)}\).

The contraceptive value of lactation is especially important in areas of the world where women have little or no access to alternative methods of child spacing.

In primitive communities like the Kung hunter-gatherer of the Kalahari in Africa who practice no form of fertility control the average interval between successive births is 44 months. This is thought to be entirely due to the contraceptive effect of breast-feeding, since no milk substitute is available in this area \(^{(56)}\).
There is little doubt that until recently breast-feeding has been the major factor in holding population growth in check. Even today it probably prevents more pregnancies throughout the world than the cumulative effect of all forms of fertility control (57).

**1.3.8. Disadvantages & contraindications to breast-feeding:**

For the average, healthy, full term infant there are no disadvantages to breast-feeding, provided that the mother's milk supply is ample and that her diet contains sufficient amounts of proteins and vitamins. Relative disadvantages of breast-feeding include the inability to determine the quantity of milk the baby has received, participation of other family members is not possible, also breast-feeding is more difficult to practice in public. It is well known that breast-feeding can be problematic to establish, difficulties and lack of success can be upsetting if determined to breast-feed.

Infrequently, allergens to which the infant is sensitized maybe conveyed in the milk. In such cases, an attempt should be made to find the specific allergens and to remove it from the mother's diet, its presence rarely is a valid reason for weaning the baby. Transmission of (HIV) by breast-feeding is well documented and contraindicates breast-feeding when there are safe alternatives and there is a low rate of endemic infection. However, in developing countries, breast-feeding may be crucial to infant survival; thus, the
risk of (HIV) transmission must be accepted even though there may be a high endemic infection rate. The WHO currently recommends that, unless safe infant formula is readily available, breast-feeding be continued in areas of high (HIV) endemicity. Regardless of the risk of transmission of (HIV), breast-feeding benefits are significantly greater than the risk of bottle-feeding in the developing countries.

Other relative contraindications to breast-feeding include maternal viral infections e.g. CMV, hepatitis, rubella, human T-cell lymphotropic virus type 1, hepatitis B and herpes simplex and maternal drugs such as anti-thyroid drugs and anti-metabolites \(^{(3,58)}\).

From the mother's stand point, there are a few contraindications to breast-feeding, markedly inverted nipples may be troublesome, fissuring or cracking of the nipples can usually be avoided if engorgement is prevented, mastitis, acute infections in the mother. Septicemia, nephritis, eclampsia, profuse haemorrhage, active tuberculosis, typhoid fever, breast-cancer, substance abuse, debility, severe neuroses and post-partum psychoses are all considered as contraindications to breast-feeding \(^{(3,58)}\).

1.4. **PROTECTING, PROMOTING AND SUPPORTING BREAST-FEEDING:**
Recognition of the major importance of breast-feeding, not only because of its nutritional qualities, but also because of its infection protective qualities, its beneficial effects on birth spacing, its protective effect on some chronic diseases later in life and the often devastating effects of artificial feeding, have resulted in a number of international policy initiatives to promote and protect breast feeding. These include the International Code of Marketing of Breast Milk Substitutes, which is under continuing evaluation, the Baby Friendly Hospital Initiative and the Innocenti Declaration\(^{(3)}\).

1.4.1. The ten steps to successful breast-feeding:

Every facility providing maternity services and cares for newborn babies should:

(1) Have a written breast-feeding policy that is routinely communicated to all health care staff.

(2) Train all health care staff necessary to implement this policy.

(3) Inform all pregnant women about the benefits and management of breast-feeding.

(4) Help mothers initiate breast-feeding within half an hour of birth.

(5) Show mothers how to breast-feed and how to maintain lactation, even if they are separated from their babies.
(6) Give new born babies no food or drink other than breast milk, unless medically indicated.

(7) Practice rooming-in: allow mothers and babies to remain together 24 hours a day.

(8) Encourage breast-feeding on demand.

(9) Give no artificial teats or pacifiers (also called dummies or soothers) to breast-feeding babies.

(10) Foster the establishment of breast-feeding supports groups and refers mothers to them on discharge from the hospital or clinic (59).

1.4.2. The Innocenti declaration:

The Innocenti Declaration on the protection, promotion and support of breast-feeding recognizes that breast-feeding is a unique process that (59):

- Provides ideal nutrition for infants and contributes to their healthy growth and development.
- Reduces the incidence and severity of infectious diseases, thereby lowering infant morbidity and mortality.
- Contributes to women health by reducing the risk of breast and ovarian cancer, and by increasing the spacing between pregnancies.
- Provides social and economic benefits to the family and the nation.
- Provides most women with a sense of satisfaction when successfully carried out; and that
- Recent research has found that these benefits increase with increased exclusiveness of breast-feeding during the first four to six months of life, and thereafter with increased duration of breast-feeding with complementary foods; and
- Program intervention can result in positive changes in breast-feeding behavior.

It was therefore declared that as a global goal for optimal maternal, child health and nutrition, all women should be enabled to practice exclusive breast-feeding and all infants should be fed exclusively on breast milk from 4-5 months of age. Thereafter, children should continue to be breast-fed while receiving appropriate and adequate complementary foods for up to two years of age or beyond. This child-feeding ideal is to be achieved by creating an appropriate environment of awareness and support so that women can breast feed in this manner.

This declaration was adopted by the participants at the WHO/UNICEF meeting on "breast feeding on the 1990's: a global initiative", co-sponsored by the United States Agency for International
Development (SIDA), held at the Spedale Degli Innocenti Florence Italy on 30th July-1st August 1990 (60).

1.4.3. The "baby friendly" hospital initiative:

This worldwide initiative was launched by the WHO and UNICEF, and seeks to ensure a ten point code of practice ensuring that breast-feeding is promoted in hospitals. The code bans the distribution of free infant formula and its use in hospitals (unless medically indicated), and aims to have health workers promote breast-feeding among mothers.

Based on a 1991 test effort in twelve leading countries, baby friendly hospital initiative (BFHI) expanded into a worldwide effort encouraging governments to prohibit manufacturers from offering free and low-cost infant formulae to health care facilities (61).

The distribution of free formula has already ceased in Algeria, Bahrain, Djibouti, Egypt, Lebanon, Oman, Saudi Arabia, Sudan, Syria, Tunisia and Yemen. Morocco has recently passed a law banning its distribution and Jordan is planning to do the same. Nevertheless, formula is still distributed for free in Kuwait, Qatar, and the U.A.E., inspite of the GCC's Al-Baha declaration, which urges an end to the practice. And in Iraq, NGO's are currently distributing the formula through humanitarian aid projects (62).
1.4.4. The international code for marketing breast-milk substitutes:

The World Health Assembly adopted the international code of marketing Breast-milk Substitutes in 1981. The main objective of the code is the protection and promotion of breast-feeding.

The code recognizes that the use of breast-milk substitutes may become necessary when mothers cannot breast-feed or only do so partially, though it warns about the health hazards of the unnecessary or improper use of such products. Moreover, the financial implications of the use of breast-milk substitute should always be remembered.

In order to achieve it's objectives, the code contains the following principles:

• The prohibition of advertising and promotion of breast-milk substitutes:

  The code does not permit advertising or any other form of promotion of breast-milk substitutes and other products covered by it to the public.

• Prohibition of giving samples:
The code bans the giving of samples of breast-milk substitutes and other products covered by it, directly or indirectly to pregnant women, mothers, and members of their families or to the consumer.

- **The ban on giving gifts and other inducements:**

  This principle covers several aspects, such as the ban of gifts of articles or utensils, the offering of financial and material inducements to health workers or members of their families, e.g. the restriction on donations or low price sales of supplies of breast-milk substitutes to institutions or organizations.

- **Information and education:**

  The code puts on the shoulders of governments the responsibility for the provision of consistent and objective information on infant and young child feeding for use by families and those involved in the field of infant and young child nutrition.

- **Encouragement and promotion of breast-feeding by health authorities:**

  The code enjoins the health authorities in Member States to take appropriate measures to encourage and protect breast-feeding. It is for the Member states to define those measures. The code also bans the use of health care facilities for promotion of products covered by it.

- **Consumer protection:**
The code recognizes that breast-milk substitutes may be necessary in certain situations. Therefore, it insists on a degree of protection for the consumer through labeling requirements, which include the composition, storage conditions, and the date of expiry of breast-milk substitutes, and the requirements of the Codex Alimentarius Commission standards.

- **Implementation of the international code:**

  This is the responsibility of Member States and could be achieved by the adoption of legislation, regulations or other appropriate methods, in the light of social and legislative framework of the State concerned. Any implementation of the Code should use it as a "minimum requirement", and it should be given effect to "in its entirety". The most important condition for the implementation of the Code by a Member State is the political commitment to protect, promote, and support breast-feeding \(^{(63)}\).

**1.5. INFANT NUTRITION AND HEALTH:**

The importance of breast-feeding to a child's wellbeing has been repeatedly shown. Breast milk is nutritionally balanced, contains immunities against common infections, can help prevent dehydration, and can reduce the severity of respiratory infections. According to one estimate, children who are given breast milk substitutes can be as
much as 25 times more likely to die in childhood than children who have been exclusively breast fed for the first 4-6 months of age.

A study in Yemen found that the mortality rates among one to five months old babies who had been breast-fed was 60/1000, compared to a rate of 157/1000 for those who were not breast-fed (64).

1.5.1. The nutritional vulnerability of infants and children:

Globally, and particularly in developing countries, where the environment is often contaminated, breast-feeding dramatically improves survival and nutritional status during infancy. Infants and children's vulnerability to under-nutrition is mainly due to:

- **Low nutritional stores:**
  
  Newborn infants, have poor stores of fat and protein. The smaller the child, the smaller the calorie reserves and the shorter the period starvation can be tolerated.

- **High nutritional demands for growth:**
  
  At four months of age 30% of an infant's energy intake is used for growth, by one year of age this falls to 5% and by three years to 2%.

- **Rapid neuronal development:**
  
  The brain grows rapidly during the last trimester of pregnancy and throughout the first two years of life. At birth, the brain accounts for
approximately two-thirds of basal metabolic rate, and for about 50% at one year of age\(^{(58)}\).

### 1.5.2. Breast-feeding and growth monitoring:

In many countries, growth faltering is most common in children aged between 6 and 18 months, the age when children are most likely to stop breast-feeding.

It thus follows that infant growth monitoring at regular intervals is an essential task of all health workers, so as to detect growth faltering earlier. It gives an excellent opportunity to interact with the mothers regarding infant-feeding behavior, whenever two consecutive weights show a faltering or downward trend, the mother should receive reinforced messages about breast-feeding and the introduction of complementary foods\(^{(63)}\).

### 1.5.3. Nutrition and the use of anthropometry:

It is widely accepted that vulnerable groups of children (6-36 months old) can be used as a relatively accurate representative sample of the nutritional status of the general population. A sharp decline in food availability and the resulting nutritional deficiencies will most easily be measurable by anthropometry at first.

Today's indicators of choice to assess mild or moderate PEM in infants and pre-school children in a given
community are based on anthropometric measurements of weight, height and age\(^{(65)}\).

- **Weight-for-age (W/A):**
  
  This indicator is often used in nutritional evaluation by employing growth-monitoring records. A deficit in the W/A indicator signifies under nutrition and is manifested by reduced body weight or underweight. To overcome the limitations of W/A method, Waterlow (1972) introduced a system that distinguishes between the degree of wasting in children (a deficit in weight for age) and that of growth retardation or stunting (a deficit in height-for-age).

- **Weight-for-height (W/H):**
  
  This indicates either wasting or obesity. A deficit in weight relative to height designates wasting, while excess denotes obesity. Wasting usually occurs under food emergency conditions (e.g. famine) or under conditions of impaired food utilization (e.g. infection). It is especially effective during an acute famine.

- **Height-for-age (H/A):**
  
  A deficit in this indicator is identified by shortness of stature, usually referred to as stunting, and attributed to chronic malnutrition.

  The above mentioned indicators can be used for monitoring, surveillance, and evaluation of local nutrition and health.
programs. These indicators are also valuable in the formulation of health care strategies because they are essential for "the identification of priorities and setting of targets for nutrition and health programming or strategy planning". (Keller and Fillmore, 1983) (66).

1.5.4. **Nutritional status in under five years old children in Sudan:**

In Sudan, many studies were done to assess the nutritional status of under five years olds.

Zumrawi et al (1987) studied infants longitudinally from birth to one year in urban poor neighborhoods in Khartoum province and found evidence of growth faltering i.e. weight gain of less than the reference - 1SD for two consecutive weeks periods. The study showed that growth in weight and height of Sudanese children began to fall below the international reference standard by five months of age, 50% of children studied had begun to falter by as early as 16 weeks (67).

1.5.5. **Infant feeding and diarrhoeal illnesses:**

It has been estimated that four million children below the age of five years die each year worldwide, due to diarrhoeal disease, most of the mortality being in the developing countries (68).

Like so many other contributors to child mortality, diarrhoeal diseases have behind them a magnitude of underlying causes. Many such diseases are water-borne, and contaminated water
supply is one way that children are exposed. Poor hygiene and early or improper weaning practices, which can easily lead to malnourishment, particularly in areas where the water supply is unclean also contribute to diarrhoeal infections.

Insuring adequate nutrition is one way to cut down on the high incidence of diarrhoeal disease. One of the best ways of doing this is to encourage breast-feeding which apart from being highly nutritious does not carry with it the risk of contamination (69).

Studies have demonstrated that breast-feeding protects against several bacterial and viral infections, especially in the gastrointestinal tract. The protection against cholera and camylobacter diarrhoea among breast-fed infants maybe due to the level of specific SIgA antibodies in breast milk (70).

In shigella attributed diarrhoea it has been found that to encourage prolonged breast-feeding in settings in which shigellosis is common has decreased the risk of symptomatic shigellosis considerably and lessened its severity in infants who acquire the infection despite being breast-fed (3).

Giardia lamblia, a common pathogenic parasite that is a major cause of waterborne enteric disease. Infection with this parasitic protozoan is prevalent in children and can cause diarrhoea and failure to thrive.
Following the discovery that normal human milk (NHM) contained a number of antibacterial proteins, some of which are found in other mucosal secretions, Frances D. Gillin and et al (University of California at San Diego) studied the effect of (NHM), on G. lamblia trophozoites. They concluded that low concentrations of (NHM) rapidly killed these trophozoites. 50% were killed in less than three minutes by 3% (NHM), in approximately 60 minutes by 1% (NHM), and in 280 minutes by 0.3% (NHM) (71).

The anti-infective properties of breast milk is a factor of numerous interacting mechanisms:

- The direct lethal action against some bacteria, viruses, fungi and parasites.  
- Maintenance of a dominant bifidus intestinal microflora.  
- Inhibition of fimbrial antigens responsible for microbial attachment to mucosal surfaces, such as E. coli in the intestines and pneumococci in the oropharynx.  
- Decreasing the permeability of the relatively open neonatal intestinal wall to pathogens and foreign protein micromolecules (72).

As evidence points to the close relationship between mode of infant feeding and the incidence of diarrhoea among infants, diarrhoeal disease control programs have directed their activities
toward protection, promotion and support of breast-feeding. This being a major strategy to reduce diarrhoeal morbidity and many countries, such as Syria, have indeed included breast-feeding in the campaigns against diarrhoeal diseases \(^{(73)}\).

1.5.6. *Infant feeding and acute respiratory infections:*

Acute respiratory infections (ARI) are one of the major killers of the world's children, taking between two and three million young lives each year. In the under developed world, acute respiratory infections are annually responsible for approximately 30% of all deaths of children under the age of five, and accounts for 30 to 50 percent of all child hospital visits worldwide \(^{(74,75)}\). As with most causes of death among children, there are many indirect factors contributing to ARI's occurrence and fatality, it's incidence can be prevented by a number of measures e.g. immunization against pertussis, measles and diphtheria can prevent some fatal infections.

The risk can be greatly reduced by improving infant and child nutrition and addressing micro-nutritional deficiencies. This can be achieved by adopting breast-feeding as the main form of nutrition in early infancy \(^{(76)}\).

1.5.7. *Adult life consequences of infant malnutrition:*

Infant malnutrition has been incriminated in a number of adulthood diseases e.g. an association has been described between
restricted growth during critical periods of development in infancy with an increase in cardiovascular and obstructive lung disease in later life.

