

**Nutrient Intake and Nutrition Knowledge of Lactating Women  
(0-6 months postpartum) in a Low Socio-Economic Area in  
Nairobi, Kenya**

by

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## **DECLARATION**

This is my original work and has not been presented before for an award of a degree/diploma in this or any other university.

Signature.....Date.....

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## **Dedication**

This thesis is dedicated to my dear mother,

**Mrs. Martha Kemunto Ongosi.**

She made me all I am through the grace of God.

Her instruction, prayers and self-sacrificing love have been blessed.

“Give her the reward she has earned and let her  
work be praised by everyone in the city.”

(Proverbs 31:31)

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## ABSTRACT

# **Nutrient Intake and Nutrition Knowledge of Lactating Women (0-6 months postpartum) in a Low Socio-Economic Area in Nairobi, Kenya**

by

Anita Nyaboke Ongosi

**Supervisors:** Ms G J Gericke, Dr. E. Mbuthia, Prof A. Oelofse

Breastfeeding is at its best when both the mother and infant benefit from the experience.

**Aim:** To obtain data on the adequacy of the diet and nutrition knowledge of lactating women (0-6 months postpartum) living in a low socio-economic area in Nairobi. The findings could be used to plan future nutrition intervention programs.

**Research design:** A cross-sectional survey in the quantitative and qualitative research paradigms. Health status indicators, socio-economic and cultural factors were additionally investigated as interactive factors that could influence the nutrient intake and nutrition knowledge of the lactating women.

**Setting:** Mbagathi District Hospital, located at the edge of Kibera slum area in Nairobi.

**Sample:** Lactating mothers (0-6 months postpartum), who were visiting the Maternal-Child Health Clinic to bring their children for immunisation, were recruited. Convenience sampling was used (N=120). Informed consent was obtained from the mothers in their home tongue.

**Methodology:** Individual interviews in Swahili, using structured questionnaires (Socio bio-demographic questionnaire, Hunger Scale, 24 Hour-recall, and Quantitative Food Frequency Questionnaire), and anthropometry (according to standard procedure) were done in the quantitative domain. Seven structured focus group discussions were employed in the qualitative domain. Descriptive and inferential statistics were used on the quantitative data, and Krueger's framework of analysis on the qualitative data. Ethical approval was obtained from the Ethics Committee, Faculty of Natural and Agricultural Sciences, University of Pretoria; *Ref no EC 080922-039*, and research permission was granted by the National Council for Science and Technology, Nairobi; *Permit no NCST/5/002/R/355*.

**Main findings:** Majority of women (92%) had energy intakes between 5040 – 10080 kJ/day with the mean energy intake of 6975.5 kJ/day which was lower than the recommended 11340 kJ/day. Macronutrient intake was within the acceptable macronutrient distribution ranges, whereas the micronutrients were consumed below the recommended dietary allowances (WHO). The mean adequacy ratio (excluding niacin) was 0.74. The highest frequency of consumption (100%) was from cereals, while the lowest were for vitamin A rich vegetables/fruits (6.6%) and dairy products (1.7%). Overall, the mean Food Variety Score (FVS) was 6.6 ( $\pm 2.0$ ) and the Dietary Diversity Score (DDS) was 4.3 ( $\pm 1.0$ ). Hunger assessment revealed 43 households that were food secure, whereas 77 households were either hungry or at risk of hunger. Majority of women (93%) had good nutrition knowledge but the rationale for applying the knowledge was lacking for most of the nutrition concepts.

Socio-economic status, cultural beliefs and practices, health status and nutrition knowledge were all identified as probable factors that influenced the dietary intake of the lactating women.

**Recommendation:** There seems to be a need for well-designed nutrition intervention programs focusing on nutrient intake from culturally acceptable and affordable foods to increase dietary diversity and food variety of lactating women in this low socio-economic area. With a concurrent increase in nutrition knowledge such interventions would improve their nutritional status.

**KEY WORDS:** *Lactation, nutrient requirement, lactating woman, hunger, nutrition knowledge, nutrient intake, dietary diversity*

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## LIST OF ABBREVIATIONS

- AAP - American Academy of Paediatrics
- BFHI - Baby Friendly Hospital Initiative
- EBF - Exclusive Breast Feeding
- FAO - Food and Agriculture Organisation
- KFSSG - Kenya Food Security Steering Group
- KFSU - Kenya Food Security Update
- LLLI - La Leche League International
- MCH - Maternal - Child Health Clinic
- NAS - National Academy of Sciences
- NFCS - National Food Consumption Survey
- QFFQ - Quantitative Food Frequency Questionnaire
- RDA - Recommended Dietary Allowance
- SSA - Sub - Saharan Africa
- BMI - Body Mass Index
- TEF - Thermal Effect of food
- UNICEF - United Nations Children's Fund
- WHO - World Health Organisation
- AMDR - Acceptable Macronutrient Distribution Ranges

## CHAPTER 1: BACKGROUND AND SUBSTANTIATION OF THE RESEARCH

*Breastfeeding is the most precious gift a mother can give to her infant. When there is illness or malnutrition it may be a lifesaving gift. When there is poverty it may be the only gift.*  
(Lawrence, 1991)

### 1.1 Background to the investigation

Lactation is the process of synthesizing and secreting milk from the breasts to feed young ones. It is an integral part in the physiologic completion of the reproductive cycle of mammals including humans.<sup>1</sup>

Human milk ensures the infants' systemic protection, growth and development; therefore breastfeeding is one of the most effective ways to ensure excellent child health and survival.<sup>2</sup> It is the opinion of many paediatricians and obstetricians that "*Children should grow up knowing breastfeeding is the norm.*"<sup>3</sup> And also, since the physiologic processes of breastfeeding are a normal part of the maturation of the female body, breastfeeding seems to have the attributes of a preventive health measure for women. Therefore, adequate breastfeeding support for mothers could save many young lives<sup>4</sup> and ensure good health for mothers.<sup>5</sup>

Breastfeeding is one of the most natural functions of a woman's body, however Considering the nutritive value of human milk and that the lactating mother will produce 20-30 ounces each day (about 850 ml), it becomes apparent to ensure that the mother receives good nutritional intake which will support the stamina that nursing an infant demands and that there is a need to educate lactating women and their families on widely acceptable variations so that dietary guidelines make minimal demands on a woman's lifestyle while ensuring successful breastfeeding since parents can make decisions about feeding the infant(s) based on accurate information.<sup>6</sup>

Lactation is the result of well-coordinated effort of the hormones. Throughout pregnancy the placenta produces oestrogen and progesterone. In addition to performing various functions, these hormones prepare breasts physically for lactation and suppress prolactin during pregnancy. Towards the end of pregnancy, prolactin increases, ready for milk synthesis. The removal of the placenta at birth triggers the breast to respond to suckling by making milk. The maternal body prepares for lactation not only by developing the breast

to produce milk but also by storing additional nutrients and energy. Lactation has profound benefits for the child as well as the mother and should be maintained for the wellbeing of both.<sup>7</sup>

Milk production appears to continue in women so long as the infant is suckled more than once in a day. Labbok and Krasovec (in 1990) divide breastfeeding into full, partial or token. Full breastfeeding is subdivided into ‘exclusive’ and ‘almost exclusive’. The WHO (World Health Organisation) uses the terms ‘exclusive’ and ‘predominant.’<sup>8</sup> Exclusively breastfed infants should receive only breast milk and vitamin drops/syrups, minerals and medicines. The ‘almost exclusive’ or ‘predominant’ breastfed infants may also receive infrequent feeds of water, juices, oral rehydration solution and ritualistic feeds. Partially breastfed infants can be further subdivided into high (> 80% of feeds are breast milk), medium (20–80% of feeds are breast milk) and low (< 20% of feeds are breast milk).<sup>8</sup>

For milk production, the transition to fully sustaining the infant should not be complex or require major adjustments for the mother. However in reference to the report by the subcommittee on nutrition during lactation of the Food and Nutrition Board, Institute of Medicine, at the National Academy of Sciences (in 1991), most writings for the nursing mother regarding the maternal diet during lactation complicated “rules” about dietary intake that failed to consider mother’s normal preferences. Thus one barrier to breastfeeding for some women was “diet rules” that were perceived to be too restrictive.<sup>9</sup>

Several organisations have put an effort towards this course, for example: During the World Breastfeeding week in March 2008, The World Alliance for Breastfeeding Action announced the theme: “*Mother support: Going for the Gold.*” This theme urged for greater support for mothers in achieving this gold standard of infant feeding, engendered by the Olympics held in August 2008. It was striving for excellence through improved attention to five areas presented as the Olympic rings: community, health system, workplace, and government/legislation and critical/emergency situations.<sup>10</sup>

To promote breastfeeding, the United Nations Children’s Fund (UNICEF) and WHO have developed the Baby Friendly Hospital Initiative (BFHI), which requires hospitals to follow ten steps to achieve baby friendly status. In addition, in 1981, the World Health Assembly adopted the International Code of Marketing of Breast milk Substitutes (the WHO Code).



The WHO Code and subsequent resolutions aim to curtail the marketing of infant formula and related products by companies more interested in shareholder value than infant health.<sup>11</sup> Other research reports such as *Healthy people 2010* and *Loving support makes breastfeeding work* (which are national health promotion and disease prevention initiatives in the United States of America) have also established goals and recommendations designed to improve the nutritional status of both mothers and infants.<sup>7</sup>

## 1.2 Historical perspective

The biological importance of milk to all mammals, including humans, is evident from historical and physiologic perspectives. The survival of human infants depended on breastfeeding until early in the twentieth century when substitutes for human milk were developed, leading to a marked decrease in breastfeeding.<sup>12</sup> Between 1940 and 1980 there was relatively little active investigation of nutrition during lactation and of the impact of breastfeeding on the mother except for the ten editions of *Recommended Dietary Allowances (RDAs)*, which included specific nutrient recommendations for lactating women since they were first published.<sup>12</sup>

In 1984, before it was recognized that national rates of breastfeeding had begun to decline in the United States of America (USA), Surgeon General C. Everett Koop convened a workshop on Breastfeeding and Human Lactation<sup>13</sup> and said, "*We must ... identify and reduce those barriers which keep women from initiating or continuing to breastfeed their infants.*"<sup>13</sup> The following six recommendations were made at that workshop to facilitate progress toward the current breastfeeding objectives (12):

- Improve *professional education* in human lactation and breastfeeding
- Develop *public education* and promotional effort
- Strengthen the support for breastfeeding in the *health care system*
- Develop a broad range of *support services* in the community
- Initiate a national breastfeeding promotion effort directed to women in the *world of work*
- Expand *research* on human lactation and breastfeeding.

The follow-up Report: *The Surgeon General's Workshop on Breastfeeding & Human Lactation* summarizes many of the activities that emanated from the recommendations made at the 1984 workshop. Attention to nutrition during lactation fell primarily under the research recommendations.<sup>13</sup>

Although great progress has been made in understanding the process of lactation and in characterizing and quantitating the composition of human milk, less progress has been made in linking the nutritional status of lactating women with various outcomes of breastfeeding. Nutrition during lactation has not been a priority in breastfeeding promotion efforts before, but in recent times there has been recognition of the need to promote adequate food intake to support milk production and the woman's health.<sup>1</sup>

UNICEF's strategy and actions in support of infant and young child feeding, through its medium term strategic plan, underlines the importance of a multi-sectoral approach to improve health and nutrition, by taking evidence based packages of interventions to scale. The strategy is based on the 1990 Innocenti Declaration on the Protection, Promotion and Support of Breastfeeding, the 2005 Innocenti Declaration on Infant and Young Child Feeding and the 2003 Global Strategy on Infant and Young Child Feeding. UNICEF efforts recognize the rights of children and families and include proven activities for advocacy as well as support of government and non-governmental actions at three levels: national, health system, and community.<sup>14</sup>

The World Health Organization currently recommends that infants be exclusively breastfed for the first six months of life to achieve optimal growth, development, and health. Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond.

### 1.3 Substantiation of the research

While life expectancy is higher for women than for men in most countries, a number of health and social factors combine to create a lower quality of life for women. Worldwide approximately 15% of the global burden disease is attributed to the combined effects of child and maternal underweight or micronutrient deficiencies.<sup>4</sup> Women of reproductive age are a vulnerable group to malnutrition since they have special needs, which are primarily related to their reproductive role. They are also responsible for rearing children, working in the home as well as working outside the home to earn a living.<sup>15</sup> Women play a key role in decisions around food, but adoption of a healthy lifestyle is affected by a number of external factors as opposed to being the sole responsibility of individuals themselves.<sup>16</sup>

About 14 million adolescent girls worldwide become mothers every year and more than 90% of these very young mothers live in developing countries.<sup>4</sup> Countries in Sub-Saharan Africa (SSA) are among the poorest in the world, with extremely high rates of infant, child and maternal mortality. SSA accounts for half of the developing world's maternal deaths due to increasing hunger and malnutrition across the continent where women bear averagely six children. Clearly the severity of ill-health threatens the inadequacies of overburdened public health care systems. The inability of struggling economies to cope with this burden, makes it difficult for the governments in the region to deal with the socio-economic problems on their own.<sup>4</sup>

The physical quality of life index of 33 out of 45 Sub-Saharan countries varies between 20.5 and 66.0 compared to levels greater than 80 for developed countries.<sup>17</sup> In the 2006 G8 meeting in Gleneagles (United Kingdom) only three out of the ten Sub Saharan countries with maternal nutrition data showed a decline in the prevalence of severe maternal undernutrition in the last decade.<sup>18</sup>

On issues of maternal wellbeing, millennium development goal five (MDG 5) aims to improve maternal health and reduce maternal mortality by 75% by 2015. But so far progress in reducing mortality in developing countries has been too slow to achieve that target. By 2005 the global maternal mortality ratio declined by only 5%, i.e. from 430 to 400 maternal deaths per 100,000 live births.<sup>4</sup>

Evidence from poor, developing countries suggests that maternal lactation can support adequate infant growth during the first six months although the consequences for maternal nutrition in the whole period are not clearly known.<sup>19</sup> The untenable situation in Africa

demands that nutritionists take lead in placing the nutritional status of the vulnerable at the centre of any discussions concerning globalisation, development and Africa. Finding appropriate and effective ways to reduce the prevalence of malnutrition in Africa remains a challenge for nutritionists and agriculturalists.<sup>20</sup>

It is important to determine the usual dietary intake of lactating women because it is a major determinant of nutritional status and depletion of nutrient stores during lactation poses a risk of malnutrition to the mother whereas inadequate amounts of breast milk can be a source of malnutrition for the infant.<sup>21</sup> Most interventions designed to improve nutritional status try to improve dietary intake. Consequently, this research study was aimed at assessing food intake and nutrition knowledge of lactating women that would identify risk where data were unavailable on nutrient intake and to add data to where paucity currently exists. This could lead to providing objective nutrition guidance to help mothers to maintain lactation while they could also remain healthy. Dietary intake *per se* cannot be used to classify a person or population as malnourished. It can however identify an at risk state.<sup>20</sup>

## CHAPTER 2: NUTRITION DURING LACTATION

Although it has been hypothesized that the mammary gland first evolved from the innate immune system as an inflammatory response to provide protection to the young and that nutritional factors developed later,<sup>22, 23</sup> throughout recorded human history, populations knew that failure to breastfeed was associated with infant mortality, with evidence that some populations did not survive due to artificially feeding their young.<sup>24</sup> To date, nutrition has assumed a position of dominance over the protective factors in considerations of the physiology of human lactation. The health, social and economic benefits of breastfeeding for the infant, mother and society, in both developed and developing countries are well documented.<sup>22, 23</sup>

### 2.1 Nutrient intake of the lactating mother

Good nutritional intake supports the stamina, patience and self-confidence that nursing an infant demands. Helping women achieve appropriate nutritional status to optimise breastfeeding is important and requires consideration of energy and nutrient needs. Social support from husbands, mothers, sisters, healthcare providers, communities, employers and policy makers is also critical to breastfeeding success.<sup>25</sup>

Nutrient requirements are considerably elevated during lactation than in any other stage of a woman's reproductive life. Women who are breastfeeding should increase their energy and nutrient intakes to levels above those of non-pregnant, non-lactating women.<sup>26</sup> The requirements are greater than during the pregnancy period, since breast milk has to supply an adequate amount of all the nutrients for an infant's needs for growth and development. By four months after birth, an infant doubles the birth weight accumulated during the nine-month pregnancy period. The milk secreted in one month represents more energy than the total cost of a pregnancy.<sup>27</sup>

Several studies have shown that metabolic disturbances early in life, particularly those related to nutrition, induce irreversible physiologic alterations in adulthood.<sup>28,29</sup> Experimental and epidemiologic studies have pointed out that nutrition is vitally important during prenatal (pregnancy) and postnatal (immediately after birth) periods. Therefore, nutrition of the lactating woman not only affects milk composition and production but also the health of the offspring in adulthood. For example, a study by Silveira and co-workers (in 2007) showed that trans fatty acids in maternal milk lead to cardiac insulin resistance in the adult offspring. Hence, trans fatty acid consumption by lactating mothers is an important factor for the

induction of long term metabolic disorders in the adult offspring, especially those related to insulin.<sup>30</sup>

Energy and nutrients can be obtained from a varied diet that includes foods from each basic food group. Some nutrient needs however are greater than others and they vary from pregnancy needs as they independently affect breast milk concentration.<sup>30</sup> These needs are discussed in the section below.

### **2.1.1 Energy**

Lactation is the most energy demanding phase of human reproduction. The energy cost of milk production in the first six months of exclusive breastfeeding increases women's daily energy needs by 30% or 1260 kJ/day above the pregnancy energy requirement. This is worldwide accepted since the energy cost of lactation is presumed to be similar in well and poorly nourished women.<sup>38</sup> However, women in developing countries generally enter lactation with low bodily energy reserves, which makes them to be at risk of adverse nutritional consequences. How these women meet this need for additional energy has created considerable interest in terms of basic biology and policy implications.<sup>38</sup>

The issue of energy saving adaptations to accommodate the cost of lactation where fat gains across pregnancy are low, has been addressed by various authors whose studies in developing countries revealed that intakes are often lower than those recommended, and that women in different populations use different strategies to cover the energy cost of milk synthesis. For example, well nourished Indian women increased their food intake but did not mobilize fat stores to any significant extent.<sup>31</sup> Guatemala women on the contrast did not increase energy intake but met the additional costs by the mobilization of body fat stores.<sup>32</sup> Since different strategies are probably contingent, at least in part dependent on environmental circumstances, we need a multicultural approach in assessment. Data are needed from a variety of populations living under a spectrum of different conditions to fully understand the energetics of lactation (intake, expenditure and body composition).<sup>33</sup>

More information from previous research on energy needs and intake in different parts of the world however give the following conclusions: Daily energy expenditure of lactating women increases across the course of lactation. Furthermore, the additional energy expenditure in physical activity, lactation and Thermal Effect of Food (TEF) is 280kJ/day greater at four months lactation than at birth and 340kJ/day greater after eight months lactation. This conclusion has been made on the assumptions that TEF does not alter across

the course of lactation, that the energy cost of breast milk production at 83% efficiency is 3.37kJ/g, and that breast milk volume increases from 680g/day at zero to one month postpartum to 830g/day at three to six months postpartum, then declining to 625g/day at 12 months for women who fully breastfeed.<sup>34</sup>

However, if breast milk output values for partial breastfeeding at four months and eight months are used instead of values of full breastfeeding, then the increase in total energy expenditure can be attributed to increased physical activity from four months lactation onwards.<sup>249</sup> It was also concluded that lactating women show a high degree of variation in dietary intake, physical activity level, and weight loss, illustrating that even in the same setting individual women's strategies can vary.<sup>34</sup>

Further results show that women, who enter lactation with low bodily fat stores and fail to compensate for the additional energy needed, have substantial postpartum weight loss. This decline indicates a compromised maternal ability to deal with energy stress during lactation and such mothers of very poor nutritional status are likely to have greater implications for subsequent pregnancies, particularly if the next pregnancy occurs soon.<sup>35</sup>

With the substantial energy increase in human lactation, when compared with more rapidly growing mammals and those that give birth to litters, the relatively dilute nature of human milk means that the cost of milk production per unit time is relatively low and therefore should allow for greater flexibility in how women can respond.<sup>36</sup> Their options are constrained by their socio-economic context.<sup>34</sup>

Cultural beliefs and practices also influence the maternal strategies of energy intake of the lactating mothers, for example the *resguardo* of the Iran and Brazil women (Muslim women) that is a 40-day postpartum period when women experience food taboos, work restrictions and practice seclusion. This period is expected to increase dietary intake and reduce energy expenditure since the woman's diet is closely monitored by family members and they do no work.<sup>34</sup>

The energy balance equation has two components or determinants, i.e. energy intake and energy expenditure. The energy cost of lactation is determined by the amount of milk that is produced and secreted, its energy content, and the efficiency with which dietary energy is converted to milk energy.<sup>37</sup> This energy comes from the mother's diet and from reserves in tissues built up during gestation.<sup>38</sup>

## 2.1.2 Macronutrients

A question often raised is whether a mother's milk may lack a nutrient if she fails to get enough in her diet. The answer differs from one nutrient to the next, but in general, nutritional inadequacies reduce the *quantity* and not the *quality* of milk. Carbohydrates, protein and fat are building blocks for physical form. They break and reassemble into fuel, which our body uses to support physical activity and basic functioning. Women can produce milk with adequate protein, carbohydrate, fat and most minerals even when their own supplies are limited. For these nutrients and for the vitamin folate as well, milk quality is maintained at the expense of the maternal nutrient stores.<sup>7</sup>

### 2.1.2.1 Carbohydrates

The three major types of dietary carbohydrate are starch, sugar and fibre. Many people regard starch and sugar as fattening and therefore to be avoided. Refined sugar is commonly blamed to cause Attention Deficit Disorder (ADD) and fibre is known as something to consume to avoid constipation. There is some scientific basis for each of the beliefs, although it is often exaggerated. Intake of excess carbohydrate can cause weight gain, and only a small percentage of children with ADD are actually sensitive to sugar. And only a certain amount of fibre is good. Too much can cause problems.<sup>27</sup>

In lactation, carbohydrate intake is slightly increased by 80g/day from 130g/day recommended for pregnancy. Human milk has a very high lactose content (the principal carbohydrate in milk), about 7g/dl and provides about 40% of energy to the infant. Human milk has a higher amount of lactose than cow's milk, which makes human breast milk taste sweeter. In most studies, breast milk concentration appears to be insensitive to changes in the diet and nutritional status. However, carbohydrates are essential to provide the lactating mother with energy for the nursing period. Carbohydrates are also necessary in the diet to spare the utilization of body protein and prevent ketosis.<sup>7</sup>

### 2.1.2.2 Proteins

Protein is a dietary essential that performs many functions in the body, i.e. structural components of body tissues (muscles, cartilage, bones), enzymes, hormones, components of the immune system, transporters of other substances, membrane bound carriers and regulators of many biochemical processes. The primary role of dietary protein is to supply amino acids



for biosynthesis, but it can be used for energy. Adequate protein intake is particularly important during periods of growth or recovery from disease.<sup>27</sup>

Protein needs during pregnancy increase to about 60g/day over the entire nine month period. This is an increase of 10 to 15g/day over the needs of a non-pregnant woman. In lactation a further increase of 15-20g/day above pre-pregnancy requirements is needed since protein is responsible for various functions, i.e. cell growth, tissue repair, energy source, maintenance of fluid and electrolyte balance, acid-base balance and a strong immune system.<sup>5</sup>

### **2.1.2.3 Fats**

The percentage daily energy that comes from fat does not change during pregnancy. However, they should not be totally avoided, since fat is essential for the new tissues and cells being formed and in addition for foetus fat stores during the third trimester. Without adequate fat stores newborns cannot effectively regulate their body temperature. From late pregnancy to lactation more care should be taken on the type of fats consumed. Monosaturated fats are important, but polyunsaturated fats that particularly contain omega-3 fatty acid known as docosahexaenoic acid (DHA), are of greater importance.<sup>3</sup>

Though fat appears to be the most variable of the macronutrients within and between individuals, it is the main source of energy in human milk. A breastfeeding woman has a higher requirement especially for DHA because her infant used a good deal of it for central nervous system development during pregnancy and also brain growth and eye development. The DHA content of maternal milk directly reflects maternal intakes. On average milk lipids comprise of about 4% of human milk.<sup>39</sup>

### **2.1.3 Micronutrients**

Maternal micronutrient status should be viewed on a continuum: from the preconception period, throughout pregnancy and lactation, for it determines pregnancy outcome, infant growth and development and maternal health.<sup>40</sup> Multiple nutrient deficiencies can occur since the needs of several vitamins and minerals increase over the requirements of pregnancy and these include vitamin A, vitamin C, vitamin E, riboflavin (B<sub>2</sub>), (B<sub>12</sub>), biotin, choline, copper, iodine, selenium, zinc, manganese and chromium.<sup>40</sup> Inadequate dietary intake is considered one of the major causes of micronutrient deficiencies and ideally nutrient deficiencies should be prevented or treated before a woman becomes pregnant.<sup>41</sup>

In lactation, maternal status or the intake of the B vitamins (except folate), vitamin A, selenium, and iodine strongly affect the breast milk concentration of these nutrients. These can result in the infant consuming less than recommended and further depleting maternal stores that were low at birth.<sup>40</sup>

The following micronutrients were considered in depth in this literature study. They are the so-called key nutrients.<sup>42</sup>

### **2.1.3.1 Calcium**

Pregnancy and lactation are states known to be accompanied by physiologically up-regulated bone absorption in response to the calcium demands of the developing foetus and nursing infant.<sup>43</sup> Calcium is a significant component of breast milk. As in pregnancy, calcium absorption is enhanced during lactation and urinary loss is decreased. In addition, some calcium appears to come from demineralization of the mother's bones and increased dietary calcium does not prevent this. Thus the recommended intake for calcium for a lactating woman is unchanged from pregnancy; that is 1000mg/day. Because of their continual growth, teenage mothers should consume 1300mg/day. Typically if calcium is adequate, a woman's bone density returns to normal shortly after lactation ends. Breastfeeding has no harmful long-term effects on bones and teeth.<sup>44</sup>

### **2.1.3.2 Iron**

Iron is needed for psychomotor development, maintenance of physical activity and resistance to infection. Its deficiency develops when the intake of bio-available iron does not meet requirements or when excessive physiological or pathological losses of iron occur.<sup>45</sup> Prevalence of iron deficiency varies greatly according to age, gender and physiological, pathological and socio-economic conditions.<sup>46</sup> In pregnancy, iron deficiency is a risk factor for preterm delivery, subsequent low birth weight and possibly inferior neonatal health, whereas in breastfeeding women need less iron as compared to pregnant women. The requirements decrease from 27mg/day to merely 9mg/day, compared to pre-pregnancy amounts of 18mg/day. This is because iron is not a significant component of breast milk and in addition, breast-feeding usually suppresses menstruation for a few months minimizing iron losses.<sup>44</sup>

A study done by De Maeyer et al. (in 1989) indicated that while a high proportion of lactating women in most poor countries have iron deficiency anaemia, it is misleading to

imply that pregnancy and lactation are part of the cause, since women of reproductive age should always be considered a risk group especially in developing countries. It is true that pregnancy will cause anaemia especially where birth spacing is short, but this study showed that lactation reduces the risk of developing iron deficiency anaemia by suppressing menstruation, known as lactation amenorrhoea.<sup>47</sup>

Labbok and co-workers (in 1990) indicated that malnourished women may produce slightly less breast milk, but somehow have longer periods of lactation amenorrhoea. Thus they not only lose less iron in breast milk, but they save more from missed menstrual periods. Therefore the anaemia protective effect of breast-feeding is likely to be larger the more malnourished a woman is.<sup>48</sup>

### **2.1.3.3 Zinc**

Zinc is an essential mineral found in almost every cell. It stimulates the activity of approximately 100 enzymes, which are substances that promote biochemical reactions in the body. It is beneficial for growth, maintenance of the immune function which enhances prevention and recovery from infectious diseases, maintains sense of taste and smell, and is needed for DNA synthesis.<sup>49</sup> Zinc deficiency most often occurs when zinc is inadequate or poorly absorbed, when there are increases in losses of zinc from the body or when the body's requirement for zinc increases. There is no single laboratory test that adequately measures zinc nutritional status, therefore when clinical signs appear that are associated with zinc deficiency, a medical doctor has to be consulted for appropriate care.<sup>50</sup>

Zinc and iron joint supplementation has been researched and is a great public health controversy today. These micronutrients have the potential to interact when given together; thus it is important to assess the biochemical and functional evidence from clinical trials before supplementation policies are established.<sup>51</sup> Zinc is also known to interact with copper. In case of zinc toxicity, copper status is low; there is altered iron function, reduced immune function and reduced levels of high-density lipoprotein.<sup>49</sup>

Maternal zinc deficiency during pregnancy has been related to adverse outcomes. During a workshop held in Wageningen (Netherlands) in June 2001, zinc was found to be beneficial on neonatal immune status, neonatal morbidity and infant susceptibility to infections. In fact, zinc is now a component of WHO's guidelines for the treatment of diarrhoea in children aged less than five years.<sup>52</sup>

Maternal zinc status and health benefits are yet to be researched more. However, Krebs (in 1998) indicated that breastfeeding might deplete maternal zinc stores because of the greater need for zinc during lactation, especially during the early weeks postpartum.<sup>53</sup>

The recommended amount of zinc during lactation is 12mg/day for women over 19 years and slightly higher than for pregnancy, which is 11mg/day. It is important for mothers who breastfeed to include good sources of zinc in their daily diet and for the pregnant and lactating women to follow the doctor's advice on taking mineral and vitamin supplements.<sup>49</sup>

### **2.1.3.4 Vitamin A**

Infant liver stores of vitamin A at birth are very small even in well-nourished populations. They greatly depend on the dietary intake of the mother. On the other hand, although vitamin A in human milk decreases over the course of lactation, breast milk is a good source of vitamin A and clinical vitamin A deficiency is rare in breastfed infants during their first year of life, even in poor populations. Therefore, if mother does not consume vitamin A in her diet, she will be depleted together with her child.<sup>40</sup>

Vitamin A is essential for vision acuity, maintaining mucosal surfaces of the respiratory, gastrointestinal, and genitourinary tracts and for differentiation of immune system cells, however excess preformed vitamin A exerts teratogenic effects. The recommended dietary allowance in lactation is 850µg/day which gives a normal retinol concentration in breast milk of 485µg /litre.<sup>44</sup> Deficiency is caused by a habitual diet that provides too little bio-available vitamin A to meet physiological needs.<sup>54</sup> Estimates suggest that more than 80% of dietary intakes of vitamin A in Africa are from plant foods.<sup>55</sup>

Vitamin A from animal foods such as dairy products, liver, eggs is preformed and the most bio-available dietary source, but that from plants, such as orange and green leafy vegetables, is in the form of pro-vitamin and has to be converted before absorption. Deficiency is common since a number of factors influence its conversion, and animal sources are expensive for resource poor households.<sup>20</sup>

### **2.1.3.5 Thiamine (Vitamin B<sub>1</sub>)**

The RDA increment for thiamine during lactation is considerably higher than thiamine losses in milk; in part because the need for thiamine depends on energy intake, which is expected to be higher during lactation. The predicted average thiamine intakes are less than the RDA only at lower than recommended energy intakes, suggesting that low

thiamine intake is seldom a problem. Low maternal thiamine intake can result in low thiamine levels in milk, however intakes of at least 1.3mg/day (the RDA for non-pregnant, non-lactating women of 1.1mg/day plus an increment for milk secretion of 0.2mg/day) are desirable among women consuming 9207 kJ/day or less.<sup>46</sup>

Thiamine deficiency results in the disease beriberi. Beriberi occurs in human milk fed infants whose nursing mothers are deficient. It also occurs in adults with high carbohydrate intakes mainly from milled rice and with intakes of anti-thiamine factors.<sup>46</sup> Some cases of thiamine deficiency have been observed with patients who are hypermetabolic, are on parenteral nutrition, are undergoing chronic dialysis or have undergone gastrectomy. Because thiamine facilitates energy utilization, its requirements are expressed on the basis of energy intake, which vary depending on activity levels. Lactating women are estimated to transfer 0.2mg thiamine in their milk each day and an additional 0.2mg is estimated as a need for the increased energy cost of lactation of about 2092kJ/day.<sup>46</sup>

### **2.1.3.6 Riboflavin (Vitamin B<sub>2</sub>)**

Riboflavin converts to flavin mononucleotide (FMN) and further to flavin adenine dinucleotide (FAD) before these flavins form complexes with numerous flavoprotein dehydrogenases and oxidases. The flavo co-enzymes (FMN and FAD) participate in oxidation – reduction reactions in metabolic pathways and in energy production via the respiratory chain. Studies of riboflavin status in adults concluded that maternal riboflavin intake was positively associated with foetal growth in a sample of 372 pregnant women. The additional riboflavin requirement of 0.3mg/day for pregnancy is an estimate based on increased growth in maternal and foetal compartments.<sup>56</sup>

Riboflavin deficiency results in the condition of hypo- or ariboflavinosis with sore throat, hyperaemia, oedema of the pharyngeal and oral mucous membranes, cheilosis, angular stomatitis, glosittis, seborrheic dermatitis and normochromic, normocytic bone marrow. For lactating women an estimated amount of 0.3mg riboflavin is transferred in milk daily and because of utilization for milk production is assumed to be 70% efficient, the value is adjusted upward to 0.4mg/day.<sup>46</sup>

### 2.1.3.7 Niacin (Vitamin B<sub>3</sub>)

Niacin deficiency classically results in pellagra, which is a chronic wasting disease associated with a characteristic erythematous dermatitis that is bilateral and symmetrical, a dementia after mental changes including insomnia and apathy preceding an overt encephalopathy, and diarrhoea resulting from inflammation of the intestinal mucous surfaces. At present, pellagra occurs endemically in poorer areas of India, China and Africa.<sup>161</sup> Although therapeutically useful in lowering serum cholesterol, administration of chronically high oral doses of nicotinic acid can lead to hepatotoxicity as well as dermatologic manifestations.<sup>57</sup>

Niacin content in human milk is approximately 1.5mg (12.3umol)/L and the tryptophan content is 210mg (1.0mmol)/L hence the total content is approximately 5mg NEs/L or 4NEs/0.75 L secreted daily in human milk.<sup>58</sup> For lactating women, estimated 1.4mg preformed niacin is secreted daily, and an additional requirement of less than 1mg is needed to support the energy expenditure of lactation. Hence, 2.4mg NEs/day is the added need attributable to lactation.<sup>58</sup>

### 2.1.3.8 Vitamin C

Vitamin C (chemical names ascorbic acid or ascorbate) is a six-carbon lactone, which is synthesized from glucose by many animals. Vitamin C is synthesized in the liver in some mammals and in the kidneys in birds and reptiles. Humans are unable to synthesize vitamin C.<sup>59</sup>

Vitamin C has enzymatic functions where it acts as electron donor for eleven enzymes, but three of those enzymes are found in fungi and not in humans or other mammals. Vitamin C also protects low-density lipoproteins against oxidation and may function similarly in blood. A common feature of vitamin C deficiency is anaemia. Vitamin C promotes absorption of soluble non-heme iron possibly by chelation or simply by maintaining the iron in the reduced form. The antioxidant properties of vitamin C may stabilise folate in food and in plasma.<sup>60</sup>

The populations at risk of vitamin C deficiency are those for whom the fruit and vegetable supply is minimal. Persons in whom the total body vitamin C content is saturated can subsist without vitamin C for approximately two months before the appearance of clinical signs. As little as 6.5-10 mg/day Vitamin C will prevent appearance of scurvy.<sup>61</sup>

In general vitamin C status will reflect the regularity of the fruit and vegetable consumption but also socio-economic conditions, because intake is determined not just by availability, but also by cultural preferences and cost. Low plasma concentrations are reported in patients with diabetes, and infections and in smokers but the relative contribution of diet and stress to these situations are uncertain. Epidemiologic studies indicate that diets with high vitamin C content have been associated with lower cancer risk, especially cancers of the oral cavity, oesophagus, stomach, colon and lung.<sup>46</sup> However, there appears to be no effect of consumption of vitamin C supplements on the development of colorectal adenoma and stomach cancer.<sup>62</sup> Data on the effect of vitamin C supplementation on coronary heart disease and cataract development are conflicting.<sup>63</sup>

During lactation 20mg/day vitamin C is secreted in milk. For an assumed absorption efficiency of 85%, the mother will need an extra 25mg. It is therefore recommended that the Recommended Nutrient Intake (RNI) should be set at 70mg to fulfil the needs of both the mother and the infant during lactation.<sup>46</sup> The potential toxicity of excessive doses of supplemental vitamin C relates to intra-intestinal events and to the effects of metabolites in the urinary system. Intakes of 2-3g/day of vitamin C produce unpleasant diarrhoea from the osmotic effects of the unabsorbed vitamin in the intestinal lumen in most people.<sup>61</sup>

Vitamin C may precipitate haemolysis in some people, including those with glucose-6-phosphate dehydrogenase deficiency. People with the haptoglobin Hp2-2 phenotype condition may also have increased risk of red cell haemolysis.<sup>64</sup> Table 2.1 below shows a summary of the RDA of the nutrients in non-pregnant and pregnant women compared to lactating women as discussed.