Studies have shown that breast-feeding in infancy is associated with a decrease in incidence of inflammatory bowel disease and diabetes mellitus in breast-fed infants when they grow up, as well as there being conflicting evidence that breast-feeding may also reduce subsequent atopic disease in adulthood due to breast-milk hypoallergenicity\(^{(58)}\).

Although cholesterol levels in human milk are generally higher than in formula milk, studies have shown that coronary artery disease in persons up to 20 years is seen less frequently in individuals who were breast-fed. This information suggests that the moderate intake of cholesterol present in breast milk may contribute to a more efficient cholesterol metabolism in adulthood\(^{(77)}\).

Results from a qualitative review of 9 published case-control studies suggest that children who are never breast-fed or are breast-fed short-term, have a higher risk than those breast-fed for less than six months of developing Hodgkin's disease (HD) but not non-Hodgkin's lymphoma or acute lymphoblastic leukaemia\(^{(78)}\).
It is important to mention here that studies have also shown that the incidence of breast cancer in mothers who breast-feed is also markedly reduced \(^{(58)}\).

1.6. ANAEMIA:

Anaemia is a very common micronutrient disease in the under developed world, yet the magnitude of this public health hazard is poorly documented.

Anaemia affects 10-70% of children in most under developed countries. It is well known that frank anaemia in children is associated with impaired muscular performance and weakened intellectual activity. Furthermore, there is some evidence that iron deficiency without anaemia may cause irritability, lassitude and inability to concentrate \(^{(79)}\). It has also been postulated that anaemia lower immunity against disease by depressing cell mediated immunity, humoral immunity appears relatively little affected by iron deficiency \(^{(80)}\).

Although human breast milk has relatively low iron content, absorption from breast-milk is about 50% whereas only 10% is absorbed from cow milk, this is one reason why unmodified cow's milk is not recommended until one year of age \(^{(81)}\).

1.6.1. Definition of anaemia:
Anaemia is defined as "the reduction of the red cell volume or haemoglobin concentration below the range of values occurring in healthy individuals"\(^{(82)}\).

In nutritional anaemia the haemoglobin content of the blood is lower than normal as a result of a deficiency of one or more of the essential nutrients.

The human body contains about 4 gm of iron. Iron plays two major roles in human physiology:

- As a component of haemoglobin it acts as an oxygen carrier.
- In intermediate metabolism, it is part of the electron transfer chain that is responsible for the oxidation of many substances.

1.6.2. Diagnosis of anaemia:

There are variations in the normal haemoglobin levels in children, values varying with age, being high at birth and falling to its lowest level at 2-3 months of age, it is therefore important to make allowance in interpreting laboratory results.

Diagnoses of anaemia is confirmed from the blood count and film, where the haemoglobin concentration, red cell count, MCV, serum ferritin and serum iron are all reduced, the blood film shows
hypochromic microcytic picture. The total iron binding capacity (TIBC) is increased and the ratio of serum iron: TIBC is reduced (83).

**1.6.3. Haemoglobin status in Sudanese children:**

Iron deficiency along with iodine, and vitamin"A" are the most common micro-nutrient deficiencies in developing countries, although control programs, when properly implemented, can be effective. Sudan is no exception, and iron deficiency anaemia is a public health problem affecting about 30-35% of children. However, it is considered as part of PEM, which is highly prevalent in various parts of the country. El-nour A. and etal studied the prevalence of the three most common micro-nutrient deficiencies and their interactions among pre-school children in Southern Blue Nile. He found that 88% of the children had haemoglobin concentration < 1.86 mmol/L and only 13.5% had serum ferritin concentrations below the cut off limit for anaemia, of 12 grams/dl, 95% had serum transferrin concentrations above the cut off of 2.5g/L (84).

**1.6.4. Haemoglobin and infant feeding mode:**

Abdullatif etal investigated the adequacy of iron nutrition levels as measured by haemoglobin and haematocrit levels in three group of infants. The mixed fed infants in the study were able to maintain satisfactory haemoglobin and haematocrit values. The prevalence of
iron deficiency among them was higher than in the breast-fed group and lower than the bottle-fed group. The study has produced evidence to show with a great amount of confidence that iron deficiency anaemia is uncommon in infants fed with human milk and hence supplementation is unnecessary, at least for the first four months of life (85).
1. Due to the importance of mode of infant feeding on infants health and subsequent development, and since feeding practices exert recognized effects on infant survival, child-health and ultimately affects adult life, it is of infinite necessity to evaluate current infant feeding trends among Sudanese mothers.

2. Despite considerable research, national and international public health efforts, models to inform decision making about the optimum breast feeding, in terms of timing of supplementation and weaning, in policy and in practice in Sudan remain unsatisfactory. Hence the need to re-evaluate the attitudes and knowledge of infant mothers about optimal infant feeding. It is also of importance to compare infant-feeding practices adopted by some sectors of the Sudanese society with the optimal infant-feeding standards set by the WHO.

3. Early childhood nutrition, growth and health are important predictors for adult physical health and intellectual capacities and hence the community's development and prosperity at large, it thus follows that it is necessary to evaluate:

- Anaemia, as being the most common micro-nutrient disease in the under developed world (10-70% in most countries).
- Diarrhoea, the commonest childhood illness.
• Early anthropometry so as to determine early physical growth delay with regards to infant-feeding mode,

The fore-mentioned are all of crucial importance in order to make settings of suitable policies regarding infant-feeding practices within the Sudanese community possible.

OBJECTIVES
1. To evaluate the recent infant feeding trends in three different social settings in Khartoum State.

2. To evaluate Sudanese mothers' knowledge, attitude and practice regarding the appropriate infant feeding-practices.

3. To determine the relationship between infant feeding practices and infant diarrhoeal episodes.

4. To determine whether there are any variations in:

   (a) Early infant physical growth in relation to mode of infant feeding.

   (b) Haemoglobin level in relation to mode of infant feeding.

CHAPTER TWO

2. POPULATION AND METHODS
2.1. STUDY DESIGN:

This is a community based cross sectional, descriptive retrospective and randomized study.

2.2. STUDY AREA:

The study was conducted in three districts in western Khartoum State. The areas were chosen as representatives of three different social groups namely:

- Mayo, representing a poor peri-urban area mostly inhabited by low socio-economic class residents and refugees (new-settlers).
  Mayo is officially called "Hay Al-Naser". It is vast and subdivided into Hay Al-Naser Shimal, Shareg, Wasat and Gareb. It is the home of a total of 89'813 people, living within 19,932 households. Males are 47'537 while females are 42'276 (male: female ratio = 1.12:1).

- Al-Salama, representing a moderate peri-urban area, its inhabitants are a mixed population mainly of moderate socio-economic status residents, a minority are of low and less are of high socio-economic classes.
  AL-Salama is made up of Al-Salama Ganoob and Imtidad Al-Salama. Its population is 16'317, living within 1'187
households. Males are 8'663 while females are 7'654 (male: female ratio is 1:1.13).

- Al-Riyadh, representing an urban-elite area, its inhabitants are mostly of high and very high socioeconomic status, with some of moderate socio-economic status.

Al-Riadh is made up of Al-Riadh Ganoob, and Al-Riadh Shimal. Its population is 12'675, living within 1'297 households.

Males constitute 6'531 and females are 6'144 (male: female ratio is 1.06: 1)

2.3. STUDY POPULATION:

The study included children whose ages ranged from 4 months to 24 months.

2.4. DURATION OF THE STUDY:

The study was carried out during a period of six months (Jan 2000-Jun 2000).

2.5. SAMPLE SIZE:

The sample was 435 mother/child pairs; it was divided unequally as follows:

Mayo : 152 mother/child pairs.

Al-Salama : 143 mother/child pairs.

Al-Riyadh : 137 mother/child pairs.
The sample size was determined by the following equation

\[ n = \frac{Z^2 (pxq)}{E} \]

\( Z \) = Normal distribution(constant) = 1.96 at 95% confidence.

\( p \) = Expected prevalence

\( q \) = 1-p

\( E \) = 0.02 - 0.05 (correction factor)

\[ = p = 50\% = 0.5 \]

\[ n = 1.96^2 (0.5^2)/0.05^2 = 384 \]

2.6. INCLUSION CRITERIA:

All children aged 4-24 months and living in these mentioned areas were included in the study.

2.7. EXCLUSION CRITERIA:

Children with congenital anomalies and those suffering from chronic illnesses, such as children with any form of incapacitation that interferes with feeding, will be excluded from the study.

2.8. STUDY TECHNIQUE:

Houses were chosen by systematic randomization (i.e. every second house in a chosen street and in which a child of appropriate age is living, if not, then the immediate next house is tried).
After describing the purpose of the house visit to the mothers, verbal consent was obtained from them so as to acquire the needed information, to carry out the examination and most specially to do a pinprick.

The author filled a designed pre-coded questionnaire for every Child selected and enrolled in the study.

2.8.1. History:

Complete and detailed history was taken from each child's mother with emphasis on personal history, history of delivery, nutritional history (including information about feeding practices, knowledge about infant feeding, attitude towards breast feeding, feeding of colostrum, age at introduction of solids, age at weaning, and bottle feeding), social history and history of diarrhoeal illnesses as well as any significant previous medical history.

Socioeconomic status of the families was determined taking into account the total income of the family, education of the father, electricity and safe water supply. Furnishing of the houses as well as acquisition of certain accessories e.g. car, television, refrigerator, cooker…Etc was taken into account.

To evaluate the knowledge, attitude and practices of mothers in the study group, the author adopted a scoring system in order to reach a reasonable conclusion. This was done in a table form in which
ten important criteria of infant feeding were included and responses recorded as either positive or negative.

**SCORING SYSTEM FOR INFANT FEEDING**

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>ATTITUDE</th>
<th>KNOWLEDGE</th>
<th>PRACTICES</th>
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<tr>
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<td>Respo.</td>
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<tr>
<td>a. Breast feeding the child.</td>
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<tr>
<td>b. Feeding of colostrum.</td>
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<tr>
<td>c. Early initiation of breast-feeding *</td>
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<td>d. Exclusive breast-feeding **</td>
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<tr>
<td>e. Supplementation after 4 months.</td>
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<tr>
<td>f. Supplementary fluids by cups.</td>
<td></td>
<td></td>
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<tr>
<td>g. Solids not before 4 months.</td>
<td></td>
<td></td>
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<tr>
<td>h. Gradual weaning.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>i. Specially prepared meals for infant.</td>
<td></td>
<td></td>
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<tr>
<td>j. No use of pacifiers.</td>
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<tr>
<td><strong>TOTAL SCORE</strong></td>
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</table>

* 1st six hours after birth.

** Exclusive breast-feeding for four months.

Every positive response is allotted a score of (1)

Every negative answer is allotted a score of (0)

**Interpretation of scores:**

For attitude, knowledge and practice each totals a score of (10)

Score of 7-10 is good.

Score of 4-6 is average.

Score of 0-3 is below average (poor).
2.8.2. Examination

Every child included in the study was thoroughly examined and assessed for the presence of any signs of protein energy malnutrition, signs of iron deficiency as well as signs of any vitamin deficiency.

The following measurements were made by the author aided by a medical assistant:

- **Weight of the child**: This was determined using a standard "Salter" spring balance with scale increasing up to 25 kg.
- **Length of the child**: This was determined by the use of an "infantometer". The child without shoes is gently coaxed in the supine position over the plank of the infantometer, gentle and firm pressure is applied over the knees to keep the baby well stretched while length measurement is recorded in centimeters.
- **Head circumference of the child**: This was determined at the largest occipitofrontal diameter using an ordinary non-stretchable measuring tape.

2.8.3. Investigations:

- **Haemoglobin level**: This was measured using the "Haemo Cue", which is a blood haemoglobin measurement system that consists of disposable micro-cuvettes with reagent in dry form and a single purpose designed photometer. The micro-cuvette is used for measuring
the sample, as reaction vessel and as measuring cuvette. No dilution is required, reading of the haemoglobin takes place in the photometer, which follows the reaction and presents the results only when the reaction has stopped. The photometer is pre-calibrated against the hemoglobin-cyanide-(HiCN) method, which is the international reference method for the determination of the total haemoglobin concentration in the blood. Haemoglobin value is shown in the instrument screen in g/L.

- **Haemoglobin interpretation:** Children were classified into four groups according to their haemoglobin levels, this was done as follows:

  - **Severe anaemia:** ≤6gm/dl
  - **Moderate anaemia:** 6.1 - 9.0gm/dl
  - **Mild anaemia:** 9.1 - 11.0gm/dl
  - **No anaemia:** >11gm/dl.

### 2.9. DATA ANALYSIS AND STATISTICS:

The pre-coded data collected for each child was entered and analyzed using the "Statistical Package for Social Science" software. Simple descriptive statistics and frequency distribution were done. Results were tested for significance using Pearson Chi square test, $X^2$. Probability value <0.05 was considered to be significant.
Chapter three

3. RESULTS

3.1. GENERAL CHARACTERISTICS OF THE STUDY POPULATION:

3.1.1. Age, sex and residence of children:

- **Sex and residence**

  435 mother / child pairs were studied. Males were 225 constituting (51.7%) and females were 210 giving a percentage of (48.3%), male to female ratio being 1.07:1.

  This population was distributed such that 137 children were from urban elite (Al-Riadh), constituting (31.5%), 146 children were from peri-urban moderate (Al-Salama) and those claimed a percentage of (33.6%), while from peri-urban poor (Mayo) 152 children were enrolled in the study and they represented a percentage of (34.9%).

  Looking at the three study areas individually, we find that male to female ratio is more or less equal, with a slight male gender predominance, except in Al-Salama where females were slightly more than males, the difference was not statistically significant (p = 0.31) as shown in (Fig.1).
**Age**

Age group distribution of the children in the study population was studied and it was found that, 122 babies (28.0%), were in the age group 4-9 months, 95 children (21.8%), were 10-14 months, 109 children (25.1%) were 15-19 months, while 109 kids (25.1%) were 20-24 months old (Fig. 2).

It was found that urban elite children age group distribution was such that, 34 children (24.8%) were in the age group 4-9 months, another 28 representing (20.5%) were in the age group 10-14 months. 41 (29.9%) were in the age group 15-19 months, while 34 children (24.8%) were in the age group 20-24 months.

Among peri-urban moderate population, 43 children (29.5%) were in the age group 4-9 months, 29 (19.9%) were in the age group 4-9 months, 33 (22.6%) were in the age group 15-19 months, while 41 children representing (28.0%) were in the age group 20-24 months.

As for the peri-urban poor population, 45 children were in the age group 4-9 months (29.6%), 38 (25.0%) were in the age group 10-14 months, 35 (23.0%) were in the age group 15-19 months while 34 children (22.4%) were in the age group 15-19 months (Fig. 3).

Age group distribution among the three areas of study showed no striking difference and was quite comparable in the three areas (p = 0.58).
3.1.2. Mother's age distribution:

Regarding mothers age distribution in the study population, 89 mothers constituting (20.4%) were < 20 years old, 158 (36.3%) were 20-30 years old, 106 (24.4%) were 31-40 years old while 82 mothers (18.9%) were > 40 years old (Fig.4).

Mothers from the less privileged Mayo (peri-urban poor) tended to be younger, for 38 mothers (25.0%) were < 20 years old, 49 (32.2%) were 20-30 years old, 38 (25.0%) were 31-40 years old while 27 (17.8%) were > 40 years old.

Concerning mothers from Al-Salama (peri-urban moderate), 28 mothers (19.2%) were < 20 years old, 65 (44.5%) were in the age group 20-30 years, 30 (20.5%) were 31-40 years while 23 mothers (15.8%) were > 40 years old.

Among affluent mothers from Al-Riad (urban elite), 23 mothers (16.8%) were < 20 years old, 44 (32.1%) were in the age group 20-30 years, 38 (27.7%) were in the age group 31-40 years while 32 (23.4%) were > 40 years old. The apparent difference between the three groups was not statistically significant (p = 0.106) as shown in (Fig.5).

• Mothers / children age distribution:

In looking at mother's age groups in relation to number of children in the whole study population, it was found that, those mothers who were < 20 years old had 88 children (20.2%).
Most mothers were 20-30 years old and they had 157 children (36.1%), while mothers who were 31-40 years old had 106 children (24.4%) as for mothers > 40 years, they had 84 children (19.3%). The findings were not statistically significant (p value = 0.96) this is shown by (Fig.6).

**Mothers education level:**

Education status of the mothers in the study population revealed that 154 (35.4%) had no education, those were mostly from the Peri-urban poor population, 16 mothers (3.7%) attended Khalwa, 97 mothers (22.3%) went to primary school while 112 mothers (25.7%) had secondary school education. As for university education and above, it was attained by 56 mothers (12.9%), majority of whom were from urban elite. The difference in education status of mothers in the three study areas was statistically significant (p < 0.00) as shown by (Figs.7, 8).

**Mother's employment status:**

In comparing the employment status of mothers in the study population, 164 mothers (37.7%) were employed. In urban elite 78 mothers (56.9%) were employed, while in peri-urban moderate they were 33 (22.6%) and in peri-urban poor 53 mothers (34.9%) had regular jobs.
The difference in employment status was not statistically significant (p = 0.33).

• Employment and maternal leave:

Maternal leaves duration for the current delivery was analyzed and results showed that majority of the mothers, 74 (45.1%) had maternal leaves of 6-8 weeks duration only. 40 mothers (24.4%) had maternal leaves duration of 9-12 weeks, 34 (20.7%) had leaves of 13-16 weeks and only 16 mothers (9.8%) had maternal leaves of > 17 weeks.

Of the 78 employed urban elite mothers who constituted (56.9%) of their population, 40 mothers (51.3%) had a maternal leave of 6-8 weeks duration for the delivery, 18 (23.1%) had a leave for 9-12 weeks, 16 (20.5%) had 13-16 weeks leave, while only 4 mothers (5.1%) had vacations of > 17 weeks. Comparing this to the maternal leaves taken by mothers from peri-urban moderate and peri-urban poor population, 15 mothers (45.5%) in the former and 19 (35.8%) in the latter had leaves of 6-8 weeks. 7 mothers from peri-urban moderate population (21.2%) compared to 15 mothers (28.3%) from peri-urban poor area had 9-12 weeks vacation, on the other hand only 7 mothers from the peri-urban moderate population (21.2%) in contrast to 11 (20.8%) from peri-urban poor area had vacations of 13-16 weeks. Very few mothers, 4 (12.1%) in peri-urban
moderate and only 8 (15.1%) in peri-urban poor areas stayed home for > 17 weeks.

In the three areas, working mothers tended to have short duration maternity leaves, mostly in the range of 6-8 weeks, the difference in the duration of vacation in the three study areas was not statistically significant ($p = 0.46$) as shown in (Fig.9).

**Employment and contraceptive use:**

In looking at the details of maternal contraceptive use of the study population and employment status, it was observed that 167 mothers (38.4%) used contraceptives. In urban elite population 79 mothers (57.7%) used contraceptives, compared to 40 (27.4%) from peri-urban-moderate population and 48 mothers (31.6%) from peri-urban-poor mothers.

It is obvious from the results, that employed mothers tended to use contraceptives much more frequently than non-working mothers. Among urban elite mothers who used contraceptives, 57 (72.2%) were on employed, while in peri-urban-moderate 33 (82.5%) were employed and in peri-urban-poor 39 mothers (81.3%) had regular jobs.

Of the 79 urban elite mothers, 43 (54.4%) used contraceptive pills, 27 (34.2%) used the loop and 9 (11.4%) used contraceptives injections.
Comparing this to results from peri-urban moderate mothers, where 25 (62.5%) used contraceptive pills, 11 (27.5%) used the loop and only 4 used contraceptive injections (10.0%).

In peri-urban-poor, 16 mothers (33.3%) used contraceptive pills, 13 (27.1%) used the loop while 19 (39.6%) used contraceptive injections. There was a statistically significant difference in type of contraceptives used in the three areas (p < 0.05).

3.1.3. Socioeconomic status of the study population:

Socioeconomic status of the studied population showed that 139 (32.0%) were of high class, the majority were from urban elite of whom this sector was represented by 114 mothers (83.2%), in peri-urban moderate 25 constituting (17.1%) of their population, and by non-in peri-urban poor area. Mothers of moderate socioeconomic class constituted 141 (32.4%) of the study population, 23 mothers were from urban elite where they constituted (16.8%) of their population urban elite, 87 (59.6%) from peri-urban moderate and 31 (20.4%) from peri-urban poor areas.

Those in the poor class were 155 mothers (35.6%), non-were from urban elite population, 34 constituting (21.9%) were from peri-urban moderate and 121 (78.1%) were from peri-urban poor areas.
3.2. INFANT FEEDING PRACTICE:

- **Breast-feeding:**

  Breast-feeding was found to be practiced by majority of the study population 418 (96.1%), no variations were discernible between the three areas of study \( p = 0.59 \). 131 of the urban elite mothers (95.6%) breast-fed their babies, 139 (95.2%) from peri-urban moderate, while 148 (97.4%) from peri urban-poor population (Table 1).

  Only 17 mothers (3.9%) of the total population did not attempt breast-feeding. 2 mothers (11.8%) claimed that they had no breast milk and not a single mother stated that she had no desire to breast-feed her baby. 3 mothers, (17.6%) claimed that their babies refused to take to the breast. 8 mothers (47.1%) attributed their failure to breast-feed to illness in the mother during the early days of delivery, while 4 (23.5%) attributed this to babies illness in the neonatal period. The difference in reasoning given in mothers in the three study areas was not statistically significant \( p = 0.33 \) as shown in (Fig.10).

- **First timely feed:**

  Most mothers initiated breast-feeding early, 266 mothers (61.1%) initiated breast-feeding in the first 12 hours while 59 (13.6%) did so in the following 12-24 hours, 48 (11.0%) in 24-48 hours time, while
62 (14.3%) delayed the 1st breast-feeding beyond 72 hours. The difference with regard to the first timely feed in the three study areas was not statistically significant (p = 0.57).

For it has been found that 88 mothers (64.2%) in the urban elite group, initiated breast-feeding in the first 12 hours, compared to 86 (58.9%) among peri-urban moderate mothers and 92 (60.5%) among peri-urban poor mothers. Between 12-24 hours after delivery 17 mothers (12.4%) in urban elite initiated breast-feeding, compared to 20 (13.7%) among peri-urban moderate mothers and 22 (14.5%) in peri-urban poor mothers. Between 24-48 hours after delivery 15 mothers in urban elite (10.9%) initiated breast-feeding, compared to 21 (14.4%) from peri-urban moderate population and 12 mothers (7.9%) in peri-urban poor mothers. Breast-feeding initiation was delayed for more than 72 hours by 17 mothers (12.4%) from urban elite, 19 (13.0%) in peri-urban moderate and by 26 mothers, giving a slightly higher percentage of (17.1%) in peri-urban poor (Fig.11).

Reasons given by the 62 mothers who delayed the first breast-feed for more than 72 hours were: 11 mothers (17.7%) claimed having no milk in the first three days. 18 mothers (29.0%) were too ill to feed their babies, 13 mothers (21.0%) stated that their babies were ill during the neonatal period. 20 babies (32.3%) were delayed because of
that milk in the first few days after delivery should not be fed to babies. The difference in reasoning was not statistically significant (p= 0.97) as shown in (Fig.12).

- **Colostrum feeding:**

  Most mothers, constituting 386 of the study population, fed their babies colostrum (88.7%). Only 49 (11.3%) did not do so. The number of mothers who fed colostrum was higher in urban elite mothers, being 130 constituting (94.9%), compared to 129 mothers (88.4%) of per-urban moderate and 127 (83.6%) of peri-urban-poor. Of the 49 mothers who did not feed their babies colostrum, 7 (14.3%) were from urban elite, while 17 (34.7%) were from peri-urban moderate and 25 from peri-urban poor, difference in this practice was not statistically significant (p = 0.45) as shown in (Table 2).
  Reasons for not feeding babies with colostrum were cultural beliefs as a major cause in 15 mothers (30.6%), followed by mothers illness in 12 during the post delivery period (24.5%), next was the babies' illness which was a cause in 10 children (20.4%). 7 mothers (14.3%) believed that colostrum is harmful to the baby and only 5 mothers (10.2%) thought that colostrum is useless and not worth giving to the baby, differences in reasoning between the three areas of study was not statistically significant (p = 0.098) as shown in (Fig.13).

- **Frequency of breast-feeding:**

  Majority of mothers who breast-fed their babies, 377 (90.2%), practiced unscheduled breast-feeding. Only 41 mothers (9.8%) fed their babies on schedule and those were mostly from urban elite
28 (68.3%) followed by 13 (31.7%) from peri-urban moderate, none of the mothers (0%) from peri-urban poor fed their babies on schedule. The difference between the three areas in this aspect was statistically significant with (p) < .05 (Table 3).

- **Main mode of feeding adopted by mothers:**

  Looking at the way babies were predominantly fed in the first year of life, it was found that 255 (58.6%) were breast-fed, 83 (19.1%) were artificially fed, while 97 (22.3%) were mixed fed i.e. both breast-feeding and artificial feeding.

  54 (39.4%) of urban mothers breast-fed their babies, compared to 89 (61.0%) of peri-urban moderate mothers and 112 (73.7%) of peri-urban poor mothers. Bottle-fed (artificial fed) babies were 37 (27.0%) in urban elite, 29 (19.9%) in peri-urban moderate and 17 (11.2%) of peri-urban poor babies. Mixed feeding was practiced by 46 (33.6%) of urban elite mothers, 28 (19.2%) of peri-urban moderate and 23 (15.1%) of peri-urban poor mothers, this apparent difference in mode of feeding between the three areas was quite significant (p < 0.05) statistically (Table 4).

- **Exclusive breast-feeding:**

  Unfortunately exclusive breast-feeding for the first four months of life was not very popular among mothers of the study population, where only 192 mothers (45.9%) practiced it. Among urban elite
mothers, 103 (78.6%) did practice exclusive breast-feeding while only 45 (32.4%) from peri-urban moderate and 44 (29.7%) from peri-urban poor did so. (p < 0.00) as shown in (Table 5).

226 mothers (54.1%) did not practice exclusive breast-feeding, of those, 59 (26.1%) had no idea that this was the advised mode of feeding, 33 (14.6%) could not practice exclusive breast-feeding for four months because of having to return to work. 66 mothers (29.2%) were very sure that breast milk alone couldn't be adequate and has to be supplemented very early. 68 mothers (30.1%) stated that it is the custom to give additional fluids, failing to do so is quite harmful, consequences being as far as affecting the children's hearing and intellect as well as affecting their general health. The difference in reasons given by mothers in the three areas was statistically significant (p < 0.05).

**Age at which any thing other than breast-milk was given:**

It was really surprising to discover that a large number of infants 148 (34.0%) were started on supplementary fluids as early as the tender age of < 2 weeks, these were mainly from the peri-urban poor Mayo.

63 infants (14.5%) were supplemented at 2-6 weeks, 32 (7.4%) at 7-15 weeks and 192 (44.1%) were given fluid supplements after the age of 16 weeks. There were remarkable differences between the three study
areas on this aspect (p < 0.05). In the urban elite area, only 25 babies (18.2%) were given supplementary fluids at age < 2 weeks compared to 60 babies (41.1%) from peri-urban-moderate and 63 (41.5%) from peri-urban poor. At ages 2-6 weeks, 7 babies (5.1%) from urban elite were given supplementary fluids compared to 29 (19.9%) from peri-urban moderate and 27 (17.8%) from peri-urban poor. At ages 7-15 weeks, 2 babies (1.5%) from urban elite were given supplementary fluids compared to 12 (8.2%) from peri-urban moderate and 18 (11.8%) from peri-urban poor. In urban elite, 103 babies (75.2%) were given supplementary fluids after 16 weeks of age compared to 45 (30.8%) from peri-urban moderate and 44 (28.9%) from peri-urban poor, the apparent difference between the three areas was found to be statistically significant (p< 0.05) as shown in (Fig 14).

• **Types of supplementation given in the first four months of life:**

Results showed that 226 babies (52.0%) were given supplementation during the first four months of life. While in urban elite they were only 28 babies constituting (12.4%), they were 94 babies (41.6%) from peri-urban moderate at the same time they constituted 104 children (46.0%) from peri-urban poor population.

The main supplementation offered by 99 mothers (43.8%) was boiled herbs and juices. 48 babies (21.2%) were given cow milk, 34 (15.0%) were given goat milk, 27 (12.0%) received formula milk.
It was noted that 18 children (8.0%) were given a variety of other supplements such as milk cream, boiled rice, asida, custard and so on. Among urban elite mothers, 21 mothers, (20.8%) had one bottle compared to 14 (31.8%) from peri-urban moderate and 17 (70.8%) from peri-urban-poor.

Also among urban elite population, 57 mothers, (56.4%) had two bottles compared to 30 (68.2%) from peri-urban moderate and 7 (29.2%) from peri-urban-poor. All mothers who had more than three feeding bottles were from urban elite population, 23 (22.8%), non-of the mothers in peri-urban moderate or peri-urban poor had more than two feeding bottles (p < 0.05) as shown in (Table 7).

**The way feeding bottles are cleaned:**

Bottle care was studied and it was found that out of the 169 mothers (38.9%) who used feeding bottles, 57 (33.7%) washed the bottles using soap and water only, 87 (51.5%) boiled the feeding bottles while 25 (14.8%) sterilized them with either pharmaceutical tablets or solutions. 13 mothers (12.9%) from urban elite area, used soap and water, compared to 25 (56.8%) from peri-urban moderate and 19 (79.2%) from peri-urban poor. 63 (62.4%) of the urban elite mothers used boiling, compared to 19(43.2%) from peri-urban moderate and 5 (20.8%) from peri-urban poor. 25 mothers (24.7%) of the urban elite population sterilized the bottles using tablets or
solutions, none in peri-urban moderate nor in peri-urban poor sterilized the feeding bottles (p < 0.05).

**Age at which soft solids are / plan to be introduced:**

Introduction of soft solids in the form of cereals, egg yolk, broad beans…. Etc, was observed, and the results showed that none of the babies in the study population were given soft solids before the age of four months (0%). A majority of 304 babies constituting (69.9%) were given soft solids (or were planned to be given) at age the age of 4-7 months while 90 babies (20.7%) were offered soft solids at age 8-10 months. A minority of 41 babies (9.4%) was delayed in solid food introduction beyond the tenth month of life (Fig. 15).

Among urban elite children, majority of 98 (71.5%) had their first soft solid supplementation at age 4-7 months which is comparable to the values from peri-urban moderate 100 (68.5%), and from peri-urban poor 106 (69.7%). Children who had their first soft solid supplementation at age 8-10 months were 28 constituting (20.5%) of urban elite population, 29 constituting (19.9%) of peri-urban moderate population and 33 constituting (21.7%) of peri-urban poor population, the difference in age at which soft solids was introduced between the three areas, was not statistically significant (p = 0.85).

Soft solids first used among infants in the study population were multiple and variable, but top of the list were the cereals which were
used as first food by 126 mothers (29.0%), this was followed by potatoes, in 84 children (19.3%).
Other soft solids used were broad beans, which was used in 75 children (17.2%), eggs in 68 children (15.6%) and biscuits in 59 (13.6%) children. Meat was only used by 23 mothers (5.3%) and this was usually minced (Fig.16).
In urban elite population, the commonest used soft solid food item was cereals, 41(29.9%) (especially Cerelac, Riri and other trade marks as well as home made cereals), this was followed by egg yolk which was used by 33 (24.1%). Third in the list came the vegetables, mainly boiled potatoes in 26 (19.0%). Comparing this to soft solid food items used by peri-urban moderate mothers, it was found that cereal (mainly home made) was the commonest food item 35 (24.0%), followed by potatoes 33 (22.6%) and then broad beans 28 (19.2%). In peri-urban poor, cereal (mainly home made), was the commonest 50 (29.8%) followed by broad beans 32 (21.1%) and then potatoes 25 (16.4%), the difference was not statistically significant.

- **Weaning:**

A considerable number of children, 174 (40.0%) were weaned or were planned to be weaned at age 18-24 months, 104 (23.9%) at age 12-17 months, 75 (17.2%) at age 6-11 months. A few children 42 (9.7%) were breast fed / planned to be on breast-feeding beyond the
24th month of age, and only a minority of 40 children (9.2%) were weaned before six months of age.