**Table 2.1:** A summary of nutrient requirements for pregnant, lactating mothers as compared to non pregnant adult women 19 to 50 years old.

Nutrient	Non-Pregnant	Pregnant			Lactating		
Energy (kJ)	9207	10462.5			11299.5		
Protein (g)	44-50	60			65		
Calcium (mg)	800	1200			1000		
Phosphorus (mg)	800	1200			1000		
Iron (mg)					(0-3)	(4-6)	(7-12)
15% bioavailability	20	N			10	10	10
12% bioavailability	24	N			12	12	12
10% bioavailability	29	N			15	15	15
5 % bioavailability	59	N			30	30	30
Magnesium (mg)	220	220			270		
Iodine (µg)	110	200			200		
Zinc (mg)		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	(0-3)	(4-6)	(7-12)
		trimester					
High bioavailability	3.0	3.4	4.2	6.0	5.8	5.3	4.3
Medium bioavailability	4.9	5.5	7.0	10.0	9.5	8.8	7.2
Low bioavailability	9.8	11.0	14.0	20.0	19.0	17.5	14.4
Selenium (µg)	26	30			35		
Vitamin A (µg RE)	500	800			850		
Vitamin D (µg)	10	10			10		
Vitamin E (µg & TE)	7.5	i			i		
Vitamin K (µg)	55	55			55		
Vitamin C (mg)	45	55			70		
Thiamine (mg)	1.1	1.4			1.5		
Riboflavin (mg)	1.1	1.4			1.6		
Niacin (mg NE)	14	18			17		
Folate (µg)	400	600			500		
Vitamin B <sub>6</sub> (mg)	1.3	1.9			2.0		
Vitamin B <sub>12</sub> (µg)	2.4	2.6			2.8		
Panhotenate (mg/day)	5.0	6.0			7.0		
Biotin (µg /day)	30	30			35		

(From: Human vitamin and mineral requirements. A report of joint FAO/WHO expert consultation committee: 2002).

*N on iron means: It is recommended that iron supplements in tablet form should be given to all pregnant women because of difficulties in correctly evaluating iron status in pregnancy.*

*i on Vitamin E means that for pregnancy and lactation there is no evidence of requirements for vitamin E that are different from those of older adults. Breast milk substitutes should not contain less than 0.3mg tocopherol equivalents (TE)/100ml*



## 2.1.4 WATER

It is widely assumed that milk production requires a high fluid intake on the part of the mother, yet the evidence suggests that lactating women can tolerate a considerable amount of water restriction and that supplemental fluids have little effect on milk volume. Lactating women who consumed no food or fluids from 0500hrs to 1930hrs during Ramadan lost 7.6% of their total body water and experienced increases in serum indices of dehydration, although values remained within the normal range. The milk volume was unaffected but changes in milk composition (lower lactose concentrations; increased osmolality due to higher electrolyte concentrations) indicated alterations in mammary cell permeability. Water turnover was very high, in part because the women apparently super hydrated themselves overnight prior to the fasting period.<sup>65</sup>

However, to protect herself from dehydration, a lactating mother should drink plenty of fluids. A sensible guideline is to drink a glass of water, milk or juice at each meal and each time an infant nurses. Despite misconceptions, a mother who drinks more fluid does not produce more breast milk.<sup>44</sup>

## 2.2 The influence of maternal nutrition on lactation

The effect of the nutrition of mothers on the quality and quantity of their milk is a frequent topic of discussion. However, studies conducted on this subject have shown that a mother's nutrition has a greater impact on her long-term health than on the quality and quantity of her milk.<sup>66, 19, 67</sup>

### 2.2.1 Does maternal nutritional status influence milk volume?

The mean volume of milk secreted by healthy women whose infants are exclusively breastfed during the first four to six months is approximately 750 to 800ml/day, but there is considerable variability from woman to woman and in the same woman at different times. The standard deviation of daily milk intake by infants is about 165ml; thus 5% of women secrete less than 550ml or more than 1200ml on a given day. The major determinant of milk production is the infant's demand for milk, which in turn may be influenced by the size, age, health, and other characteristics of the infant as well as by his or her intake of supplemental foods. The potential for milk production may be considerably higher than that actually produced, as evidenced by findings that the milk volumes produced by women nursing twins or triplets are much higher than those produced by women nursing a single infant.<sup>2</sup>

Studies of healthy women in industrialized countries demonstrate that milk volume is not related to maternal weight or height or indices of fatness. In developing countries there is conflicting evidence about whether thin women produce less milk than do women with higher weight for height. However, increased maternal energy intake has not been linked with increased milk production, at least among well-nourished women in industrialized countries.<sup>19</sup>

Nutritional supplementation of lactating women in developing countries where under-nutrition may be a problem has generally been reported to have little or no impact on milk volume. However, most studies have been too small to test the hypothesis adequately and lacked the design needed for causal inference. Studies of animals indicate that there may be a threshold below which energy intake is insufficient to support normal milk production, but it is likely that most studies in humans have been conducted on women with intakes well above this postulated threshold.<sup>27</sup>

The weight loss ordinarily experienced by lactating women has no apparent deleterious effects on milk production. Although lactating women typically lose 0.5 to 1kg per month, some women lose as much as 2kg per month and successfully maintain milk volume. Regular exercise appears to be compatible with production of an adequate volume of milk.<sup>19</sup>

There is growing evidence that the volume of milk produced by women is primarily a function of infant demand and is unaffected by maternal factors such as nutrition, age, parity (except at very high parities).<sup>68</sup> However, the influence of maternal intake of specific nutrients on milk volume has not been investigated satisfactorily. Early studies in developing countries suggest a positive association of protein intake with milk volume, but those studies remain inconclusive. Fluids consumed in excess of thirst do not increase milk volume.<sup>1</sup>

### **2.2.2 Does maternal nutritional status influence milk composition?**

The composition of human milk is distinct from the milk of other mammals and from infant formulas ordinarily derived from them. Human milk is unique in its physical structure, types and concentrations of macronutrients (protein, fat, and carbohydrate), micronutrients (vitamins and minerals), enzymes, hormones, growth factors, host resistance factors, inducers/ modulators of the immune system, and anti-inflammatory agents.<sup>1</sup>

A number of generalizations can be made about the effects of maternal nutrition on the composition of milk as follows (25):

- Even if the usual dietary intake of a macronutrient is less than that recommended in *Recommended Dietary Allowances*, there will be little or no effect on the total amount of that nutrient in the milk. However, the proportions of the different fatty acids in human milk vary with maternal dietary intake.
- The concentrations of major minerals (calcium, phosphorus, magnesium, sodium, and potassium) in human milk are not affected by the diet. Maternal intakes of selenium and iodine are positively related to their concentrations in human milk, but there is no convincing information on this.
- The content of at least some nutrients in human milk may be maintained at a satisfactory level at the expense of maternal stores. This applies particularly to folate and calcium.
- Increasing the mother's intake of a nutrient to levels above the RDA ordinarily does not result in unusually high levels of the nutrient in her milk; vitamins B<sub>6</sub> and D, iodine, and selenium are exceptions. Studies have not been conducted to evaluate the possibility that high levels of nutrients in milk are toxic to the infant.
- Some studies suggest that poor maternal nutrition is associated with decreased concentrations of certain host resistance factors in human milk, whereas other studies do not suggest this association.

### **2.2.3 Can nutrient needs during lactation be met by usual dietary intake alone?**

Most lactating mothers can obtain all the nutrients they need from a well-balanced diet without taking vitamin-mineral supplements. Nevertheless, some may need iron supplements, not to enhance the iron in their breast milk but to refill their depleted iron stores. The mother's iron stores dwindle during pregnancy as she supplies the developing foetus with enough iron to last four to six months of the infant's life. In addition, childbirth may have incurred blood losses. Thus a woman may require iron supplements during lactation, though until menstruation resumes her iron requirement is about half that of other non-pregnant women of her age.<sup>27</sup> The requirement for folate during lactation is 500µg/day, which is decreased from the 600µg/day required during pregnancy but is higher than pre-pregnancy needs of 400µg/day.<sup>44</sup>

## **2.2.4 How can it be determined whether lactating women are well nourished?**

To determine whether women are adequately nourished, investigators use biochemical or anthropometrical methods, or both. For lactating women, however, there are serious gaps and limitations in the data collected with these methods. Consequently, there is yet no scientific basis for determining whether poor nutritional status is a problem among certain groups of these women.<sup>27</sup>

The Subcommittee of Nutrition during Lactation (USA) used an approach involving nutrient densities (nutrient intakes per 1,000kcal) to identify the nutrients likely to be consumed in inadequate amounts by lactating women. These were calculated from typical diets of non-lactating U.S. women, by making the assumption that the average nutrient densities of the diets of lactating women would be the same as those of non-lactating women but that lactating women would have higher total energy intake (and therefore higher nutrient intake). Using this approach, the nutrients most likely to be consumed in amounts lower than the RDAs for lactating women are calcium, zinc, magnesium, vitamin B<sub>6</sub>, and folate.<sup>1</sup>

Lactating women eating self-selected diets typically lose weight at the rate of 0.5 to 1.0kg per month in the first four to six months of lactation. Such weight loss is probably physiological. During the same period, values for sub-scapular and supra-iliac skin fold thickness also decrease. However, triceps skin fold thickness does not and not all women lose weight during lactation. Studies suggest that approximately 20% may maintain or gain weight.<sup>69</sup>

Biochemical data for lactating women have been obtained only from small, selected samples. Such data are of limited use in the clinical situation because there are no norms for lactating women, and the norms for non-pregnant, non-lactating women may not be applicable to breastfeeding women. For example, there appear to be changes in plasma volume post-partum, and there are changes in blood nutrient values over the course of lactation that are unrelated to changes in plasma volume.<sup>1</sup>

### **2.2.4.1 Changes in anthropometrical characteristics**

Several investigators have followed anthropometrical characteristics of well-nourished women and marginally nourished women during lactation.<sup>31,70</sup> In a few of those studies fat stores were estimated. In general, anthropometrical changes during lactation were minor. The range of mean daily energy deficits was reported to be 462 to 1440kJ/day in

presumably well-nourished women living at home and followed longitudinally during lactation for four to six months.<sup>44</sup>

The rate at which a woman (lactating or not) returns to her pre-pregnancy weight after delivery is affected by many factors. These include oedema during pregnancy, the route of delivery, pre-pregnancy weight, post-partum weight, parity, and maternal age and weight gained during pregnancy. Therefore it is difficult to obtain accurate measurements without extensive training and monitoring. However, due to recent developments, other approaches (e.g., bioelectrical impedance or isotope dilution) can be used for the evaluation of changes in body composition in lactating women.<sup>44</sup>

#### **2.2.4.1.1 Breastfeeding and the onset of obesity**

There is little doubt that major physiological adjustments influence energy stores during lactation. Animal data support the view that excess fat is more likely to accumulate in women who do not breastfeed after pregnancy and who have adequate food intakes. Research done by Jevitt and co-workers (in 2007) showed that mothers who are obese (BMI>30) are less likely to initiate lactation, have delayed lactogenesis II and are prone to early cessation of breastfeeding.<sup>69</sup> Why some women retain weight gained from pregnancy is not fully understood. Factors such as excessive gestational weight gain,<sup>51,71,72</sup> depression,<sup>73,74</sup> high energy intake,<sup>51</sup> lactation status<sup>70,75,76</sup> maternal insulin concentrations during pregnancy,<sup>77</sup> and age<sup>78</sup> influence postpartum weight retention.

However, even for the women who are obese, the level of physical activity needs to be considered. Intakes below 6300kJ/day are not recommended at any time during lactation, although brief fasts (lasting less than one day) are unlikely to decrease milk volume. Liquid diets and weight loss medications are not recommended. Dieting during this period is also not recommended.<sup>69</sup>

## 2.2.5 Meeting maternal nutrient needs during lactation

The following is suggested to ensure that maternal nutrient needs will be met during lactation<sup>37</sup>:

- Lactating women should be encouraged to obtain their nutrients from a well-balanced, varied diet rather than from vitamin-mineral supplements.
- There should be a well-defined plan for the health care of the lactating woman that includes screening for nutritional problems and providing dietary guidance.
- Suggested measures for improving nutrient intake of women with restrictive eating patterns include:
  - Encourage increased intake of nutrient-rich foods to achieve an energy intake of at least 7533 kJ/day. If the mother insists on curbing food intake sharply, promote substitution of foods rich in vitamins, minerals, and protein for those lower in nutritive value. In individual cases it may be advisable to recommend a balanced multivitamin-mineral supplement. Discourage use of liquid weight loss diets and appetite suppressants.
  - *Complete vegetarianism*, i.e., avoidance of all animal foods, including meat, fish, dairy products, and eggs. Advise intake of a regular source of vitamin B<sub>12</sub>, such as special vitamin B<sub>12</sub>-containing plant food products or a 2.6 mg vitamin B<sub>12</sub> supplement.
  - *Avoidance of milk, cheese, or other calcium-rich dairy products*. Encourage increased intake of other culturally appropriate dietary calcium sources.
  - *Avoidance of vitamin D-fortified foods*, such as fortified milk or cereal, combined with limited exposure to ultraviolet light, recommend 10µg of supplemental vitamin D per day.

Women who plan to breastfeed or who are breastfeeding should be given realistic, health-promoting advice about weight change during lactation.<sup>69</sup>

## CHAPTER 3: NUTRITION KNOWLEDGE

### 3.1 Nutrition knowledge defined

Nutrition knowledge is the understanding of different types of food and how food nourishes the body and influences health.<sup>79</sup> Although breastfeeding is one of the most natural functions of a woman's body, knowledge about lactation can make breastfeeding a success for both the mother and infant. Parents should make decisions about feeding their infant(s) based on accurate information, thus providing information to the lactating mother should be an integral part of prenatal care.<sup>79</sup>

### 3.2 Importance of nutrition knowledge

Several studies have been done in regard to nutrition knowledge and its relation to diet quality. Worsley (in 2002) concluded that the status and explanatory role of nutrition knowledge is uncertain in public health nutrition. Much of the uncertainty about this area has been generated by conceptual confusion about the nature of nutrition knowledge and food behaviours in particular. The main argument is that 'nutrition knowledge' is a necessary but not sufficient factor for changes in consumers' food behaviours.<sup>80</sup>

Assessment of nutrition knowledge in early postpartum can help nutrition and health professionals identify women who may be at risk for retaining excessive weight. A study by Nuss and others (in 2007) in the USA showed that non-Hispanic black and Hispanic women, who had lower knowledge, had greater postpartum weight retention. Breastfeeding was positively associated with nutrition knowledge and lower weight retention, and should be encouraged by health care professionals.<sup>81</sup>

Nutrition interventions generally focus on increasing knowledge, changing attitudes and improving practices related to the three pillars of good nutrition, namely health, care and dietary intake. However, factors affecting food choice are complex and wide ranging as noted by Shepherd (in 1989), and an awareness and understanding of the problems associated with an inadequate diet are not in themselves likely to be sufficient to enforce positive change.<sup>82</sup> In the early eighties, Beattie (in 1984) already indicated that there is a considerable gap between awareness and behaviour.<sup>83</sup>

### 3.2.1 Importance of nutrition knowledge during lactation

There is no doubt today that breastfeeding is the optimal method of infant feeding as it is associated with a range of positive benefits. Benefits for maternal and infant health are well recognised, and extensive efforts to promote breastfeeding have been implemented in many countries.<sup>84</sup>

It is the position of the American Dietetic Association (ADA) and Dieticians of Canada (DC) that women have specific nutritional needs and vulnerabilities and, as such, are at unique risk for various nutrition-related diseases and conditions. Therefore, the ADA and DC strongly support research, health promotion activities, health services, and advocacy efforts that will enable women to adopt desirable nutrition practices for optimal health.<sup>85</sup> Mothers are the major providers of food for their families and are also a substantial source of nutrition information for their children. It is thus important that mothers have good nutrition knowledge and are aware of the recommended intakes of core foods.<sup>86</sup>

A study done among Hong Kong Chinese women by Chan et al (in 2000) showed that there was a high rate of discontinuation of breastfeeding in a group of mothers who were selected on the basis that they intended to breastfeed exclusively for three months. Although the mothers were aware of the benefits and techniques of breastfeeding and were apparently encouraged by hospital staff to breastfeed, a feeling of an insufficient milk supply and difficulties in managing breastfeeding-related problems were given as the main reasons for the early discontinuation of breastfeeding.<sup>87</sup>

More effort is needed to foster mothers' confidence, commitment and knowledge in breastfeeding. The study among 2619 postpartum Honduran women who had had a normal, in-hospital delivery in one of 16 public hospitals located throughout the country also revealed that standardized health education for Honduran women of reproductive age was needed if folic acid consumption through fortification and supplementation is to be successful and sustainable in order to prevent neural tube defects.<sup>88</sup>

Providing information about bodily functions, health risks and how to avoid them is not effective in bringing about specific behavioural changes to maintain optimal health. The key is to show that modification of the diet is desirable and will have positive outcomes.<sup>16</sup> Other than the benefit of mothers taking better care of themselves with better nutrition knowledge, the demand for child micronutrient status may depend largely on maternal nutrition knowledge. Indeed, Block (in 2002) found that maternal nutrition knowledge was a more central determinant of child micronutrient outcomes than maternal schooling.<sup>89</sup>



Maternal education has however also played a central role in empirical studies of the demand for child health (usually measured by height). Behrman and Wolfe (in 1984), Alderman and Garcia (in 1994), and others consistently found a strong positive association between maternal education and child height.<sup>89,90</sup> Far fewer studies have extended the analysis to consider the mechanisms through which maternal education contributes to child height.<sup>91, 92,93</sup>

Barrera (in 1990) drawing on Philippines data, considered the impact of maternal education on the height of children of different ages, found the greatest sensitivity in pre-schoolers particularly during the weaning period. Moreover, Barrera demonstrated that there may be an interaction effect between maternal education and public health programmes, such that more educated mothers are able to use health inputs more efficiently and benefit more from the reduced cost of health information.<sup>91</sup> Glewwe (in 1999) addressed similar questions with Moroccan data, considering three possible mechanisms:<sup>92</sup>

- The direct teaching of nutrition knowledge in school.
- The facilitation of gaining nutrition knowledge that comes from the literacy and numeracy learned in school.
- Exposure to modern society through school.

He found that maternal knowledge stood alone among these possible mechanisms in contributing to child height (his proxy for health), and that such knowledge was gained largely outside the classroom.<sup>92</sup> Such findings have direct and important policy implications as formal schooling is often limited among the poor, the potential benefits of specific nutrition training may be substantial.<sup>94</sup>

### **3.2.2 Factors to consider in nutrition knowledge research**

In general, four categories of factors influence food consumption:

1. consumers' incomes versus food prices
2. the prices of other products and services,
3. consumers' knowledge of health and nutrition, and
4. Consumers' tastes and preferences.

It is well-known that personal and household characteristics—such as education, race, ethnicity, and family size—are associated with certain patterns of food consumption. However; personal and household characteristics not only reflect the underlying tastes and preferences of people but also may have an informational or knowledge effect. The most common example cited is that more educated individuals may acquire, process, and retain

information more easily and thus have a higher stock of nutrition knowledge, which is then reflected in the choice of certain foods.<sup>120</sup>

If nutrition knowledge is estimated with unreliable instruments, then the power of the study to detect associations with other variables is correspondingly reduced.<sup>95</sup> The problem for analysts has been the lack of a unified data set that simultaneously collects measures of nutrition knowledge, demographic information, and food consumption data. Without such information, researchers cannot separate the effect of nutrition knowledge (which is highly correlated with some socioeconomic characteristics) on consumption from the effect of taste and preferences (which cannot be measured directly but must be inferred from personal and household characteristics).<sup>120</sup>

Issues of power of the nutrition knowledge research also relate to the size of effects which can be detected. As nutrition research often comes from a clinical perspective, studies are typically powered to detect clinically significant effects while more modest, but nonetheless real, effects may not reach statistical significance. Small effects [in Cohen's (in1988) terms] may well be considered to be of little clinical significance even where they do achieve statistical significance, but when considered on a population-wide perspective, they may add up to a significant impact on public health.<sup>96</sup>

Methods of statistical analysis based on assessing the strength of associations (e.g., correlation coefficients) are increasingly being replaced with statistics which estimates the size of effects. Logistic regression, for example, can be used to indicate the increase in the odds of eating healthily for each increment of nutrition knowledge.<sup>96</sup>

A major problem faced by nutrition educators and public-health professionals in their efforts to achieve further dietary improvements is a lack of specifics on consumers' use of diet-health information. For example, to what degree does nutrition information access and use vary across different segments of the population? Likewise, does more nutrition information help people to improve their diet quality? Any understanding of factors slowing the adoption of healthful diets requires empirical knowledge of how diet-health information and its effect on dietary choices vary across the population. Such knowledge can be useful for targeting nutrition-education programs, for promoting and marketing foods, and for forecasting food consumption trends.<sup>120</sup>

### **3.3 Appropriate nutrition knowledge during lactation**

Health of the family especially the infants rotate around the mother, so it is essential to assess the knowledge and awareness of women regarding dietary practices during pregnancy, lactation and infancy. Adequate knowledge and appropriate nutritional practices play a pivotal role in determining optimal health.<sup>44</sup>

Goel (in 2008) noted that knowledge regarding various aspects of feeding practices during pregnancy and in infants such as avoidance of smoking and alcohol, importance of rest in pregnancy and importance of colostrum in infants, was lacking in the studied subjects despite high literacy status. Hence the provision of health education for all females is a prerequisite for reduction of morbidity and mortality amongst vulnerable groups of mothers and infants.<sup>97</sup> While knowledge does not necessarily lead to behaviour change, it would be difficult to choose a healthy diet without knowing the food intake recommendations.<sup>98</sup>

#### **3.3.1 Knowledge of the mothers**

Nutrition education to women is a good starting point for the introduction of better dietary habits. In an Australian study mothers remained the primary care givers for their children, and had a major role in deciding the food intake of most families.<sup>86</sup>

A need exists for establishing a nutrition education activity in maternal and child health centres in order to teach women better methods of feeding themselves during pregnancy and lactation and their infants before and throughout the weaning period. Knowledge about nutrition should be largely diffused to the public through the mass media.<sup>97</sup>

Nutrition knowledge affects food choice and preparation. Knowledge particularly given to women is a powerful weapon against malnutrition since increased knowledge and skills enable women to earn higher incomes and thus enhance household food security and improve the quality of day to day care women gives themselves and all members of their household, especially children. It empowers women to make optimal choices for nutritious and safe food.<sup>18</sup>

Women seem to be motivated to change during pregnancy and in the postpartum period, thus it is important to determine whether they have appropriate knowledge of food intake guidelines that have been developed by health authorities.<sup>99</sup>

Block conducted studies in Indonesia on the *Maternal Nutrition Knowledge and the Demand for Micronutrient-Rich Foods* (in 2004)<sup>94</sup> as well as *maternal nutrition knowledge versus schooling as determinants of child micronutrient status (in 2002)*<sup>100</sup> and concluded that the results suggested:

- The possibility that specific nutrition education for girls and women may yield high returns in terms of enhanced child micronutrient status. This approach would be particularly efficacious in light of the evidence that maternal nutrition knowledge substituted for formal schooling and thus provided heightened benefits to haemoglobin concentrations among children of the least educated mothers.
- Nutrition knowledge appeared to have a strong effect on households' allocation of their food budget. Budget shares for high quality (for example micronutrient-rich) foods are widely known to increase as a function of income. The present study demonstrated, however, that nutrition knowledge can substitute for both income and formal schooling among poorer consumers. Households with nutrition knowledge in the bottom decile of the expenditure distribution in which the mother had only primary education, allocated 20% more of their food budget to micronutrient-rich foods than did households lacking nutrition knowledge.
- Increased maternal schooling increased the demand for micronutrient-rich foods, and thus explains some of the apparent effect of nutrition knowledge therefore schooling is one source of nutrition knowledge. The evidence presented here clearly demonstrated that schooling is only one (and not the primary) source of nutrition knowledge and that nutrition knowledge retains substantial explanatory power independent of schooling. These findings highlight the importance of identifying the sources of nutrition knowledge.

In Kenya a study done on maternal nutritional knowledge and the nutritional status of preschool children in the Kibera slum area, by Waihenya and others (in 1996), revealed that though most mothers (97.5%) had access to nutrition education there was no significant relationship between the nutritional status of children and overall nutritional knowledge. This is because nutritional knowledge alone is inadequate in ensuring nutrition security and, hence, for nutrition education programmes to have a positive impact, facilitational strategies must be incorporated.<sup>101</sup>

Other than mothers' knowledge, knowledge of their partners and health workers would also affect the knowledge and practice of the lactating mothers. In Kenya community

health workers (CHWs) have also been trained for service for example; Based in part on the UNICEF/WHO/UNESCO "Facts for Life" program, the training of community health workers focuses on simple things like promoting hygiene and breast-feeding, understanding elementary nutrition, the importance of immunization, and stopping infantile diarrhoea. However evaluations of CHW performance in 1998, 1999, and 2001 in Siaya, Kenya by Kelly and others (in 2001) found that "key reasons for the deficiencies [in performance] appear to be guideline complexity and inadequate clinical supervision".<sup>102</sup>

### **3.3.2 Knowledge of partners of breastfeeding mothers**

Recognizing that an expectant father may influence a mother's decision to breast- or formula-feed, Wolfberg and others (2004) tested the effectiveness of a simple, educational intervention that was designed to encourage fathers to advocate for breastfeeding and to assist his partner if she chooses to breastfeed. A randomized controlled trial was conducted in which expectant fathers (N = 59) were assigned randomly to attend either a 2-hour intervention class on infant care and breastfeeding promotion (intervention) or a class on infant care only (control group). The classes, which were led by a peer-educator, were interactive and informal and utilized different media to create an accessible environment for participants. Overall, breastfeeding was initiated by 74% of women whose partners attended the intervention class, as compared with 41% of women whose partners attended the control class suggesting that expectant fathers can be influential advocates for breastfeeding, and play a critical role in encouraging and supporting a woman to breastfeed her new born infant.<sup>103</sup>

Another study to determine the effects of a partner-support, incentive-based educational program on breast feeding knowledge, attitudes and support and to examine the relationship between feeding intentions and feeding behaviour among low-income women indicated that the partners of intervention group women were perceived to be more supportive of breastfeeding than control group partners. These findings suggest that incentives, such as donated prizes, can be used to attract lower socio-economic group women and their partners to breastfeeding promotion interventions. Participation in such interventions can produce positive changes in breastfeeding knowledge, attitudes, and support, and can have a dramatic effect on promoting breastfeeding.<sup>104</sup>

### **3.3.3 Knowledge of health workers**

In some settings health workers are a major source of information to lactating mothers. In a study done in Manisa (Turkey) on breastfeeding knowledge and practices

among 158 lactating women, about half ( $n = 88$ , 55.7%) of the participants had received information about breastfeeding. Most ( $n = 66$ , 41.8%) said that they had received this from a midwife or nurse, but a few women ( $n = 19$ , 12.0%) received information from doctors. Nearly one in five women ( $n = 35$ , 22.2%) had read about breast feeding in books or journals. Four women reported that they had learned something about breastfeeding from their relatives or friends.<sup>84</sup> However, in Australia health professionals only provided nutrition information to 4% of the 168 postpartum women who participated in the study.<sup>105</sup> In a Hong Kong study, Chan et al (2000) concluded that hospitals have an important role to play. Enforcement of the International code of marketing breast milk substitutes and the ten steps of the BFHI, as well as greater involvement by doctors, family and society, are required if Hong Kong is to achieve the ideal of having the majority of infants receiving exclusive breastfeeding for four to six months.<sup>87</sup>

### **3.3.3.1 Nurse practitioners and nurse midwives**

Nurse practitioners and nurse midwives place a high value on health promotion and teaching in their practices. The ability to promote and support breastfeeding may be one of the most beneficial activities they can perform because breast milk is widely acknowledged as the best nutrition for the human infant. However, there is a limited body of literature on the knowledge and attitudes of nurse practitioners and nurse midwives toward breastfeeding. Given the health value of breastfeeding for the mother/baby and the number of women who are cared for by these health workers, it was important to assess the knowledge, experience, and attitudes that these professionals bring to the care setting.<sup>106</sup>

Hayes and Crowder (in 1981) found inconsistencies and deficits in the knowledge of nurses who worked in maternity settings during the 1970s.<sup>107,108</sup> Anderson and Geden (in 1991) studied nurses working in maternal/neonatal settings and elicited knowledge about the management of breastfeeding both in-hospital and when a health problem is present, postpartum anticipatory guidance, anatomy, physiology, and nutrition. The low mean score of the respondents suggested that there had been little improvement in nursing knowledge in the ten years since the work of Crowder and Hayes. However, in the later study, those nurses who had breastfed an infant and who had more years and more breadth of work experience did score significantly higher than nurses who did not.<sup>106</sup>

### **3.3.3.2 Physicians**

In Turkey, because the breast feeding rate is fairly high and the mean time to weaning is long,<sup>109</sup> mothers do not need to be encouraged to breastfeed. However, they do need to be

educated to maintain exclusive breast feeding for the first six months. Mothers likely to have difficulties with breastfeeding should be identified early, followed frequently, and encouraged and assisted with breast feeding.<sup>110,111</sup>

Freed and others (in 1995) conducted a national survey of practicing physicians and residents in paediatrics, obstetrics/gynaecology, and family practice ( $n = 3275$ ). All of the groups demonstrated significant knowledge deficits in the benefits and clinical management of breastfeeding. The single greatest predictor of physician confidence about effectiveness in providing breastfeeding counselling was personal or partner experience with breastfeeding. He concluded that the physician sample as a whole, and when broken down by specialties, were ill prepared to assist women to breastfeed successfully.<sup>112</sup>

### **3.3.3.3 Dietitians**

Dietitians in most middle and high-income countries are regarded as the main advocates and experts with regard to promoting a healthy diet and lifestyle. Most countries have developed dietary guidelines aimed at encouraging a healthy diet.<sup>113</sup>

A study on attitudes and knowledge of dietitians, nurses, and physicians who work with recipients of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) found a higher knowledge score for nurses than noted previously. However, dietitians scored significantly higher than nurses on the knowledge items. All of these professionals appeared to be more knowledgeable about the benefits of breastfeeding than they were about such maternal concerns as weight loss and the use of oral contraceptives. In general, attitudes toward breastfeeding were positive in all three groups. Knowledge and attitude scores were only weakly related.<sup>114</sup>

The increase in barriers to healthful eating as postpartum progress is not surprising because lifestyle changes so abruptly during this time. Health professionals should discuss changes and difficulties often faced in postpartum, identify potential techniques and emphasize potential changes to overcome these obstacles to healthful eating.<sup>81</sup> It is the recommendation of the WHO that health professionals and employers should encourage mothers to breast feed in order to reduce infant mortality to below 20% by 2020.<sup>115</sup>

The partners and health workers are not the only sources of nutrition information for lactating women, for example, in an Australian study the major sources of nutrition information cited by the women were reading (44%), education (36.9%), family (22%), media (13.1%), organisations (4.8%) and health professionals (4.2%). Most of the 22% who identified family as a source of nutrition information specifically mentioned their mothers.<sup>105</sup>

In contrast, in Turkey, among 158 lactating women, (41.8%) said that they had received information from a midwife or nurse, but a few women (12%) received information from doctors. Nearly one in five women (22.2%) had read about breastfeeding in books or journals. Four women reported that they had learned something about breast feeding from their relatives or friends.<sup>116</sup>

Therefore the contribution of partners and health workers in imparting knowledge to lactating mothers vary from one region to another however. They have been considered since they are common sources of the information across most regions globally. However, a team approach including dietitians, nurses, physicians and lactation consultants is suggested. Intervention programs should continue to emphasize the benefits of breastfeeding but also teach problem-solving techniques and breastfeeding skills. To be most effective breastfeeding education should continue well beyond the birth of the child, i.e. critical teachable moments such as prior to returning to work.<sup>116</sup>

### **3.4 The relationship between nutrition knowledge and nutrient intake in lactation**

In many studies correlations between nutrition knowledge and dietary behaviour failed to reach statistical significance, leading researchers to question the relevance of nutrition knowledge to food choice, and the value of nutrition education campaigns.<sup>117,118,119</sup> However, a study done by Parmenter and others (in 1999) on the relationship between knowledge and intake of fat, fruit and vegetables, using a well-validated measure of nutrition knowledge, indicated significant association between knowledge and healthy eating, and the effect persisted after controlling for demographic variables. The respondents in the highest quintile for knowledge were almost 25 times more likely to meet current recommendations for fruit, vegetable and fat intake than those in the lowest quintile.<sup>95</sup> Therefore, the results support the likely value of including nutrition knowledge as a target for health education campaigns aimed at promoting healthy eating and the significance of knowledge as one of the determinants of food choice which may have been under-estimated, and the value of nutrition education prematurely rejected.

Many regard information and knowledge as the keys that will unlock the door to better diets and in turn better health, longer lives, and children with improved cognitive and learning abilities. Variyam and Blaylock (in 1998) in their study verified some of these observations with the findings that more nutrition knowledge led to higher healthy eating index scores. Nutrition information affected overall diet quality, even after controlling for



individual differences in a host of personal and household characteristics, including income, education, age, gender, race, ethnicity, smoking behaviour, and body mass. The positive effects of higher incomes and education levels on diet quality are due to the greater nutrition knowledge that wealthier, more educated people possess. If this informational advantage were to disappear, for example through nutrition-education targeted to low income individuals or that starts early in childhood, then those with greater incomes or education may in fact have diets that are no better, or possibly poorer, than would people with lower incomes or education have.<sup>120</sup>

During the prenatal period, mothers can be educated about incorrect nutritional practices to decrease problems that may arise related to their own nutrition as a result of misinformation about nutrition. Mothers need to be made aware of factors in the production of milk that increase or decrease supply, and to be encouraged that they do not need to increase their intake of sweet foods to be successful in breastfeeding. Physicians, midwives and nurses in healthcare institutions that monitor pregnant and lactating women can inform them about this subject and ensure that they understand its importance and can monitor their activities.<sup>121</sup>

Results from these studies on maternal nutrition in lactation showed that healthcare personnel were a great resource on the subject of breastfeeding and infant nutrition. Therefore, if they became more knowledgeable, they could reduce the gap between scientific recommendations and traditional nutritional practices by using supportive and culturally sensitive approaches. The strong link between nutrition knowledge and diet quality suggests a continued role for nutrition education efforts to close the persistent gap between actual and healthful diets.

## CHAPTER 4: APPROPRIATE RESEARCH PERSPECTIVES AND METHODOLOGIES

### 4.1 Appropriate research perspectives

Research is the systematic study of one or more problems, usually posed as research questions germane to a specific discipline.<sup>122</sup> The two most important general classifications of research are those of quantitative and qualitative studies.<sup>123</sup> The two types of research differ in various aspects, but are complementary in others.<sup>124</sup> One of the biggest differences is the nature of the data itself. Quantitative research observation methods are designed to produce data in the form of numbers, appropriate for statistical (quantitative) analysis whereas qualitative research methods are designed to produce data in the form of words, sentences and paragraphs which cannot easily be reduced to numbers.<sup>124, 125</sup> The second difference lies in the orientation of qualitative research. It makes assumptions about social life, objectives for research and ways to deal with data that conflict with the quantitative research methods. However, quantitative standards cannot be used to judge qualitative research. Qualitative reports are rich in description, have colourful detail and unusual characters instead of the formal, neutral tone with statistics found in quantitative reports.<sup>124</sup> Other differences are shown in table 4.1 below.

**TABLE 4.1** A summary of the differences between quantitative and qualitative research.

QUANTITATIVE RESEARCH	QUALITATIVE RESEARCH
Test hypothesis is that the researcher begins with	Capture and discover meaning once the researcher becomes immersed in the data
Concepts are in form of distinct variables	Concepts are in the form of themes, motifs, generalizations, taxonomies
Measures are systematically created before data collection and are standardized	Measures are created in an ad hoc manner and are often specific to the individual setting or researcher
Data are in the form of numbers from precise measurement	Data are in the form of words from documents, observations, transcripts
Theory is largely casual and deductive	Theory can be casual or non-casual and is often inductive
Procedures are standard and replication is assumed	Research procedures are particular and replication is very rare
Analysis proceeds by using statistics tables or charts and discussing how what they show relates to hypothesis	Analysis proceeds by extracting themes or generalizations from evidence and organizing data to present a coherent, consistent picture

(Available from: Neumann, Social Research Methods Qualitative and Quantitative approaches. Boston: Allyn & Bacon; 1997)

Therefore, quantitative research is the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect, whereas qualitative research is concerned with the quality or nature of human experiences and what these phenomena mean to individuals.<sup>125</sup> Quantitative research is mostly done for the purpose of obtaining empirical evaluations of attitudes, behaviour or performance developed from a relatively small group that is representative of a larger universe.<sup>126</sup> The results can be projected to the universe from which the sample is drawn.<sup>127</sup> Qualitative research tends to start with ‘what’, ‘how’ and ‘why’ type of questions rather than ‘how much’ or ‘how many’ questions. It is also concerned with examining these questions in the context of everyday life and each individual’s meaning and explanations.<sup>128</sup>

Decisions on the type of research domain to use is not always clear cut, however, Denzin and Lincoln (in 1994) clarify the choice of the method as follows:<sup>129</sup>

- When research questions are formulated about one’s body, life or power, survey methods should be used that start with questions such as “how many, how much or how often” or numerically measurable association among phenomena.
- Experimental methods should be used with questions such as “if \_\_, then\_\_ or is more effective than\_\_”.
- Qualitative methods should be used with questions concerning experience, meaning, patterns, relationships and values, since these questions refer to knowledge as story. Denzin & Lincoln further state that in attempting to evaluate the physical/behavioural, conceptual/historical, social/emotional and spiritual features relevant to a particular clinical question, multiple paradigms and methods are necessary.”<sup>129</sup>

According to Neumann (in 1997) the logic of qualitative research does not forbid the use of numbers. Statistics and precise quantitative measurement such quantitative data can be a source of information that supplements or complements qualitative data. Sometimes a single method design is appropriate, both being qualitative or quantitative, but some other times a research design requires both qualitative and quantitative approaches. The type of study population will also determine the appropriate research style within each of the mentioned methods.<sup>124</sup> Table 4.2 below illustrates four different formats in which qualitative and quantitative methods are integrated within a multi-method approach.

**Table 4.2** Different formats of a multi-method approach

TYPE	DESCRIPTION	EXAMPLE
Concurrent design	Two independent studies are conducted concurrently on the same study population and the results are then converged	Enhancing clinical trial results with simultaneously conducted interpretive studies to explain why an intervention does/does not work
Nested design	The two methods are directly integrated into one research study. Quantitative studies incorporating qualitative methods to help identify and operationalise key variables	Simultaneously collecting and analysing data on a concept to measure key independent variables within the context of a prospective epidemiological study design
Sequential design	The results of one study are used to inform another	Using field methods for identifying and describing key variables before developing measurement instruments for hypothesis testing
Combination design	Combining some of the above design options	Using a sequential design to identify patterns followed by survey techniques to confirm the findings

(Available from Denzin NK, Lincoln YS editors. Handbook of Qualitative research. London.Sage Publications; 1994)

The quantitative research methods were needed for the description of the socio bio-demographic profile of the individual mothers, the nutritional status of the women in terms of anthropometry and dietary adequacy and the food security of individual lactating mothers and their households. The qualitative research methods were needed for investigation into cultural beliefs and practices of the lactating women and its relation with their nutrient intake and nutrition knowledge therefore combination design was chosen from the above listed formats on the basis of appropriateness.

## 4.2 Data collection methods

There is a wide array of different data collection techniques but these techniques mostly fall into the categories of interviews and observations of social life, both of which yield textual data.<sup>128</sup>

Since in the quantitative research study, the problem is based on testing a theory composed of variables, measured in numbers and analysed with statistical procedures in order to determine whether the predictive generalisations of the theory hold true therefore data collection in quantitative paradigm is done using measuring instruments such as questionnaires, checklists, indexes and scales.<sup>130</sup> The type of measuring instrument to use for quantitative research will be determined by the research design employed. The research designs in quantitative strategy include experiments, surveys and content analysis. For the purpose of this research, the research design was a cross-sectional survey and structured questionnaires were used to collect the quantitative data.<sup>131</sup>

On the other hand, in qualitative research, qualitative research designs are naturalistic and holistic i.e. the focus is generally on studying subjects in naturally occurring settings . It is open ended and flexible and the research question may be modified as the research progresses therefore interviews may be more or less structured and may be conducted on an individual or group basis, such as focus groups.<sup>128</sup>

A focus group is a technique involving the use of in-depth group interviews in which participants are selected because they are a purposive, although not necessarily representative, sampling of a specific population, this group being ‘focused’ on a given topic. Participants in this type of research are, therefore, selected on the criteria that they would have something to say on the topic, are within the age-range, have similar socio-characteristics and would be comfortable talking to the interviewer and each other. This approach of selection relates to the concept of “Applicability” in which subjects are selected because of their knowledge of the study area.<sup>132, 93</sup>

The main aim of focus groups is to initiate discussion between the group members, so as to understand, and explain, the meanings, beliefs and cultures that influence the feelings, attitudes and behaviours of individuals. It is ideally suited for exploring the complexity surrounding food choice and dietary and other lifestyle behaviours within the context of lived experience, and in ways encourage the participants to engage positively with the process of the research.<sup>133</sup>

The simplest test to determine whether focus groups are appropriate for a research study is to ask how easily and actively participants would discuss the topic of interest. In this research, the aspect of cultural practices in relation to mothers' feeding habits and the aspect of nutrition knowledge were topics of interest thus considered an appropriate technique for this study.<sup>134</sup>

### 4.3 Data analysis methods

Data analysis in quantitative research can be done by use of statistical computer programs to generate descriptive and inferential statistics and the data presented as frequencies, means, standard deviations and percentages.

The analysis can take a *conversation analytic approach*, it can concentrate on *group dynamics* or it can concentrate on providing an *understanding of substantive issues in the data*. However the amount of data analysis required largely depend on the aim of the research.<sup>59</sup>

On the other hand in qualitative research, as there are a number of different theoretical orientations, there are also a number of different strategies available for the analysis of qualitative data.<sup>128</sup> Certain approaches have well-articulated (although considerably debated) processes attached to them such as grounded theory, phenomenology and content and discourse analysis.

Other approaches vary depending on whether an 'objective' (distant researcher) position is involved, or whether the researcher's submergence in the data or his subject view is required.<sup>135</sup>

Four models have been identified on the basis of:

- The researcher's position in regarding the data collection
- The type of data collected – existing documentation in contrast to researcher generated data from live participants
- The different interpretive approaches/the frames applied by the researcher.

The four models of analytical procedures generated are:

**Enumerative:** dealing largely with documentation. The recurrence of particular aspects is recorded and the researcher inhabits a distant position. It involves the general procedure of document collection, application of these codes and emphasis on the 'why' and 'how' aspects of contextual interpretation, rather than on a focus on numerical strengths.<sup>136, 137</sup>

A characteristic of this approach is that data are collected as a complete entity prior to analysis.<sup>135</sup>

**Investigative:** The researcher collects documentation but undertakes a form of analysis that searches beneath the superficial words or other forms of evidence to uncover the history that has impacted on current practice rather than enumerating predefined categories as in content analysis. Discourse and semiotic analysis fit into this model.<sup>135</sup>

**Iterative:** The researcher collects data from the field by interviews and observation, reflects upon it and notes emerging themes which are used to inform further forays into the field. Methodologies within this mode include grounded theory, phenomenology, ethnography, oral histories, case studies and action and evaluative research.<sup>135</sup>

**Subjective:** The researcher either becomes highly involved in the lives of those under research as in heuristic phenomenology and memory work or targets him/herself as the research focus as in feminist or other narratives and post-modern approaches. The researcher's subjective experiences are inseparable from the analysis; both the researcher's and participants' voices are heard. Clearly there is overlap. The dynamic nature of qualitative research means that boundaries must inevitably be artificial and that new creative combinations will continue to emerge.<sup>135</sup>

It is important that qualitative research reports give enough methodological details to enable readers to understand what has been done and so make a judgement about the quality and usefulness of the work. However, qualitative research techniques are complex and full of explanations therefore using a recognised framework can be helpful as long as readers understand what the framework entails.<sup>138</sup>

The two particular approaches discussed here that are used in nutrition and health research are:

- Interpretative phenomenological analysis
- Krueger's framework of analysis

The Interpretative phenomenological analysis (IPA) can be used to develop in-depth descriptions of human experiences and can also be taken further to develop theories, models and explanations that help in understanding human experience better.

The IPA has two basic approaches (135):

- ⇒ *Ideographic case-study approach*- Suitable for small samples up to ten respondents. It enables the researcher to write up a single case or an exploration of themes shared between cases.
- ⇒ *Theory building approach*- This approach is useful for evolving explanations from data in the form of models or narratives which can be used by other researchers to help illuminate the phenomenon to which they apply, but they should be checked against incoming data and evolved where necessary.

Nutritionists or dietitians who wish to explore and/or develop theories for the shared meanings that a group of individuals attach to a particular lived experience could make use of IPA as a framework for qualitative data analysis. IPA may be particularly useful when the researcher's personal stance is that certain values and beliefs are likely to remain outside his or her consciousness and that as a consequence it would be impossible to bracket them out even with use of formal reflexive techniques.<sup>139</sup>

On the other hand, Krueger's framework of analysis may be used for qualitative data analysis. It consists of a number of stages, i.e. examining, categorising and tabulating or otherwise recombining the evidence, in order to address the initial goal of a study.<sup>139</sup> Krueger & Casey (in 2000) suggest that the purpose should drive the analysis. They believed that 'analysis begins by going back to the intention of the study and survival requires a clear fix on the purpose of the study'. Krueger & Casey also point out that the analysis should be systematic, sequential, verifiable, and continuous.<sup>140</sup> Following this path provides a trail of evidence, as well as increasing the extent of dependability, consistency and conformability of the data, important issues for assessing the quality of qualitative.<sup>141, 142</sup>

The advantage of the Krueger approach is that it provides a clear series of steps, which could help first-time researchers to manage the large amount and complex nature of qualitative data much more easily.<sup>143</sup> 'Framework analysis' is used for both individual and focus-group interviews and unlike quantitative analysis, qualitative analysis, particularly focus-group analysis, occurs concurrently with data collection.<sup>143</sup> Krueger's framework of analysis was the chosen approach in this study and has been discussed in detail below.



### 4.3.1 Krueger's framework of analysis

The key stages outlined in Krueger's framework are:

- ⇒ familiarization;
- ⇒ identifying a thematic framework;
- ⇒ indexing;
- ⇒ charting;
- ⇒ mapping
- ⇒ interpretation.

The other distinctive aspect of framework analysis is that although it uses a thematic approach, it allows themes to develop both from the research questions and from the narratives of research participants.

*Familiarization:* This stage is achieved by listening to tapes, reading the transcripts in their entirety several times and reading the observational notes taken during interview and summary notes written immediately after the interview. The aim is to immerse in the details and get a sense of the interview as a whole before breaking it into parts. During this process the major themes begin to emerge.

*Identifying a thematic framework:* By writing memos in the margin of the text in the form of short phrases, ideas or concepts arising from the texts and beginning to develop categories at this stage, descriptive statements are formed and an analysis is carried out on the data under the questioning route.

*Indexing:* Comprises sifting the data, highlighting and sorting out quotes and making comparisons both within and between cases.

*Charting:* Involves lifting the quotes from their original context and re-arranging them under the newly-developed appropriate thematic content. Indexing and charting could also be viewed as managing the data. One of the most important aspects of this task is data reduction, which is achieved by comparing and contrasting data and cutting and pasting similar quotes together.<sup>133</sup>

*Mapping and Interpretation:* The task here is not only to make sense of the individual quotes, but also to be imaginative and analytical enough to see the relationship between the quotes, and the links between the data as a whole.

Krueger (in1994) provides seven established criteria, which suggest the following headings as a framework for interpreting coded data.<sup>143</sup> These are:

*Words:* This is focusing on the participants' use of their own words while talking about their experience, it becomes easier to understand the relationship between the actual experience and the question asked and whether the participants understood the question.

*Context:* The context deals with the wording of the moderators' questions and subsequent comments made by others in the group for this influences the context within which the comments are made.

*Frequency and extensiveness of comments:* Frequency relates to consideration of how often a comment or view is made, while extensiveness refers to the number of participants who express a particular view.

*Intensity of the comments:* Intensity considers the depth of feeling in which comments or feelings are expressed.

*Internal consistency:* Considers any changes in opinion or position by the participants on a particular subject.

*Specificity of responses:* Responses referring to personal experience receive greater attention as opposed to hypothetical situations. The researcher takes note of narration of personal experience.

*Big ideas:* This considers the larger trends or concepts that emerge from an accumulation of evidence and cut across the various discussions.

#### **4.3.1.1 Development of Krueger's framework of analysis**

The above mentioned headings for the framework were reduced to five headings in a later publication by Krueger and Casey (in 2000) namely: Frequency; specificity; emotions; extensiveness; big picture. The main difference being that the words, context and internal consistency were excluded from the interpretation; frequency and extensiveness were separated into two categories, intensity of comments and big ideas was reframed as emotions and the big picture was introduced<sup>140</sup>

The development of Krueger’s framework of analysis is shown in the table 4.3 below.

**Table 4.3** Development of Krueger’s framework of analysis

<b>Krueger, 1994</b>	<b>Krueger &amp; Casey, 2000</b>	<b>Rabiee, 2004</b>
1 Words		1 Words
2 Context		2 Context
3 internal consistency		3 Internal consistency
4 Frequency & Extensiveness	1 Frequency	4 Frequency
5 Intensity of comments	2 Motion	5 Intensity of comments
6 Specificity of responses	3 Specificity of responses	6 Specificity of responses
7 Big ideas	4 Extensiveness	7 Extensiveness
	5 Big picture	8 Big picture

[Adapted from: F. Rabiee *Proceedings from the Nutrition society*, (2004)]

Although the development of the new categories is welcome, as it is now crisp and concise, experience suggests that students and first time practitioner researchers tend to find that incorporating the three excluded criteria is easier to follow, it can be applied with more rigour and produce a richer interpretation. Rabiee, reporting on the proceedings of the British Nutrition Society, recommends a more comprehensive modification of the latest criteria making the headings eight rather than five headings.<sup>133</sup>

## CHAPTER 5: METHODS OF INVESTIGATION

### 5.1 Substantiation of research problem

Maternal depletion syndrome, defined as a broad pattern of maternal malnutrition resulting from the combined effects of dietary inadequacy, heavy workloads, and energetic costs of repeated rounds of reproduction, has been determined to be an important predictor of maternal and child health. Debates regarding the existence of maternal depletion syndrome have centred on the inability to identify a single universal pattern of parity-related depletion. However, it is becoming increasingly apparent that patterns of depletion may be linked to overall dietary inadequacy and conditioned by socio-economic development. Therefore, variable patterns of maternal depletion are useful for examining changing patterns of women's nutritional status in the process of development.<sup>144</sup>

A study done in Texas on food choices of low income women during pregnancy and the postpartum period showed that many state and national food and nutrition programs that targeted low income women, focused their attention more on the child rather than the mother, due to limited resources.<sup>145</sup> Other investigations have also shown nutrient inadequacies among lactating women, for example Vitamin A and iron status have been found to be deficient among lactating women in some parts of Kenya<sup>180</sup>, Zimbabwe,<sup>146</sup> and South Africa.<sup>147</sup>

Women of reproductive age need to be prepared for lactation since they have special needs which are primarily related to their reproductive role and thus is a vulnerable group to malnutrition.<sup>15</sup> Preparation for lactation also involves education. Providing information about bodily functions, health risks and how to avoid them, is not effective in bringing about specific behavioural changes to maintain optimal health. The key is to show that modification of the diet is desirable and will have positive outcomes.<sup>16</sup>

#### 5.1.1 Research problem

Hence, this research was aimed at assessing both the dietary intake and the nutrition knowledge of the lactating women (0-6 months postpartum) living in low socio-economic communities in Nairobi, Kenya. The factors that could possibly impact on the dietary intake and nutrition knowledge were also investigated; these included the socio-economic factors, health status indicators and cultural factors. The results could be used to substantiate recommendations aimed at the improvement of the nutritional status of lactating women. Information on dietary intake *per se* cannot be used to classify a person or population as malnourished – it can however identify an at risk state.<sup>20</sup>

## 5.2 Research perspective

In this research study, the combination design was chosen on the basis of appropriateness. (See table 4.2.) This was a cross - sectional survey to obtain baseline data on nutrient intake and nutrition knowledge of lactating women (0-6 months postpartum) living in a low socio-economic community in Nairobi, Kenya. An exploratory and descriptive survey in both the quantitative and qualitative research domains was implemented. Exploratory studies attempt to determine whether or not a phenomenon exists.<sup>148</sup> For the purpose of this study the exploration was aimed to determine whether:

- the lactating mothers met the recommended dietary allowance of nutrients;
- the lactating mothers had appropriate nutrition knowledge;
- socio-economic factors influenced the mothers' dietary adequacy;
- cultural beliefs and practices influenced the mothers' dietary adequacy.

Descriptive studies attempt to describe a phenomenon to more fully define it, or differentiate it from others.<sup>148</sup> In this study it was necessary to assess and describe the mothers' nutritional status and identify the interactive factors of socio-economic status, health status and cultural factors that could probably influence the mothers' nutrient intake.

## 5.3 Sub-problems

The following sub-problems were formulated for the lactating women (0-6 months postpartum) living in a low socio-economic area in Nairobi, Kenya (i.e. the study group):

**5.3.1** To determine the usual food consumption of the study group.

**5.3.2** To assess the nutrient intake of the study group in relation to the RDA and WHO recommendations.

**5.3.3** To assess the nutrition knowledge of the study group.

**5.3.4** To determine the relationship between the money spent on food per day, the employment status and the nutrient intake of the study group.

**5.3.5** To explore whether cultural beliefs and practices affect the nutrient intake of the study population.

**5.3.6** To determine the relationship between the visit to the inpatient and outpatient clinics and the nutrient intake of the study group.

**5.3.7** To determine the relationship between nutrient intake and the interactive factors, i.e. nutrition knowledge, socio-economic status, cultural factors and health status in the study group.

## **5.4 Research hypotheses**

The following research hypotheses were formulated:

**5.4.1** The nutrient intake of the lactating women in the low socio-economic area would not be adequate. Adequate diets are most easily obtained by consuming a variety of nutrient dense foods.<sup>25</sup>

**5.4.2** The nutrition knowledge of the lactating mother would influence her nutrient intake. Nutrition information is useful in food choice, purchasing and preparation. and in overall dietary practices.<sup>149</sup>

**5.4.3** The socio-economic status would be related to nutrient intake of the lactating mother. Economics, family structure and interactions are powerful factors in limiting or expanding the dietary pattern of an individual.<sup>150</sup>

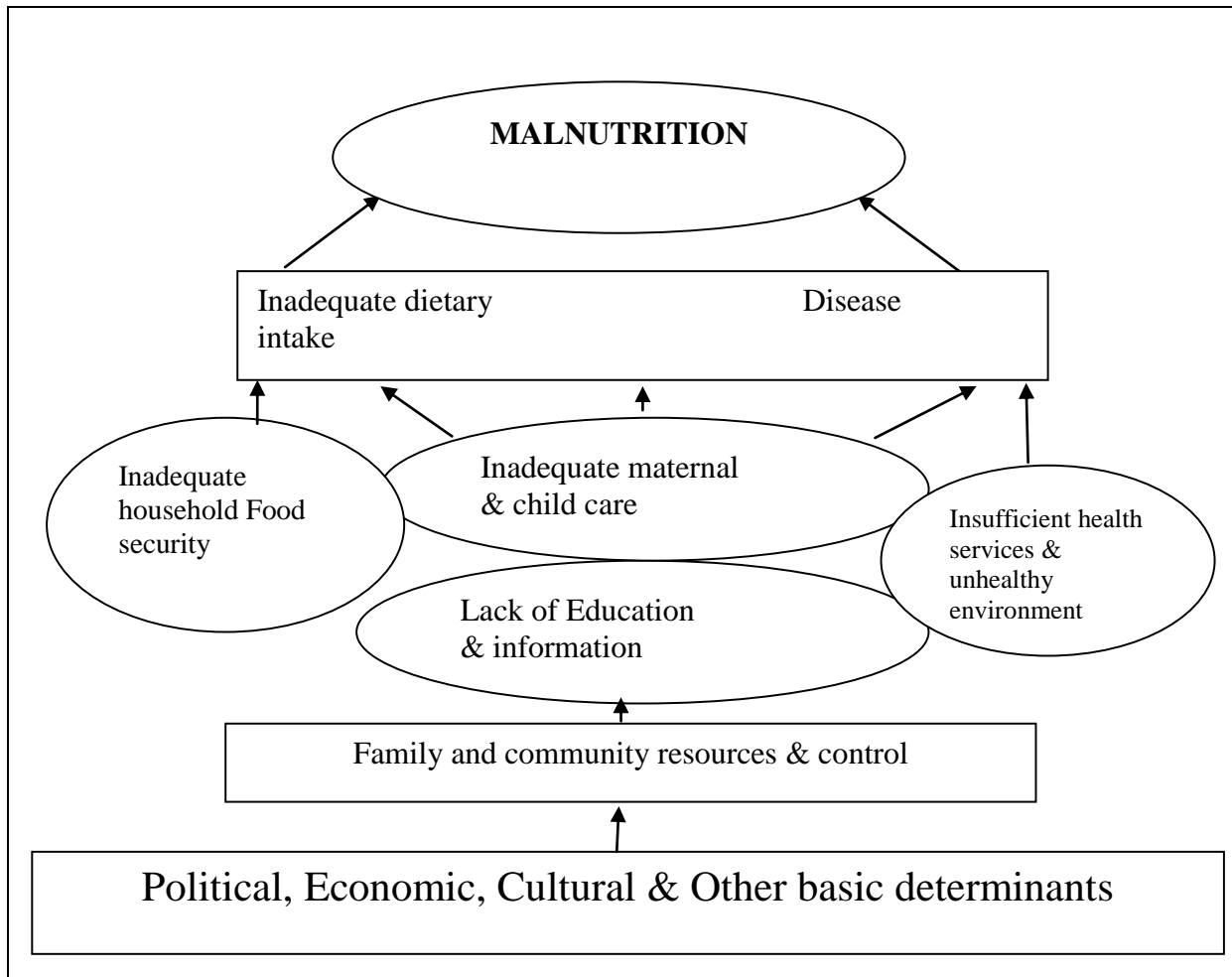
**5.4.4** Cultural beliefs and practices would be related to the nutrient intake of the lactating mother. The culture in which we develop determines to a large extent our food patterns or habits. Also within culture, individual and subgroup preferences differ.<sup>149</sup>

**5.4.5** The health status and wellbeing of the mother would affect her nutrient intake. Absence of disease (health) puts you in a neutral health status; positive health changes (wellness) push you into a forward motion.<sup>25</sup>

## 5.5 Research design

### 5.5.1 Conceptual framework

The UNICEF conceptual framework of malnutrition in (figure 5.1) was used to outline immediate, underlying and basic determinants of malnutrition including all the interactive factors that could influence the nutrient intake and nutrition knowledge of the lactating woman. The factors are discussed in 5.5.1.1 – 5.5.1.3



**Figure 5.1** Conceptual Framework of Malnutrition (Adapted from UNICEF, Conceptual Framework of Malnutrition, 1997)

#### 5.5.1.1 socio-economic factors

The socio-economic factors fall under the category of the family and community resources available to the woman. The extent of control she had over these resources was investigated to identify their effect on the household food security, access to health care as well as the environment in which the lactating women lived.

Nutrition education can stimulate the demand for certain foods, but the individual must have means and opportunities to act on that knowledge. Inadequate intakes are often

caused by household food insecurity, defined as a household's *lack of access* to amounts of food of the right quality to satisfy the dietary needs of all its members throughout the year.<sup>151</sup>

### 5.5.1.2 Health status indicators

Adequate dietary intake is essential for good nutrition. It may however not be sufficient, because the presence of disease can result in reduced bioavailability or increased needs or nutrient losses and thus can also be an immediate cause of malnutrition.<sup>152</sup> The conceptual framework (*figure 5.1*) indicates that inadequate maternal - child care, insufficient health services and unhealthy environment contribute to disease and eventually to malnutrition. Lactation is a transition phase in woman's reproductive life and it comes with a number of ailments that can affect woman's dietary intake.<sup>6</sup>

A longitudinal study done in France and Italy on women's health after childbirth, indicated that when the baby was one year old, more than half of the mothers reported backache, anxiety and extreme tiredness, while around one third reported headache, lack of sexual desire, sleep disorders, piles, constipation and depression.<sup>153</sup> Other causes would be chronic diseases such as HIV/AIDS, which requires more nutrient intake as well as brings about opportunistic diseases that make dietary intake difficult.<sup>152</sup>

### 5.5.1.3 Cultural beliefs and practices

The family structure, interactions and social values are important influences on development of food habits and dietary patterns. They also influence access and control of family and community resources as shown (*figure 5.1*).