Variations in age at weaning were noted, mainly between urban elite population on one hand and peri-urban moderate, peri-urban poor on the other hand, and were found to be statistically significant (p < 0.05). Among urban elite population, majority were weaned or planned to be weaned at ages 12-17 months, this was followed by the 6-11 months old group 36 (26.3%) and then those who were weaned / planned to be weaned at 18-24 months and those were 27 (19.7%). This is in contrast to those in peri-urban moderate, where a majority of 69 (47.3%), followed by weaning at 12-17 months and then weaning at 6-11 months. These values were comparable to those observed in peri-urban poor area, where 78 (51.3%) were weaned or planned to be weaned at ages 18-24 months. 25 children (16.5%) were weaned or planned to be weaned at age 12-17 months while 18 (11.8%) at age 6-11 months, differences in age at weaning between the three groups of study were statistically significant (p < 0.05) as shown in (Fig.17).

• Mode of weaning:

At the time of the study, 147 (33.79%) children were already weaned, of those 94 (63.9%) were weaned gradually, while 53 (36.1%) were suddenly weaned. Although most mothers recognized sudden weaning as being harmful, still 12 (25.5%) thought it was the
ideal way to wean babies, majority 18 (38.3%) weaned the babies suddenly because of a new unplanned pregnancy.

8 mothers (17.0%) weaned their babies suddenly because of having to go back to work, 6 (12.8%) because of child illness while 3 mothers weaned their kid early (6.4%) due to mothers' illness (Fig. 18).

Mothers who thought it ideal to wean babies suddenly were mainly from peri-urban poor, and they were 7 mothers, constituting (14.9%), 3 (6.4%) were from peri-urban moderate while 2 (4.3%) from urban elite. A new pregnancy was the cause of sudden weaning in 3 children (6.4%) from urban elite, 5 (10.6%) from peri-urban moderate and 10 (21.3%) from peri-urban elite. Resuming work was incriminated by 3 mothers (6.4%) from urban elite, 3 (6.4%) from peri-urban moderate and 2 (1.4%) from peri-urban poor. Mother and child illness was a cause in 3 (6.4%) from urban elite, 4 (8.5%) from peri-urban moderate and 3 (6.4%) from peri-urban poor.

- **Mothers' knowledge, attitude and practice regarding infant feeding:**

  Analysis of the scoring sheets was a real revelation. Although knowledge score was rather disappointing, 227 mothers (52.2%) had good knowledge about the ideal infant feeding practices, in contrast to 123 (28.3%) who had poor knowledge, 85 (19.5%) had average knowledge.
Gratifying was the discovery that mothers score on attitude towards breast-feeding was good in 314 mothers (72.2%), average in 71 (16.3%) and poor in a minority of 50 (11.5%). The practices of mothers were good in a majority of 348 mothers (80.0%), average in 53 (12.2%) and poor in a few cases of 34 coinciding to (7.8%).

In comparing the scores in the three study areas, great differences were noted. It was found that in urban elite population, 108 mothers (78.8%) had good knowledge regarding infant feeding 18 (13.1%) average and 11 (8.1%) had poor knowledge.

In peri-urban moderate population, 70 mothers (47.9%) had good knowledge, 39 (26.7%) average and 37 (25.3%) had poor knowledge, while in peri-urban poor population 49 (32.2%) were good in knowledge, 28 (18.4%) had average knowledge and 75 (49.3%) were poor in knowledge. The difference in knowledge between the three areas of study was of significance (p < 0.05), statistically (Fig.19a).

Attitude score was good in 104 (75.9%) of urban elite population, 108 (74.0%) in peri-urban moderate and 102 (67.1%) in peri-urban poor population. It was average in 21 (15.3%) of urban elite, 18 (12.3%) and 32 (21.1%) in peri-urban moderate and peri-urban poor respectively. Attitude was poor in 12 (8.8%) from urban elite, 20
(13.7%) and 18 (11.8%) in peri-urban moderate and peri-urban poor respectively, (p = 0.2) which is not statistically significant (Fig.19b). Practice score was good in 117 (85.4%) of urban elite population, 122 (83.6%) in peri-urban moderate and 109 (71.7%) in peri-urban poor population. It was average in 12 (8.8%) of urban elite, 14 (9.6%) and 27 (17.8%) in peri-urban moderate and peri-urban poor respectively. Attitude was poor in 12 (8.8%) from urban elite, 20 (13.7%) and 18 (11.8%) in peri-urban moderate and peri-urban poor respectively. (p < 0.035) as shown by (Fig.19c).

3.3. DIARRHOEAL ILLNESS:

- **Number of diarrhoeal episodes in the first year of life:**

  Diarrhoeal episodes among population children was studied and analyzed. Majority of children had 1-3 episode of diarrhea in the first year of life, these were 208 (47.8%). In urban elite the children who had 1-3 episodes of diarrhea were 58 constituting (42.3%), compared to 71 (48.6) from peri-urban moderate while 79 children (52.0%) were from peri-urban poor. Those who had no diarrhea during the first year of life were 124 (28.5%). In urban elite they were 52 children (38.0%), from peri-urban moderate they were 45 (30.8%) and from peri-urban poor 27 (17.8%). Among the study population, 88 children (20.2%) had 4-6 diarrhoeal episodes in the first year of life, 24 (17.5%) were from urban elite, 26 (17.8%) from peri-urban moderate...
and 38 children (25.0%) from peri-urban poor. Those who had > 6 diarrhoeal episodes in the first year of life were 15 (3.4%), 3 (2.2%) from urban elite, 4 (2.7%) from peri-urban moderate and 8 (5.3%) from peri-urban poor. The number of diarrhoeal episode / year varied considerably and the difference was statistically significant (p < 0.009) as shown by (Table 8).

\textbf{Number of diarrhoeal episode per year and exclusive breastfeeding:}

\textbf{-Urban elite}

Among urban elite children 103 children (75.2%) were exclusively breast-fed while 34 (24.8%) were not. Of those who were exclusively breast-fed, 47 (34.3%) had no diarrhea in the first year of life, compared to 5 (3.6%) of those who were not exclusively breast-fed. 42 (40.8%) among exclusively breast-fed babies, had 1-3 diarrhoeal episodes compared to 14 (41.2%). Children who had 4-6 episodes of diarrhoea were 11 (10.7%) among exclusively breast-fed children compared to 9 (26.5%) among non-exclusively breast-fed children. 3 children (2.9%) among exclusively breast-fed had more than six episodes of diarrhoea compared to 6 (17.6%) among non-exclusively breast-fed children. The co-relation between exclusive breastfeeding and number of diarrhoeal episodes in the first year of life was of high statistical significance, (p) being < 0.001 (Table 9a).

\textbf{-Peri-urban moderate}

Among peri-urban moderate children 45 children (30.8%) were exclusively breast-fed while 101 (69.2%) were not. Of those who were exclusively breast-fed, 24 (53.3%) had no diarrhea in the first year of life, compared to 21 (20.8%) of those who were not exclusively breast-fed. 12 (26.7%) among exclusively breast-fed babies, had 1-3 diarrhoeal episodes compared to 44 (43.6%). Children who had 4-6 episodes of diarrhoea were 6 (13.3%) among exclusively breast-fed
children compared to 28 (27.7%) among non-exclusively breast-fed children. 3 children (6.7%) among exclusively breast-fed had more than six episodes of diarrhoea compared to 8 (7.9%) among non-exclusively breast-fed children. Correlation was also of high statistical significance (p < 0.001) as shown in (Table 9b).

-Peri-urban poor:

Among peri-urban poor children 44 children (28.9%) were exclusively breast-fed while 108 (71.1%) were not. Of those who were exclusively breast-fed, 11 (25.0%) had no diarrhea in the first year of life, compared to 16 (14.8%) of those who were not exclusively breast-fed. 22 (50.0%) among exclusively breast-fed babies had 1-3 diarrhoeal episodes compared to 41 (37.9%). Children who had 4-6 episodes of diarrhoea were 7 (15.9%) among exclusively breast-fed children compared to 29 (26.9%) among non-exclusively breast-fed.

4 children (9.1%) among exclusively breast-fed had more than six episodes of diarrhoea compared to 22 (20.4%) among non-exclusively breast-fed children. The findings showed differences that were statistically significant (p < 0.078) as seen in (Table 9c).

*Age at first episode of diarrhoea:*

Although the recall period was somewhat lengthy, however, most mothers were able to give dates of no more than four weeks approximation regarding the first time their baby had diarrhoea.
The children of study who had no diarrhoea till the time of interview were 124 (28.5%). Those who had their first episode of diarrhoea before the age of four months were 72 (16.6%), 108 (24.8%) at the age of 5-12 months, 78 (25.1%) at the age of 13-18 months while 53 (12.2%) had their first diarrhoeal episode at 19-24 months.

It was observed that most children of peri-urban origin, 46 had the first attack of diarrhoea at age 5-12 months (30.3%), similarly of those from peri-urban moderate area, most children 38 had the first attack at age 5-12 months. In the urban elite area the highest number of children had the first attack at age 13-18 months.

On looking at the details of the results concerning the first diarrhoeal episodes in the three study areas, it was found that among urban elite, 52 (38.0%) had no diarrhoea till the time of the interview (regardless of age).

Among the remaining population, 12 (8.8%) had diarrhoea at the age of < 4 months, 24 (17.5%) at age 5-12 months, 25 (18.2%) at age 13-18 months and 24 (17.5%) at age 19-24 month.

Results from peri-urban moderate showed that 45 (30.8%) had no diarrhoea till now. Among the remaining population, 29 (19.8%) had diarrhoea at the age of < 4 months, 38 (26.1%) at age 5-12 months, 21 (14.4%) at age 13-18 months while 13 (8.9%) at age 19-24 months.
Regarding peri-urban poor children, 27 (17.8%) had no diarrhoea till now. As for the remaining population (311 who had no diarrhoea), 31 children (20.4%) had diarrhoea at the age of < 4 months, 46 (30.3%) at age 5-12 months, 32 (21.0%) at age 13-18 months and 16 children (10.5%) at the age 19-24 months (Table 10).

The difference was statistically significant (p < 0.014).

**Breast feeding practice during diarrhoea:**

The practice of breast-feeding during diarrhoea among mothers was briefly looked on. Results showed that, during diarrhoea attacks, 91 mothers (20.9%) stopped breast-feeding all together, till the diarrhoea ceased, on the other hand, those who increased the frequency of breast-feeding were a minority of 38 (8.7%). 108 mothers constituting (24.8%) decreased the frequency of breast-feeding, while a good number of mothers constituting 198 mothers, (45.5%) did not alter their way or frequency of breast-feeding (Fig.20).

Majority of those who stopped breast-feeding were from peri-urban poor population, constituting 56 mothers (36.8%), compared to 27 (18.5%) from peri-urban moderate and 8 (5.8%) from urban elite. Most mothers from urban elite population 89 (65.0%), did not change breast-feeding frequency during diarrhoea compared 62 (42.5%) from peri-urban moderate and 47 (30.9%) from peri-urban poor. Those who decreased frequency of breast-feeding during diarrhoea, were 42
(27.6%) among peri-urban poor, 38 (26.0%) among peri-urban moderate and 28 (20.4%) among urban elite population.

Only 7 mothers (4.6%) from peri-urban poor population increased frequency of breast-feeding during diarrhoea, 19 (13.0%) from peri-urban moderate and 12 (8.8%) among peri-urban poor mothers. Difference in breast-feeding practice in the three study areas during diarrhoe was statistically significant (p < 0.00) (Table 11).

● *First episode of diarrhoea and exclusive breast-feeding:*

- **Urban elite**

  103 mothers (75.2%) of urban elite population practiced exclusive breast-feeding. Among their children, 52 (50.5%) had no diarrhoea till the time of interview, 35 (67.3%) were exclusively breast-fed while 17 children (32.7%) were not. 85 (62.2%) had diarrhoea, out of those, 68 (80.0%) were exclusively breast-fed and 17 (20.0%) were not.

  Among the exclusively breast fed children 9 (13.2%) had the first episode of diarrhoea at age < 4 months, 12 (17.6%) at age 5-12, 18 (26.5%) at age 13-18 months and 29 (42.7%) at age 19-24 months. As for those who were not breast-fed exclusively, 4 (23.5%) had diarrhoea at < 4 months, 6 (35.3%) at 5-12 months, 4 (23.5%) at 13-18 while 3 children (17.7%) had the first episode of diarrhoea at 19-24 months. Difference in age at the time of the first episode of diarrhoea
between exclusively breast-fed and non-exclusively breast-fed was not statistically significant ($p = 0.247$)

- **Peri-urban moderate**

  45 mothers (30.8%) of peri-urban moderate population practiced exclusive breast-feeding. Among their children, 45 (30.8%) had no diarrhoea till the time of interview, 15 (33.3%) were exclusively breast-fed, 30 children (66.7%) were not exclusively breast-fed.

  101 children (69.2%) had diarrhoea, out of those, 30 (30.8%) were exclusively breast-fed and 71 (69.2%) were not. Among the exclusively breast fed children 3 (10.0%) had the first episode of diarrhoea at age < 4 months, 5 (16.7%) at age 5-12, while 9 (30.0%) at age 13-18 months and 13 (43.3%) at the age of 19-24 months.

  In comparison, among those who were not breast-fed exclusively, 14 (19.7%) had diarrhoea at < 4 months, 20 (28.2%) at 5-12 months, 26 (36.6%) at 13-18 while 11 children (15.5%) had the first diarrhoeal episode at 19-24 months of age. The variations were not statistically significant ($p = 0.115$).

- **Peri-urban poor**

  44 mothers (28.9%) of peri-urban poor population practiced exclusive breast-feeding. Among their children, 27 (17.8%) had no
diarrhoea till the time of interview, 15 (55.6%) were exclusively breast-fed, 12 (44.4%) were not.

125 (82.2%) had diarrhoea, out of those, 29 (23.2%) were exclusively breast-fed and 96 (76.8%) were not. Among the exclusively breast fed children 4 (13.8%) had the first episode of diarrhoea at age < 4 months, 8 (27.6%) at age 5-12, 8 (27.6%) at age 13-18 months and 9 (31.0%) at age 19-24 months. As for those who were not breast-fed exclusively, 25 (26.0%) had diarrhoea at < 4 months, 28 (29.6%) at 5-12 months, 22 (22.9%) at 13-18 and 21 (21.9%) at 19-24 months. Apparent differences were not statistically significant (p = 0.346).

3.4. GROWTH PARAMETERS:

• Weight for height:

Anthropometric measurements were done for children in the study sample and weight for height was determined for all. The study population showed a tendency towards lighter weights for heights. A sizable number of 142 children constituting (32.6%) were found to be between the 25th-50th centiles, while 129 children, comprising (29.7%) were between the 5th-25th centile. Fortunately, only 39 children, giving a percentage of 9.0% were below the 5th centile, on the other hand, 23 babies (5.3%) had weights for heights > 95th centile.
The differences in height for weight in the three areas were statistically significant (p < 0.00) as shown by (Fig.21).

**Weight for height and mode of feeding:**

Weight for height of children on different feeding patterns, i.e. breast, bottle (artificial) and mixed feeding were assessed. It was unsettling to discover that majority of the children falling below the 5th centile were mainly breast-fed. And though these were only 29 children, corresponding to a percentage of 11.4% of breast-fed children, it is still quite a considerable number compared to 3 children from the artificially fed group (3.6%) and 7 babies from the group who were mixed fed.

The highest number of breast-fed children was found to fall between the 25th - 50th centiles and those were 88 kids constituting 34.5% of breast-fed population, while many of the artificially fed infants, namely 28 corresponding to (33.7%) fell between the 50th - 95th centiles.

The greatest number of breast-fed children was found to fall between the 25th - 50th centiles and those were 88 kids constituting 34.5% of breast-fed population, while many of the artificially fed infants, namely 28 corresponding to (33.7%) fell between the 50th - 95th centiles. Among the mixed fed group, 31 children constituting the
highest percentage of (32.0%) among the group were found to be between the 5th - 25th centiles (Fig. 22).

As for the children who fell within the highest centile of > 95th, the greatest percentage of (8.2%) was contributed by the mixed fed group and these were 8 children, compared to 5 children (6.1%) from the artificially fed group and ten from the breast-fed group, giving a percentage of (3.9%).

In looking at the mode of feeding and weight for height in each area individually the following was noted:

- **Urban elite**

  Results showed that among children of urban elite population, 54 (39.4%) were mainly breast-fed, 37 (27.0%) were artificially fed and 46 (33.6%) were mixed fed. Majority of breast-fed children among this group, were found to be between the 25th - 50th centile, and these constituted 21 children, making up a percentage of 38.8%, while artificially fed babies were mostly between the 50th and 95th centiles and they were 18 children (48.7%).

  In the mixed fed population, majority were also found to be between the 50th - 95th centiles, these tallied to 20 kids and represented (43.5%) of mixed fed group.
Among those breast fed population, 1 child (1.9%) had a weight for height < 5\textsuperscript{th} centile, compared to 1 (2.7%) among artificial fed and 3 (6.5%) of mixed fed group.

High centiles results showed that 4 children (7.4%) among breast-fed infants were above the 95\textsuperscript{th} centile compared to 3 (8.1%) and 4 (8.7%) among artificial fed and mixed fed respectively (p = 0.477) (Fig.23a).

- **Peri-urban moderate:**

Regarding peri-urban moderate population, 89(61.0%) were mainly breast-fed, 29 (19.8%) were artificially fed and 28 (19.2%) were mixed fed.

Among those breast fed, 13 children (14.6%) had a weight for height < 5\textsuperscript{th} centile, compared to 1 (3.5%) among artificial fed and 1 (3.6%) of mixed fed.

32 breast-fed children, constituting the highest percentage of (35.9%) fell between the 25\textsuperscript{th} - 50\textsuperscript{th} centiles, similarly, among artificially fed, the highest number of children, 15, making up (51.7%) was also found to be falling between the 25\textsuperscript{th} - 50\textsuperscript{th} centiles. In contrast, mixed fed children fell mostly between the 5\textsuperscript{th} - 25\textsuperscript{th} centiles; these were 12 children (42.9%).

3 children (3.4%) among breast-fed infants were above the 95\textsuperscript{th} centile compared to 1 (3.5%) and 3 (10.7%) among artificial fed and mixed fed respectively (p = 0.120) as shown in (Fig.23b).
-Peri-urban poor

As for peri-urban poor population, 112 children (73.3%) were mainly breast-fed, 17 (11.2%) were artificially fed while only 23 (15.1%) were mixed fed.

Among the breast fed group, 15 children (13.4%) had a weight for height < 5th centile, compared to 1 (5.9%) among artificial fed and 3 (13.1%) of mixed fed.

Most of the breast- fed children had centiles between the 5th - 25th, and these were 46 children, comprising (41.1%). Artificially fed babies as well as mixed fed babies were similarly found to be between the 5th - 25th centiles, in the former this constituted 5 children (29.4%), while in the latter they were 10 children (43.5%).

3 children (2.7%) among breast-fed infants were above the 95th centile compared to 1 (5.9%) and 1 (4.3%) among artificial fed and mixed fed respectively (p = 0.312) as shown by (Fig.23c).
3.5. **HAEMOGLOBIN:**

- **Mean haemoglobin / mode of feeding:**

  Haemoglobin estimation for the study population revealed a mean haemoglobin value of 12.4 gm/dl in urban elite children, 10.9 gm/dl in peri-urban moderate children and 9.7 gm/dl in peri-urban poor children.

  Variations in haemoglobin with different modes of feeding were not so remarkable, for in urban elite population the mean haemoglobin in breast-fed children was 12.9 gm/dl, 12.3 in artificially fed children and 12.1 in mixed fed children. Situation was similar in peri-urban moderate and peri-urban poor children. It was observed that in the former, the mean haemoglobin for breast-fed infants was 11.0 gm/dl, as for artificially fed infants it was 10.7 gm/dl, while for mixed fed children it was 10.8 gm/dl. In the latter the mean haemoglobin for breast-fed infants was 10.0 gm/dl, 9.4 gm/dl for artificially fed and 9.7 gm/dl for mixed fed infants. There was no statistically significant difference between the three modes of feeding in relation to haemoglobin level in the three study areas (p = 1.0) in all.

  According to the level of haemoglobin, children were classified as having no anaemia, moderate anaemia, mild anemia and no anaemia. This was then correlated to the mode of feeding. It was
observed that among the breast-fed population, the largest group, made up of 86 children (34.7%), had no anaemia. On the other hand, majority of mixed fed children that constituted 33 babies (34.0%) had mild anaemia. Similarly among artificially fed, the most common was mild anaemia and was observed in 30 children (36.1%).

Severe anaemia was encountered in a minority of the study population, where only 34 children were afflicted, giving a percentage of (7.8%). The distribution of severe anaemia in children with regards infant feeding mode was noted, and it was found that 16 children (6.3%) were breast-fed, 9 (10.8%) were artificially fed where as 9 children were on mixed feeding constituting (9.3%).

Haemoglobin was normal in 86 children (33.7%) who were breast-fed, 23 children (27.7%) from the artificially fed group, while 32 kids (33.0%) from the group on mixed feeding had no anaemia. Variations in haemoglobin level of the study population with mode of feeding were not statistically significant (p = 0.621) (Fig. 24).

- **Urban elite:**

  None of the children from the urban elite population suffered from severe anaemia, at the same time majority of the children, 56 had normal haemoglobin (40.9%). Among children who had normal haemoglobin, 24 were breast-fed constituting (45.3%) of the breast fed
population, while 19 were from those on mixed feeding (41.3%) and 13 children were from the artificial fed group (35.1%).

It was noted that most of the children on mixed feeding had no anaemia in contrast to the artificially fed that among whom the majority had mild anaemia. The findings were not statistically significant (p = 0.893) as shown in (Fig. 25a)

**Peri-urban moderate:**

The largest group, which had no anaemia, was from breast fed infants, these were 34 children, representing (38.2%). Severe anaemia was more prevalent in the artificially fed group among whom it constituted 4 children (13.8%), compared to 5 (5.6%) from the breast fed group and 2 children from the mixed fed group. The artificially fed babies mostly had mild anaemia 11 (37.9%), while children on mixed feeding were mostly not anaemic 10 (35.7%). Differences were not statistically significant (p = 0.798) as shown in (Fig. 25b)

- **Peri-urban poor:**

Most of the children in this area comprising of 54 children had moderate anaemia (35.5%), this was followed by mild anaemia in 42 children (27.6%), then those who had normal haemoglobin 33 (21.7%) and last the severe anaemia group which was made up of 23 children (15.2%)
It was unpleasant to discover that among breast-fed infants in this area, 42 children (37.5%) constituting the largest sector, suffered from moderate anaemia, this was followed by those who had mild anaemia and those constituted 31 children (27.7%), while only 28 children (25.0%) had normal haemoglobin. Severe anaemia was encountered in 11 breast-fed children (9.8%).

It was noted that children on mixed feeding had better haemoglobin levels where 8 (34.8%) had mild anaemia. The differences in haemoglobin levels with mode of feeding was statistically significant (p < 0.05) as shown in (Fig. 25c)
4.1. GENERAL CHARACTERISTICS OF THE STUDY

POPULATION:

4.1.1. Age, sex and residence of children:

A total of 435 children were studied in three areas in Khartoum Province, each area representing a different socioeconomic population in the majority. Male to female ratio was 1.1:1 with a slight male gender predominance. The difference in ratio of male to female between the three studied areas was statistically not significant.

The most common age group was 4-9 months, which constituted a percentage of 28.0%; the rest of the population was distributed more or less equally between the other age groups. These demographic findings are consistent with the reports of The Sudanese National Population Census - Central Bureau of Statistics 1995-1996.

4.1.2. Mother's age, education and employment:

Majority of the mothers' ages was between 20-39 years; most were of low education levels and unemployed. These
findings are consistent with the Sudanese female social status (86). They are also similar to the findings by Omer et al in Sudan where he found that most mothers of the children in his study were not employed (30).

The mothers age group distribution difference between the three studied areas was statistically insignificant, but there was a significant difference in employment status and education level between them. This is explained by the social background differences in the studied areas with urban elite mothers having ample chance at education and hence employment.

- **Employment, maternal leave and contraceptive use:**

  Most working mothers had a short duration maternal leave for this delivery, which is comparable to the finding by Mansour S.A. in Egypt (19). The duration of breast-feeding was found in many studies to be directly correlated to the maternity leave. An example is the finding by a study done in Denmark that revealed that one year after delivery, significantly more mothers were housewives, whereas those who weaned their babies early were the working mothers (87).

  One third of the mothers used contraceptives; majority was from working population in the urban elite area. The most common form of contraception used was the pill followed by the loop and
injection; this is consistent with the findings of the baseline survey on reproductive health and family planning in Khartoum. The survey identified that breast-feeding, employment and use of contraception are not only inter-related but are complementary to one another (88). For working mothers tend to use contraceptives to increase the birth interval so as to avoid the frequent interruptions to her work by childbirth. The use of contraceptives, especially the pills shortens the lactational amenorrhoea and subsequently reduces the duration of lactation and hence the mother becomes more liable to a new pregnancy in case of failure of the contraception.

**Socioeconomic status of the study population:**

The population was somewhat evenly distributed between the three socioeconomic classes each constituting a third. Most families had a monthly income in the range of 7,500-35,000 Sudanese Dinars representing the actual pattern of Sudanese family's monthly income (86). Most of those of low income were from Mayo (peri-urban poor) while the most affluent were from Al-Riadh (urban elite). It was observed that income alone was not a good reflection of socio-economic class. A large sector of the studied population in Mayo had moderate to high incomes from non-professional jobs, at the same time their living conditions were well
below average in terms of type of housing, sewage disposal, education and safe water supply.

4.2. INFANT FEEDING PRACTICE:

- **Breast-feeding:**

  Most of the children of study were breast-fed (96.1%), this is a similar finding to those by Omer et al in whose study almost all mothers breast-fed their children for some time after birth \(^{30}\). Similar findings were encountered in most countries of the Eastern Mediterranean Region (EMA) and Africa, where results from WHO studies in different periods showed that the percentage of babies who have been breast-fed at some point is high: 98% in Africa, 96% in Asia and 90% in South America \(^{25}\). This is unlike percentages from the United States where only 35-45 \% of children were ever breast-fed, while in European countries the breast-fed babies were 86-95\% \(^{18}\). There was no statistically significant difference in breast-feeding between the three areas of the current study.

- **Reasons for not attempting breast-feeding:**

  The leading cause for not breast-feeding was the mother's illness followed by the baby's illness during the early neonatal period. No milk and baby's refusal tailed the list, none of the mothers showed a desire against breast-feeding. These findings were
similar to those in the study by Omer et al in Sudan and unlike those
given by mothers in Vancouver where concern for baby's nutrition,
concern about milk supply, and returning to work were the deciding
factors in their choice not to breast-feed \(^{30,89}\).

- **Time lapse before the first breast-feed offered**

  **to the baby:**

  Majority of babies were started on breast feeding in the first
12 hours following delivery and these constituted 61.1% of the study
population 24.6% were put to the breast in the next 24-48 hours
while 14.3% were delayed beyond 72 hours. These are similar
findings as in a number of studies done in Sudan, in one of which
Omer et al found that among rural mothers, 72% initiated breast
feeding in the first half hour to 24 hours after delivery, delay of 6
hours or more was practiced mainly by rural mothers. At the same
time, 13% and 17% of urban elite and urban poor mothers
respectively initiated breast-feeding after 24 hours \(^{30,31,32}\). These are
matched by the findings in our study in which 60.5% of urban elite
children, 58.9% of peri-urban moderate and 60.5% of peri-urban
poor were put to the breast within the first 12 hours. In 17% from
urban elite, 19% from peri-urban moderate and a large number
constituting 26% from peri-urban poor were delayed in breast-
feeding for more than 72 hours after birth.
These are different from findings from a tribal community in India where 70% of the children received their first breast feed after the first 24 hours after birth (13). These differences are most probably due to cultural beliefs of different population groups (20). Initiation of breast-feeding in the three study areas was nearly similar and no significant statistical difference was found.

Reasons for delaying the first breast-feed among the mothers of the study were cultural beliefs in 32.2%, mother illnesses in 29.1%, baby's illness in 21.0% and 17.7% claimed that they had no milk during the early postpartum period. These were consistent with findings from several African countries and countries from the region of the EMA, in which the cultural belief that colostrum is harmful to babies is a leading cause for delay. In the interim between birth and breast-feeding (usually about 3-7 Days), foods were offered according to the customs and traditions in the different area (90).

- **Colostrum feeding:**

  It was a great relief to discover that most children of the study, 88.7%, were fed colostrum. The highest rate being in urban elite area where 94.9% were breast-fed with colostrum, in peri-urban moderate 88.4% and in peri-urban poor those constituted 83.4%. The difference
in colostrum feeding rates of the three areas was statistically insignificant.

Most children who were not fed with colostrum were from the peri-urban poor area where they represented 16.4% and the least number was from urban elite, 5.1%. These findings are similar to those by Omer et al in 1978 where 75-85% of his study population was fed colostrum. Findings are unlike those from a study done in Oman jointly by the government of Oman and UNICEF in 1973 where breast-feeding was mostly started 3-7 days after delivery so as to avoid colostrum feeding which is believed to be harmful (90).

In a study done in Mexico, 91% were initiated early on breast milk and were fed colostrum (91).

The leading cause for not giving children colostrum in our study was cultural belief in 44.9%, among those 14.3% believed that colostrum is harmful to babies. It was noted that 60% of mothers from peri-urban poor who did not feed colostrum feared jeopardizing their child's health by doing so. Also in peri-urban moderate 41.2% declined to feed colostrum due to cultural reasons, 11.8% believing it harmful, these are similar beliefs as mothers from Oman (90). There was an obvious difference in concept among urban elite mothers among whom the cause for not feeding colostrum was either due to the mother's or baby's illness during the early postpartum period. This
difference between urban elite mothers on one hand and peri-urban moderate and poor on the other hand can be attributed to the fact that mothers in urban-elite are more educated and have access to a variety of health education and promotion channels. Their counterparts in peri-urban moderate and poor are still tied down by their cultural heritage and deep set traditions and tribal beliefs, their illiteracy hindering them further.

- **Frequency of breast-feeding offered to infants:**

Feeding on demand was the main mode of feeding among the study population, it was practiced by 90.2%. All mothers in the peri-urban poor area fed their children on demand while in the peri-urban moderate area they constituted 90.6% where as 78.6% of urban elite mothers practiced feeding on demand. These findings were more or less comparable to results from the study by Omer etal where 74-97% of mothers in his study breast-fed their babies on demand. Feeding on demand was also the main practice by mothers from Oman as shown by a joint Oman government / UNICEF (1973), where the rate was <90% (90). Similar results were found among mothers from Sweden- Uppsala among whom feeding on demand rate was <75% (92).

Although the difference in practice between the three areas of study was not statistically significant, but there is quite an
apparent difference in the percentage of mothers in urban elite who practiced feeding in demand less frequently, compared to the other two groups. This difference is most probably due to the fact that urban mothers are still holding to concepts, which makes scheduled feeding appear more civilized and fashionable.

- **Mode of feeding adopted by mothers:**

  Majority of children were breast-fed, comprising 58.6% of the population of the study, 19.1% were bottle fed (artificial fed) and 22.3% had mixed feeding. Bottle and mixed feeding was mainly practiced by urban elite mothers, among whom they constituted 60.6% of its population, while breast-feeding was mostly practiced by peri-urban poor mothers 73.7% and peri-urban moderate mothers 61.0%. These are consistent with the findings by Luckman H. etal, who found that bottle feeding was more frequently practiced by the highly educated mothers, it seemed that the higher the income, the more mothers tended to give bottle feeding (93). Our findings are unlike those by Omer etal in 1987, where he found that bottle-feeding was introduced by majority of mothers very early on, during the first few days after delivery. In his study the percentage of who bottle-fed was
highest in the rural group 62% compared to the other groups, the range being from 16% to 34% \(^{(30)}\). The difference between these results can well be explained by the time difference of the two studies. Done thirteen years apart, the Sudanese household financial status has changed so much that return of the poor population to breast-feeding can well be due to it being less costly. Being optimistic, it could also be due to the great expansion in health care programs reaching the outskirts and providing needed information on child health to mothers in these areas.