Individual practices differ according to the culture in which one is brought up. For example, a paper on women's health in the Arab world argued for viewing women's health using a holistic concept of health and wellbeing. The authors stated that pregnancy and childbearing are frequent events in women's lives that were seen as natural processes and that attendance of prenatal care were perceived as being unnecessary.<sup>154</sup> A study done on women's understanding of pregnancy-related morbidity in rural Egypt, found a 40-day postpartum seclusion period that was regarded to be important in the community. Women feared the dangers of *kabsa* – a belief that if woman would not observe seclusion she would become infertile, thus postnatal check-ups and infant care were neglected due to seclusion.<sup>155</sup>

The setting for this research study was Kibera. An area of the originally Nubian community, where the soldiers used to hide in the forest during the war. There are many families in this area of Nubian origin who are still under the influence of the Arab culture and



Islam influence. Kibera is also a metropolitan area which represents all the 42 tribes of Kenya.<sup>156</sup> Data on cultural influences are lacking in this community and it was important to explore the cultural practices that affect the mothers' feeding habits in order to obtain valuable insight useful for practical policy implementation.

### 5.5.2 Conceptualisation and operationalisation

**Table 5.1** A summary of conceptualisation and operationalisation of the concepts used in this study

Concept	Definition	Operationalisation
<b>Nutrition knowledge</b>	This is the understanding of different types of food and how food nourishes the body and influences health. <sup>79</sup> In this study this implied the information the mothers had about their food intake during lactation.	The level of nutrition knowledge was measured against the scores obtained on the nutrition knowledge questionnaire: (0-4) indicated the women had poor knowledge,(5-8) indicated good knowledge while (9-12) indicated excellent knowledge.
<b>Nutrient intake</b>	This is the ingestion of the recommended nutrients based on observation or experimentally determined estimates by a group of people. <sup>44</sup> In this study the investigation was to find out if the lactating women had sufficient nutrient intake.	Nutrient intake levels were measured against the WHO recommended values for lactating women. <sup>46</sup>
<b>Nutritional status</b>	A measurement of the context to which the physiological needs for nutrients of the individual are met. <sup>44</sup> In this study, the anthropometric measurements for height, weight and as well as dietary intake were used in order to evaluate the nutritional status of the lactating women.	The Body Mass Index (BMI) reference values were used to determine the mothers' nutritional status. <sup>44</sup>
<b>Lactation</b>	This is the process of synthesizing and secreting milk from the breasts after giving birth to feed young ones. <sup>1</sup> In this study, this was the period considered for selecting women included in the study group (0-6 months postpartum) Breastfeeding, lactating and nursing are synonyms that were used interchangeably in the study.	

Continued.../

<b>Anthropometry</b>	The measurement of the physical dimensions and gross composition of the body. <sup>44</sup> Height and weight of the lactating women were measured in this study.	The Body Mass Index (BMI) reference values were used for the mothers' anthropometrical evaluation. <sup>44</sup>
<b>Dietary adequacy</b>	This is the consumption of a diet that provides the proper combination of energy and nutrients enough to maintain a person's health. <sup>44</sup> In this study the investigations were to find out if the diet consumed by the lactating women was proper and enough.	The macronutrient intake of women in this study was assessed using AMDR <sup>44</sup> And the micronutrient intake levels were compared against the WHO recommended intake values for lactation. <sup>46</sup>
<b>Maternal health</b>	This is the health status of the women during pregnancy, childbirth and during the postpartum period. <sup>27</sup>	
<b>Nutrient requirement</b>	This is an intake level which will meet specified criteria of adequacy preventing risk of deficit or excess. These criteria include a gradient of biological effects related to the nutrient intake. <sup>27</sup>	
<b>Dietary diversity</b>	This is a qualitative measure of food consumption that reflects household access to foods from a wide variety of food groups, and is also a proxy of the nutrient adequacy of the diet for individuals. <sup>157</sup>	The information obtained from the 24 hour recall in this study was analysed by use of Individual Dietary Diversity Scores (IDDS). <sup>161</sup>
<b>Food Variety</b>	This is a qualitative measure of food consumption that reflects household access to a wide variety of food items, and is also a proxy of the nutrient adequacy of the diet for individuals. <sup>157</sup>	The information obtained from the 24 hour recall in this study was analysed by use of Food variety Score (FVS) <sup>157</sup>
<b>Hunger</b>	In a narrow dimension, hunger is the physical sensation signalling that the body is running out of food whereas in a broad dimension hunger involves problems with household food supply, referred to as food security. <sup>96</sup>	Household food security was measured against the scores obtained on the Hunger Scale questionnaire. <sup>162</sup>

## 5.6 Measuring instruments

### 5.6.1 Measuring instruments used in the quantitative domain

#### 5.6.1.1 Questionnaires used for the individual interviews

The questionnaires are discussed below.

*Socio-bio Demographic Questionnaire (S-BDQ):* This provided information on factors relevant to the lactating woman regarding the environment she lived in. The data collected included age of the mother, marital status, education level, and number of children as well as number of people in the household. Data on socio-economic status were gathered from housing standards, food, water and fuel sources, occupation, daily expenditure and average monthly income while information on health status was gathered from; visits to out-patient and in-patient clinics, encouragement during breastfeeding and consumption of special diet (*Appendix A*).

*24-hr Recall Questionnaire (24-H-RQ):* This provided information on the types of foods consumed at mealtimes and between meals, portion sizes over the past twenty four hours. It was also useful in analysis of food variety and dietary diversity of the lactating women. The 24-hr recall technique attempts to estimate the usual food intakes of individuals over a period of time.<sup>162</sup> This information is then used to calculate mean daily supplies of nutrients. Due to the fact that consumption patterns may be atypical during feast and celebration periods, a question to determine whether the previous day was normal or atypical diet was included in the questionnaire (*Appendix B*).

*The Hunger Scale* provided information on the food availability and the consumption by the women and their households. The Hunger Scale questionnaire was used with permission from the South African National Food Consumption Survey, 1999.<sup>162</sup> The Hunger Scale had three major components that were used to determine domestic hunger. These are: household level insecurity, individual level insecurity and child hunger (*Appendix C*).

*The Quantitative Food Frequency Questionnaire (QFFQ):* This provided information on the eating pattern and intake. The food frequency questionnaire developed by Food and Nutrition Technical Assistance (FANTA) was modified and used in the study. The QFFQ comprised of a list of foods and beverages on which respondents reported their usual amount and frequency of consumption over the previous three (*Appendix D*).

*Nutrition knowledge questionnaire:* This provided information on the nutrition knowledge of the women. During the interview, the lactating women were individually asked

to give an answer to each of the twelve questions that were in this questionnaire. The answers they gave were then used to rate their level of nutrition knowledge<sup>162</sup>(*Appendix E*).

The consent form (*Appendix F*) and nutrition knowledge questionnaire were translated into Swahili language(*Appendix G*) which is the national language in Kenya for the mothers to better understand what the study was all about and the questions they were being asked. The other questionnaires were in English since they were interviewer-administered; the researcher understood Swahili language and conducted all the interviews.

### **5.6.1.2 Validity and reliability of the questionnaires**

Reliability and validity are central issues in all scientific measurements. Perfect reliability and validity are ideals to strive for. Reliability deals with the dependability and consistency of an indicator while validity is concerned with the actual meaning of an indicator. Reliability is done in order to get the same information when the same questionnaire is administered to the same individual more than once in the same conditions. According to Neumann (in 1997) reliability means that the information provided by the measuring instrument does not vary because of the characteristics of the instrument itself. Validation of the questionnaire ensures that it measures what it is intended to measure accurately.<sup>124</sup>

The questionnaires used were assessed for reliability and validity. They were adapted from standardized questionnaires of previous studies. The Hunger Scale, Socio-bio demographic questionnaire and *24-H-RQ* were used with permission from the committee of South African National Food Consumption Survey (1999).<sup>162</sup> while the quantitative food frequency questionnaire (QFFQ) was adapted from a validated food frequency questionnaire developed by the Food and Nutrition Technical Assistance (FANTA) during a study to compare the eating habits of rural and urban residents in Nairobi, Kenya.<sup>157</sup> A pilot test was done in the clinic to ensure that the translated nutrition knowledge questionnaire would be well understood by the mothers.

### **5.6.2 Measuring instruments used in the qualitative domain**

A focus group schedule (*Appendix H*) was developed to guide in the focus group discussions.

## 5.7 Setting

This study was done in Maternal-Child Health Clinic in Mbagathi District Hospital, located at the edge of the Kibera slums and other neighbourhood centres such as Langata estate and Nairobi West estate in Nairobi province, Kenya (*Appendix I*). The Mbagathi District Hospital is the only District hospital in Nairobi, adjacent to two hospitals, the Kenyatta National Hospital (KNH) which is the main hospital in the country and main referral centre for East African countries and the War Memorial Hospital which caters mainly for the soldiers and their families and other government officials. (*See fig 5.2-5.4.*)



**Figure 5.2** Map of the study area (Source: Googleearth.com/2009)

The satellite image shows the location of Mbagathi District hospital where the study was done and the surrounding areas where the lactating women who participated in the study resided.



**Figure 5.3** Maternal-Child Health (MCH) clinic of Mbagathi District Hospital



**Figure 5.4** Nutrition room in the MCH Clinic where individual interviews were carried out.

## **5.8 Population and sampling**

A study group of 120 lactating women (0-6 months postpartum) who volunteered and consented were interviewed. Convenience sampling was used as sampling technique so as involve mothers who were within the desired group of the study. The sample was taken daily as the mothers visited the Maternal-Child Health Clinic in Mbagathi district hospital to bring the children for immunisation. Informed consent was obtained (*Appendix J*).

### **5.8.1 Eligibility criteria and screening**

#### **Inclusion Criteria:**

- All women interviewed were between 20-40 years of age.
- The women were living in the low socio-economic community in Kibera.
- The age of child being breastfed was between 0-6 months postpartum.
- The women were considered lactating if they reported breastfeeding their infant at least three times a day.
- The women who were willing to participate.

### **5.8.2 Focus group participants**

The participants recruited for the focus group interviews were purposively selected. A focus group had seven to eight mothers both from (0-3 months and 4-6 months postpartum groups respectively). The participants were mothers who had been previously interviewed using the quantitative questionnaires and had given consent to participate in the focus group discussions. These sessions were undertaken as the qualitative phase of the investigation to determine the general information and especially on the cultural beliefs and practices.

## **5.9 Data collection**

### **5.9.1 Data collection in the quantitative domain**

#### **5.9.1.1 Anthropometry**

Measures of height in centimetres (to the nearest 0.1cm) and weight in kilograms to (the nearest 0.1kg) for every mother were taken using a weighing scale with an attached height metre (Seca) provided at the MCH clinic. These measures of height and weight were done without shoes with the mother facing away from the scale according to the standard protocol. The measures of height and weight were recorded on the questionnaire and were later used to calculate the Body Mass Index (BMI) of the mother.



### **5.9.1.2 Socio-bio demographic profile**

An interviewer-administered *S-BDQ* was used to collect data on socio-bio demographic variables as the mother visited the clinic and consented for the study (*Appendix A*).

### **5.9.1.3 Food intake**

The QFFQ and the 24-hr recall method were used to assess dietary intake of the lactating mothers. The researcher asked the respondents to state the foods and the amounts they had consumed in the past 24 hours and the information was recorded on the 24-hr recall sheet. Each of the respondents was also asked to give the amount and frequency she consumed for each of the food items in the QFFQ.

During the recall, the respondents were asked whether the food consumption was as usual or whether there was something peculiar about it, for example the presence of visitors, eating away from home or there was a function that they were attending. In order to obtain a participant's portion sizes for their food intake, food models and common household utensils used in the community were used to help with the recording of amounts. Ordinary household measures were converted into grams and millilitres.

### **5.9.1.4 Household food security**

The interviewer - administered Hunger Scale was used to determine household, individual and child hunger (*Appendix C*).

## **5.9.2 Data collection in the qualitative domain**

### **5.9.2.1 Focus groups**

Seven focus group discussions were used to collect data. These sessions were undertaken as the qualitative phase of the investigation to determine the general information and especially on the cultural beliefs and practices. Each of the groups had seven women except for one group which had eight women, making a total of fifty women who participated in the group discussions. The researcher led out in the discussion using a focus group guide to direct the discussions. There were two assistants to the researcher who took notes and made observations during each discussion. In addition a tape recorder was used to record the discussions.<sup>127</sup> The researcher ensured that the physical facility where the focus group discussions were conducted was easy to find, convenient and had comfortable sitting

arrangements for the participants. There were no outside interferences; temperature and lighting were adequate since the clinic was a new building that had recently been renovated.

## **5.10 Data analyses**

### **5.10.1 Data analysis in the quantitative research domain**

Descriptive and inferential statistics were done and the data were presented as frequencies, means, standard deviations and percentages. The Stata 10.0 computer software program was used to generate tables and graphs which were used to summarise the basic information and illustrate relationships between the various interactive factors.

The Nutrisurvey software program was used for nutrient analysis of the data obtained with the QFFQ. Nutrisurvey is the English translation of the German nutrition software (EBISpro). It contains all useful functions which are typical for nutrient analysis and calculation of energy requirements, planning of diets, searching of nutrients in foods and handling of recipes. It is based on the 'Guidelines for Nutrition Baseline Surveys in Communities' by Gross et al.<sup>158</sup> This program was chosen for its efficiency since it also contains the food databases of different countries, including Kenya where the study was conducted. Currently, Unga Flour Mills/Seaboard is voluntarily fortifying selected wheat and maize flour products, oil is fortified with Vitamin A and salt is iodized<sup>159</sup> but this was not taken into consideration in the software programme during the nutrient analysis.

The information obtained from the 24-hour recall was analysed for food variety and dietary diversity. These are two of the score based methods used in evaluation of dietary patterns. The other score based methods are food group patterning scores, the diet quality index, the healthy eating index, the recommended foods score and the mediterranean diet score. The other methods used in evaluation of dietary patterns are data driven methods which include factor analysis, principal component analysis and cluster analysis.<sup>160</sup>

In studies of diet and chronic disease, the traditional approach had been to examine associations between individual nutrients or food groups with risk factors or outcomes related to the chronic conditions but more recently nutritional epidemiologists have studied dietary patterns or combinations of foods and nutrients which are often intended to represent the total diet or key factors of the diet.

There are several reasons that have been cited for the use of dietary patterns: <sup>161</sup>

- People eat meals with complex combinations that are likely to be interactive or synergistic.
- Many nutrients are highly correlated making it difficult to examine their separate effects.
- The effect of a single nutrient may be too small to detect but the cumulative effects of multiple nutrients included in a dietary pattern may be sufficiently large to detect.
- Analyses of single nutrients may be confounded by the effect of dietary patterns.

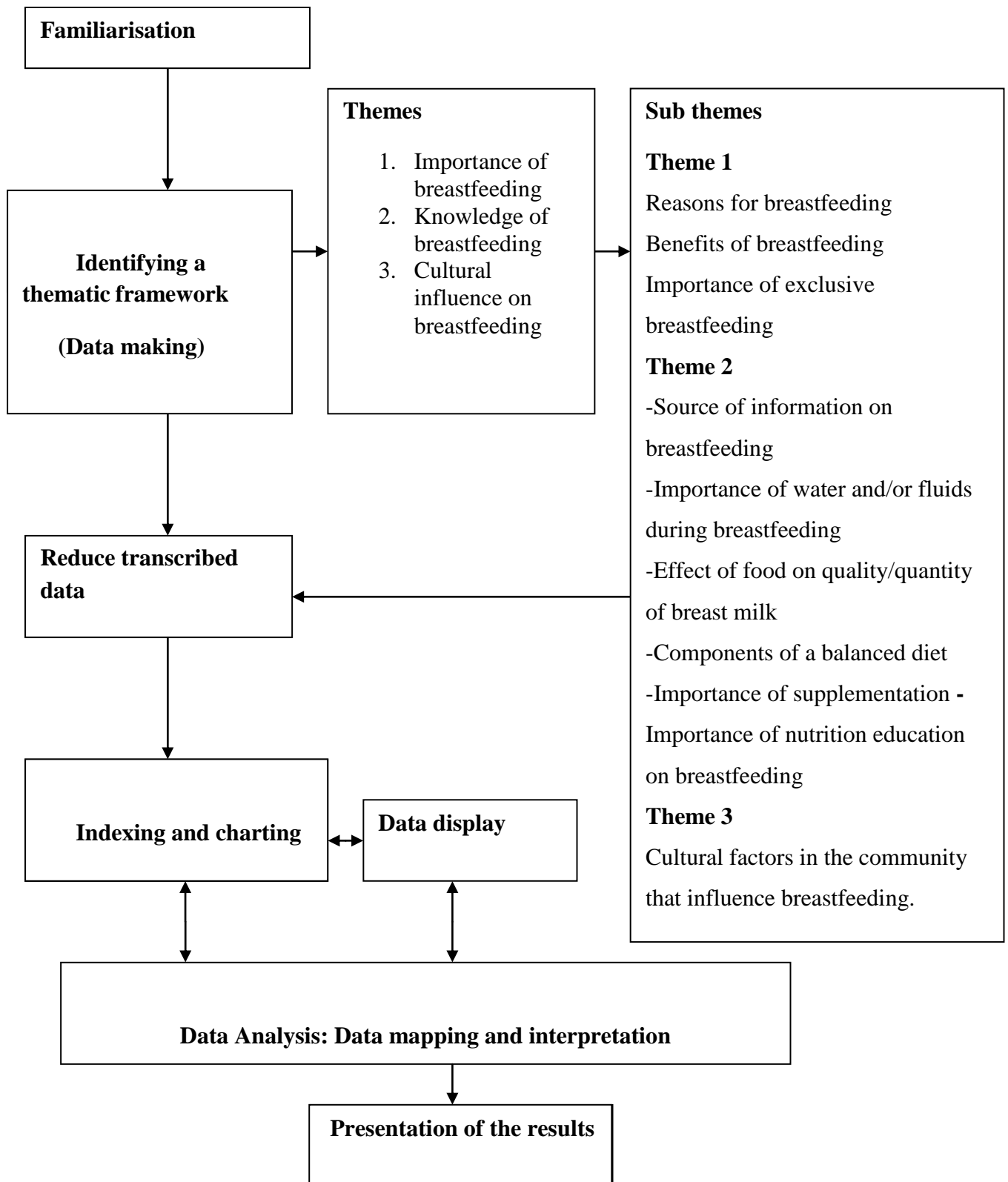
The Hunger Scale had eight questions which were used as a means of estimating hunger and food insecurity in the household. A score of five affirmative/positive (yes) responses or more out of a maximum possible of eight indicated a food shortage problem affecting everyone in the household. These families would be considered as “hungry.” A score of one to four indicated that the family was “at risk of hunger”; a negative response (No) was assumed to mean a food secure household. Further examination of the data included the frequency of an affirmative or negative (yes or no) response for each of the eight questions.<sup>162</sup>

On the analysis of the nutrition knowledge questionnaire, a score of four or less (0-4) correct responses out of a maximum possible of 12 indicated poor nutrition knowledge of the lactating mother. A score of five to eight indicated that the mother had good nutrition knowledge. A score of nine to 12 indicated that the mother had very good nutrition knowledge. The rating of the scores was developed by the researcher and thus was not verified.

A statistician was consulted for the statistical analysis.

### **5.10.2 Data analysis in the qualitative research domain**

The focus groups’ views were transcribed and conclusions made based on information collected, the transcription included writing down the group’s views using information from the tape recorder as well as by observing body language used during the interview. Krueger’s framework of analysis was used for data analysis and interpretation (*Chapter 4, paragraph 4.3.1*). Ethnographic descriptions were presented in the discussion of the data. The process of analysis that was followed is illustrated in the figure 5.5



**Figure 5.5** The process of analysis used in the research project

## **Familiarisation**

A full audio transcription of each of the group discussion was done. This was necessary since transcription would facilitate analysis and also provide a permanent record of interviews.<sup>161</sup> The transcriptions were then supplemented with notes from fieldworkers, as well as a summary of the events as they were observed.

## **Identifying a thematic framework**

The main themes in the data were selected by writing short phrases, ideas and concepts in the margin of the text. A thematic framework was achieved by reading the transcripts in their entirety several times and grouping responses according to the questions they answered as follows:

### **Importance of breastfeeding [Questions 1, 3, 4 (*see appendix H*)]**

- Why are you breastfeeding?
- Benefits of breastfeeding to the mother
- Duration and (why) benefits of breastfeeding to the child

### **Knowledge of breastfeeding [Questions 2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 (*see appendix H*)]**

- Who taught you how to breastfeed in your first experience?
- Foods that should specifically be eaten and why
- Importance of water and/or fluids during breastfeeding
- Effect of food on: (i) quality/quantity of milk; (ii) taste and/or smell
- Components of a balanced diet
- Number of meals a breastfeeding mother should eat per day
- Importance of supplementation
- Do you think breastfeeding women should be taught on how to eat?

### **Cultural influence on breastfeeding [Questions 5, 17, 18 (*see appendix H*)]**

- Factors in your community that influence how you breastfeed.

- Foods prohibited by community and why?
- Foods allowed by community while breastfeeding and why?
- Activities a breastfeeding mother should not do and why
- Activities breastfeeding mother is allowed to do.

### **Indexing and charting**

Indexing, involved sifting the data, highlighting and sorting out quotes and making comparisons both within and between cases. In order to classify under one heading all data relating to a particular theme, the context of any extract of speech was checked and the arguments of individuals and the group followed through the transcript.

Charting involved lifting quotes from their original context and re-arranging them under the newly developed thematic content (the three themes that emerged). This was done as shown below in table 5.3 and the factors considered according to the responses to each question.

**Table 5.3 Example of how qualitative data were indexed and chartered**

**Question 2:** Who taught you on how to breastfeed in your very first experience?

<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>	<b>Group 5</b>	<b>Group 6</b>	<b>Group 7</b>
Nobody	Health worker	Nobody	Nobody	Nobody	Nobody	Mother-in-law
Mother	Birth attendant	Health worker	My mother	Mother-in-law	My mother	Healthworker
Health worker	Nobody	Older ladies	My aunt/Grandmother	Aunt		Nobody

<b>Group</b>	<b>Nobody</b>	<b>Health worker</b>	<b>Relative (Mother-in-law/aunt)</b>	<b>Friend/older lady/neighbour</b>
Group1	5	1	1	0
Group2	5	2	0	0
Group3	5	1	0	1
Group4	5	0	2	0
Group5	6	0	1	0
Group6	6	0	1	0
Group7	5	1	1	0
<b>Total(in groups)</b>	<b>7</b>	<b>4</b>	<b>5</b>	<b>1</b>

**Charting**

<b>Question</b>	<b>outcome</b>
1. <b>Did the participants answer the question that was asked?</b> If yes, go to question 3; if no, go to question 2; if don't know, set it aside and review it later;	<b>Yes</b>
2. <b>Does the comment answer a different question in the focus group?</b> If yes, move it to the appropriate question; if no, go to question 3;	<b>NO</b>
3. <b>Does the comment say something of importance about the topic?</b> (If yes, put it under the appropriate question; if no, set it aside ;)	<b>Yes</b>
4. <b>Is it something that has been said earlier?</b> If yes start grouping like quotes together, if no, start a separate pile.	<b>No</b>

## Mapping and interpretation

One of the tasks here is not only to make sense of the individual quotes, but also to be imaginative and analytical enough to see the relationship between the quotes, and the links between the data as a whole.<sup>143</sup> This was done on the responses given by the groups. Ethnographic descriptions were included to bring out the exact ideas of the participants. Misconceptions were also noted.

## Example of how data was mapped and interpreted

Question 2 was about identifying the source of information for the mothers which would lead to the influence on their practice and even feeding habits.

**Words:** When the participants talked about their first experience it seemed to be an obvious experience that did not need teaching. Since the participants gave the answer in one-word form without much explanation.

- “Nobody”
- “Nobody, just myself”
- “My mother”

**The context:** The researcher was specific by referring to the ‘first experience’ and thus the subsequent comments or responses were only given in reference to the first breastfeeding experience regardless of whether the child brought to the clinic now was the first or not.

**Frequency and extensiveness of comments:** The majority of the mothers reported that they had not been taught by anybody on how to breastfeed during their first experience. All groups had five or more mothers who had not been taught by anybody.

## Intensity of the comments

There was a general feeling that breastfeeding took a natural course even for the first time mothers. Other than the mothers who were not taught, those mothers who were taught reported that it was not detailed teaching.



For example:

-“Yeah you are taught, but just how to hold the baby while breastfeeding and you make sure you give the baby one breast until it is emptied then you turn to the other, the rest you learn by yourself.”

-“And the baby to breastfeed until six months without giving him anything else.”

-“There are many sources of information from which a mother can know how to breastfeed like clinic or even at home with the older mothers.”

-“Once you give birth your breasts start becoming full and you breastfeed.”

-“As you grow up and mature into marriage you see how other people do it so when you get your baby somehow know how to do it.”

### **Internal consistency**

There was an altered opinion by some of the participants indicating that probing helped them to remember better the past experiences.

For example: After many of them reported that no one had taught them about breastfeeding, one said;-“Oh eeh...I was. Yeah you are taught how to hold the baby while breastfeeding.”

In one group the respondent said that breastfeeding was natural. The researcher then asked the question “do we all agree that breastfeeding is natural?”

In this context a respondent replied that it is not obvious.

“It is not obvious sometimes. For example if it is your first born the sister (nurse) can show you how to hold the baby while breastfeeding and you are told not to give anything else to the baby until he/she is six months.”

### **Specificity of responses**

Most of the responses were general on this question except for a few who were specific to their situation. For example:

“Well, I just learnt when I delivered my firstborn. He was premature. So in the hospital the sister (nurse) would always tell me to express the milk and feed him. But as he grew and got out of the nursery, I started breastfeeding him.”

“I was helped by my mother-in-law and my aunt who were also staying with us at the time when I delivered.”

### **The big ideas**

Majority of the mothers were not taught on how to breastfeed (n=37), however there are those who received education from health workers (n=5), birth attendants (n=1), relatives (n=6) and friends (n=1).

## **5.11 Assumptions**

The following assumptions were made regarding the research:

- The mothers gave their full cooperation during interviews to complete all the individual questionnaires honestly.
- The mothers participated openly and honestly in the focus groups.
- The mothers understood what was expected of them concerning each of the measuring instruments.
- The mothers did not in any way try to please the researcher with the answers that they provided.
- The mothers' recall of the food intake was not hampered by memory loss and the recall provided was representative of habitual food intake.

## **5.12 Limitations**

- Using one 24 - hour recall does not provide an indication of an individual's habitual diet as it was done in this research; and is therefore not indicative of the adequacy of the usual diet. However, it provides an assessment of the diet at population level, and can be useful to monitor progress or target interventions.<sup>127</sup>
- Estimation of the food quantities might not be accurate leading to over-and/or under reporting of the dietary intakes.<sup>162</sup>
- A QFFQ does not give detailed information on the day to day variation in the diet for the period assessed.<sup>162</sup>
- The Nutri-survey Software used for nutrient analysis is German based and may not be accurate in nutrients of foods from other populations.<sup>158</sup>
- BMI categories do not take into account frame size and muscularity.<sup>44</sup> In this study, the BMI might not give accurate information on the individual mother's nutritional status due to weight retention after birth.

- The diets of the lactating women would not be thoroughly assessed for nutrient quality thus might not give the actual amount of nutrient consumed. For example, the food sources of the nutrients, method of cooking and bioavailability of the nutrients in the foods consumed were not assessed.
- By use of the Nutrisurvey programme, food fortification was not considered in the nutrient analysis and this could affect the results on nutrient intake. Some of the foods that are fortified in Kenya for example wheat and maize flour products, cooking oil and salt were not considered.

### **5.13 Ethical approval**

Ethical approval for the research study was sought from the Ethics committee of the Faculty of Natural and Agricultural Sciences, University of Pretoria (*Ref EC080922-039*). Permission was also obtained from National Research Council of Science and Technology, Nairobi (*Permit No NCST/5/002/R/355*), and the administration of Mbagathi District Hospital (*Appendices K, L*).

## CHAPTER 6: RESULTS IN THE QUANTITATIVE RESEARCH DOMAIN

To answer specific research questions we cannot skim across the surface. We must dig deep to get a complete understanding of the phenomenon we are studying. We collect numerous forms of data and examine them from various angles to construct a rich and meaningful picture-multifaceted situation.<sup>163</sup> This chapter deals with the results in the quantitative research domain. The quantitative research methods were used for the description of:

- the bio-demographic and socio-economic profile of the individual mothers
- the nutritional status of the women in terms of BMI and dietary adequacy
- the food security of lactating mothers and their households.

The appropriate evaluation techniques and the chosen measuring instruments used were discussed previously (*Chapter 5, paragraph 5.6*). The quantitative results are divided into sections of bio-demographic data, anthropometrical evaluation, household characteristics, economic related characteristics, health status, food intake and nutrition knowledge, and presented in tables and graphs.

### 6.1 Bio-demographic status

This includes the anthropometry, mean age, marital status and education level of the lactating women in the study group.

The mean age of the mothers who were between zero and three months postpartum (n=77) was 23 years, while the mean age of those mothers between four to six months postpartum (n=43) was 26 years, giving a mean age of 24 years. The majority of the lactating women (89%) interviewed were married, three women were separated while ten mothers were unmarried. Majority of the women had received high school (43%) and upper primary education (41%); 13 women had reached tertiary level while seven women had lower primary education. The summary of the subjects' characteristics is shown in table 6.1.

**Table 6.1** A summary of age, marital status and education level of the lactating women in the study group (N=120)

<b>Variable</b>	<b>n</b>	<b>Mean</b>	<b>SD</b>
Age (yrs)	120	24.34	3.76
<b>Marital status</b>	<b>n</b>	<b>%</b>	
Unmarried	10	8	
Married	107	89	
Separated	3	3	
<b>Education level</b>	<b>n</b>	<b>%</b>	
Lower primary	7	6	
Upper primary	49	41	
High school	51	43	
Tertiary	13	11	

## 6.2 Anthropometrical status

### 6.2.1 Mean weight, height and BMI

In this study, measures of height in centimetres and weight in kilograms for every mother were taken and recorded (*chapter 5, paragraph 5.9.1.1*). The mean height, weight and BMI is as shown in table 6.2.

**Table 6.2** Mean weight, height and BMI of the lactating women in the study group (N=120)

<b>Variable</b>	<b>Observations (n)</b>	<b>Mean</b>	<b>SD</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Weight (kg)</b>	120	60.38	7.75	43.5	84.0
<b>Height (cm)</b>	120	157.11	6.83	144	174
<b>BMI (kg/m<sup>2</sup>)</b>	120	23.9	2.22	18.2	29.6

## 6.2.2 Body Mass Index

The body mass index (BMI) was calculated and the BMI categories<sup>44</sup> were used in the classification of the lactating women into various BMI categories as shown in table 6.3

**Table 6.3** BMI values and classification of lactating women in the study group (N=120)

BMI categories	Classification	n
Less than 18.5kg/m <sup>2</sup>	Underweight	2
18.5-24.9 kg/m <sup>2</sup>	Normal weight	91
25.0-29.9 kg/m <sup>2</sup>	Overweight	27
30kg/m <sup>2</sup> and higher	Obese	none

The majority of the lactating women (98%) had a BMI 18.5kg/m<sup>2</sup>. Only two women had a BMI slightly less than 18.5kg/m<sup>2</sup>, i.e. they had 18.4kg/m<sup>2</sup> and 18.2kg/m<sup>2</sup> respectively. On the other hand, ten women had a BMI above 27.0 kg/m<sup>2</sup> with the highest BMI being 29.6kg/m<sup>2</sup>, thus giving the study group a mean BMI of 23.9kg/m<sup>2</sup>.

## 6.3 Household characteristics

Household characteristics included the source of food, water, and fuel used by the lactating women in the study group as well as the type of dwelling in which they lived in. Table 6.4 summarizes these household characteristics of the women in the study group.

The market and garden were the only two food sources that were reported; 98% of the women obtained their food from the market and only two women had gardens as their source of food.

The majority of the women (75%) reported that the communal tap was their source of water; two women had a borehole, while 27 women got their water from their own taps. However, out of those 27 who reported having their own tap, 12 women sometimes also used water from the communal taps.

The main source of fuel among the lactating women was the paraffin stove (72%), followed by gas (15% of the women). Electricity (3%) and firewood (2%) were the least used types of fuel. Nine women used charcoal as their main source of fuel. However, 76 women of those who used the paraffin stove as their main source of fuel also used charcoal, and 12 of

the 19 women who used gas as their main source of fuel, also used charcoal, while five women also used the paraffin stove. The three women who used electricity as their main source of fuel also used the paraffin stove and among the two women who used firewood, one also used the paraffin stove. A total of 99 women (83%) used more than one type of fuel to prepare food in their households.

The majority of the women were living in tin (68%), stone (18%) or brick (9%) dwellings, whereas the least number of women reported to be living in mud (3%) and wooden type of dwellings (3%) as shown in table 6.4

**Table 6.4** A summary of the household characteristics of the lactating women in the study group (N=120)

<b>Variable</b>	<b>n</b>	<b>%</b>
<b>Source of food</b>		
Market	118	98
Garden	2	2
<b>Source of water</b>		
Own tap	27	23
Communal tap	91	76
Borehole/well	2	2
<b>Source of fuel</b>		
Gas	19	16
Electricity	3	3
Firewood	2	2
Stove	87	73
Charcoal	9	8
<b>Type of dwelling</b>		
Brick	11	9
Mud	4	3
Tin	81	68
Wood	3	3
Stone	21	18

## 6.4 Economic related characteristics

The economic related characteristics that were investigated included the occupation of the women, the average monthly income, the average daily expenditure on household food, the number of people living in the household and the number of children each woman had.

### 6.4.1 Occupation of the lactating mothers in the study group

The largest numbers of the women were housewives (52%) who accounted for slightly more than half of the study group. The other half had a majority of self-employed women (17%), and those who offered skilled labour (12%), the unemployed (4%), the casual workers and students were (3%) each. The occupations with the lowest frequency among the women were the professionals and bar/hotel attendants with two women in each group and one woman was a farmer. Table 6.5 gives a summary of the occupation of the women in the study group.

**Table 6.5** Occupation of the lactating women in the study group (N=120)

Occupation	n	%
Student	3	3
Skilled	14	12
Self - employed	20	17
Professional	2	2
Bar/hotel attendant	2	2
Casual worker	3	3
Farmer	1	1
Housewife	62	52
Unemployed	5	4



### 6.4.2 Mean monthly household income of the lactating mothers in the study group

The mean monthly income of a household was up to Ksh.10000 ( $\approx$ R1430).The majority (25%) of the women earned between ksh.5001-8000 ( $\approx$ R 714 – 1143). However, one mother had an average income of less than Ksh.500 ( $\approx$  R 71) and 23% of the mothers did not know what the monthly income was. This household income was based on the total amount of income they had in the household for use and not just the mother’s income and since the majority of the women were housewives and/or depended on their spouses or family members, they could not project how much income they had to spend on food per month as they bought food on daily basis. Table 6.6 gives a summary of the mean monthly household income of the women in the study group.

**Table 6.6** Mean monthly household income of the lactating women in the study group (N=120)

Income level	n	%
Ksh. 1-500	1	1
Ksh. 1001-3000	13	11
Ksh.3001-5000	14	12
Ksh.5001-8000	30	25
Ksh.8001-10000	12	10
Over 10000	23	19
Don't know	27	23

Conversion factor of Kenya shilling to South African Rand (1ksh. = 0.14 rands)

### 6.4.3 Daily expenditure on food of the lactating mothers in the study group

The majority of the mothers (40%) spent between Ksh.151 and Ksh.200 ( $\approx$ R 22 – R. 29) per day on food for the household. There was no daily expenditure that exceeded ksh.400 ( $\approx$  R. 58). Four mothers spent between zero and 50 Kenyan shillings (zero and seven rands) per day, and four mothers reported that they did not know how much was spent as this expenditure was not based on the mother’s earnings only but on the available household income. Table 6.7 gives a summary of the daily expenditure of the women in the study group on food.

**Table 6.7** Daily expenditure on household food of the lactating women in the study group (N=120)

Daily expenditure	n	%
Ksh. 0 - 50	4	3
Ksh. 50 - 100	18	15
Ksh. 101 - 150	17	14
Ksh. 151 - 200	47	39
Ksh. 201 - 250	9	8
Ksh. 251 - 300	15	13
Ksh. 301 - 350	4	3
Ksh. 351 - 400	2	2
Over 400	0	0
Don't know	4	3
Total	120	100

Conversion factor of Kenya shilling to South African Rand (1ksh. = 0.14 rands)

#### **6.4.4 Other occupants in the household of the lactating mothers in the study group**

Most of the women (n=102) reported that they were living with their spouses. The remaining 18 women were either living with parents (n=8), brother/sister (n=5) or other relatives (n=4). Only one woman reported that she was living with friends.

Three women were living with the spouse and also their siblings, two women were living with their spouses and other relatives, while only one woman was living with both the spouse and parents. Out of the eight women who were living with their parents, six also had a brother or a sister in the same household while one had her children as well. Two women were living with both other relatives and their children in the same household. Table 6.8 shows a summary of the number of people in the households of the lactating women in the study group.

**Table 6.8** Other occupants in the household of the lactating women in the study group (N=120)

<b>Living with</b>	<b>n</b>	<b>%</b>
Spouse	102	85
Parents	8	7
Brother/sister	5	4
Friends	1	1
Other relatives	4	3
Total	120	100

#### **6.4.5 Number of children of the lactating mothers in the study group**

One hundred and eleven women had three children or less. Seven out of the remaining nine women had four children, while two women had more than four children. The majority of the women (47%) had one child. Table 6.9 shows a summary of the number of children the women in the study group had.

**Table 6.9** Number of children of the lactating women in the study group (N=120)

<b>Number of children</b>	<b>n</b>	<b>%</b>
1	56	47
2	32	27
3	23	19
4	7	6
More than 4	2	2
Total	120	100

## 6.4.6 Interactions between economic related characteristics and nutrient intake

### 6.4.7.1 Money spent on food per day and the mean adequacy ratio (MAR)

Interaction between money spent on food per day and MAR resulted in various values shown in table 6.10. Those who spent the least amount of money (Ksh. 0-50) had a lower MAR as compared to those who spent more however there was no significant difference in MAR in all the expenditure categories.

**Table 6.10** Interaction of money spent on food per day on MAR of the study group (N=120)

Money spent on food/day	n	MAR	Std. Err.	[95% C I]	
Ksh. 0- 50	4	0.7144486	0.0307104	0.6536058	0.7752914
Ksh. 50-100	18	0.7465426	0.0228505	0.7012717	0.7918135
Ksh.101-150	17	0.7440382	0.0331067	0.6784479	0.8096285
Ksh.151-200	47	0.738467	0.0213116	0.6962448	0.7806891
Ksh.201-250	9	0.734493	0.0567533	0.6220545	0.8469315
Ksh.251-300	15	0.7345352	0.0386347	0.6579929	0.8110776
Ksh.351-400	4	0.7412191	0.0860432	0.5707521	0.9116862

Conversion factor of Kenya shilling to South African Rand (1ksh. = 0.14 rands)

To determine the relationship between the nutrition knowledge, money spent on food per day and their influence on MAR, an ANOVA was done between the nutrition knowledge and money spent on food per day as shown in table 6.11

**Table 6.11** Relationship between MAR, nutrition knowledge scores and money spent on food per day

Source	Partial SS	df	MS	F	Prob > F
Model	0.179025601	16	0.0111891	0.57	0.9005
Nutrition knowledge	0.002402773	2	0.001201387	0.06	0.9409
Daily expenditure on food	0.058786021	6	0.00979767	0.50	0.8089
Nutrition knowledge * Daily expenditure on food	0.172960454	8	0.021620057	1.10	0.3717
Residual	1.91072817	97	0.019698229		
Total	2.08975377	113	0.018493396		

To determine the relationship between the money spent on food per day and their influence on MAR, an ANOVA was done between the money spent on food per day and MAR as shown in table 6.12.

**Table 6.12** Relationship between MAR and money spent on food per day

Source	Partial SS	df	MS	F	Prob > F
model	0.004381509	6	0.000730251	0.04	0.9998
Daily expenditure on food	0.004381509	6	0.000730251	0.04	0.9998
Residual	2.08537227	107	0.01948946		
Total	2.08975377	113	0.018493396		

The women who spent over Ksh. 400 were not included in the analysis (n=2) as it was a small number and those who did not know how much was spent on food per day (n=4) were also not included in the analysis since they did not offer information that would influence the analysis. Therefore 114 observations were analysed.

The influence of daily expenditure on MAR ( $\alpha = 0.05$ ) where  $f = 0.04$  and  $prob > f = 0.9998$  (close to 1) was significant.

It can be concluded that nutrition knowledge had a greater influence on MAR ( $f = 0.06$ ;  $Prob > 0.9409$ ), as compared to the daily expenditure on food ( $f = 0.50$ ;  $Prob > f = 0.8089$ ). However the interaction of both factors combined did not show significant influence on the nutrient intake (table 6.11). Each of the factors had an influence on the nutrient intake but in varying degree.

#### 6.4.7.2 The employment status and MAR

To determine the relationship between socio-economic status indicators and the nutrient intake of the lactating women, ANOVA was done between the money they spent on food per day, the employment status and the mean adequacy ratio (MAR).

**Table 6.13** Employment status and mean MAR of the study group (N=120)

Occupation	n	Mean (MAR)	SD (MAR)
Housewife	62	0.725	0.128
Self-employed	20	0.752	0.144
Unskilled (+casual worker + hotel/bar attendants)	13	0.809	0.113
Skilled(+farmer + Professional)	17	0.719	0.176
Unemployed (+student)	8	0.693	0.117

Five categories of occupation were used in the analysis of the relationship between the employment status and the nutrient intake (*table 6.13*). The unemployed women and students had the lowest mean MAR while the unskilled had the highest. However employment status had no significant interaction with the nutrient intake. ( $f=0.14$ ;  $prob>f=0.25$ ) (*refer to table 6.14*).

**Table 6.14** Relationship between MAR and employment status

Source	Partial SS	df	MS	F	Prob > F
Model	0.101605694	4	0.025401423	1.37	0.2492
Occupation	0.101605694	4	0.025401423	1.37	0.2492
Residual	2.13449848	115	0.018560856		
Total	2.23610417	119	0.018790791		

**Table 6.15** Interaction between money spent on food per day and employment status on MAR

Source	Partial SS	df	MS	F	Prob > F
Model	0.408600724	29	0.01408968	0.69	0.8674
Occupation	0.128085865	4	0.032021466	1.58	0.1873
Daily expenditure on food	0.062508318	8	0.00781354	0.38	0.9262
Interaction between occupation and daily expenditure on food	0.271817043	17	0.015989238	0.79	0.7028
Residual	1.82750345	90	0.020305594		
Total	2.23610417	119	0.018790791		

Both the money spent on food per day and employment status had no significant interaction with the nutrient intake. ( $f=0.79$ ;  $prob>f=0.70$ ) (*refer to table 6.15*).

## 6.5 Health status

To investigate the health status of the lactating women in the study group, the women were asked if they had visited an outpatient clinic or if they had been hospitalized in the previous month. They were also asked to give information if they received encouragement while breastfeeding.

A larger number the women interviewed in this study had not been sick in the past month. The results show that more than half of the women in the study group had neither been hospitalized or visited an outpatient clinic in the past month. A total of 45 women visited an outpatient clinic in the previous month prior to the study. The majority (n=28) of them being mothers 0-3 months postpartum.

Only 13 women who account for 10% of the total study group had been hospitalized in the past month. Eight of the women were 0-3 months postpartum while the remaining five were in the 4-6 months postpartum group. In the whole study population, 48% of the women were reported to have been sick in one way or the other in the previous month before the study was carried out. Table 6.16 shows a summary of the number of women who had visited an outpatient clinic and those who had been hospitalised in the previous month.

**Table 6.16:** Number of women who had visited the outpatient clinic / hospitalised in the past month (N=120)

<b>Visited an outpatient clinic in past one month</b>	<b>Study group</b>					
	Women (0-3 months) (n)	Women (0-3 months) (%)	Women (4-6 months) (n)	Women (4-6 months) (%)	Total (n)	Total (%)
Yes	28	23	17	14	45	37
No	49	41	26	22	75	63
<b>Hospitalised in past month</b>	<b>Study group</b>					
	Women (0-3 months) (n)	Women (0-3 months) (%)	Women (4-6 months) (n)	Women (4-6 months) (%)	Total (n)	Total (%)
Yes	8	6	5	4	13	10
No	69	58	38	32	107	90

To determine the relationship between the number of visits to inpatient and outpatient clinic and the nutrient intake of the lactating women, ANOVA was done between the number of visits of the women to the outpatient and inpatient clinics and MAR. (refer to table 6.17).

**Table 6.17** Mean MAR of the visits to the clinic of the study group (N=120)

Group	Visit	n	Mean	SD.	[95% C I]	
1	Inpatient (no)	69	0.7578008	0.0176447	0.7228627	0.792739
	Outpatient (No)					
2	Inpatient (No)	38	0.7166726	0.0184378	0.6801639	0.7531812
	Outpatient (yes)					
3	Inpatient (yes)	6	0.6161521	0.0587204	0.4998798	0.7324244
	Outpatient (No)					
4	Inpatient (yes)	7	0.7211842	0.0375523	0.6468269	0.7955414
	Outpatient (yes)					

#### Relationship between MAR and number of visits to the clinic

**Table 6.18** Relationship between MAR and number of visits to the clinic of the study group (N=120)

Source	Partial SS	df	MS	F	Prob > F
Model	0.134683291	3	0.04489443	2.48	0.0647
Visit	0.134683291	3	0.04489443	2.48	0.0647
Residual	2.10142088	116	0.018115697		
Total	2.23610417	119	0.018790791		

The greatest number of women (n=69) had not visited the clinic for inpatient or outpatient services and had a greater MAR as compared to those who had visited the clinic. However, the overall clinic visit did not have a significant influence on MAR ( $f = 2.48$ ;  $prob>f = 0.06$ ) (refer to table 6.18).



### 6.5.1 Source of encouragement to the women in the study group while breastfeeding

The women were asked if they had received encouragement on breastfeeding and who had offered the encouragement. The majority of the women studied (75%) received encouragement from the health workers, while ten women received encouragement from their spouses, eight women received encouragement from their parents and four women received encouragement from their friends. The results are summarized in the table 6.19.

**Table 6.19** Source of encouragement while breastfeeding (N=120)

Source of encouragement	n	%
Spouse	10	8
Parent	8	7
Friend	4	3
Health worker	90	75
Did not receive any encouragement	8	7
Total	120	100

### 6.5.2 Special diet of the lactating mothers in the study group

The women were asked if they were on any special diet, and if so which one. The majority of the women in the study group (96%) reported that they did not follow any special diet. Four women had a special diet that they followed. Of the four women, one had a slimming diet; one woman was allergic to eggs, while the two remaining women followed diets that were not in any of the categories listed.

## 6.6 Food intake

Dietary assessment methodologies may be broadly classified into two categories. Those that measure the intake of groups or households and those that measure individual intake. For the purpose of this research, individual intake was measured by use of quantitative food frequency questionnaire (QFFQ) and 24 - hr recall method while household food security was determined by the use of a Hunger Scale.<sup>162</sup>

## 6.6.1 The quantitative food frequency questionnaire (QFFQ)

### 6.6.1.1 Food frequency

The results of the QFFQ revealed the frequency of the most commonly consumed food items (i.e. consumed by at least 80% of the women in the study group).

**Table 6.20** Common food items consumed by at least 80% lactating women in the study group (N=120)

Food item	% Women eating it	Mean intake per day (g)
Maize meal (ugali)	100	120
Rice	100	60
Mandazi	98	30
Githeri (maize and beans)	97	50
Kale (sukumawiki)	97	45
Tea (usually black/with little milk)	96	450
Finger millet porridge	89	250
White bread	87	60
Cabbage, white	86	25
Avocado	80	40

Both maize meal and rice were consumed by everyone in the study group. More women consumed mandazi than white bread. Kales were also consumed slightly more than cabbage. Avocado was reported to be consumed by a large number of women since it was in season when the study was carried out.

### 6.6.1.2 Nutrient analysis

The data of the QFFQ were also used for nutrient analysis with the Nutrisurvey analysis software and then compared to the WHO recommended values <sup>46</sup> as shown on table 6.21.

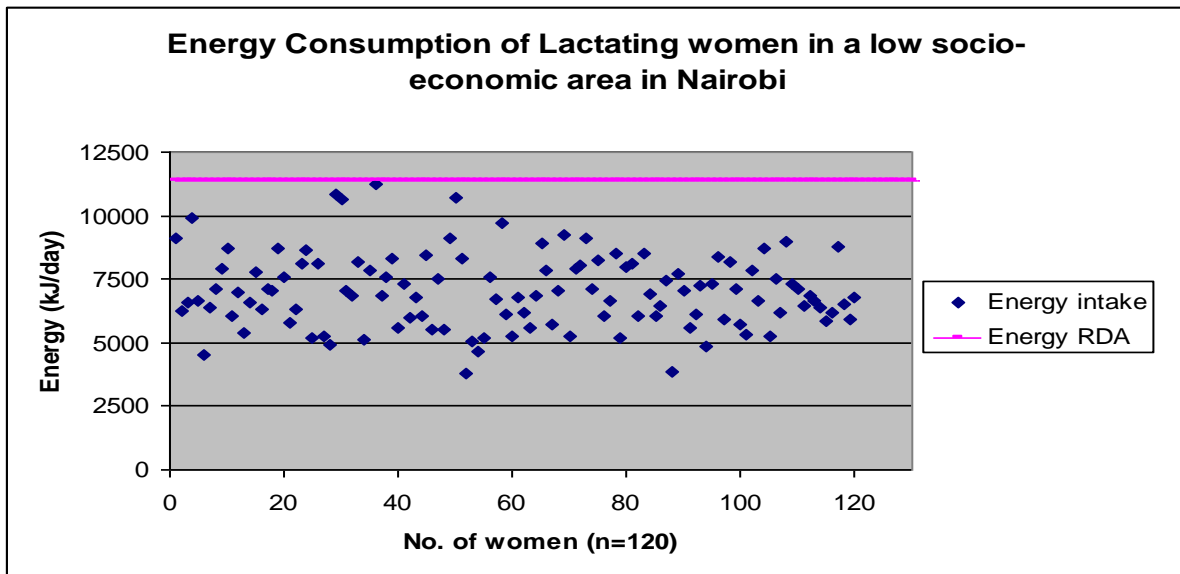
**Table 6.21** Mean energy and nutrient intake of the lactating women in the study group (N=120)

Nutrient	Mean value	WHO recommended value/day <sup>46</sup>	Percentage fulfilment
Energy (kJ)	6975.5	11299.5 kJ	61%
Protein (g)	50.0 (12%)	65.0 (12 %)	77 %
Fat (g)	45.9 (24%)	69.1 (< 30 %)	66 %
Carbohydrate (g)	271.4 (64%)	290.7 (> 55 %)	93 %
Dietary fibre (g)	30.2	30.0	101 %
PUFA (g)	11.5	10.0	115 %
Vitamin A (µg)	758.9	850.0	89 %
Vitamin E (mg) (eq.)	7.1	7.5	95 %
Vitamin B <sub>1</sub> (mg)	1.2	1.5	80 %
Vitamin B <sub>2</sub> (mg)	1.0	1.6	63%
Vitamin B <sub>6</sub> (mg)	1.7	2.0	85 %
Tot. folic acid (µg)	293.0	500.0	59 %
Vitamin C (mg)	66.7	70.0	95 %
Potassium (mg)	2174.7	3500.0	62 %
Calcium (mg)	407.2	1000.0	41 %
Magnesium (mg)	357.5	270.0	132 %
Phosphorus (mg)	957.6	1000.0	96 %
Iron (mg)	12.1	12.0	100 %
Zinc (mg)	8.0	12.0	67 %

The mean intake of Vitamin B<sub>2</sub> (riboflavin), folic acid, potassium and calcium was below <sup>2</sup>/<sub>3</sub> of the WHO recommended values.

### 6.6.1.2.1 Individual nutrients compared to the Recommended Dietary Allowances (RDAs)

#### Energy



**Figure 6.1** Average energy consumption of lactating women in the study group (N=120).

Six women consumed an average of less than 5040 kJ/day whereas four women consumed more than 10080 kJ/day on average. The majority of the women (n=110) consumed between 5040-10080 kJ in a day with the highest consumption as 11205 kJ/day. The RDA for energy of a lactating woman is 11340 kJ per day. None of the studied women met the RDA for energy. However 42 women met  $\frac{2}{3}$  of the RDA for lactation. <sup>44</sup>

#### Macronutrients

The macronutrient intake was compared to the Acceptable Macronutrient Distribution Ranges (AMDR). The AMDR are ranges of intake for a particular energy source that are associated with reduced risk of chronic disease while providing adequate intake of the essential nutrients. The AMDR is expressed as a percentage of total energy (or as a percentage of total kcal). The AMDR ranges for carbohydrate, fat and protein are: <sup>151</sup>

Nutrient	AMDR
Carbohydrate	45-65%
Protein	10-35%
Fat	20-35%

## Carbohydrate

For lactation, the carbohydrate recommendation is slightly increased by 80g/day over and above the 175g/day recommended for pregnancy. Thus the RDA for carbohydrates during lactation is 255g/day. Almost half of the women (48%) consumed less carbohydrate when compared to the RDA of 255g/day with the lowest intake of 134g/day. Fifteen women had a carbohydrate intake below 200g/day. On the other hand, 62 women had an intake above the RDA, with ten women who consumed more than 365g/day. The highest carbohydrate intake was 451g/day. The carbohydrate intake as a percentage of the total energy intake was compared with the AMDR (45-65% E) and is summarised in table 6.22

**Table 6.22** Carbohydrate contribution to energy intake of the lactating women in the study group (N=120)

Carbohydrate consumption (range)	n	%
< 45%	0	0
45-65%	71	59
> 65%	49	41

## Protein

Protein needs during pregnancy increase to about 60g/day, which is 10-15g/day more than the needs of a non-pregnant woman. In lactation a further increase of 15-20g/day above the pre-pregnancy requirements is needed.<sup>44</sup>

The majority of the lactating women (69%) consumed protein within the acceptable dietary range (AMDR) of 10-35% E Table 6.23 shows the protein consumption range (in %) by the lactating women in this study.

**Table 6.23** Protein contribution to energy intake of the lactating women in the study group (N=120)

Protein consumption (range)	n	%
<10%	17	14
10-35%	83	69
> 35%	20	17

## Fats

From late pregnancy to lactation more care should be taken on the type of fats consumed than the amount of fats consumed since the percentage daily kilojoules that come from fat does not change. Polyunsaturated and monosaturated fats, particularly those containing Omega 3 fatty acids, are essential since an infant needs them for the development of the brain and eyes. The AMDR value of fats for a healthful diet is 20-35% of the total energy.<sup>44</sup> Table 6.24 shows the distribution of the lactating women in the study group according to the percentage fat they consumed.

**Table 6.24** Fat contribution to energy of the lactating women in the study group (N=120)

Range of fat consumed	n	%
< 20%	18	15
20-35%	102	85
>35%	0	0

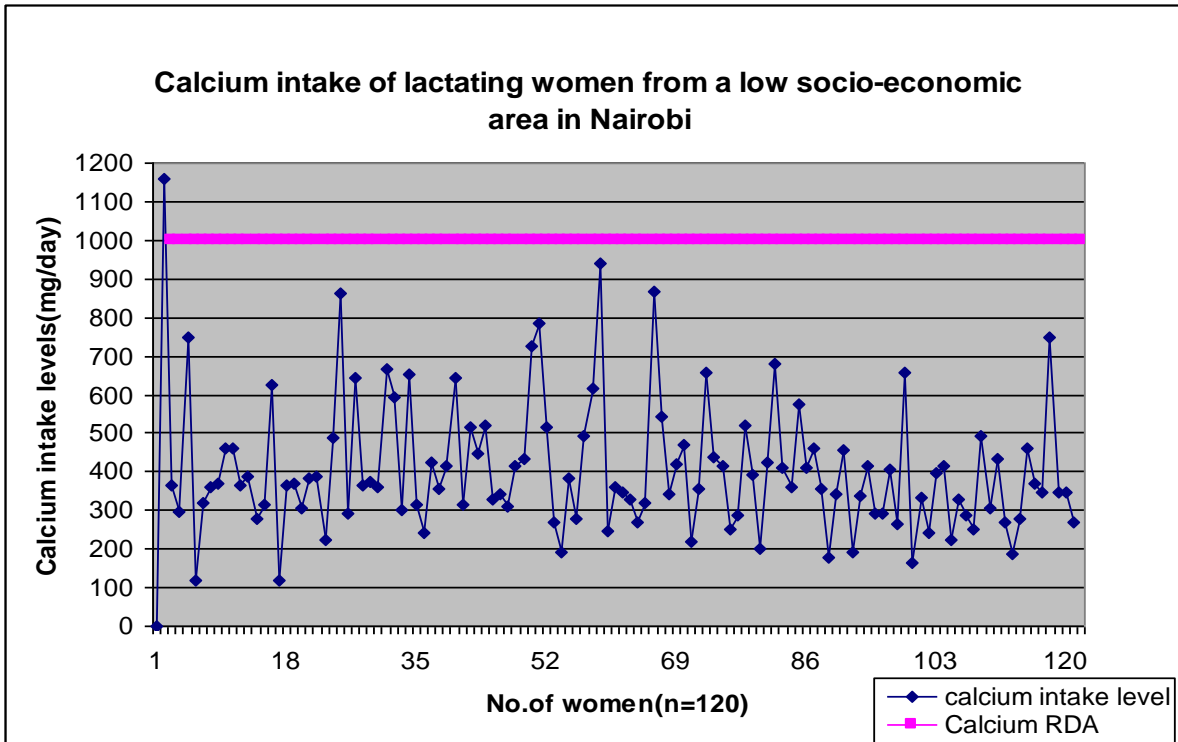
In the study group, 18 women consumed a diet with a fat content of less than 20%. The fat contribution ranged between 16% and 19%. One hundred and two women had diets with a fat content within the recommended levels. The highest contribution in this range was 33%. There was no one who consumed a diet with a fat content higher than the acceptable range.

## Micronutrients

The micronutrients were compared against the recommended dietary allowances (RDAs) for lactation.<sup>44</sup>

## Calcium

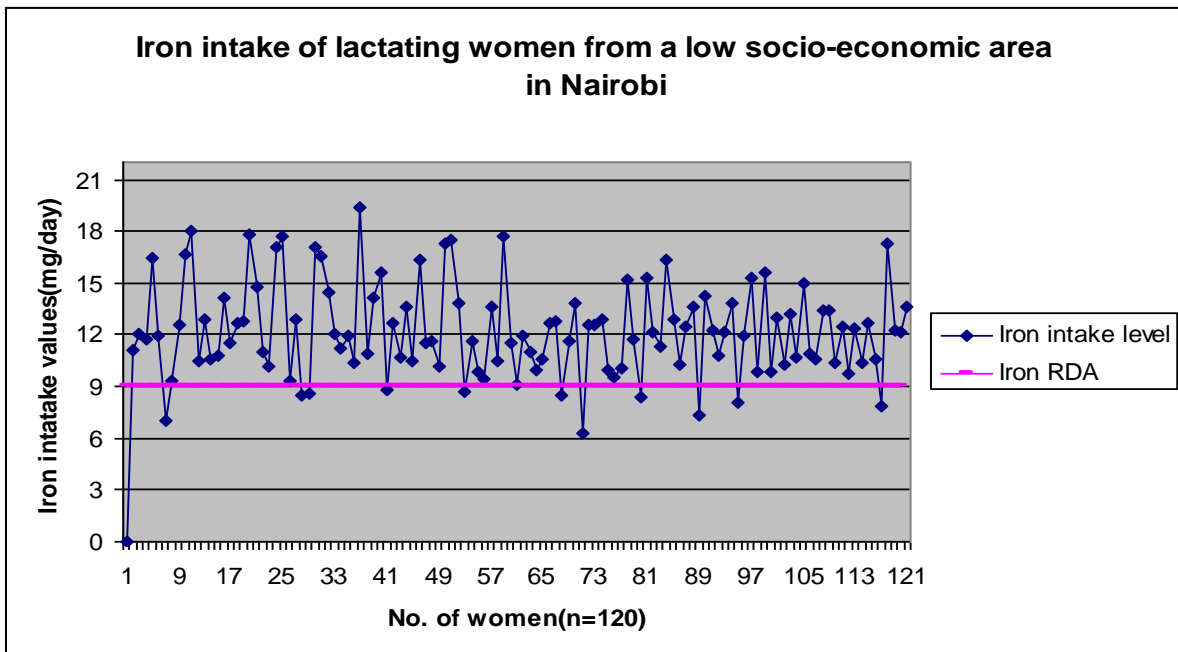
Only one woman met the RDA for calcium while all the other women had an intake lower than the recommended dietary level. The majority of the women (n=102) consumed between 200mg/day and 700 mg/day. Seven women consumed below 200mg/day of calcium. The RDA for Calcium during lactation is 1000mg/day.



**Figure 6.2** Average calcium intake of the lactating women in the study group (N=120) compared to RDA

**Iron**

In breastfeeding women need less iron as compared to pregnant women. The requirements decrease from 27mg/day to merely 9mg/day, compared to pre-pregnancy amounts of 18mg/day.<sup>44</sup> Iron consumption was between 6mg/day and 19mg/day with the majority of women (n=109) meeting the RDA, which is 9mg/day. Eleven women consumed less than the RDA as shown in figure 6.3.

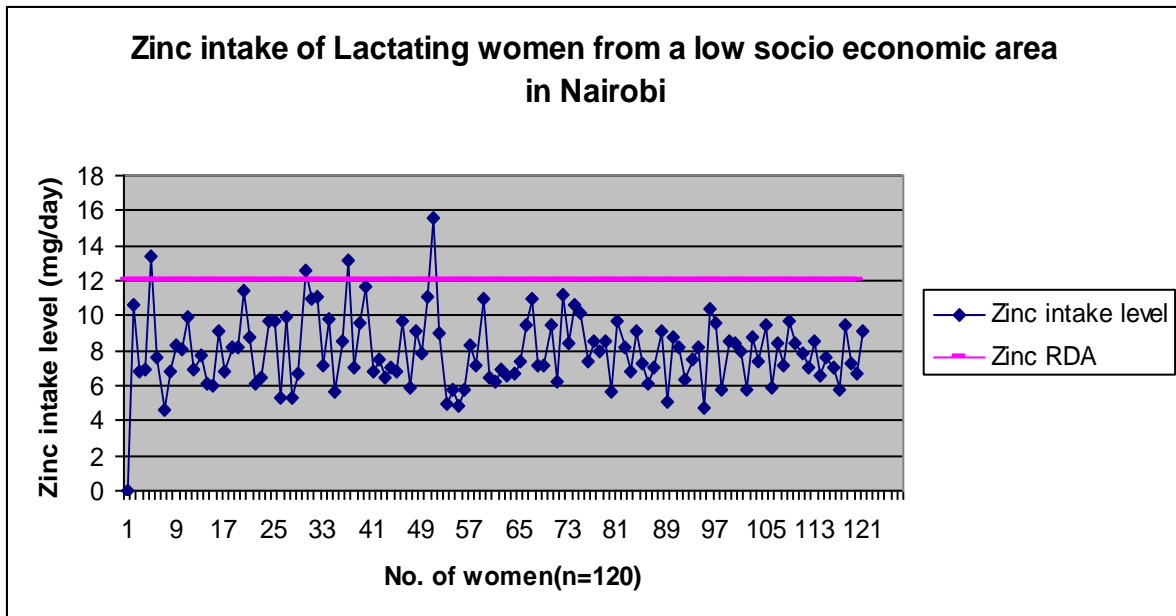


**Figure 6.3** Average iron intake levels of the lactating women in the study group (N=120) as compared to RDA during lactation

## Zinc

The recommended amount of Zinc during lactation is 12mg/day for women over 19 years. It is slightly higher than for pregnancy, which is 11mg/day.

Four women met the RDA for zinc in lactation. The rest of the women (n=116) had intake levels between 5mg/day and 12mg/day. Figure 6.4 shows the average zinc intake levels of the lactating women in the study group as compared to the RDA for lactation.

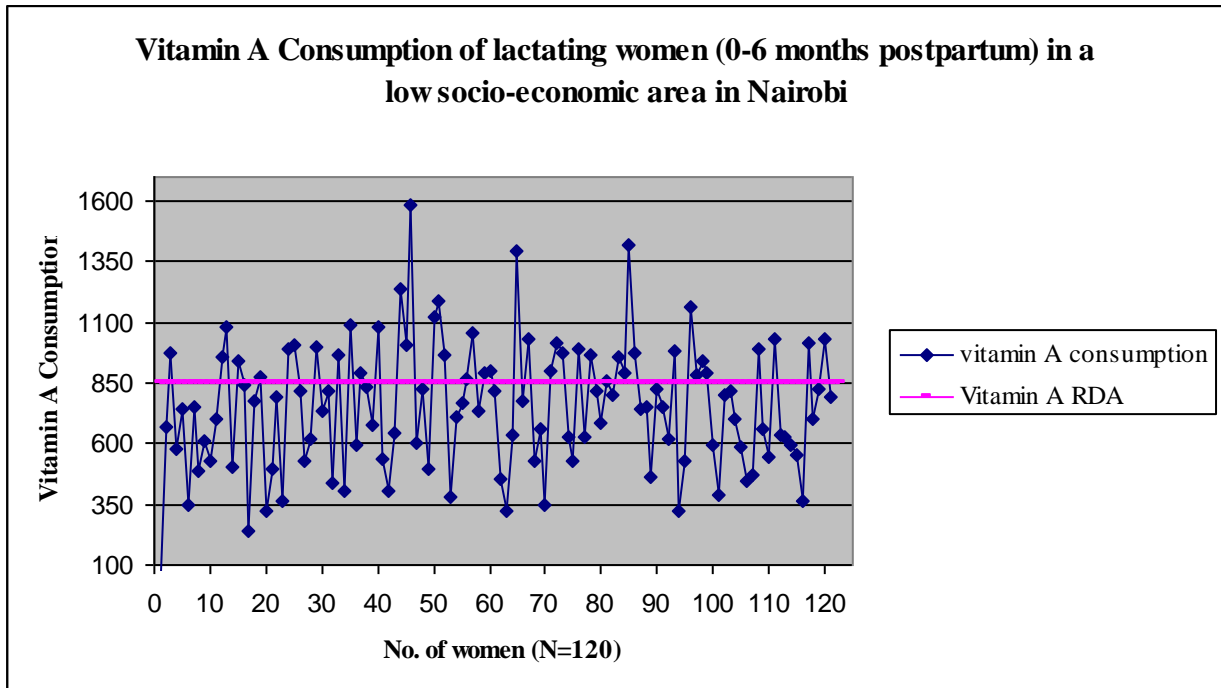


**Figure 6.4** Zinc intake of the lactating women in the study group (N=120) as compared to RDA



## Vitamin A

The recommended vitamin A for lactation is 850µg/day. Figure 6.5 shows the average Vitamin A intake of the lactating women in the study group as compared to RDA.