- **Exclusive breast-feeding:**

  Exclusive breast-feeding was practiced by 44.1% of the study population, the highest rate being in urban elite population where 78.6% of children were exclusively breast-fed. These were similar to the findings from Sweden where in one study 40% were exclusively breast-fed \(^{(91)}\). Zodpi in India found a rate of 69%, which is much higher than the rate in this study \(^{(13)}\). Data from Pakistan and Tunisia show that only 12% and 13% of infants respectively, were receiving exclusive breast-feeding, which are much lower percentages than our study. On the other hand results from Morocco showed that 46% of mothers practiced exclusive breast-feeding \(^{(19)}\).
In peri-urban moderate and peri-urban poor areas, the rate was 32.4% and 29.7% respectively. The difference in practice between the study areas was statistically significant. This difference in practice among our study population is probably explained by the better education status among urban elite mothers, and their deliveries mostly taking place in hospitals where medical personnel advice mothers about exclusive breast-feeding and other aspects of optimum practice. On the other hand the other two groups, majority of the mothers are still practicing home births, which curtails a large number of mothers from important information, which would have been obtained from the medical personnel in hospitals.

The leading reason for not practicing exclusive breast-feeding was that it is the custom to give babies some form of supplements (30.1%), especially dextrose water. This went hand in hand with the next big group (29.2%) who were adamant that breast-feeding alone could never satiate their baby. The most surprising finding was that 26.1% claimed that they had no idea about such practice i.e. exclusive breast-feeding. A group of 14.6% incriminated returning to work soon after delivery as being the cause, since their babies have to learn from earlier on to depend on nutrition source other than breast-milk. These
reasoning give an insight into the fact that mothers need to be enlightened very early on about this in order to convince them about its beneficial effects.

- **Age at which anything other than water was given:**

  Alarming was the finding that 34.0% of the study population received some form of supplementation as early as < 2 weeks of age. Some of those children were given fluid supplements for a week or two and then they were reverted to exclusive breast-feeding. Among the rest of the population, 44.1% were given the first supplement at age > 16 weeks, 14.5% at 2-6 weeks and 7.4% at 7-15 weeks. Most of those who were given supplementation were from peri-urban moderate, 41.1%, and peri-urban poor, 41.5%, while only 18.2% from urban high gave their infants supplements before two weeks of age. These findings were similar to those reported in a study on nutritional status in Sudan in 1982, where it was revealed that water, and sometimes diluted cow or goat milk were given to infants as early as the first 48 hours after delivery (94). Omer et al also reported early introduction of supplements, majority between the ages of 3-5 months. Supplements were introduced much earlier in urban new settlers than other group (30).
In a study done in Somalia, it was found that 41.5% of infants received supplementation in the first six months of infancy, a great number constituting 39.5% received water even before the onset of breast-feeding (19).

The commonest fluid supplementation was sweetened water, or water in which various types of herbs were boiled which was used by 43.8%. Cow milk was next in the list and was used by 21.2%, followed by goat milk in 15.0%, formula milk in 12.0% and other types of supplements in 8.0%. The striking and strange supplement used by a number of mothers from peri-urban moderate as well as poor, is milk cream, which is given to babies with the belief that it improves their appetite and gives them protection against gastroenteritis. Formula milk was used as a supplement mainly in urban elite, where 42.8% of mothers there used it. Taha et al from Sudan reported that the common fluid supplements given to infants were milk, fruit juices, sugared water, dilute sorghum pap or dilute custard (31).

- **Addition of sugar to supplementation:**

A considerable proportion of 83.2% of mothers who gave early supplementation to their babies used sugar for sweetening, most of those were from peri-urban moderate and peri-urban poor areas where 86.2% and 92.6% respectively sweetened
supplements, compared to 39.3% from urban elite. This is consistent with findings from a number of studies done in Africa and the EMA where it was discovered that almost all mothers sweetened the baby's supplements. In Jordan, and Somalia sweetened water was given at birth (19).

- **The way supplementary fluids are given:**

  61.1% of mothers used cups and spoons to feed their babies, while 38.9% used feeding bottles. 73.3% of mothers from urban elite supplemented their babies using feeding bottles. In peri-urban moderate 30.1% used feeding bottles while only 15.8% of peri-urban poor mothers did. In Taha's study, a bottle was used in feeding most children, similarly Omer et al reported a high rate of bottle use (30,31).

The greater use of bottle in feeding infants among the urban population is probably due to one of many factors. Going out to work can be reason enough to use the bottle, the better financial set up makes mothers more able to afford the more costly bottle feeding, also the convenience as well as its being perceived as more fashionable and modern.

In Somalia and Tunisia, most infants were given fluid supplements by cups and spoons (19).
- **Number of feeding bottles per infant:**

  30.8% of babies had one feeding bottle, 55.6% had 2 bottles and only 13.6% had more than 2 feeding bottles. A single bottle was used by 70.8% of peri-urban poor mothers and none had more than 2 bottles. On the other hand, all mothers in urban elite had more than 2 feeding bottles. Acquisition of one feeding bottle would not be adequate regarding hygiene. Putting in mind that the least form of acceptable bottle care is boiling after every use, this would not be feasible in most cases with a single bottle. This gives a frank clue about the misconception in use of feeding bottles, especially among the less educated sector in peri-urban moderate and poor.

- **Bottle care:**

  Bottles were boiled by 51.5% of mothers who used them, but none of the mothers did this after every feed. The commonest practice between mothers was to boil bottles every 2-3 days, most believing that washing with soap and water is sufficient in between boiling, a number of mothers had a weekly boiling schedule. A considerable number of bottle-feeding mothers, constituting 33.7%, washed the bottles with water and soap only (some did this only once / day, the rest of the day bottles were
rinsed in water only!). 79.2% of bottle feeding mothers in peri-urban poor practiced bottle washing only, while only 20.8% boiled bottles. A minority, all of whom are from urban elite, where they constituted 24.7%, practiced sterilization using commercial solutions and tabs. There is very marked variation in bottle care practice among the three study groups, especially between the urban elite on one hand and peri-urban poor and moderate on the other hand. These differences are mostly due to the unawareness of mothers of low socioeconomic classes, mostly being uneducated, about the hazards of using feeding bottles and caring for the feeding utensils inappropriately. Situation in Lebanon was comparable, in a study done there it was found that 56.3% of mothers boiled the feeding bottles after each feed, while 22.5% boiled it casually and 21.2% did not boil the bottles and relied on washing only \(^{(19)}\).

- **Soft solid introduction:**

  Soft solids were not introduced as a supplement until after the age of 16 weeks in all children of the study. The majority, comprising 69.9% started soft solids at age 4-7 months,
percentages were comparable in the three study areas. Only 9.4% were delayed till they were more than 10 months before they were given any soft solid supplementation. Findings among the three study areas were also comparable. These findings were similar to those in the studies done in Sudan, Taha, found that the majority of children were started on soft solids by the age of seven months. Omer also reported this as being done between 4-7 months while Ostrowski reported that soft solids were first introduced after the age of four months in southern Sudan. In Pakistan Khan reported that many children were started on soft solids from as early as two to three months of age.

- **Soft solids commonly used:**

  Cereals, in their different forms, were the most popular first foods among the study population and were used by 29.0%, vegetables, mainly potatoes were next and were used by 19.3%, broad beans by 17.2%, eggs in 15.6% (mainly the yolk was the used). Cereals were used by the majority of mothers in the three study areas as first food, but after that there was a difference in arrangement of food items. It was found that broad beans and potatoes were next in the items of peri-urban poor and moderate population, while in urban elite eggs and then vegetables followed the cereals. The cereals used in urban elite were mostly ready-
made, commercial trademarks, while in the other two areas the cereals were home made. Taha and Omer studies gave a variety of soft solids used by the Sudanese mother, but the most commonly used are the cereals \(^{30,31}\). In Somalia and Pakistan cereals were also commonly used along with biscuits, vegetables, bread and minced meat \(^{19}\).

- **Weaning:**

  40.0% of mothers either weaned their babies at 18-24 months or thought this is the appropriate age to wean their still unweaned baby. The next big group were those who weaned or thought to wean at 12-17 months of age, these constituted 23.9% Only 9.2% were weaned at less than 6 months of age and 9.7% were still breast-feeding or their mothers wish to feed them beyond 24 months of age.

  Mothers from urban elite weaned their babies much earlier than in the other two groups, most being weaned at 12-17 months, followed by those weaned at 6-11 months. This is in contrast to the other two areas where most babies, were weaned at 18-24 months followed by weaning at age 12-17 months of age.

  In Omer et al study, the mean ages at weaning were 14.2, 14.6, 16.1 and 16.7 of urban elite, urban new settlers and rural respectively. He also found that of all mothers who had stopped breast-feeding the
highest percentage was observed among urban-elite mothers 84% (30). These are comparable to the results of our study in which urban mothers weaned their babies much earlier than the other two groups.

- **Mode of weaning:**

  Weaning was abrupt and sudden in 10.8% of weaned children, a new pregnancy being the leading cause in 38.3% mothers. 25.5% of mothers believed sudden weaning to be the ideal way, those were mainly mothers in peri-urban poor and moderate. Other reasons included mother or child illness in 19.2% and returning to work in 17.0%. Gradual weaning in Sudanese children was also reported by Omer and Taha who stated that weaning was initiated very early, mothers who stopped breast-feeding suddenly did so because of a new pregnancy, mother or child illness (30,31). Abrupt weaning because of a new pregnancy is very common practice in the Sudan where it is believed that the milk becomes harmful to the baby when the mother is pregnant.

  In countries such as Lebanon, abrupt weaning is the mode and is practiced by almost all mothers. To do so mothers either use bitter tasting substances such as quinine on the breast, or give the baby to a relative for some time (19).

- **Mothers' knowledge, attitude and practice regarding infant feeding:**
It was heartening to discover that though the knowledge about the optimum feeding practices among the study population was good in only 52.2%, average in 19.5% and poor in 2.3%, the practice was good in 80.0%, average in 12.2% and poor in only 7.8%. While good attitude scored a high 72.2%, was average in 16.3% and poor in 11.5%. These findings signify that the traditional practices regarding breast-feeding are not way out of line, this being reflected by the high scores regarding both attitude and practice of breast-feeding. The gap between attitude and practice was also observed among Kuwaiti mothers, majority of whom believed that breast-feeding was good for the health of children and mothers, while at the same time only 50% of these mothers breast-fed their infants' (95).

The differences between the three study areas of the study were quite remarkable regarding knowledge, which was good in 78.8% of urban high population, compared to 47% and 32.2% in peri-urban moderate and peri-urban poor successively.

As for practice, it was comparable in the three areas, being good in 85.4% of urban elite mothers, 83.6% in peri-urban moderate and 71.7% in peri-urban poor. Attitude was good in 75.9% of urban high population, 74.0% of peri-urban moderate population and 67.1% of peri-urban poor population.
The difference were statistically different only regarding knowledge which is good in a greater percentage of urban elite mothers than the other two groups. This is a typical finding since mothers of the first group are more educated and are more in contact with the health education programs of the different media.

4.3. DIARRHOEAL ILLNESS:

- *First diarrhoeal episode and exclusive breast-feeding:*

A greater number of non-exclusively breast-fed children had their first diarrhoeal episode early at < 4 months of age compared to those exclusively breast-fed children, the ratio being 1.8:1 in urban elite, 1.9:1 in peri-urban moderate and 1.7:1 in peri-urban poor. It was also noted that the number of exclusively breast-fed babies in subsequent age groups who had the first diarrhoeal episode signifies some sort of protection conveyed by this mode of feeding, but still this difference was not significant statistically. Similar findings were observed in the three areas of study. First diarrhoeal episode is a result of multiple factors that include the immunity of the baby, the environmental situation that he is living in as well as feeding practices. These are usually variable even among the same population. It is therefore difficult
to come up with a reasonable conclusion without standardizing for all the contributory factors.

- **Diarrhoeal episodes per year:**

  It was observed that diarrhoeal episodes were more frequent among children who were not exclusively breast-fed, which was a common observation among the three study groups. The difference in diarrhoeal episodes per year was significant statistically in the three areas of study. This signifies a positive correlation between exclusive breast-feeding and reduction in diarrhoeal episodes in infants, Although this association might well disappear if controlling for other factors such as age, general hygiene and other factors, which are important in the relationship between breast-feeding and diarrhoea.

  The children from the other two groups are mostly of low social classes, living mostly in unhealthy environment, with over crowded housing conditions making them more liable to illnesses.

  The findings of this study in this aspect were comparable to those by Zumrawi et al, who stated that the episodes of diarrhoea were higher among supplemented than among exclusively breast-fed infants. The mean number of episodes in the supplemented group is 5.2 days/month, 4.4 days in the non-supplemented group, however, the findings were not statistically significant\(^{67}\).
Breast-feeding practice during diarrhoea:

The commonest practice among mothers during diarrhoea was to continue with the same pattern of feeding with no change in frequency or duration of breast-feeds in 45.6%. However, it was rather disappointing to find that a considerable number, constituting 24.8% decreased the frequency of breast-feeding during diarrhoea while 20.9% stopped it altogether. During diarrhoea they gave their children a variety of fluid supplements, mostly, boiled herbal concoctions sweetened with sugar which unfortunately made the diarrhoea much worse.

Only few mothers increased the frequency of breast-feeding during diarrhoea and they comprised a meager 8.7%. These findings are comparable to those found by the WHO in Jordan where 65.4% of the mothers did not alter their pattern, 22.7% decreased it, 5.7% increased the breast-feeding frequency, while 6.2% believed stopping breast-feeding was good in the treatment of diarrhoea \(^{(32)}\).

These findings were quite different from those observed by El-Bushra in a hospital based study done in 1987, where he found that only 2.9% of mothers stopped breast-feeding their children during diarrhoea, 12.7% reduced breast-feeding and the rest 84.4% continued breast-feeding as normal. A high percentage of mothers 44.1% gave fluid foods during diarrhoea, while 28.2% gave solids, family food was
given by 23.6% and nothing by 4.1% (67). These different findings are probably due to the fact that El-Bushra's study population was derived from mothers who presented to the hospital of the study. The hospital based study misses a large group of mothers who are mostly from poor social classes and who tend to manage their children's illnesses traditionally at first, if the diarrhoea persists and they are forced to seek medical care this is usually late, at which time the children present either as cases of severe dehydration or cases of protein energy malnutrition.

Among urban mothers, the commonest practice was to breast-feeding without change in frequency or duration of feeds in 65.0%. Among peri-urban moderate, a majority of 42.5% also did not alter their way in breast-feeding, unlike peri-urban poor mothers among whom 36.8% stopped breast-feeding during diarrhoea. These differences, which were statistically significant, are probably due to different cultural beliefs, and poor knowledge among peri-urban poor mothers about the significance of reducing fluid intake during diarrhoea. Urban mothers and peri-urban moderate on the other hand have more contact with medical personnel and medical literature as well as contact with health education media from which much information is gained.
5.4. Growth and mode of feeding:

Interpretation of the various growth parameters in relation to mode of infant feeding showed statistically significant differences between the three areas of study, children from the urban high population having higher centiles in weight, height and weight for height than children from the other two study areas. However, weight for height correlation with mode of feeding in each study area showed no striking difference. The minor variations were statistically not significant.

In the population from peri-urban moderate and peri-urban poor the differences were also not remarkable. But in this case it would be difficult to compare weight for height and other growth parameters in the three modalities of feeding i.e. breast-feeding, artificial feeding and mixed feeding, since a few number of children represents the latter two feeding modalities. The unexpected finding was the high percentage of breast-fed children in peri-urban poor population whose weights for heights were less than the 5th centile, this disappointing observation could well be due to putting babies on breast-feeding without supplementation at the proper age. Or it could be that supplementation given are of very poor nutritional values, keeping in mind that babies and children in these social setting are usually fed
after the elders. In spite of the fore-mentioned finding, still the weight for height among breast fed babies was slightly higher in both areas regarding the other centiles, mixed fed babies were higher in centiles than artificially fed babies. Zumrawi also studied and compared the weight gains of exclusively breast-fed and supplemented children and found that no difference of statistical significance was discernible between the two group's \(^{(67)}\).

The observation that breast-fed infants in the study had better weight for height centiles (although this was not statistically significant), suggest that breast-feeding in all situations is more beneficial than other modalities of feeding in terms growth.