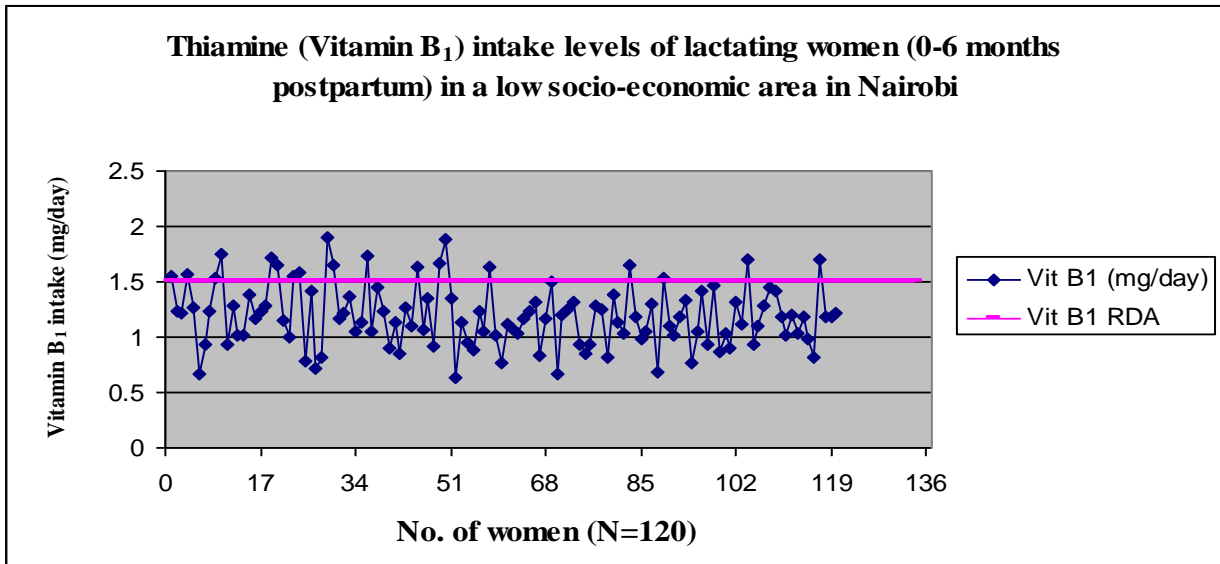


**Figure 6.5** Vitamin A intake of the lactating women in the study group (N=120) as compared to RDA

In the study group 42 women had an intake above the RDA, of these 39 women consumed between 850µg/day and 1350µg/day and one woman had the highest intake of 1581µg/day. On the other hand, 78 women consumed vitamin A below the RDA with the lowest intake of 236µg/day.

## Thiamine (Vitamin B<sub>1</sub>)

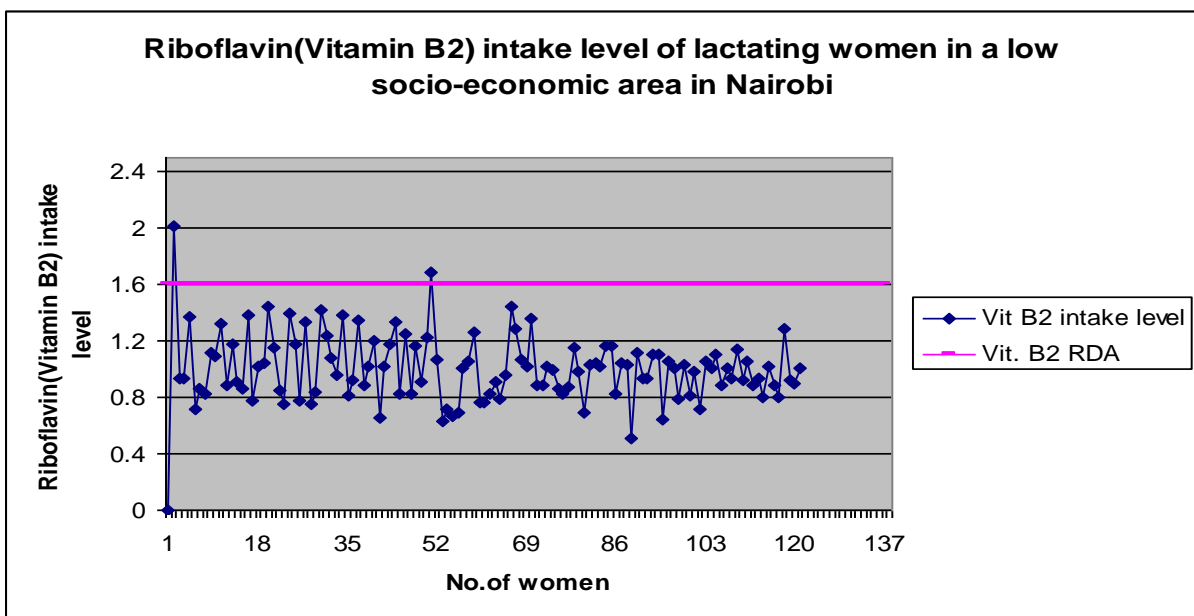
Maternal thiamine intakes of at least 1.5 mg/day are recommended for lactating women. In this study 19 women met the RDA for thiamine while 101 women consumed levels below 1.5mg/day as shown in figure 6.6



**Figure 6.6** Thiamine intake of the lactating women in the study group (N=120) as compared to RDA.

### Riboflavin (Vitamin B<sub>2</sub>)

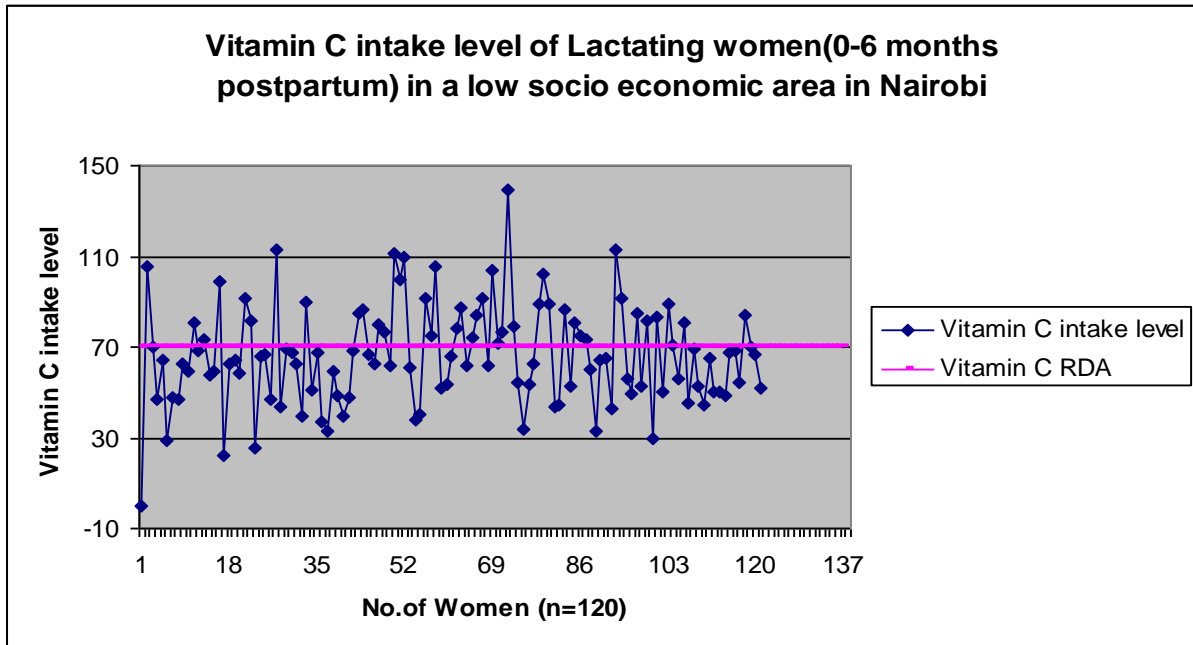
For lactating women, an estimated amount of 0.3mg riboflavin is transferred in milk daily and because of its utilization for milk production, it is assumed to be 70% efficient if the value is adjusted upward to 0.4mg/day. Lactating women should consume at least 1.6mg/day to meet these levels.<sup>46</sup> In this study, two women met the RDA for riboflavin in lactation. The majority of the women (n=118) had intake levels below 1.6mg/day with 82 women consuming between 0.8 mg/day and 1.2mg/day is shown in the figure 6.7



**Figure 6.7** Riboflavin intake of the lactating women in the study group (N=120) as compared to RDA.

## Vitamin C

The RDA for vitamin C during lactation is 70mg/day. Figure 6.8 shows the average Vitamin C intake of the lactating women in the study group as compared to RDA for lactation.



**Figure 6.8** Vitamin C intake of the lactating women in the study group (N=120) compared to RDA

In the study group 45 women met the RDA for vitamin C which is 70mg/day. The majority of the women (n=75) did not meet RDA with five women consuming less than 30mg/day.

### 6.6.1.3 Nutrient adequacy

As an overall measure of nutrient adequacy, the Mean Adequacy Ratio (MAR) was calculated as described by Madden et al (in 1976):

$$\text{MAR (Mean Adequacy Ratio)} = \frac{\sum \text{NAR (each truncated at 1)}}{\text{Number of nutrients}}$$

The Nutrient Adequacy Ratio (NAR) for a given nutrient is the ratio of a subject's intake to the current recommended allowance (in this case WHO reference standards were used)<sup>46</sup> for the subject's sex and age category.<sup>166</sup>

**Table 6.25** Nutrient Adequacy Ratios of the nutrients under investigation

NUTRIENT	WHO STANDARD <sup>46</sup>	NUTRIENT ADEQUACY RATIO
Energy (KJ)	11340	0.619004
Protein (g/day) - median	68	0.740113
Calcium (mg/day)	1000	0.407287
Iron (mg/day)	12	1.020861
Zinc( mg/day)	12	0.670493
Folic acid (µg DFE/day)	500	0.593817
Vitamin A (µg RE/day)	850	0.892923
Thiamine (vit B <sub>1</sub> )(mg/day)	1.5	0.794444
Riboflavin (vit B <sub>2</sub> )(mg/day)	1.6	0.661198
Niacin (vit B <sub>3</sub> ) (NEs/day)	17	-
Vitamin C (mg/day)	70	0.95545
<b>TOTAL</b>		<b>7.44</b>

(-): Niacin values would not be calculated as they were missing from the software used.

The average of the 10 NARs mentioned in table 6.17 was used (excluding niacin which was unavailable from the software). NAR was truncated at 1 so that a nutrient with a high NAR could not compensate for a nutrient with low NAR<sup>166</sup>

$$\text{MAR (Mean adequacy ratio)} = \frac{7.44}{10} = 0.74$$

The proportion of women with a nutrient intake below the recommendations varied between the nutrients. The results indicated that all the women had a sufficient intake of iron which had NAR above 1. This could be so because the iron requirements during lactation decrease from 27mg/day in pregnancy to merely 12mg/day, compared to pre-pregnancy amounts of 18mg/day. This is because iron is not a significant component of breast milk and in addition, breast-feeding usually suppresses menstruation for a few months, thus minimizing iron losses.<sup>44</sup> Overall, the MAR was 0.74. The ideal cut-off for nutrient adequacy should be 1, which would mean that all the nutrients were consumed in sufficient/adequate amounts.<sup>166</sup>

## 6.6.2 24-Hour recall

The information obtained from the 24 hour recall was analysed for food variety and dietary diversity (*refer to chapter 5, paragraph 5.10.1*).

The food variety score (FVS) is defined as the number of different food items that were eaten during the 24 hr recall period in the study. The method was adapted from the studies of Krebs-Smith<sup>164</sup>, Drewnowski<sup>165</sup> and Hatloy.<sup>166</sup> The total number of foods included in the FVS was 45 food items independently of the frequency and quantity consumed. The diet was classified according to the nine food groups recommended by the FAO which included 1) cereals, roots and tubers; (2) vitamin-A-rich fruits and vegetables; (3) other fruit; (4) other vegetables; (5) legumes and nuts; (6) meat, poultry and fish; (7) fats and oils; (8) dairy; and (9) eggs. These food groups were the basis for calculation of food variety and dietary diversity scores. Other remaining items such as tea, sugar and sweets were not used in DDS and food variety score (FVS) calculations. The FVS is defined as the number of food items consumed over a 24 h period, from a possible total of 45 items. The possible total (n = 45) reflects all the different types of food items that were eaten by this sample of lactating women.

The mean FVS was calculated by the formula<sup>166</sup>:

$$\begin{aligned} \text{Mean Food Variety Score} &= \frac{\text{Sum of individual FVS}}{\text{Total number of women}} \\ &= \frac{788}{120} = 6.56 \cong 6.6 \end{aligned}$$

The mean FVS was 6.6 (S.D. 2.0). The lowest number of food items consumed in the study group was one and the largest number of food items consumed was 12 food items over the 24 hr recall period.

Dietary diversity scores were calculated by summing the number of food groups consumed by the individual respondent over the 24 hour recall period.<sup>157</sup> Currently there is no international consensus on which food groups to include in the scores to create the Household Dietary Diversity score (HDDS) and Individual Dietary Diversity score (IDDS), although work is underway to determine the best set of food groups for IDDS as an indicator of adequate micronutrient intake.<sup>157</sup>

The mean DDS was calculated by the formula<sup>166</sup> :

$$\begin{aligned} \text{Mean dietary diversity score} &= \frac{\text{Sum of individual DDS}}{\text{Total number of women}} \\ &= \frac{518}{120} = 4.31 \cong 4.3 \end{aligned}$$

The mean DDS was 4.3 (*S.D.* 1.0). The lowest number of food groups from which the food items were consumed by the study group were two and the largest number of food groups from which the food items were consumed were six food groups.

Table 6.26 gives a summary of the frequency of the food groups and food items consumed during the 24 hour period.

**Table 6.26** Food groups and food items used at least once during the 24 hour period recorded by the study group (N=120)

Food groups	Frequency (%)	Food items
<b>Cereals, tubers and roots</b>	100	84%: maize meal (ugali) 27% maize 48%: wheat (bread) 48%: millet (porridge) 48%: rice 38%: wheat (mandazi) 18%: wheat (chapati ) <10%: wheat (injira), (pancakes), (spaghetti), samp. 22% potatoes <10% green bananas
<b>Vitamin A rich vegetables and tubers and vitamin A rich fruits</b>	6.6	<10% sweet potatoes, carrots, peas < 10% pawpaw, mango
<b>Other vegetables</b>	100	58% kales (sukumawiki) 14% spinach <10% black night shade, spider leaves, amaranth and cow pea leaves 28% cabbage < 10% tomatoes
<b>Other fruits</b>	35	22% oranges 20% banana 13% avocado
<b>Meat, poultry and fish</b>	39.9	< 10% liver, offals 25% beef < 10% sausage < 10% sardines, Tilapia
<b>Eggs</b>	18.3	18% eggs
<b>Legumes, nuts and seeds</b>	46.6	53% beans < 10 % green grams,
<b>Dairy</b>	1.66	< 10% fresh milk, fermented milk
<b>Oils and fats</b>	100	100% cooking oil/fat < 10% margarine

All the lactating women had eaten some kind of cereal mainly maize, wheat, millet and rice and all the women used cooking oil/fat in their dishes.

The other food items eaten by over half of the women sampled were kales (sukumawiki) and beans. In total, 46.6% of the women consumed at least one item from the legumes nuts and seeds group, 39.9% of the women consumed at least one item from the meat, poultry and fish group and 35% of the women consumed at least an orange, banana or avocado, with 13% of the women consuming avocado (which was in season during the study period) and 18.3 % of the women consumed at least one egg during the 24 hr period. Vitamin A rich vegetables and fruits and dairy products were the least consumed foods during the 24 hr period by the women, 6.6% and 1.7% respectively.

The regression analysis between the MAR and both the FVS and the DDS showed a negative relationship between DDS and MAR but a positive relationship between FVS and MAR as shown in table 6.27. However none of the relationships were significant.

**Table 6.27** Regression analysis between MAR, FVS and DDS

Source	Partial SS	df	MS			
Model	0.011	2	0.006			
Residual	2.225	117	0.019			
MAR	Coef.	SD	t	P> t	[95% Conf. Interval]	
dds	-0.009	0.018	-0.530	0.596	-0.044	0.025
fvs	0.006	0.008	0.760	0.448	-0.010	0.022
_cons	0.735	0.062	11.890	0.000	0.613	0.858

Further analysis was done on the MAR scores for different food variety scores (FVS) and dietary diversity scores (DDS) by a linear regression model as shown in table 6.28.

**Table 6.28** Estimated MAR scores for different food variety score (FVS) and dietary diversity scores (DDS) by a linear regression model

Dietary diversity scores (DDS)	Food Variety Score (FVS)				
	1	4	6	9	12
2	0.723	0.741	0.753	0.771	0.789
3	0.714	0.732	0.744	0.762	0.780
4	0.705	0.735	0.735	0.753	0.771
5	0.696	0.714	0.726	0.744	0.762
6	0.687	0.705	0.717	0.735	0.753

$$\text{MAR} = 0.735 - 0.009 * \text{DDS} + 0.006 * \text{FVS}$$

Linear regression model: Dependent variable: MAR

Predictors: DDS and FVS

R-squared= 0.0050 Adj R-squared = -0.0120 Root MSE = 0.1379 significance = 0.05

As indicated by Hatloy et al (1998) DDS and FVS cannot give a full picture of the adequacy of the nutrient intake but they are simple useful methods that can be used to give a fairly good indication of nutrient adequacy. Further validation studies were needed to show whether the simple methods would be used to give similar results using 24 h or 48h dietary recall.<sup>166</sup> The results (*table 6.19*) show that data from one 24 hour recall seemed not to be sufficient as it would need a larger number of food groups to show a positive relationship.

### 6.6.2.1 Nutrient analysis

The micronutrient rich sources consumed within the 24 hr period that contributed to the micronutrients being investigated in this study were analysed using formula;<sup>167</sup>

$$\frac{\text{Sum of individuals who consumed iron rich foods} \times 100}{\text{Total number of respondents}}$$

Total number of respondents

The scores were presented per foods consumed that are rich in the micronutrient (%) in table 6.29



**Table 6.29** Percentage of women who consumed the micronutrient-rich foods during the 24-hour recall period

<b>Micronutrient rich foods</b>	<b>%</b>
Protein rich foods	59
Calcium rich foods	74
Iron rich foods	36
Zinc rich foods	
• From animal sources	25
• From legumes, nuts and seeds	47
• From cereals	100
Folate rich foods	
• From animal sources	25
• From white tubers and roots	21
• From legumes, nuts and seeds	47
• From cereals	100
Vitamin A rich foods	73
Thiamine (vitamin B <sub>1</sub> ) rich foods	72
Riboflavin (vitamin B <sub>2</sub> ) rich foods	32
Niacin (vitamin B <sub>3</sub> ) rich foods	68
Vitamin C rich fruits	41
• Vitamin A rich fruits	
• Other fruits	
Vitamin C from dark green leafy vegetables	68

Cereals were consumed by all the women in the study group in the past 24 hour recall period and thus the zinc-rich and folate-rich sources were classified according to the specific contribution sources to give a clearer picture of micronutrient intake.

### 6.6.3 Hunger Scale

For the purpose of this research, it was deemed necessary to include a means of estimating hunger and food insecurity for the purpose of having some additional indirect means of reflecting on the dietary assessment (*chapter 5, paragraph 5.6.1*). The results were used to classify the food secure households, the households that were at risk of hunger and the households that were hungry as shown below.

**Households that were hungry:** (Five or more positive responses)

n = 44 households

= 36.7 % of the total households

**Households that were ‘at risk of hunger:’** (1-4 positive responses)

n = 33 households

= 27.5 % of the total households

**Food secure households:** (negative response)

n = 43 households

= 35.8 % of the total households

Further analysis of the data was done to find out if the hunger situation had occurred recently in the past 30 days and if so, whether it had lasted for five or more days in the past 30 days. Table 6.30 illustrates the results on each of the questions of the Hunger scale.



**Table 6.30:** Responses and frequency of the occurrence of positive responses on the Hunger Scale by the study group (N=120)

QUESTION	YES		
	HAS IT HAPPENED?	IN THE PAST 30 DAYS	5 OR MORE DAYS IN THE PAST 30 DAYS
1) Does your house hold ever run out of money to buy food?	Yes (n=61) 50.8%	n=39 32.5%	n =25 24.2%
2) Do you ever rely on a limited number of foods to feed your children because you are running out of money to buy food for a meal?	Yes (n=47) 39.2%	n =34 28.3%	n= 21 17.5%
3) Do you ever cut the size of meals or skip because there is not enough money for food?	Yes (n=48) 40.0%	n =34 28.3%	n =23 19.2%
4) Do you ever eat less than you should because there is not enough money for food?	Yes (n=61) 50.8%	n =41 34.2%	n =29 24.2%
5) Do your children ever eat less than you feel they should because there is not enough money for the food?	Yes (n=33) 27.5%	n =27 22.5%	n =26 21.7%
6) Do your children ever say they are hungry because there is not enough food the house?	Yes (n=28) 23.3%	n =25 24.2%	n =22 18.3%
7) Do you ever cut the size of your children's meals or do they skip meals because there is not enough money to buy food?	Yes (n=26) 21.7%	n =23 19.2%	n =20 16.7%
8) Do any of your children ever go to bed hungry because there is not enough money to buy food?	Yes (n=24) 20.0%	n =22 18.3%	n =18 15.0%

## 6.7 Nutrition knowledge

During the interview, the lactating women who participated in this research were individually asked to give an answer to each of the 12 questions shown in table 6.31. The answers they gave were then used to rate their level of nutrition knowledge

**Table 6.31** Responses on the nutrition knowledge questionnaire of lactating women in the study group (N=120)

QUESTION	Correct answer	Women who answered <i>Yes</i>	Women who answered <i>No</i>	Women who did not know the answer
1. Most vitamins and minerals cannot be made by the human body and must be obtained from diet	Yes	n=88 73.3%	n=18 15.0%	n=14 11.6%
2. Vitamins and minerals are essential for growth of children	Yes	n=107 89.1%	n=8 6.6%	n=5 4.2%
3. Vitamins provide energy	No	n=89 74.2%	n=25 20.8%	n=6 5.0%
4. Most vitamins and minerals are lost during cooking of food	No	n=59 49.2%	n=47 39.2%	n=14 11.6%
5. Maize meal (Fortified-Ugali) is a very good source of vitamins and minerals	Yes	n=74 61.7%	n=33 27.5%	n=13 10.8%
6. Most vitamins are not stored in the body and must be taken daily	Yes	n=78 65.0%	n=32 26.7%	n=10 8.3%
7. Minerals help to build strong bones and teeth	Yes	n=91 75.8%	n=14 11.7%	n=15 12.5%
8. Fruits and vegetable are the best sources of vitamins and minerals	Yes	n=107 89.2%	n=6 5.0%	n=7 5.8%
9. Vitamins losses from fruits and vegetables can occur as a result of poor conditions harvesting and storage	Yes	n=77 64.2%	n=29 24.1%	n=14 11.7%
10. There is more protein in a glass of whole milk than skimmed milk	No	n=85 70.8%	n=21 17.5%	n=14 11.7%
11. Do you think intake of more water during breastfeeding increases the amount of milk	No	n=54 45.0%	n=43 35.8%	n=22 18.3%
12. A variety of food in the diet helps the body get enough vitamins and minerals everyday	Yes	n=93 77.5%	n=16 13.3%	n=11 9.2%

### 6.7.1 Rating of the women in the study group on nutrition knowledge

The scores on the nutrition knowledge were used to rate whether the mothers had poor, good or very good nutrition knowledge. Table 6.32 shows how the mothers scored on the nutrition knowledge questionnaire.

**Table 6.32** Score and rating of nutrition knowledge of lactating women in the study group (N=120)

Score	Number of women	Rating	Women
Zero (0)	3	<b>Poor knowledge (0-4)</b>	n=8 6.7%
4	5		
5	6	<b>Good knowledge (5-8)</b>	n=67 55.8%
6	15		
7	14		
8	32		
9	24	<b>Very good knowledge (9-12)</b>	n=45 37.5%
10	15		
11	6		
12	0		

More than half of the women (n=67) who participated had good nutrition knowledge with the majority (n=32) scoring eight out of the 12 questions in the questionnaire; 45 women had very good nutrition knowledge whereas eight women had poor nutrition knowledge. None had all the answers correct. The responses to the questions also reveal that for every question asked, five women did not know what the answer could be.

The relationship between the nutrition knowledge and the nutrient intake (MAR) was investigated by analysis of variance (*refer to table 6.33*). The interaction between nutrition knowledge and nutrient intake was positive ( $f = 0.04$ ;  $Prob > f = 0.96$ ).

**Table 6.33** Mean MAR of the different categories of nutrition knowledge scores

Nutrition knowledge	n	MAR	SD (MAR)
Poor (0-4 scores)	8	0.728	0.150
Good (5-8 scores)	64	0.739	0.133
Very good (9-12 scores)	48	0.732	0.144

To determine the relationship between the nutrition knowledge and Hunger Scale scores and their influence on MAR, ANOVA was done between the nutrition knowledge and Hunger Scale scores [i.e. answer (yes/no) to eight main questions] as shown below.

**Table 6.34** Relationship between MAR, nutrition knowledge scores and Hunger Scale Scores

Source	Partial SS	df	MS	F	Prob > F
Model	0.00789906	5	0.01579812	0.08	0.9951
Nutrition knowledge	0.002792269	2	0.001396134	0.07	0.9311
Hunger Scale scores	0.001061523	1	0.001061523	0.05	0.8161
Nutrition knowledge *Hunger Scale scores	0.004888557	2	0.002444278	0.13	0.8826
Residual	2.22820511	114	0.019545659		
Total	2.23610417	119	0.018790791		

It can be concluded that the interaction between the perception of hunger (Hunger scale scores) and nutrition knowledge and nutrient intake (MAR) was positive ( $f = 0.05$ ;  $prob > f = 0.82$  and  $f = 0.07$ ;  $prob > f = 0.93$ , respectively). The combined effect of perception of hunger and nutrition knowledge on nutrient intake was not positive ( $f = 0.13$ ;  $prob > f = 0.88$ ) (refer to table 6.34).

The majority of the women (93% in the study group) had good basic nutrition knowledge and had at least received upper primary education (94% in the study group). This was also shown by the positive responses during the focus group discussions, though some nutrition concepts were not well understood. It can be concluded that nutrition knowledge influenced the nutrient intake of the women. This was further affirmed by the analysis (table 6.34).

## CHAPTER 7: RESULTS IN THE QUALITATIVE RESEARCH DOMAIN

In this research study a total of seven focus group discussions were carried out among the lactating women and Krueger's framework of content analysis was used for data analysis and interpretation (*chapter 4, paragraph 4.3.1*).<sup>133</sup>

The information given by the mothers in the various focus group discussions is presented here according to the number of groups that gave the information and in a few cases, the number of mothers who individually gave that information. The three main themes that emerged from the focus group discussions are listed below with their respective sub-themes:

- ❖ Importance of breastfeeding
  - Reasons for breastfeeding
  - Benefits of breastfeeding
  - Importance of exclusive breastfeeding
- ❖ Knowledge of breastfeeding
  - Source of information on breastfeeding
  - Components of a balanced diet
  - Importance of water and/or fluids during breastfeeding
  - Effect of food on quality/quantity of breast milk
  - Importance of nutrition education on breastfeeding
  - Importance of supplementation during breastfeeding
- ❖ Cultural influence on breastfeeding
  - Factors in the community that influence breastfeeding- foods and activities that are allowed or prohibited during breastfeeding

### 7.1 Importance of breastfeeding

The majority of the mothers regarded that breastfeeding was important and that it was beneficial to both the mother and the child. Mothers in more than half of the groups reported that breastfeeding enhanced bonding between the mother and the baby, and that breastfeeding relieved breasts. However, a greater emphasis was put on the health of the child and to a lesser extent on their own health. This was portrayed where the benefits of breastfeeding to the mother were only listed after further exploration of the matter and even then breastfeeding benefits to the baby were mentioned again in some groups. The data also revealed that

information on benefits of breastfeeding specifically to the mother was not well known since in almost all the groups there were mothers who did not know how breastfeeding would benefit them. Table 7.1 gives a summary of the findings on the importance of breastfeeding.



**Table 7.1** Findings on the importance of breastfeeding of the lactating women in the focus group discussions

THEME AND SUB-THEMES	FINDINGS
<p><b>7.1 Importance of breastfeeding</b></p> <p>The sub-themes were:</p> <p><b>7.1.1</b> Reasons for breastfeeding</p> <p><b>7.1.2</b> Benefits of breastfeeding to the mother</p> <p><b>7.1.3</b> Importance of exclusive breastfeeding</p>	<p><b>7.1.1 Reasons for breastfeeding</b></p> <ul style="list-style-type: none"> <li>- Mothers in six groups reported that breast milk is food for the baby</li> <li>- Mothers in four groups reported that breast milk made the baby healthy and prevented the baby from disease</li> <li>- Mothers in three groups reported that the baby’s system was immature and could not digest other foods</li> <li>- Mothers from one group mentioned that they breastfed so that the child would be satisfied</li> <li>- Mothers in two groups breastfed because they once also had been breastfed</li> <li>- Mothers in three groups reported that they breastfed because breastfeeding relieved breasts</li> <li>- Mothers in all the groups mentioned that breast milk made the baby healthy and prevented him from disease</li> </ul> <p><b>7.1.2 Benefits of breastfeeding to the mother</b></p> <ul style="list-style-type: none"> <li>- Mothers from all the groups reported that breastfeeding relieved the breasts</li> <li>- Mothers in four groups reported that breastfeeding helped the mother bond with her child</li> <li>Mothers in two groups reported that breastfeeding was a cheap way to feed the baby</li> <li>- Mothers in one group reported that breastfeeding made them feel good that they could feed the baby</li> <li>- The benefits of breastfeeding to the baby were also reported. Mothers from three groups reported that breastfeeding made the baby grow</li> <li>- Mothers in two groups indicated that breastfeeding made the baby healthy and prevented disease</li> <li>- There was a misconception that breastfeeding improved appetite in one group and in six groups some mothers did not know how breastfeeding was beneficial to them</li> </ul>

Continued...../

	<p><b>7.1.3 Importance of exclusive breastfeeding</b></p> <ul style="list-style-type: none"> <li>- Mothers in all the groups reported that the baby would be breastfed for six months without being given any other food or drink, except in one group some mothers had the opinion that the child would be exclusively breastfed for four months. Below are the reasons they gave for exclusive breastfeeding:</li> <li>- Mothers in all the groups reported that they were taught at the clinic to exclusively breastfeed</li> <li>- Mothers in five groups reported that breast milk had all the nutrients the baby required up to the age of six months</li> <li>- Mothers in one group reported that, below the age of six months the baby did not need a lot of food and thus breast milk was enough</li> <li>- Mothers in two groups added that after six months breast milk was not enough to satisfy the baby</li> <li>- Mothers in one group reported that the baby would choke. Mothers from three of the groups mentioned that the child would become sick if other foods were given below the age of six months</li> </ul>
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## Ethnographic descriptions

### 7.2 Knowledge on breastfeeding

The mothers were of the opinion that six months was the recommended duration of exclusive breastfeeding. The majority of them reported that they had been taught in the clinic. Some mothers went further to explain that the health worker had instructed them not to even give water to the baby during that period. Nevertheless, some admitted that it was not always practical for them to exclusively breastfeed until six months, citing reasons that they had to go back to work/business and some women felt that the milk was not enough and that the baby cried a lot.

**Respondent:** “Yeah sister, you know sometimes you don’t have a choice, when the baby is about three months you start going back to work or to your own business, so you are forced to leave the baby at home and since you are gone for too long then you have to leave either milk or porridge for the baby.”

There was a misconception in one of the groups that the child should be weaned at six months since that was the time he had received all the major immunizations. There was also a

misconception that when the baby cried a lot the mother had to give the baby a mixture of salt and sugar dissolved in water.

**Respondent:** “Sometimes the baby cries a lot and people say you can give water mixed with sugar and salt and by day you start giving other foods.”

This practice of giving the mixture indicated a tendency among mothers to start weaning children earlier than recommended. Some of the mothers also admitted that if they had weaned the older child earlier and nothing happened then they continued to wean the younger siblings at about the same age without taking into consideration the recommended age for weaning.

The majority of mothers learnt about breastfeeding from their very first experience. From the discussion below some mothers thought one did not really need to be taught.

**Researcher:** “Who taught you how to breastfeed on you very first experience?”

**Respondent:** “Is there anyone to teach you how to breastfeed really?”

[Laugh]

**Respondent:** “No one just myself.”

There was a general feeling that breastfeeding was a natural experience even for the first time mothers. Other than the mothers who were not taught, those mothers who were taught reported that it was not detailed teaching.

**Respondent:** “Yeah, you are taught, but just how to hold the baby while breastfeeding and you make sure you give the baby one breast until it is emptied, then you turn to

the other. The rest you learn by yourself.”

**Respondent:** “Once you give birth, your breasts start becoming full and you breastfeed.”

**Respondent:** “As you grow up and mature into marriage you see how other people do it; so when you get your baby somehow you know how to do it.”

However from the findings, it seemed that health workers, birth attendants and older relatives played a role in instructing new mothers. Friends and/or neighbours seemed to have the least influence.

**Respondent:** “There are many sources of information from which a mother can know how to breastfeed like clinic or even at home with the older mothers.”

The mothers had knowledge of the components of a balanced diet since the examples of foods were correctly listed under each category. The commonly listed examples indicated

foods that were usually available or commonly consumed. Avocados were in season during the time of data collection and thus appeared to be the most frequently listed source of vitamins in most groups.

During the discussion some of the mothers learnt that the foods they were consuming were regarded to have negative effects by others in the group.

**Respondent:** “A mother should take porridge most of the time because tea and coffee are not good. [**Respondent 2:** “Yeah, tea and coffee decrease the amount of milk...eeh I don’t know how but it always happens especially if you take a lot of it.”]”

The greater number of the mothers were unsure whether supplementation was necessary or not. Those who thought it would improve the health of the mother related it to past experience of supplementation during pregnancy, while others thought the matter would best be decided by the health workers. It was also noted that supplements were viewed as medicine.

**Respondent:** “You know sister, anything you take as medicine, it is good to be careful for you don’t know if it gets to the baby or not through the milk.”

**Respondent:** “If you tell us then we can take” [**Respondent 2:** “You know no one can refuse something that is beneficial to them.”]”

And if they were to be supplemented, it was suggested to be done in hospital due to the costs involved.

**Respondent:** “Yeah, I think they improve health so the mothers should be given in hospital.”  
[**Respondent 2:** “It is true because some mothers cannot afford, so the hospital should give them like they do to the children.”]”

When asked whether they thought it was important for mothers to be taught on how to eat while they were breastfeeding, mothers in all the groups felt it was important to be given more information on nutrition. However, again there was a tendency to view it more beneficial to the health of the child than to the health of the mother. This indicated that more mothers were concerned about the health of the child than their own health, even though the question was addressing the health of the mother. A summary of the findings on the knowledge on breastfeeding of the lactating women in the focus group discussions is given in the table 7.2

**Table 7.2** Findings on the knowledge on nutrition during breastfeeding of the lactating women in the focus group discussions

THEME AND SUB-THEMES	FINDINGS
<p><b>Knowledge on nutrition during breastfeeding</b></p> <p>The sub - themes were:</p> <p><b>7.2.1</b> Source of information on breastfeeding</p> <p><b>7.2.2</b> Components of a balanced diet</p> <p><b>7.2.3</b> Effect of Food/drink on Breastfeeding</p> <p><b>7.2.4</b> Importance of Vitamin/mineral supplementation</p> <p><b>7.2.5</b> Importance of nutrition education on breastfeeding</p>	<p><b>7.2.1 Source of information on breastfeeding</b></p> <p>Each of the women in the group gave information on who taught them on their very first experience</p> <ul style="list-style-type: none"> <li>- In all the groups at least five mothers were not taught. In two groups six mothers were not taught by anybody</li> <li>- In five of the groups at least one mother was taught by a health worker</li> <li>- In six of the groups at least one mother was taught by a relative and in one group one mother was taught by an older lady friend who was not a relative</li> </ul> <p><b>7.2.2 Components of a balanced diet</b></p> <ul style="list-style-type: none"> <li>- Ugali (maize meal) and rice were the most commonly mentioned carbohydrates by mothers in five groups</li> <li>- Beans, eggs, meat and milk were the commonly mentioned protein sources by mothers in four of the groups</li> <li>- Bananas, oranges and avocado were the most commonly mentioned vitamin source by mothers in three of the groups</li> </ul> <p><b>7.2.3 Effect of food/drink on breastfeeding</b></p> <ul style="list-style-type: none"> <li>- There were no definite number of times reported that a breastfeeding mother was expected to eat in a day. Neither was there an amount of water she was required to take. The amount of water consumed, had no effect on the quantity of breast milk produced</li> <li>- Fish, bone soup, mursik (locally fermented milk mixed with charcoal of a specific tree), honey and green bananas boiled in the skin were reported as foods that best promoted quick healing for the mother after child birth. It was also mentioned that as lactating mother required more energy, millet porridge mixed with cassava, a type of black beans (njahi), yams, sweet potatoes, soup, green bananas boiled in the skin and a variety of indigenous vegetables were recommended to increase the energy intake. It was mentioned that a breastfeeding mother needed to consume liver and water from cooked indigenous vegetables especially the black night shade and spider leaves to increase her blood formation and to replace the blood lost during childbirth</li> </ul>

Continued.../

	<ul style="list-style-type: none"> <li>- Mothers in three groups reported that there was no food that had any effect on the quality of the breast milk</li> <li>- Two groups reported they did not know much on the subject. Mothers of one group only mentioned that tea consumption dilutes the milk and makes it weak and watery</li> <li>- Millet porridge, amaranth, spider leaves, black beans (Njahi), black night shade, cocoa/chocolate, bone soup, pumpkin leaves,, and mursik (locally fermented milk), were mentioned by most of the groups as the foods regarded to increase the quantity of milk if consumed by the mother regularly. Tea and coffee were reported to reduce the amount of breast milk if consumed regularly or in large quantities</li> <li>- Cow pea leaves were also mentioned by mothers in one group to have a tendency to reduce the amount of breast milk</li> <li>- Mothers from six groups reported that they did not know of foods that had effect on the taste or smell of breast milk. Only one group mentioned that fish and onions were likely to affect both the taste and smell of breast milk, though not all mothers were in agreement. Some of the mothers in one group thought that in case there were any changes in taste and smell of breast milk, it was unlikely that the baby would realize it</li> </ul> <p><b>7.2.4 Importance of vitamin/mineral supplementation</b></p> <ul style="list-style-type: none"> <li>- Mothers in four groups reported that it would be a good idea to give vitamin/mineral supplements to the breastfeeding mother since it would improve the health of the mother</li> <li>- In all the groups there were mothers who were not sure whether supplementation was necessary or not. Mothers in one group thought it would be best decided by the health workers since they knew which medicines affected the baby if taken while breastfeeding</li> </ul> <p><b>7.2.5 Importance of nutrition education on breastfeeding</b></p> <ul style="list-style-type: none"> <li>- Mothers from all the groups reported that it was important for breastfeeding women to be taught on how to eat while breastfeeding since they would then know how best to feed their children and the children would be healthy</li> <li>- Mothers from one group indicated that they would teach others once they were taught</li> </ul>
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### 7.3 Cultural influence on breastfeeding

A summary of the findings on the cultural influences on breastfeeding of the lactating women in the focus group discussions is given in the table 7.3

**Table 7.3** Findings on the influence of cultural beliefs and practices on breastfeeding of the lactating women in the focus group discussions

THEME AND SUB-THEMES	FINDINGS
<p><b>7.3 Cultural influence on breastfeeding</b></p> <p>The sub - themes were:</p> <p><b>7.3.1</b> Activities expected / prohibited by the community while breastfeeding</p> <p><b>7.3.2</b> Foods allowed /prohibited by the community for a breastfeeding mother</p>	<p><b>7.3.1 Activities expected/prohibited by the community while breastfeeding</b></p> <ul style="list-style-type: none"> <li>- Mothers in all the groups reported that breastfeeding was a noble responsibility and a mother was not allowed too long before she started breastfeeding her baby</li> <li>- One of the groups indicated that the mother was expected to breastfeed her husband on one of the breasts as part of the noble responsibility</li> <li>- She would also avoid travelling a lot and instead stay home while all the other members of the family would ensure she ate and rested well since she had a noble responsibility to honour</li> <li>- Mothers in all the groups also reported that the breastfeeding mother was not allowed to do a lot of work outside or in the since the mother was not strong enough after childbirth</li> <li>- Mothers in one of the groups indicated that the breastfeeding mother was not allowed to have extra marital affairs since this was believed to have an effect on both the mother and the baby. Another group indicated that she was to avoid contact with her father-in-law and other older men as a sign of respect. It was also reported by one group that a breastfeeding mother was not to sit in the sun for too long. However, the reason for this was not known</li> <li>- It was also mentioned by one of the groups that mothers were advised to cover the baby while breastfeeding since in the community there were those people who had bad eyes which could cause something bad to happen if they looked at the baby</li> </ul> <p><b>7.3.2 Foods allowed/prohibited by the community for a breastfeeding mother</b></p> <ul style="list-style-type: none"> <li>- The foods that were given and the reasons are as indicate above (see sub-theme 7.2.3 on effect of foods consumed during breastfeeding)</li> </ul>

The mothers' responses revealed that communities had different beliefs (expectations or prohibitions) on breastfeeding. The women mentioned a number of their communities' expectations but pointed out that they were no longer highly valued since they were now staying in the urban areas. Expectations seemed to be fading with time.

**Respondent:** "Breastfeeding nowadays is just for you and your baby. The community does not care much as in the olden days. Even if someone decides not to breastfeed, no one really cares."

**Respondent:** "Some even hide their children when breastfeeding so no one bothers about the other."

**Respondent:** "You know at home people would come to visit you once they got the news, they would bring you gifts, some would bring you vegetables like 'terere' or 'sagaa.' But nowadays life is hard, who will bring you such here in town for free?"

Others reflected on the beliefs and practices of the olden days where they pointed out that some practices had been long forgotten.

**Respondent:** "Long ago, women were not supposed to eat eggs and some specific pieces of chicken, like the kidneys and wings, but ah, nowadays it is not so."

**Researcher:** "Why was it so?"

**Respondent:** "They said that if one ate while pregnant or breastfeeding the child would become rude and even when they were sent they would not go."

[Laugh]

It is worth noting that the mothers did not know the reasons behind some these expectations although they practised them anyway.

Some practices that were not part of the question were included, for example:

**Respondent:** "The mother should use *supanet* (mosquito net) when sleeping with the baby so that they do not get malaria."

Thus, indicating that the mothers had some knowledge on how to care for the baby.



## CHAPTER 8: DISCUSSION

This chapter gives an in depth discussion of the findings of this research study. It is divided into two main parts:

- Food intake and dietary adequacy
- Interactive factors

### 8.1 Food intake and dietary adequacy

Analysis was done to determine the usual food consumption of the women in the study group, the diversity and variety scores of their diets, the degree of individual and household hunger and the nutrient intake in relation to both the RDA and the WHO recommended standards.

#### 8.1.1 Usual food consumption of the study group

The information on the usual food consumption of the lactating women was collected using the QFFQ, the 24-H-RQ and the Hunger Scale. The data from QFFQ were used in the analysis of food frequency and of individual nutrients (*chapter 6, paragraph 6.6.1.1 and paragraph 6.6.1.2*), the 24-hr recall data were analysed for dietary diversity and food variety (*chapter 6, paragraph 6.6.2*), and the Hunger Scale information depicted the individual and household food security (*chapter 6, paragraph 6.6.3*). Figures (*figure 6.1- figure 6.8*) and tables (*Tables 6.21- 6.24*) were used to illustrate the nutrient intake of the women in this study group.

##### 8.1.1.1 Food frequency

The most commonly consumed food items by this study population were maize meal, (ugali) and rice by 100% of the sample. These were followed by githeri (mixture of maize and beans), kales and mandazi by 97 % of the sample. Tea (usually black/with little milk) was consumed on a daily basis by 96% of the sample. Other common foods that were taken frequently by more than 78% of the sample population were finger millet porridge, green bananas, white bread, cabbage and avocado.

Maize and beans are common foods consumed in Kenya. Maize availability considered synonymous with food security. Beans are very often consumed with maize.<sup>168</sup>

The 24 hr recall (*table 6.26*) also indicated that all the lactating women had eaten some kind of cereal mainly maize, wheat, millet and rice and all the women used cooking

oil/fat in their dishes. The other food items eaten by over half of the women sampled were kales (sukumawiki) and beans.

The findings of this study are in line with the report on the nutrition profile of Kenya by the Food and Nutrition Division, that maize is the basic staple of the Kenyan diet. *Ugali*, is a thick porridge of maize meal that is usually eaten with a sauce of vegetables or meat, or simply accompanied with fermented milk. Dishes of boiled maize and beans (*githeri*) and maize, beans, vegetables and potatoes (*irio*) are also common. Mashed plantain (*matoke*) is an alternative to maize. Other staples are cassava and sweet potatoes, and rice in urban areas.<sup>192</sup>

### 8.1.1.2 Dietary diversity and food variety

These are two of the score based methods used in evaluation of dietary patterns. The other score based methods are the food group patterning scores, the diet quality index, the healthy eating index, the recommended foods score and the mediterranean diet score. The other methods used in evaluation of dietary patterns are data driven methods which include factor analysis, principal component analysis and cluster analysis<sup>160</sup> (*Chapter 5, paragraph 5.10.1*). Studies have shown these score based tools to be useful tools<sup>164,165,166</sup> and further indicated that FVS is a poorer indicator of MAR than DDS. This also makes sense in nutritional terms since a high DDS corresponds to dietary recommendations in several countries, while this is not necessarily the case for FVS.<sup>166</sup>

Hatloy and others (in 2000) analysed the associations between the Food Variety Score (FVS), Dietary Diversity Score (DDS) and nutritional status of children as well as the associations between FVS, DDS and socioeconomic status (SES) on a household level and between urban and rural locations in Koutiala, Mali. This study concluded that food variety and dietary diversity seem to be associated with nutritional status (weight/age and height/age) of children in heterogeneous communities. Socio-economic factors seemed to be important determinants for FVS and DDS both in urban and rural areas. They conclude that FVS and DDS are useful variables in assessing the nutritional situation of households, particular in urban areas.<sup>169</sup>

In another study by Clausen et .al (in 2005) a higher food variety score was associated with improved physical and cognitive functioning in older adults in Botswana. This study led to development of a screening tool that predicts food variety in this population and its

recommendation to be incorporated at a primary care level to identify older adults most at risk of a poor quality diet.<sup>170</sup>

The food variety score results in this study showed that an average of seven food items were consumed by the lactating women during the 24 hr period out of a theoretical maximum of 45 food items, ranging from one food item to the maximum of 12 food items. The dietary diversity score results show that the food items were consumed from an average of four food groups which varied from two to six food groups in the sample. It can be concluded that a limited variety and diversity were experienced in the diet since both the food items and food groups were less than half of the theoretical number. (refer to chapter 6 paragraph 6.6.2.)

### **8.1.1.3 Household and individual food security**

#### **8.1.1.3.1 Household level security**

Household food security is internationally defined as the availability of food in one's home which one has access to. A household is considered food-secure when its members do not live in hunger or fear of starvation.<sup>171</sup>

In this study, half of the households reported food uncertainty, i.e. 61 households reported that they sometimes ran out of money to buy food, with 39 households having ran out of money to buy food sometime during the past month and of these, 25 households ran out of money to buy food for five days or more in that month. In addition, 47 households reported that sometimes they relied on a limited number of foods to feed their children because they were running out of money to buy food for a meal. Thirty four households relied on these limited number of foods in the past month and of these, 21 households relied on a limited number of foods to feed their children for five days or more in that month.

Food insecurity in Kenya is often seen as a problem of availability of food because of the poor performance of the agricultural sector, but problems of access to food also play an important role, because of inadequate market and transport infrastructure and low income and purchasing power due to poverty. An assessment conducted in July 2005 by the Government of Kenya and the World Food Programme indicated that there had been significant deterioration in household food security especially in most parts of north-eastern Kenya (Wajir, Garissa and Tana River districts) and in farming households in the south-eastern and coastal marginal districts.<sup>176</sup>

More recent data from the Kenya Integrated Household Budget Survey<sup>172</sup> show significant regional disparities within the country with levels of food poverty reported at over 90% in some areas of the country.

### **8.1.1.3.2 Individual level security**

Forty eight women indicated that sometimes they would cut the size of the meals or sometimes skip because there was not enough money for food. In the past month, this affected 34 mothers and of these 23 women had to cut the size of their meals or skip meals because there was not enough money for food for five or more days in that month. Sixty one women reported that they ate less than they felt they should when they did not have enough money to buy food and this happened to 41 of the women in the past month, with 29 women having had to eat less than they felt they should for five days or more in that month.

In the 1999 South African NFCS, where the same hunger scale questionnaire had been used, it was found that one in two households (52%) experienced hunger, one in four (23%) were at risk of hunger and only one in four households (25%) appeared food-secure. The NFCS indicated that a large majority of households were food-insecure and that energy deficit and micronutrient deficiencies were common, resulting in a high prevalence of stunting. These results were used as motivation for the introduction of mandatory fortification in South Africa.<sup>162</sup> More recent data show that large discrepancies in income between different ethnic groups of South Africans are still prevalent.<sup>173</sup> For instance, 57% of South Africans still live below the poverty index line (meaning that they spend some days in the week without food).<sup>174,175</sup>

These results then indicate that the problem of food insecurity is still prevalent in most households and in accordance with the report by the World Food Program (in 2005), hunger and malnutrition are in fact the number one risk to the health worldwide - greater than AIDS, malaria and tuberculosis combined - and more than 60% of chronically hungry people in the world are women<sup>176</sup>

### 8.1.1.3.3 Child hunger

When asked about how they fed their children, 33 women reported that their children ate less than they felt they should eat because they did not have enough money to buy food, 28 women reported that sometimes the children would say they were hungry because there was not enough food in the house, 26 women cut the size of the children's meals or they skipped meals because there was not enough money to buy food and 24 women reported that their children sometimes went to bed hungry because there was not enough money to buy food.

In the past month, children of 27 women ate less because there was not enough money to buy food and of these, children of 26 women were reported having eaten less for five days or more in that month. Twenty five women reported that their children sometimes would say they were hungry in the previous month because there was not enough food in the house with 22 women reporting that their children said they were hungry in five or more days during the month. Twenty three women cut the size of their children's meals or their children had to skip meals sometimes during the past month because there was not enough money to buy food with children of 20 of these women having had to cut the size or skip the meals for five days or more in the month. Children of 22 women were reported having gone to bed hungry sometimes in the past month with 18 of the women reporting that this happened for five days or more in that month.

These findings were in line with the nutrition profile report which revealed that Kenya is a low-income food-deficit country and that in 2004, it was estimated that more than 10 million Kenyans were experiencing chronic hunger, with only a small decline in absolute numbers over the ten-year period ending in 2002.<sup>176</sup> According to the food security update (2009), urban food insecurity was worsening and the reduction in disposable income had resulted in a precipitous decline in household food consumption in informal settlements in Nairobi and Mombasa.<sup>177</sup>

The food insecurity and vulnerability problems in the country are known to be compounded by high levels of poverty. An estimated 17 million people (56% of the population), of whom three-quarters are found in rural areas, were living below the poverty line in 2009. The urban livelihood is home to about 35% of the Kenyan population or about 12 million people. An estimated 5.7 million of these reside in slums, deriving most of their income from wage labour and small business.<sup>177</sup> The Kenyan economy was shown to have

performed poorly during the last two decades. Consequently, per capita income had been reported to decline and unemployment to rise.<sup>178</sup>

These findings also further indicated that in this low socio-economic area, there seemed to be disparities in food distribution, since the number of households that reported to be hungry (n= 44) were almost the same number as those that reported to be food secure (n=43). However, there was also a considerable number of households that were at risk of hunger (n=33). When the households that were reported to be hungry are combined with those at risk of hunger, there is more tendency to food insecurity in this study population.

In 2009, the Kenya Food Security Steering Group (KFSSG) estimated that about 2.5 million people, including an estimated 850,000 schoolchildren, in the pastoral, agro pastoral and marginal agricultural areas were affected by extended drought seasons. A further 150,000 people were displaced following the post-election crisis, about 1.9 million people were affected by HIV/AIDS, and 4.1 million urban poor were also highly food insecure. High food prices, endemic conflict, debilitating livestock and human disease, and floods compounded the impacts of drought, increasing markedly the number and categories of the highly food insecure.<sup>177</sup>

### **8.1.2 Nutrient intake of the study group in relation to the WHO recommendations**

Nutrient analysis was done on the data collected by QFFQ using the Nutrisurvey software programme (*Chapter 6, paragraph 6.6.1.2*). The nutrient analysis revealed that the macronutrients were consumed within the acceptable ranges but the micronutrients were consumed below the WHO recommendations<sup>46</sup> by some of the women as indicated below.

Only one woman met the RDA for calcium and 3% (n=4) met the RDA for zinc. All the rest of the women, 96% (n=116) had zinc intake levels between 5mg/day and 12mg/day. In the study group, 65% (n=78) of the women had vitamin A intake below the RDA; 84% (n=101) of the women had thiamine intake below RDA, 98% (n=118) of the women had riboflavin intake below the RDA and 63% (n=75) women had vitamin C intake below the RDA.

Further analysis of the nutrient adequacy by using the WHO recommendations to calculate the Mean adequacy Ratio (MAR), showed that all the ten nutrients investigated (*chapter 6, paragraph 6.6.1.3*) had individual Nutrient Adequacy Ratios (NAR) of less than 1 (*where the ideal cut-off for nutrient adequacy should be 1*), except for iron and this would be

so because the iron requirements during lactation decrease from 27mg/day in pregnancy to merely 12mg/day, compared to pre-pregnancy amounts of 18mg/day. Overall, the MAR was 0.74 where the ideal cut-off for nutrient adequacy should be 1, which would mean that all the nutrients were consumed in sufficient/adequate amounts..

In 2000, a study done among mothers aged 15 to 49 years on vitamin A in Kenya, revealed that 12% experienced night blindness during their last pregnancy. However, the prevalence varied moderately by region.<sup>179</sup> Data from a local study conducted in Nandi district showed that 78% of breastfeeding mothers had a low level of retinol in breast milk (<1.05  $\mu\text{mol/L}$ ).<sup>180</sup>

Other micronutrients that have been studied on women in Kenya are iron and iodine. The 1999 national micronutrient survey found 43% of women to be iron deficient. The survey identified the factors associated with this deficiency as a staple diet of low bio availability potential, reduced food security during the dry season and malaria infection (each associated with two fold increase in maternal and child anaemia). In addition, diarrhoea, family size and a mother's iron status were associated with a two fold increase in childhood anaemia.<sup>181</sup>

Data on iodine deficiency <sup>182</sup> indicated an improvement from 16% deficiency in 1994 to 6% in 2004, attributed to the consumption of iodized salt by a large proportion of Kenyan households although regional disparities persisted with districts in the coastal region having inadequate intake as compared to central and the midlands with excessive intake. A new national survey on micronutrients is required as also recommended by UNICEF (2009).<sup>183</sup>

Data from this research study indicate a limited food variety and dietary diversity, the lactating women consumed diets below RDA and WHO recommendations and the majority of the households (64%) reported food insecurity. Therefore it can be concluded that nutrient intake of the lactating woman was not adequate. Similar observations that have been made previously in the reports on the Kenya nutrition profile that undernutrition in Kenya is associated with widespread micronutrient deficiencies and more long-term strategies are needed such as fortification, dietary diversification and nutritional education.<sup>192</sup>

## 8.2 Interactive factors

These were the components that were additionally considered to give meaning to the assessment of the dietary intake of the study group. They include:

- Nutrition knowledge
- Socio-economic factors
- Health status indicators
- Cultural factors

### 8.2.1 Nutrition knowledge of the study group

Nutrition knowledge of the mothers was assessed by making use of questionnaire (*Appendix E*). The analysis (*chapter 6, paragraph 6.7*) revealed that over half of the women (n=67) had good nutrition knowledge. Forty five women had very good nutrition knowledge, whereas eight women had poor nutrition knowledge. Three women scored zero indicating that they did not give any correct answer to the questions asked. The responses to the questions also revealed that for every question asked, five women did not know what the answer could be.

The education level was assessed as part of the socio-bio demographic questionnaire (*Appendix A*). It was revealed that the majority of the women had received high school (43%) and upper primary education (41%); 11% of the women had reached tertiary level while 6% of the women had lower primary education (*chapter 6, paragraph 6.1*). It can be concluded that the majority of the women (94 %) had at least upper primary education. One could assume that they should at least be knowledgeable about basic nutrition.

The focus group discussions conducted during this study (*chapter 5, paragraph 5.9.2.1*) revealed that the mothers had the information that six months was the recommended duration of exclusive breastfeeding and the majority of them reported that they had been taught in the clinic. However, all the seven groups at least five mothers in each group were not taught about breastfeeding by anybody during their very first experience. In five of the groups at least one mother was taught by a health worker and in six of the groups at least one mother was taught by a relative. Only one group had a mother who was taught by an older lady friend who was not a relative.

Mothers in four of the groups reported that it would be a good idea to give vitamin/mineral supplements to the breastfeeding mother since it would improve the health of the mother, but in all the groups there were mothers who were not sure whether



supplementation was necessary or not. Mothers of one group thought it would be best decided by the health workers since they knew that some medicines affected the baby if taken while breastfeeding.

Mothers from all the groups in this study were willing to be taught on how to eat while breastfeeding since they would like to know how best to feed their children to be healthy and mothers from one group indicated that they would teach others once they were taught.

From the analysis of the nutrition knowledge questionnaire, responses to the following three questions revealed lack of knowledge on the nutrition concept by more than half of the study group, and could be used as key areas when planning a nutrition education program for the mothers in this study area.

**Question 3 (Do vitamins provide energy?):** Eighty-nine women gave a wrong answer to this question indicating that a great number of the women thought that vitamins provide energy. In addition, six women did not know the answer to this question. This gives a total of 95 women (79% of the study group) who did not know the correct answer to this question. Considering that question 2 (*Vitamins and minerals are essential for growth of Children*) and question 8 (*Fruit and vegetable are the best sources of vitamin and minerals*), were correctly answered by the majority (n=107), there seemed to be evidence that as much as most of the women knew the sources of vitamins and minerals they did not know the functions these vitamins played in the human body.

**Question 4 (Are most vitamins and minerals lost during cooking?):** Fifty nine women gave a wrong answer to this question indicating that a great number of the women thought that most vitamins and minerals are lost during cooking of food. Fourteen women did not know the answer to this question. This gives a total of 73 (61% of the study group) women who did not know the correct answer to this question.

**Question 11 (Do you think intake of more water during breastfeeding increases the amount of milk?):** This was the question that had the highest number (n=22) of women who did not know the answer, in addition 54 women gave the wrong answer thus 78 women (65% of the study group) did not know that the intake of water during breastfeeding did not increase the amount of breast milk produced. Due to the fact that this aspect will influence their breastfeeding practice it would be important that the mothers are given nutrition education on this issue.

However, it is of significant importance to note that the same question was presented during the focus group discussions and was answered correctly. It may be assumed that the mothers who did not answer in the questionnaire also did not answer during the focus group discussion or on the other hand, only those who knew the answer attended in the discussion.

It is important to note that the majority of the mothers who were answering these questions had received high school and upper primary education as revealed by their demographic data. Thirteen women had reached tertiary level while only seven women had lower primary education.

The results show that interaction between the perception of hunger (Hunger scale and nutrient intake scores) and nutrient intake was positive ( $f = 0.05$ ;  $prob > f = 0.82$  and  $f = 0.07$ ;  $prob > f = 0.93$ , respectively). but when combined the interaction between perception of hunger and nutrition knowledge on nutrient intake was not positive ( $f = 0.13$ ;  $prob > f = 0.88$ ) (Refer to table 6.34). This information is in agreement with the observations made during the study in Kibera slum area in Nairobi by Waihenya et al (in 1996). They found that though most mothers (97.5%) had access to nutrition education there was no significant relationship between the nutritional status of their pre-school children and overall nutritional knowledge.<sup>101</sup> The Kenyan nutrition profile report also indicated similar observations that duration of breastfeeding did not vary by urban/rural sector, and education only had a modest influence; uneducated mothers breastfed for about four months more than educated mothers.<sup>190</sup>

## 8.2.2 Socio-economic factors

For persons living in urban areas, food access hinges primarily on the household's ability to purchase food. Most urban poor neither have large food stores, nor do they have access to areas for own food.<sup>184</sup> This is evident from the socio-bio demographic data of this research study where the market and garden were the only two food sources that were reported with majority of the women (n=118) obtaining their food from the market.(refer to table 6.4)

Those who spent the least amount of money (Ksh. 0-50) had a lower MAR as compared to those who spent more, however there was no significant difference in MAR in all the expenditure categories (refer to table 6.10.)

The interaction between the nutrition knowledge, money spent on food per day and their influence on MAR (refer to table 6.11) concluded that nutrition knowledge had a greater influence on MAR ( $f = 0.06$ ;  $Prob > 0.9409$ ), as compared to the daily expenditure on food ( $f$

= 0.50;  $Prob>f = 0.8089$ ). However the interaction of both factors combined did not show significant influence on the nutrient intake. Each of the factors had an influence on the nutrient intake but in varying degree.

The influence of daily expenditure on MAR ( $\alpha = 0.05$ ) where  $f = 0.04$  and  $prob>f = 0.9998$  (close to 1) was significant whereas employment status had no significant interaction with the nutrient intake. ( $f=0.14$ ;  $prob>f=0.25$ ) (Refer to table 6.14) and when both factors were combined, the money spent on food per day and employment status had no significant interaction with the nutrient intake. ( $f=0.79$ ;  $prob>f=0.70$ ) (refer to table 6.15)

Some of the women did not actually know how much money was available for daily expenditure of food, because most of them were housewives and could only get money for food from the spouse or parents but could not calculate how much they spent in total and/or their spouses did casual work and thus bought food out of daily income. This information is in line with the findings of a survey done on urban dietary patterns by Maxwell, and co-workers (2000) that revealed that the urban poor often paid more for food purchases than did their wealthier urban counterparts, as they were obliged to buy small quantities daily because they did not have the resources or living conditions which permitted them to purchase and store large quantities of food at home.<sup>185</sup>

Another study done in Kenya that compared the frequency and types of street food purchased by individuals from different socio-economic strata showed that persons living in slum areas consumed street foods more often than families living in a low-middle income neighbourhood. The fact that street foods were inexpensive was a major purchasing incentive.<sup>186</sup> Therefore, since almost all food access in the urban areas is by means of purchase, the urban poor have to struggle to raise money for food.

Another update report on food security in Kenya (in 2009) indicated that a significant proportion of urban dwellers lost their livelihoods after businesses failed to reopen or operate at normal levels following the post-election crisis of December 2007 to January 2008. Income sources and wage rates in particular, remained static as the supply of labour increased, while food and non-food prices increased by over 100 %, also due to failure of long rains in 2008 in the central highlands, eastern and coastal lowlands. Preliminary results from a rapid urban assessment, conducted in December 2008 by the Kenya Food Security Steering Group (KFSSG), indicated that households were sacrificing medical, education, transport, and other important non-food needs, further entrenching chronic food insecurity.<sup>177</sup>

The socio-economic profile of this study group was characterised by a greater number of the women living in tin dwellings (n=81), stone (n=21) or brick dwellings (n=11). Four women reported to be living in mud dwellings and three women in wooden dwellings (*refer to table 6.4*).

The most commonly used main source of fuel among the lactating women was the paraffin stove (n=87) followed by gas by 19 women. Three women used electricity and two women used firewood. However, more than one source of fuel was reported by majority of the women. (*Chapter 6, Paragraph 6.3.*)

Similar observations on the sources of fuel among low income households were made by SPARKNET (*an organisation that deals with the knowledge network on energy for low income households in Southern and East Africa*), in their country report on Kenya (2009) they indicated that around 80% of charcoal produced is utilised in urban centres. Although kerosene is available very widely and used for some cooking tasks mostly on wick stoves, it is not typically a primary cooking fuel. Gas and electricity are used for cooking mainly by high income groups. Coal is not available as a household fuel in Kenya.<sup>187</sup>

It is therefore important to note that dietary intake among the urban poor is greatly influenced by price since they have to buy food and non-food items. This is revealed by the influence of daily expenditure on mean adequacy ratio and during the focus group discussions, while mothers from all the groups agreed that a breastfeeding woman would eat whenever she was hungry. Mothers from two groups indicated that she could eat as much as she could afford. Food variety and dietary diversity is also limited (*see paragraph 8.2.1.2*). It can be therefore concluded that the socio-economic status influenced the nutrient intake of the lactating mother in this study group.