In studying growth in weight and height in Sudanese children, Zumrawi found that they fell below the reference standard by the age of five months. About half the children began to falter by 16 weeks. When comparing the exclusively breast-fed with those who are supplemented she found no difference in weight gain, however the study was done in a short duration of time and the conclusions drawn may well differ if the children were followed for longer periods \(^{(67)}\).
4.5. Haemoglobin:

The mean haemoglobin among breast-fed babies was 11.3 gm/dl, mixed fed babies had a mean haemoglobin of 10.9 gm/dl while artificially fed babies had the lowest haemoglobin among the studied population being 10.5 gm/dl these findings were however, not statistically significant. The lower haemoglobin among infants who were on artificial feeding is probably due to the fact that those children are given less nourishing foods with no iron or vitamin supplementation, at the same time that they are deprived of the highly nutritious breast milk. The higher mean haemoglobin among breast-fed followed by mixed-fed infants is supported by findings in a study done in Jordan by Hijazi who found that the prevalence of anaemia among the mixed-fed infants is more than the breast-fed and less than the bottle fed infants (19).

The higher haemoglobin values among the urban elite population is due to the far better social setting, the better quality of nutrition care where mothers are more educated and more aware of the nutritional needs of their children.
Haemoglobin status in relation to mode of feeding was not significant in the urban elite and peri-urban moderate population, this is probably due to the greater awareness of mothers in these groups about how to feed and supplement their babies feeds as well as how to deal with bottle feeding and artificial feeding. However, it was of statistical significance in the population of peri-urban poor area (p <0.05) where breast-fed infants had higher haemoglobin values than the other two groups. Also, the mixed fed group had higher haemoglobin levels than the artificially fed group. These findings are similar to those observed by Hijazi (96). The mothers' unawareness about the nutritional needs of babies is the main reason for these findings, followed by the limited resources which makes it difficult for mothers of low income to provide their babies with suitable supplements to guard against anaemia.

Severe anaemia was found to be more prevalent among the artificially fed children in peri-urban moderate population, while in peri-urban poor population severe anaemia was commoner in those who received mixed feeding. As already mentioned, the artificial-fed and mixed fed groups were represented by a small number of children, it is therefore difficult to come up with positive conclusions in such a situation. Still, the obviously high percentage of severe anaemia among these children in comparison to breast-fed children indicates that breast-feeding may be a protective factor in
guarding against anaemia. These findings were similar to those observed by Abdullatif et al. who found that anaemia is more prevalent in artificially fed children, the mixed fed infants in the study were able to maintain satisfactory haemoglobin. His study produced enough evidence that iron deficiency anaemia is uncommon in infants who were breast-fed (85).
CONCLUSIONS

1. Breast-feeding was found to be the most prevalent practice among Sudanese mothers, regardless of their social background.

2. Initiation of breast-feeding was early in a great majority, delay for more than 72 hours being more common among peri-urban population.

3. Most mothers practiced colostrum feeding, failure to do so was commoner among peri-urban population, and was mainly due to cultural belief about its inappropriateness.

4. Exclusive breast-feeding was not widely practiced, especially among the moderate and lower social classes, but was largely practiced by urban elite mothers

5. Supplementation was inappropriately started at an earlier age than four months, this was more so among the peri-urban population, supplementary fluids used were mostly sweetened with sugar regardless of the babies age.

6. Bottle-feeding was practiced much more by urban elite mothers than the other two groups. In the other two groups, supplementation is given by cups and spoons. Bottle care among the peri-urban poor and
peri-urban moderate populations was not properly undertaken, urban elite mothers had better bottle care practice.

7. Most mothers gradually undertook weaning. Sudden weaning was associated with cultural beliefs regarding the consistency of breast-milk being harmful during pregnancy, and was mainly practiced by peri-urban poor mothers.

8. Mothers knowledge about optimum infant feeding lacked a lot, especially in the peri-urban poor population, on the other hand attitude and practice were at a far better level, in the three areas.

9. Exclusively breast-fed infants had less diarrhoeal episodes in the first year of life, but there was no change in the age at which the infants had the first attack of diarrhoea.

10. Growth parameters showed no significant variations in relation to different modes of feeding.

11. Haemoglobin values were higher for breast-fed infants than those on artificial or mixed feeding. Mixed fed infants also had higher haemoglobin levels than the artificially fed. In peri-urban poor population the relationship between haemoglobin status and mode of infant feeding was of palpable significance, where breast-fed infants had better haemoglobin values than other modes of feeding.
RECOMMENDATIONS

1. Widening the scope of breast-feeding programs so that maternal education about infant feeding would be initiated as early as possible. The effort would be more fruitful if breast-feeding and child-care are included as subjects in the syllabus of high school female education. This is important because the incorrect traditional practices and cultural beliefs are usually deep set and erasing them requires a lot of time and effort.

2. Make the optimum use of the available facilities and channels. These include the health centers, the media and so on, in promoting and encouraging breast-feeding, by ensuring the availability of skilled personnel and service providers in the already established facilities, where messages are being transmitted to mothers and mothers to be.

3. To establish, wherever possible "mother groups", in villages and urban communities, so that these groups are able to help women in the same area and community to gain more knowledge and understanding about the optimum feeding practices and the basic nutritional needs of children.

This could be done under the supervision of the various breast-feeding promotion programs and national committees. These "mother groups"
would move the focus of breast-feeding promotion programs from being defensive in nature to being more proactive.

The sense of involvement and self-achievement, which would be felt by the mothers, will be a great contribution in promotion of useful policies regarding infant feeding and childcare.
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Arab (38.3% comprising ethnic Arab, Berber and Arabized Sudanese descendents) in the North, and Negro in the South. In addition to the Arabs, the Beja and Nuba ethnic groups, Nubians and West Africans (each accounting for 5-6% of the population) live in the North, while the Dinka (11.2%, the largest ethnic group) live in the south, as well as the Nuar (4.5%), Bari, Azandi (2% each) and various other Nilotic and Sudanic ethnic groups.
Chi square test = 2.343

p value = 0.31
'p value = 0.58
Fig. (6) Mother's Age Groups in (years) / Number of Children

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>19.3</td>
</tr>
<tr>
<td>20-30</td>
<td>36.1</td>
</tr>
<tr>
<td>31-40</td>
<td>20.2</td>
</tr>
<tr>
<td>&gt;40</td>
<td>24.4</td>
</tr>
</tbody>
</table>

p value = 0.96

Fig. (7) Distribution of Mothers According to Education Level

<table>
<thead>
<tr>
<th>Education Level</th>
<th>% Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>70</td>
</tr>
<tr>
<td>Khalwa</td>
<td>60</td>
</tr>
<tr>
<td>Primary School</td>
<td>50</td>
</tr>
<tr>
<td>Secondary School</td>
<td>40</td>
</tr>
</tbody>
</table>

p value < 0.05
Fig. (8) Mothers Education Level in the Study Sample

- 35.4% None
- 35.4% Khalwa
- 25.7% Primary School
- 22.3% Secondary School
- 12.9% University or above
- 3.7% University or above
Fig. (9) Distribution According to the Duration of Vacations Taken for Delivery

'p value = 0.46
Table (1): Breast feeding among mothers in the study sample

\( (n = 435) \)

<table>
<thead>
<tr>
<th>Residence</th>
<th>Did breast-feed (%)</th>
<th>Didn't b. feed (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>131 (95.6)</td>
<td>6 (4.4)</td>
<td>137 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>139 (95.2)</td>
<td>7 (4.8)</td>
<td>146 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>148 (97.4)</td>
<td>4 (2.6)</td>
<td>152 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>418 (96.1)</td>
<td>17 (3.9)</td>
<td>435 (100)</td>
</tr>
</tbody>
</table>

p value = 0.59

Fig. (10) Reasons for not Breast Feeding

- No Milk: 23.5
- Baby Refused: 11.8
- Mother illness: 11.8
- Baby illness: 17.6

p value = 0.33
Fig. (11) Time Lapse Before the First Breast Feed Offered to the Baby

Fig. (12) Reasons given for delay of the First Feed for more than 72 hrs

'p value = 0.57
Table (2): Colostrum feeding among infants in the study population

\((n = 435)\)

<table>
<thead>
<tr>
<th>Residence</th>
<th>Did feed colostrum (%)</th>
<th>Didn't feed colostrum (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>130 (94.9)</td>
<td>07 (05.1)</td>
<td>137 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>129 (88.4)</td>
<td>17 (11.6)</td>
<td>146 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>127 (83.6)</td>
<td>26 (16.4)</td>
<td>152 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>386 (88.7)</td>
<td>49 (11.3)</td>
<td>435 (100)</td>
</tr>
</tbody>
</table>

\[p \text{ value } = 0.454\]

Fig. (13) Reasons for Not Feeding Colostrum

\[p = 0.095\]
Table (3): Frequency of breast-feeding offered to infants in the study population

*(n = 418)*

<table>
<thead>
<tr>
<th>Residence</th>
<th>Demand feeding (%)</th>
<th>Scheduled feeding (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>103 (78.6)</td>
<td>28 (21.4)</td>
<td>131 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>126 (90.6)</td>
<td>13 (09.4)</td>
<td>139 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>148 (100)</td>
<td>00 (00.0)</td>
<td>148 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>377 (90.2)</td>
<td>41 (09.8)</td>
<td>418 (100)</td>
</tr>
</tbody>
</table>

Chi square test = 35.935

p value < 0.00
Table (4): The main mode of feeding practiced by mothers in the study population

\((n = 435)\)

<table>
<thead>
<tr>
<th>Residence</th>
<th>Breast feeding (%)</th>
<th>Artificial feeding (%)</th>
<th>Mixed feeding (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>54 (39.4)</td>
<td>37 (27.0)</td>
<td>46 (33.6)</td>
<td>137 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>89 (61.0)</td>
<td>29 (19.8)</td>
<td>28 (19.2)</td>
<td>146 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>112 (73.7)</td>
<td>17 (11.2)</td>
<td>23 (15.1)</td>
<td>152 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>255 (58.6)</td>
<td>83 (19.1)</td>
<td>97 (22.3)</td>
<td>435 (100)</td>
</tr>
</tbody>
</table>

Chi square = 36.118

\(p\) value < 0.00

Table (5): Exclusive breast-feeding for the first four months of infancy among the study population

\((n = 418)\)

<table>
<thead>
<tr>
<th>Residence</th>
<th>Exclusive (%)</th>
<th>Non-exclusive (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>103 (78.6)</td>
<td>28 (21.4)</td>
<td>131 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>045 (32.4)</td>
<td>94 (67.6)</td>
<td>139 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>044 (29.7)</td>
<td>104 (70.3)</td>
<td>148 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>192 (45.9)</td>
<td>226 (54.1)</td>
<td>418 (100)</td>
</tr>
</tbody>
</table>

Chi square test = 82.316

\(p\) value < 0.00
Fig. (14) Age at which any thing other than Breast Milk was given to Infants

% Value

<table>
<thead>
<tr>
<th>District</th>
<th>Mayo</th>
<th>Al-Salama</th>
<th>Al-Riadh</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;16</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p = < 0.05
Table (6): The way supplementary fluids are given to infants of the study population

\( n = 435 \)

<table>
<thead>
<tr>
<th>Residence</th>
<th>Cups / spoons (%)</th>
<th>Feeding bottles (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>36 (26.3)</td>
<td>101 (73.7)</td>
<td>137 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>102 (69.9)</td>
<td>44 (30.1)</td>
<td>146 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>128 (84.2)</td>
<td>24 (15.8)</td>
<td>152 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>266 (61.1)</td>
<td>169 (38.9)</td>
<td>435 (100)</td>
</tr>
</tbody>
</table>

Chi square test = 45.366

\[ p \text{ value} < 0.00 \]
Table (7): Number of feeding bottles / infant in the study population

\( (n = 169) \)

<table>
<thead>
<tr>
<th>Residence</th>
<th>One bottle (%)</th>
<th>2 bottles (%)</th>
<th>&gt; 2 bottles (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>21 (20.8)</td>
<td>57 (56.4)</td>
<td>23 (22.8)</td>
<td>101 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>14 (31.8)</td>
<td>30 (68.2)</td>
<td>00 (00.0)</td>
<td>044 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>17 (70.8)</td>
<td>07 (29.2)</td>
<td>00 (00.0)</td>
<td>024 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>52 (30.8)</td>
<td>94 (55.6)</td>
<td>23 (13.6)</td>
<td>169 (100)</td>
</tr>
</tbody>
</table>

Chi square = 44.437

p value < 0.00
Fig. (15) Soft Solid Food Introduction Among the Study Population

- 4-7: 20.7%
- 8-10: 9.4%
- >10: 69.9%
Fig. (16) Types of Soft Solid Foods First Introduced/Plan to be Introduced

- Cereals: 19.3%
- Biscuits: 17.2%
- Eggs: 5.3%
- B. Beans: 15.6%
- Potatoes: 13.6%
- Meats: 29%

Legend:
- Cereals
- Biscuits
- Eggs
- B. Beans
- Potatoes
- Meats
p < 0.05
Fig. (18) Reason for Sudden Weaning

- Mother illness: 25.5%
- Child illness: 17%
- A new pregnancy: 12.8%
- Returning to work: 6.4%
- Ideal way to wean: 38.3%
Fig. (19b) Mothers Knowledge Score on Infant Feeding

p < 0.05

p = 0.2
Fig. (19c) Mothers Practices Score on Infant Feeding

p < 0.035
Table (8): Number of diarrhoeal episode in the first year of infancy in the study population

\( (n = 435) \)

<table>
<thead>
<tr>
<th>Residence</th>
<th>No diarrhoea (%)</th>
<th>1-3 episode (%)</th>
<th>4-6 episode (%)</th>
<th>&gt;6 episode (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>52 (38.0)</td>
<td>58 (42.3)</td>
<td>24 (17.5)</td>
<td>03 (2.2)</td>
<td>137 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>45 (30.8)</td>
<td>71 (48.6)</td>
<td>26 (17.8)</td>
<td>04 (2.7)</td>
<td>146 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>27 (17.8)</td>
<td>79 (52.0)</td>
<td>38 (25.0)</td>
<td>08 (5.3)</td>
<td>152 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>124 (28.5)</td>
<td>208 (47.8)</td>
<td>88 (20.2)</td>
<td>15 (3.5)</td>
<td>435 (100)</td>
</tr>
</tbody>
</table>

p value < 0.009

Table (9a): Diarrhoeal episodes in the first year of infancy and exclusive breast-feeding in urban elite

\( (n = 137) \)

<table>
<thead>
<tr>
<th>Diarrhoeal episodes/yr</th>
<th>Exclusive breast-feeding (%)</th>
<th>No exclusive breast-feeding (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>47 (45.6)</td>
<td>05 (14.7)</td>
<td>52 (38.0)</td>
</tr>
<tr>
<td>1 – 3</td>
<td>42 (40.8)</td>
<td>14 (41.2)</td>
<td>56 (40.9)</td>
</tr>
<tr>
<td>4 – 6</td>
<td>11 (10.7)</td>
<td>09 (26.5)</td>
<td>20 (14.6)</td>
</tr>
<tr>
<td>&gt; 6</td>
<td>03 (02.9)</td>
<td>06 (17.6)</td>
<td>09 (06.5)</td>
</tr>
<tr>
<td>Total</td>
<td>103 (75.2)</td>
<td>34 (24.8)</td>
<td>137 (100)</td>
</tr>
</tbody>
</table>

Chi square test = 19.256
p value < 0.0
Table (9b): Diarrhoeal episodes in the first year of infancy and exclusive breast-feeding in peri-urban moderate

\( (n = 146) \)

<table>
<thead>
<tr>
<th>Diarrhoeal episodes/yr</th>
<th>Exclusive breast-feeding (%)</th>
<th>No exclusive breast-feeding (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>24 (53.3)</td>
<td>21 (20.8)</td>
<td>45 (38.0)</td>
</tr>
<tr>
<td>1 – 3</td>
<td>12 (26.7)</td>
<td>44 (43.6)</td>
<td>56 (40.9)</td>
</tr>
<tr>
<td>4 – 6</td>
<td>06 (13.3)</td>
<td>28 (27.7)</td>
<td>34 (14.6)</td>
</tr>
<tr>
<td>&gt; 6</td>
<td>03 (06.7)</td>
<td>08 (07.9)</td>
<td>11 (06.5)</td>
</tr>
<tr>
<td>Total</td>
<td>45 (30.8)</td>
<td>101 (69.2)</td>
<td>146 (100)</td>
</tr>
</tbody>
</table>

Chi square test = 15.675
p value < 0.00

Table (9c): Diarrhoeal episodes in the first year of infancy and exclusive breast-feeding in peri-urban poor

\( (n = 152) \)

<table>
<thead>
<tr>
<th>Diarrhoeal episodes/yr</th>
<th>Exclusive breast-feeding (%)</th>
<th>No exclusive breast-feeding (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>11 (25.0)</td>
<td>16 (14.8)</td>
<td>27 (38.0)</td>
</tr>
<tr>
<td>1 – 3</td>
<td>22 (50.0)</td>
<td>41 (37.9)</td>
<td>63 (40.9)</td>
</tr>
<tr>
<td>4 – 6</td>
<td>07 (15.9)</td>
<td>29 (26.9)</td>
<td>36 (14.6)</td>
</tr>
<tr>
<td>&gt; 6</td>
<td>04 (09.1)</td>
<td>22 (20.4)</td>
<td>26 (06.5)</td>
</tr>
<tr>
<td>Total</td>
<td>44 (28.9)</td>
<td>34 (71.1)</td>
<td>152 (100)</td>
</tr>
</tbody>
</table>

Chi square test = 6.825
p value < 0.05
Table (10): Age at the first episode of diarrhoea in the study population

\( (n = 311) \)

<table>
<thead>
<tr>
<th>Residence</th>
<th>&lt; 4 months (%)</th>
<th>5-12 months (%)</th>
<th>13-18 months (%)</th>
<th>19-24 months (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>12 (08.8)</td>
<td>24 (17.5)</td>
<td>25 (18.2)</td>
<td>24 (17.5)</td>
<td>085 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>29 (19.8)</td>
<td>38 (26.1)</td>
<td>21 (14.4)</td>
<td>13 (08.9)</td>
<td>101 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>31 (20.4)</td>
<td>46 (30.3)</td>
<td>32 (21.0)</td>
<td>16 (10.5)</td>
<td>125 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>72 (16.6)</td>
<td>108 (24.5)</td>
<td>78 (17.9)</td>
<td>15 (3.5)</td>
<td>311 (100)</td>
</tr>
</tbody>
</table>

p value = 0.014

Fig. (20) Breast Feeding Practice during Diarrhoea
Table (11): Breast-feeding practice during diarrhoea in the study population 

\( n = 435 \)

<table>
<thead>
<tr>
<th>Residence</th>
<th>Stopped (%)</th>
<th>Decreased (%)</th>
<th>Increased (%)</th>
<th>N0 change (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Riadh</td>
<td>08 (36.8)</td>
<td>28 (20.4)</td>
<td>12 (08.8)</td>
<td>89 (65.0)</td>
<td>137 (100)</td>
</tr>
<tr>
<td>Al-Salama</td>
<td>27 (18.5)</td>
<td>38 (26.0)</td>
<td>19 (13.0)</td>
<td>62 (42.5)</td>
<td>146 (100)</td>
</tr>
<tr>
<td>Mayo</td>
<td>56 (36.8)</td>
<td>42 (27.6)</td>
<td>07 (04.6)</td>
<td>47 (30.9)</td>
<td>152 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>91 (20.9)</td>
<td>108 (24.5)</td>
<td>38 (08.7)</td>
<td>198 (45.6)</td>
<td>435 (100)</td>
</tr>
</tbody>
</table>

Chi square = 60.177

p value < 0.000
Fig. (21) Weight for height centiles of the study population children

- 23.4 (5th)
- 32.6 (5th-25th)
- 9 (25th-50th)
- 5.3 (50th-95th)
- 29.7 (>95th)
Fig. (22) Weight for height for the three different modes of feeding

- Breast
- Artificial
- Mixed

% of children

Mode of feeding

- <5th
- 5th-25th
- 25th-50th
- 50th-95th
- >95th
Fig. (23a) Mode of Infant Feeding and Weight for Height in Al-Riadh

Fig. (23b) Mode of Infant Feeding and Weight for Height in Al-Salama

p = 0.48

p = 0.12
Fig. (23c) Mode of Infant Feeding and Weight for Height in Mayo

<table>
<thead>
<tr>
<th>Wt. for Ht. Centiles</th>
<th>5th-25th</th>
<th>25th-50th</th>
<th>50th-95th</th>
<th>&gt;95th</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p = 0.31
Fig. (24) Haemoglobin status in the three modes of feeding

- No anaemia
- Mild anaemia
- Moderate anaemia
- Severe anaemia

p = 0.62
Fig.(25a) Haemoglobin status and mode of feeding in urban elite (Al-Riadh)

- No anaemia
- Mild anemia
- Moderate anaemia

p < 0.05

Fig.(25b) Haemoglobin status and mode of feeding in peri-urban moderate (Al-Salama)

- No anaemia
- Mild anemia
- Moderate anaemia
- Severe

'p = 0.80
Fig. (25c) Haemoglobin status and mode of feeding in peri-urban poor (Mayo)

p < 0.05
ANNEX 1

QUESTIONNAIRE

INFANT FEEDING PRACTICES IN
KHARTOUM PROVINCE

SERIAL NO…………………………
DATE:…………………………

1. PERSONAL DATA:

1.1. Name…………………………………………………………

1.2. Age…………………………………………………………

1.3. Age-group:

1.3.1. 4 - 9 Months
1.3.2. 10 - 14 Months.
1.3.3. 15 - 19 Months.
1.3.4. 20 - 24 Months.

1.4. Sex:

1.4.1. Male
1.4.2. Female

1.5. Residence:

1.5.1. Al-Riadh
1.5.2. Al-Salama
1.5.3. Mayo

2. MOTHER:

2.1. Age……………………………………

2.2. Age group:

2.2.1. < 20 years
2.2.2. 20-30 years
2.2.3. 31-40 years
2.2.4. > 40 years.
2.3. Education level:
   2.3.1. None. 
   2.3.2. Khalwa. 
   2.3.3. 1<sup>st</sup> school. 
   2.3.4. 2<sup>nd</sup> school. 
   2.3.5. University education. 

2.4. Employment:
   2.4.1. Yes 
   2.4.2. No 

2.5. If employed, what is the duration of vacation taken for this delivery:
   2.5.1. 6 - 8 weeks 
   2.5.2. 9 - 12 weeks 
   2.5.3. 13 - 16 weeks 
   2.5.4. > 17 weeks 

2.6. Mode of delivery of this baby:
   2.6.1. Normal 
   2.6.2. Assisted 
   2.6.3. Caesarian section 

2.7. Use of contraceptives:
   2.7.1. Did use 
   2.7.2. Did not use 

2.8. If contraceptives are used, specify type:
   2.8.1. Pills 
   2.8.2. Loop 
   2.8.3. Injections. 

3. INFANT FEEDING:
   3.1. Did you breast-feed your baby at all:
      3.1.1. Yes 
      3.1.2. No 

   3.2. If not, why:
      3.2.1. No milk
3.2.2. Didn't wish to breast-feed
3.2.3. Baby refused
3.2.4. Mother illness
3.2.5. Baby illness

3.3. Did you feed colostrum:
3.3.1. Yes
3.3.2. No

3.3. If not, why?:
3.3.1. Its bad for baby
3.3.2. Useless
3.3.3. Cultural beliefs
3.3.4. Mother illness
3.3.5. Baby illness

3.4. Time lapse till 1st breast-feeding offered to baby:
3.4.1. 1 - 12 hours
3.4.2. 12 - 48 hours
3.4.3. 48 - 72 hours
3.4.4. > 72 hours

3.5. Cause for delay of the first breast-feeding:
3.5.1. No milk
3.5.2. Mother illness
3.5.3. Baby illness
3.5.4. Cultural beliefs.

3.6. Frequency of breast-feeding offered to the baby:
3.6.1. Fed on demand
3.6.2. Fed on Schedule

3.7. Is exclusive breast-feeding practiced in the first four months of life:
3.7.1. Yes
3.7.2. No

3.8. If not, Why?:
onths
3.15.2. 4 - 7 months

3.8.2. Employment

3.8.3. Not adequate for the baby

3.8.4. It is the custom to give water

3.9. Age at which you started giving anything other than breast-milk:

3.9.1. < 2 weeks

3.9.2. 2 - 6 weeks

3.9.3. 7 - 15 weeks

3.9.4. > 16 weeks

3.10. Types of supplementation offered:

3.10.1. Water/herbs/juices

3.10.2. Cow milk

3.10.3. Goat milk

3.10.4. Formula milk

3.10.5. Others

3.11. Is sugar added to supplementation:

3.11. Yes

3.11. No

3.12. How is supplementation given:

3.12.1. Using a cup/spoon

3.12.2. Using feeding bottles

3.13. If bottles are used, how many do you have:

3.13.1. One

3.13.2. Two

3.13.3. > Three

3.14. How are feeding bottles cleaned:

3.14.1. Washed in water only

3.14.2. Washed with water and soap

3.14.2. Sterilized by boiling

3.14.3. Sterilized by tabs and solutions

3.15. Age at which solids are/plan to be introduced

3.15.1. < 4 months
3.15.2. 4 - 7 months
3.15.3. 8 - 10 months
3.15.4. > 10 months

3.16. Types of solids first introduced:
3.16.1. Cereals
3.16.2. Egg yolk
3.16.3. Biscuits
3.16.4. Broad beans
3.16.5. Potatoes
3.16.6. Minced meat

3.17. Age at weaning/plan on weaning:
3.17.1. < 6 months
3.17.2. 6 - 11 months
3.17.3. 12 - 17 months
3.17.4. 18 - 24 months
3.17.5. > 24 months

3.18. Mode of weaning:
3.18.1. Gradual
3.18.2. Sudden

3.19. If weaning was sudden, why ?:
3.19.1. Mother illness
3.19.2. Child illness
3.19.3. A new pregnancy
3.19.4. Returning to work
3.19.5. Other

3.20. Type of milk the child is weaned to:
3.20.1. Cow milk
3.20.2. Goat milk
3.20.3. Formula milk
3.20.4. Other

3.21. Type of feeding you relied on mainly in the first year of life:
3.21.1. Breast-feeding
3.21.2. Bottle feeding
3.21.3. Mixed feeding

**SCORING SYSTEM FOR INFANT FEEDING**

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>ATTITUDE</th>
<th>KNOWLEDGE</th>
<th>PRACTICES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Respo.</td>
<td>Score</td>
<td>Respo.</td>
</tr>
<tr>
<td>a. Breast feeding the child.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Feeding of colostrum.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Early initiation of breast-feeding *.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Exclusive breast-feeding **.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Supplementation after 4 months.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Supplementary fluids by cups.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Solids not before 4 months.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Gradual weaning.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Specially prepared meals for infant.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. No use of pacifiers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL SCORE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.22. Knowledge score:

3.22.1. Good
3.22.2. Average
3.22.3 Poor

3.23. Attitude score:

3.23.1. Good
3.23.2. Average
3.23.3 Poor

3.24. Practice score:

3.24.1. Good
3.24.2. Average
3.24.3 Poor

4. **SOCIAL HISTORY:**
4.1. Education of the father:
   4.1.1. None
   4.1.2. Khalwa
   4.1.3. 1st school
   4.1.4. 2nd school
   4.1.5. University education

4.2. Housing conditions:
   4.2.1. Poor
   4.2.2. Average
   4.2.3. High

4.3. Average income of the family:
   4.3.1. < 10,000 Dinars/month
   4.3.2. 10 - 35,000 Dinars/month
   4.3.3. > 35,000 Dinars

4.4. The family lives as:
   4.4.1. Nuclear family
   4.4.2. Extended family

4.5. Water supply:
   4.5.1. Safe water source
   4.5.2. Unsafe water source

4.6. Electricity:
   4.6.1. Yes
   4.6.2. No

4.7. Latrines of housing:
   4.7.1. Nil
   4.7.2. Pit latrine
   4.7.3. Syphone
5. DIARRHOEAL ILLNESS:

5.1. Number of diarrhoeal episodes in the 1st year of life:

5.1.1. None
5.1.2. 1 - 3
5.1.3. 4 - 6
5.1.4. > 6

5.2. First episode of diarrhoea:

5.2.1. < 4 months
5.2.2. 5 - 12 months
5.2.3. 13 - 18 months
5.2.4. 18 - 24 months

5.3. Breast-feeding practice during diarrhoea:

5.3.1. Increased
5.3.2. Decreases
5.3.3. Stopped
5.3.4. No change

5.4. Hospitalization for diarrhoeal illness:

5.4.1. Yes
5.4.2. No

5.5. Intervention at hospital (if hospitalized)

5.5.1. I.V. fluids
5.5.2. ORS
5.5.3. Drugs (oral/parenteral)
5.5.4. Other

5.6. Vaccination of the baby:

5.6.1. Fully vaccinated to date
5.6.2. Partially vaccinated
5.6.3. Not vaccinated

6. Examination:

6.1. Weight…………………..Kg

6.2. Weight centile………………

6.3. Weight for age:
   6.3.1. < 5th centile
   6.3.2. 5th - 25th centile
   6.3.3. 25th - 50th centile
   6.3.4. 50th - 95th centile
   6.3.5. > 95th centile

6.4. Length…………………….cm

6.5. Weight for height
   6.5.1. < 5th centile
   6.5.2. 5th - 25th centile
   6.5.3. 25th - 50th centile
   6.5.4. 50th - 95th centile
   6.5.5. > 95th centile

6.6. Head circumference……………….cm

6.7. Head circumference centile:
   6.7.1. < 5th centile
   6.7.2. 5th - 25th centile
   6.7.3. 25th - 50th centile
   6.7.4. 50th - 95th centile
   6.7.5. > 95th centile

6.8. Is the child pale:
   6.8.1. Yes
6.8.2. No

6.9. Any signs of malnutrition:

6.9.1. Yes

6.9.2. No

6.10. Signs of vitamin deficiency:

6.10.1. Yes

6.10.2. No

6.11. Milestones:

6.11.1. Normal

6.11.2. Abnormal

7. Investigation:

7.1. Hb………………………g/dl

7.2. Haemoglobin status:

7.2.1. No anaemia.

7.2.2. Mild anaemia

7.2.3. Moderate anaemia

7.2.4. Severe anaemia
6.10. MODE OF DELIVERY OF THIS BABY:

1.9.1. NORMAL □

6.10.1. ASSISTED □

6.10.2. CAESARIAN SECTION □

6.11. USE OF CONTRACEPTIVES:

1.10.1. YES □

1.10.2. NO □

6.12. IF YES, SPECIFY TYPE:

1.11.1. PILLS □

6.12.1. LOOP □

6.12.2. INJECTIONS □

3. FEEDING:

1.1. DID YOU BREAST FEED YOUR BABY:

1.1.1. YES □

1.1.2. NO □
1.2. IF NOT, WHY:

1.2.2. No milk

1.2.3.
APPENDIX 2

SCHEMA FOR BREAST FEEDING DEFINITION

BREASTFEEDING

FULL

Exclusive
No other liquid or solid is given to the infant.

Almost Exclusive
Vitamins, water, juice and ritual bikost given not more than once or twice per day; not more than 1-2

PARTIAL

BF episodes have insignificant

TOKEN

High
>80% of feeds

Medium
79-20% of feeds

Low
<20% of feeds

Source: Breast-feeding: The technical bases and recommendation for action WHO/NUT/MCH/93.1
APPENDIX 3

BEHAVIORS FOR OPTIMAL

INFANT FEEDING

1. Begin breast-feeding as soon as possible after the child is born and feed colostrum during the first few days following birth.

2. Breast-feed frequently, whenever the baby is hungry, both day and night. This pattern is called feeding on demand.

3. Breast-feed exclusively for the first 4 to 6 months.

4. After the first 4 to 6 months, when supplemental foods are introduced, breast-feeding should precede supplemental feeding.

5. Continue to breast-feed into the second year and beyond. Breast milk remains an excellent source of both calories and protein for the older infant and toddler.

6. Continue to breast-feed, even if the mother or the baby become ill.

7. Avoid using a bottle, pacifiers (dummies) or other artificial nipples. Use of artificial nipples may decrease an infant's ability and desire to suckle at the breast.

8. The mother should eat and drink sufficient quantities to satisfy her hunger. Mothers' caloric needs are elevated while breast-feeding, and women should be encouraged to consume additional calorically dense foods. No foods are forbidden.