### **8.2.3 Effect of cultural beliefs and practices on the nutrient intake of the lactating women in the study group**

The family structure, interactions and social values are important influences on development of food habits and dietary patterns. Individual preferences differ according to the culture in which one is brought up.<sup>154</sup> A study by Kruger and Gericke (in 1999) on breastfeeding practices of mothers with children (aged 0-36 months) in a rural area of South Africa showed that strict cultural beliefs and practices further impeded the quality of the feeding practices of the children (e.g. discarding colostrum and a consequent perception of inadequate milk flow).

The findings from the focus group discussions in this study (*chapter 7, paragraph 7.2.3*) also revealed that cultural beliefs and practices had an effect on the nutrient intake of the women. Consumption of some foods was believed to have a positive effect on the health of the breastfeeding mother. Fish, bone soup, mursik (locally fermented milk mixed with charcoal of a specific tree), honey and green bananas boiled in the skin were reported as foods that best promoted quick healing of the mother after child birth. Millet porridge mixed with cassava, a type of black beans (njahi), yams, sweet potatoes, soup, green bananas boiled in the skin and a variety of indigenous vegetables were recommended to increase the energy level which the mother needs during lactation. The consumption of liver and water from cooked indigenous vegetables, especially the black night shade and spider leaves, were reported to increase the mother's blood formation to replace the blood lost during childbirth.

Some foods were believed to have an effect on the quality and quantity of breast milk. For example, consumption of tea was believed to dilute breast milk. However, majority of the women did not know much about the effect on quality of the breast milk but had more information on the effect on the quantity of breast milk. Consumption of millet porridge, amaranth, spider leaves, black beans (njahi), black night shade, cocoa/chocolate, bone soup, pumpkin leaves and mursik (locally fermented milk) were believed to increase the quantity of milk if consumed by the mother regularly. On the other hand, consumption of tea, coffee and cow pea leaves was reported to reduce the amount of breast milk.

Mothers from only one group mentioned that the consumption of fish and onions were likely to affect both the taste and smell of breast milk. However, the mothers in all the other groups did not know much about any of the food items.

It was also evident that reasons for some beliefs and practices were not well known to the mothers and they practised them without knowing why they were practised. A similar observation was made when mothers discussed nutrition knowledge, where they followed advice given by the health worker but did not know the reason why.

Activities allowed or prohibited by the community regarding the breastfeeding mother were also discussed and the data revealed that mothers from all the groups agreed that breastfeeding was a noble task and that a mother was not allowed to take too long before breastfeeding her baby. In addition, responses from one of the groups indicated that the mother was expected to breastfeed her husband on one of the breasts as part of the noble responsibility. She would also avoid travelling a lot and instead stay home while all the other members of the family would ensure that she ate and rested well since she had this noble responsibility.

Mothers from all the groups also reported that the breastfeeding mother was not allowed to do a lot of work in the home or outside since she was not strong enough after childbirth. Mothers from one of the groups also indicated that the breastfeeding mother was not allowed to have extra marital affairs since this was believed to have effect on both the mother and the baby. Another group indicated that she was to avoid contact with her father-in-law and other older men as a sign of respect. It was also reported by one group that a breastfeeding mother was not to sit in the sun for too long. However, the reason for this was not known. It was mentioned by one of the groups that mothers were advised to cover the baby while breastfeeding since in the community there were those people who had bad eyes and could cause something bad to happen if they looked at the baby.

These activities and restrictions revealed that some practices were demanding and could impact negatively on the mother's health, for example breastfeeding both the child and the husband. However, most of the activities promoted the health and well-being of the mother and child. Some communities ensured that the breastfeeding mother could get enough rest, eat well, and feed the baby timely. However, it was not clear whether the practice of the mother having enough rest was cultural or whether they had gained it from education at the clinic. Some mothers explained that it was not practical for them to rest as they were the bread winners at home. Others cultural practices that would ensure hygiene and proper care of the mother and the baby were covering the baby while breastfeeding, avoiding extra marital affairs and how the mother would behave in front of the father-in-law and other older men. These too would ensure good morals.

Kibera, being the largest urban informal settlement on the African continent with a population of over one million people,<sup>188</sup> it is a metropolitan area and some practices had been borrowed from other communities, i.e. acculturation. For example, Kibera is an area with a vast Arab and Islam influence and the practice of fully covering the baby while breastfeeding is common with the Islam communities. Mothers from other communities also covered the baby but they all did this for different reasons.

During the discussions, the mothers reported that some practices had long stopped as they were practised during the olden days; others were stopped since they moved to the urban settlement and were not living with the older people who would then encourage them. This is evident from their socio-demographic information where 102 women in the study group reported that they were living with their spouses and only one woman was living with both the spouse and parents. It is also evident from their source of encouragement where over half of the women studied (n=66) received encouragement from the health workers while ten

women received encouragement from their spouses, eight women from their parents and four women received encouragement from their friends.

The results of the focus group discussions revealed both activities and foods that were either allowed or prohibited culturally, it can therefore be concluded that cultural beliefs and practices influenced the nutrient intake of the women in this study group.

#### 8.2.4 Health status

Adequate dietary intake is essential for good nutrition. It may however not be sufficient or well utilized, because of the presence of disease which can result in reduced bioavailability or increased needs or nutrient losses and thus can also be an immediate cause of malnutrition.<sup>233</sup>

In this study group health status indicators investigated were anthropometry, responses on number of visits to in or outpatient clinics in the previous month and if the women followed a special diet. HIV/AIDS, tuberculosis, sexually transmitted infections are reported to be rampant in this low socio-economic settlement,<sup>189</sup> but they were not considered extensively in this research study.

In anthropometry, the weight and height of the lactating women were measured and BMI values calculated (*chapter 6, paragraph 6.2.2*). The majority of the mothers (98%) in this study had BMI within healthful ranges; none of them had BMI above 30kg/m<sup>2</sup>. As mentioned earlier (*chapter 2 paragraph 2.2.4*), the rate at which a woman (lactating or not) returns to her pre-pregnancy weight after delivery is affected by many factors and the reason why some women retain weight gained from pregnancy is not fully understood.<sup>69</sup>

A national survey report on the anthropometry of adult women in Kenya in 2003 indicated that only 1% of adult women were stunted (height <1.45m), but more than one out of ten (12%) had a body mass index <18.5kg/m<sup>2</sup>, defining chronic energy deficiency (CED). The prevalence of CED was the highest among young women aged 15-19 years, reaching 20%. Women living in rural areas were much more likely to suffer from CED than urban women (15% and 5% respectively). Food deficits were noted to be common in the North-Eastern province and this affected the nutritional status of women living in this area. There was an inverse relationship between educational level and CED: only 6% of women with secondary or higher education level were affected.<sup>190</sup>

Between 1998 and 2003, no drop in malnutrition among women was observed.<sup>190</sup> In comparison with data from 1993, the nutritional status of women worsened slightly, with prevalence increasing from 9% to 12%.<sup>190</sup> In 2003, almost one-quarter of women were

overweight or obese. A positive trend was observed with advancing age. Prevalence of overweight and obesity were much higher in the urban sector (38%) as compared to only 18% in the rural sector.<sup>190</sup> Estimates taken from the Surveillance of chronic disease Risk Factor by the WHO (SuRF report, 2005) were similar.<sup>191</sup> The representativeness of the data was however not documented. The data suggest that the urban population of Kenya was starting to be affected by the nutrition transition.<sup>192</sup>

The results of this study showed that 63% of the women interviewed had not visited an outpatient clinic in the past month and 89% of the women had not been hospitalized in the past month.

The women were asked if they were following any special diet. 97% of the women reported that they did not follow any special diet, while four women had a special diet they followed. Of the four women, one had a slimming diet, another was allergic to eggs thus followed a special diet, and two women had other diets that were not in any of the categories listed. Since a greater number was not on any special diet, it was not of great influence on the nutrient intake. As mentioned earlier (*paragraph 8.1*) the majority of the mothers in this study had BMI within healthful ranges; none of them had BMI above 30kg/m<sup>2</sup> and moreover BMI classification is not a good indicator in lactation as there are many factors that influence the rate at which a woman (lactating or not) returns to her pre-pregnancy weight after delivery.<sup>69</sup>

Gina in her study (in 2005) on food security in the context of urban Sub-Sahara Africa reported that poor slum areas are the least serviced in terms of water and sanitation facilities.<sup>184</sup> This is also true for the study site of this research. The majority of the women (n=91) reported that the communal tap was their main source of water, two women had a borehole while 20 women got their water from their own taps. However even for those who reported having their own tap, twelve women also used communal tap sometimes.

Generally, previous reports from Multi Indicator Cluster Survey (MICS, 2000) and Kenya Demographic and Health Survey (KDHS,1989), (1993) and (1998) showed that there had been no improvement in access to improved water sources in Kenya in the past decade and that most of the rural population still used only unprotected wells, springs and boreholes.<sup>193</sup> However, 89 % of the urban population and 46% of the rural population have access to a sustainable, improved watersource.<sup>192</sup> As a result of the unofficial status of the settlement, there are few government or social services available to the residents of Kibera<sup>189</sup>



The number of visits to the clinic for inpatient and outpatient services, source of encouragement during breastfeeding and consumption of special diet did not reveal significant influence on the nutrient intake. It can therefore be concluded that health status and wellbeing of the mother did not affect the nutrient intake of the lactating women in this study group.

## CHAPTER 9: EXECUTIVE SUMMARY AND RECOMENDATIONS

*A mother is a person who seeing there are only four pieces of pie for five people, promptly announces she never did care for a pie. A mother's love is like nothing else in the world. It knows no law, no pity. It dares all things and crushes down remorselessly all that stands in its path.*

*Mother is the dearest one on earth.*

**Agatha Christie (1890-1976)**

These words by Agatha Christie, English novelist and playwright,<sup>194</sup> summarise the important role of the mother in society. During the period of great susceptibility and most rapid development in a child's life, a huge responsibility is in the mother's hands<sup>195</sup>

The essence of this study is to better understand the influence of the maternal depletion syndrome on the nutritional status of lactating women. The maternal depletion syndrome is defined as a broad pattern of maternal malnutrition resulting from the combined effects of dietary inadequacy, heavy workloads, and energetic costs of repeated rounds of reproduction.

The aim of the study was to obtain data on the adequacy of the diet and nutrition knowledge of lactating women (0-6 months postpartum) living in a low socio-economic area in Nairobi. The study site was the Mbagathi District Hospital, located at the edge of the Kibera slum area. Lactating mothers, visiting the Maternal-Child Health Clinic to bring their children for immunisation, were recruited and informed consent was obtained in their home tongue. Convenience sampling was used (N=120). The findings of the study could be used in future nutrition interventions in the mentioned area to improve the health status of lactating mothers.

The UNICEF conceptual framework for malnutrition was useful in reflecting on the interactive factors that could affect nutritional status and there by the many dimensions of the malnutrition problem were considered.

A cross-sectional survey in the quantitative and qualitative research paradigms was undertaken. Individual interviews in Swahili, using structured questionnaires (Socio bio-demographic questionnaire, Hunger Scale, 24 Hr-recall, and Quantitative food frequency questionnaire), and anthropometry (according to standard procedure) were done in the quantitative domain. Seven structured focus group discussions were employed in the qualitative domain. Descriptive and inferential statistics were used on the quantitative data

and Krueger's framework of analysis on the qualitative data. Ethical approval was obtained from the Ethics committee, Faculty of Natural and Agricultural Sciences, University of Pretoria; *Ref no EC O80922-039*, and research permission was granted by the National Council for Science and Technology, Nairobi; *Permit no NCST/5/002/R/355*.

Specific research hypotheses were set (Chapter 5, *paragraph 5.4*) and are reflected on in this summary.

The present study indicates that:

- ❖ The nutrient intake of the lactating women in the low socio-economic area was not adequate. While it is clear that all the women consumed macronutrients within the acceptable distribution ranges, consumption of the key micronutrients considered during the study was found to be lower than the recommended dietary allowances. The lactating women consumed a limited variety of foods and in less amounts than they should during lactation. This was best illustrated by the responses on the Hunger Scale, the individual dietary diversity and food variety scores, the food frequency and the focus group discussions. It was also reported during the focus group discussions that the mother often sacrificed her food intake for the sake of the other children in the household.
  
- ❖ Nutrition knowledge of the lactating mother influenced her nutrient intake. The nutrition knowledge scores indicated that the majority (93%) of the women in this study group had good basic nutrition knowledge. However, further analysis of the questions revealed that they did not understand the nutrition concepts well. During the focus group discussions, some of the mothers were surprised when their counterparts cited foods that they knew should be avoided during lactation. It was also noted during the discussions that the advantages of breastfeeding to the baby were more obviously stated than the advantages of breastfeeding to the mother. This was in addition to the fact that the majority of the women thought that breastfeeding was a natural experience and that they did not need to be taught by anyone thus revealing that they put more attention to the care of the child than to themselves. As long as the child breastfed they were satisfied, not knowing what effect breastfeeding had on their own nutritional status. Improvement of nutrition knowledge among the women will probably improve their nutrient intake as this will positively impact on the food

purchases and preparation, and the attention they pay to their own food consumption while lactating.

- ❖ The socio-economic status of the mother determined the nutrient intake of the lactating woman. This was demonstrated by the fact that the women obtained virtually all their food from the market. The majority of the women were housewives and/or depended on their spouses or family members who were casual labourers and thus could not even project how much income they had to spend on food per month. There were women who spent as little as fifty shillings (Kenyan currency) on food purchases for the household for the day. From the analysis the majority of the households were reported to be ‘hungry’ or ‘at risk of hunger.’ The major sources of fuel were the paraffin stove and charcoal and the major type of dwelling was tin. This then best illustrated the income level of the women. Bearing in mind that they purchased all foods for the household, it could be concluded that the foods were purchased for survival and not so much for their nutrient contribution to health. The results also indicated that daily expenditure on food had a significant effect on nutrient intake. In the focus groups when mothers were asked if they thought it was important to be given vitamin and mineral supplements, some of the women thought it was essential to be given the supplements and suggested that the hospital should provide them for free since they could not afford them. This confirmed that as much as the women would like to achieve good nutrient intake, socio-economic status was a hindrance.
  
- ❖ The health status and well-being of the mother probably affected her nutrient intake. Although the results showed that the visits to the outpatient and inpatient clinics had no significant effect on the nutrient intake of the women in this study group, there were women who had been sick in the past month. The fact that some women had not visited the clinic did not mean that they had not been unwell in the past month. There were women in the study group who had BMI levels lower than 18.5 kg/m<sup>2</sup>, indicating that their health status was poor for lactation. The majority of the women reported the communal tap to be their main source of water and even the few who used their own taps also indicated that sometimes they used water from communal taps. Knowing that this environment is polluted by soot, dust, human and animal faeces and open sewages, use of water from a communal tap is a risk that could cause disease.<sup>188</sup>

- ❖ Cultural beliefs and practices affected the nutrient intake of the lactating mother. The data revealed that regardless of the fact that the women in this study group had moved from their rural homes to the urban area, they knew much of their culture and what it required of them while breastfeeding. Different cultures had different requirements regarding foods, implying that the women would also have varying nutrient intake according to the foods allowed or prohibited by their own culture. It was also observed that they held on to the beliefs and practices whether they knew why they were to follow them or not. Foods were listed that were allowed. Those that were prohibited during breastfeeding implied that the women missed out on the nutrients of the foods that were prohibited by culture. Some foods were linked to the functions they were known to play in the health of the mother and therefore allowed, for example, blood formation, promotion of wound healing after child birth and provision of energy needed for breastfeeding. Other foods were avoided as they were believed to affect the smell and taste of breast milk. This practice limited dietary diversity since the women would eat continually from the foods allowed while avoiding the foods prohibited thereby limiting variety and diversity in the diet. Some cultural practices also promoted good nutrient intake such as those ensuring the mother rested and ate well. This was also observed when some women were escorted to the clinic by their partners, helping them to carry the baby to the clinic for immunisation.

## **Recommendations**

The observations made in this research study revealed that there are opportunities that could be used to improve the nutritional status of lactating women living in this low income area. Nutrition interventions should be geared towards improving both the nutrition knowledge and the nutrient intake of the lactating women. As it has been observed before, the problem of undernutrition in Kenya mainly lies with micronutrient deficiencies.<sup>192</sup> This was also observed in this research study and measures need to be taken to curb micronutrient deficiencies among lactating women in low socio-economic areas in Kenya, especially among the urban poor, who are among the most vulnerable livelihood groups together with the pastoral and marginal agricultural households.<sup>177</sup>

Improvement of nutrition knowledge is feasible because:

- The majority of the women had either acquired high school or upper primary education. The UNESCO definition of education stipulates that a minimum of three years of uninterrupted schooling is required for a person to achieve a sustainable level of reading and writing ability.<sup>192</sup> Even to those who have a low education level the information could be explained to them in a way they would understand.
- The research showed that the majority of the women had good basic knowledge on nutrition. They needed further understanding of nutrition concepts which then would promote their understanding and practices. However, some women also needed the basic knowledge as they were not able to answer any of the questions. The majority of the women understood the benefits of breastfeeding to the baby but did not know benefits of breastfeeding to the mother. Therefore nutrition education materials should be developed that promote easy understanding and yet give a clear picture of the importance of good nutrition during lactation and how it can be achieved.
- Health workers were reported to have a significant influence on providing encouragement to the lactating mothers and thus would be a good channel to provide the nutrition education. It was observed that mothers were taught at the clinic in Mbagathi hospital as they brought their children for immunization. This opportunity should be expanded to cover more nutrition topics.
- Nutrition education could also be done in the clinics in the slum area as part of an outreach program. Thus those mothers who are not able to attend the clinic at the Mbagathi hospital would be reached. A proper needs assessment should underpin such an outreach program.
- Most of the women reported that they were staying with their spouses. However only a few spouses were reported to have provided encouragement. Nutrition education offered for the spouses will promote understanding and support from the spouses regarding the importance of healthful eating of the lactating wife including food accessibility.

Improvement in nutrient intake could be done by:

On the macro and meso-levels:

- The provision of more of the essential services in the settlement such as water, fuel, housing and education is a long term strategy that will ensure the women to live in a clean and safe environment, and thus controls disease that hampers nutrient intake.

Currently Kibera is undergoing a slum upgrading process since 2001. The government, UN-HABITAT and a contingent of Non-Governmental Organizations (NGOs) are making inroads into the settlements in an attempt to facelift the housing and sanitary conditions. However, there is unmatched demand for the services among other challenges due to the large population.<sup>196</sup>

On the macro, meso and micro-levels:

- Education opportunities to girls and women will also improve their nutrition knowledge which will consequently improve nutrient intake of all household members since food purchase and preparation are done chiefly by the women. It was affirmed by heads of state in 2000 during the signing of Millennium Declaration of Human Rights that educating girls is a powerful and necessary tool in reducing poverty and achieving human rights. Education has a profound effect on girls' and women's ability to claim other rights and achieve status in society, such as economic independence and political representation.<sup>197</sup> Also, a need exists for establishing a nutrition education activity in maternal and child health centres in order to teach women better methods of feeding themselves during pregnancy and lactation, as well as and their infants before and throughout the weaning period.
- Improving food accessibility in the urban area: Knowing that the steep deterioration in food security over the past few months in Kenya due to poor weather conditions and the effects of post-election violence is the result of fragile livelihoods being subjected to a multiplicity of shocks over a short period of time, the Government should consider food supply also to the urban poor who are not adequately cushioned by current government measures intended to provide subsidised maize to low-income areas.<sup>131</sup> The very needy households should be identified and food supply provided. It has to be borne in mind that some regions of the country require a mix of emergency and medium-term food and non-food interventions that mitigate urgent needs while the resilience of livelihoods is concurrently being restored.
- The Women's Dietary Diversity Project (WDDP), a collaborative research initiative carried out by Food and Nutrition Technical Assistance (FANTA) to assess the potential of simple indicators of dietary diversity, would be of much value if done among women in Kenya alongside the other sites in Bangladesh, Burkina Faso, Mali, Mozambique and the Philippines to function as proxy indicators of the micronutrient adequacy of women's diets in resource-poor areas.<sup>198</sup>

- Food fortification of the commonly consumed foods like maize meal, bean products, millet flour and rice which were found to be the most common foods consumed in this group. As indicated earlier (*paragraph 8.2.2*) data on iodine deficiency indicated an improvement from 16% deficiency in 1994 to 6% in 2004. This decrease is attributed to the consumption of iodized salt by a large proportion of Kenyan households. However, the FAO and WFP 2005 nutrition profile reports on Kenya (the latest available) revealed that iodine deficiency disorders were still prevalent and regional disparities persisted and that the national program of iodisation of salt needed to be evaluated. Vitamin A deficiency and iron deficiency anaemia were both highly prevalent in the country since the implementation of supplementation in vitamin A and iron. The initiative seemed to be insufficient at that point in time. More long-term strategies are needed such as fortification, dietary diversification and nutrition education.<sup>176</sup>
- Provision of employment or ways of creating employment among the urban poor: It is well known that purchasing capacities are constrained in this study area by the impact of rising food prices and further by lingering impacts of the post-election crisis, in which several businesses that offered employment to people in informal settlements failed to reopen or do not operate at previous capacities.<sup>177</sup> Empowering the people in this settlement to operate businesses or community-based projects is a big step towards poverty alleviation that needs to be considered by the government. This will provide them with resources needed to purchase food and thus increase nutrient intake.
- Encouraging food production activities: The urban poor do not have enough land to grow food for the household, but youth projects such as growing vegetables in sacks filled with soil being done in Kibera (*see appendix M*) should be encouraged and supported as a way of food production and a way of generating income.
- Discouraging cultural practices that hamper nutrient intake or that place heavy demands upon the health of lactating mother will also improve nutrient intake.



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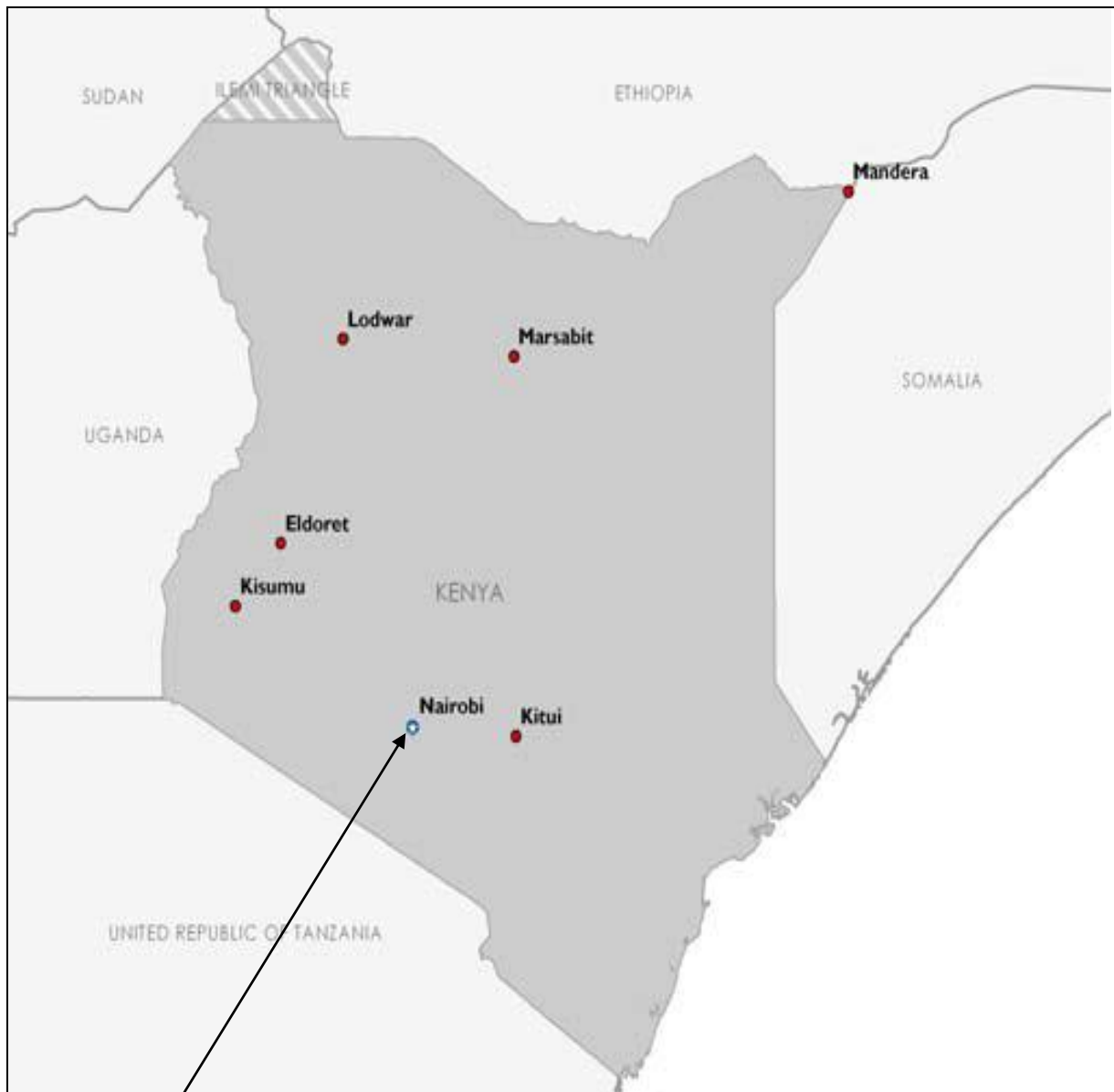


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# APPENDICES

## Map of Kenya

COUNTRY WHERE THE STUDY WAS CONDUCTED



The study was carried out in Nairobi, the capital city of Kenya.



**YOUTH PROJECT: PLANTING VEGETABLES (*kales-sukumawiki*) IN SACKS FOR FOOD AND AS AN INCOME GENERATING ACTIVITY IN KIBERA.**



**OTHER SOCIO-ECONOMIC ACTIVITIES IN KIBERA**



Toi market.





Roadside grocery stalls



Roadside shoe makers (makina)



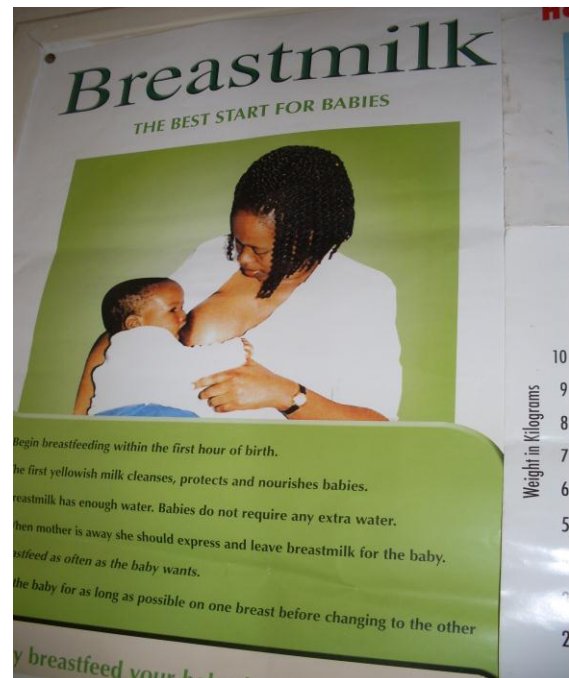
## DURING DATA COLLECTION



Anita Nyaboke (researcher) and Felistus Nyangwara (nurse) at MCH clinic Mbagathi during data collection period.



Jackline cleaning up MCH clinic at the end of the day's work.



Nutrition poster displayed at the clinic to add to knowledge on breastfeeding

## CONSENT FORM

### NUTRIENT INTAKE AND NUTRITION KNOWLEDGE OF LACTATING WOMEN (0-6 MONTHS POSTPARTUM) LOW SOCIO-ECONOMIC AREA IN NAIROBI, KENYA

ETHICS COMMITTEE REFERENCE NUMBER    **EC080922-039**

#### **DECLARATION BY PARTICIPANT**

I, the undersigned, ..... hereby give my permission to take part in the above mentioned research study.

I understand that the purpose of the study is to determine how sufficient the diet of breastfeeding mothers is in regard to their nutrition knowledge, health status, cultural practices and socioeconomic factors. My participation in the study will imply the following:

- Measurement of my weight and height
- General information about myself and my living conditions
- Information about my eating habits
- There will also be a group discussion for about one hour (about diet of breastfeeding women, nutrition knowledge, health, socioeconomic factors and cultural practices) in which I will participate.

Advantages for my participation in the study include my contributions to the description of the diet of breastfeeding women with the result of an intervention afterwards in order to improve the nutritional status of the breastfeeding women in the community.

I understand that I have agreed to take part in the study on a voluntary basis

I understand that I may withdraw from the study at any stage without any consequences.

I understand that I cannot hold the University of Pretoria or Mbagathi District Hospital responsible for any inconvenience that I may experience because of the study.

Signature \_\_\_\_\_ Date \_\_\_\_\_

#### **DECLARATION BY THE RESEARCHER**

I, ..... declare that, I have explained the information about this study to the participant named above and I asked her to ask any questions for clarification if something was not clear to her.

Signature \_\_\_\_\_ Date \_\_\_\_\_

(Researcher)

Signature \_\_\_\_\_ Date \_\_\_\_\_

(Witness)

**NUTRIENT INTAKE AND NUTRITION KNOWLEDGE OF LACTATING WOMEN (0-6 MONTHS POSTPARTUM) IN A LOW SOCIO-ECONOMIC AREA IN NAIROBI, KENYA**

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Interview code

**HUNGER SCALE**

1 ALL SECTIONS OF EACH QUESTION MUST BE ANSWERED

		YES	NO
1	Does your household ever run out of money to buy food?		
	1a Has it happened in the past 30 days?		
	1b Has it happened 5 or more days in the past 30 days?		
2	Do you ever rely on a limited number of foods to feed your children because you are running out of money to buy food for a meal?		
	2a Has it happened in the last 30 days?		
	2b Has it happened 5 or more days in the past 30 days?		
3	Do you ever cut the size of meals or skip any because there is not enough food in the house?		
	3a Has it happened in the last 30 days?		
	3b Has it happened 5 or more days in the past 30 days?		
4	Do you ever eat less than you should because there is not enough money for food?		
	4a Has it happened in the last 30 days?		
	4b Has it happened 5 or more days in the past 30 days?		
5	Do your children ever eat less than you feel they should because there is not enough money for food?		
	5a Has it happened in the last 30 days?		
	5b Has it happened 5 or more days in the past 30 days?		
6	Do your children ever say they are hungry because there is not enough food in the house?		
	6a Has it happened in the last 30 days?		
	6b Has it happened 5 or more days in the past 30 days?		
7	Do you ever cut the size of your children's meals or do they ever skip meals because there is not enough money to buy food?		
	7a Has it happened in the last 30 days?		
	7b Has it happened 5 or more days in the past 30 days?		
8	Do any of your children ever go to bed hungry because there is not enough money to buy food?		
	8a Has it happened in the last 30 days?		
	8b Has it happened 5 or more days in the past 30 days?		

**THANK YOU FOR YOUR CO-OPERATION**

**NUTRIENT INTAKE AND NUTRITION KNOWLEDGE OF LACTATING WOMEN (0-6 MONTHS POSTPARTUM) IN A LOW SOCIO-ECONOMIC AREA IN NAIROBI, KENYA**

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**SOCIO-DEMO-BIOGRAPHIC QUESTIONNAIRE**

Interviewee code

**Instructions to the research Assistant:** Circle and/or write the correct Response.

**BASIC INFORMATION**

1.1 Date of interview (dd/mm/yy) \_\_\_\_\_

1.2 Study Site

[1] Mbagathi MCH Clinic

1.3 Study Group [1] 0-3 months postpartum [2] 4-6 months Postpartum

1.4 Age \_\_\_\_\_

1.5 What is your marital status?

1. Unmarried	2. Married	3. Divorced	4. Separated	5. Widowed	6. Living together	7. Traditional Marriage	8. Other Specify
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1.6 What is your highest formal education level?

1. None	2. lower Primary School	3. Upper Primary School	4. High school	5. Tertiary Education
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**2) ANTHROPOMETRIC ASSESSMENT**

Weight

Height

BMI

**3) SOCIO-ECONOMIC INFORMATION**

Circle one number only for every question	Student	Employed Unskilled	Employed Skilled	Self-employed	Professional	Attendants in Hotel, Bars	Casual worker	Farmer	Housewife	Unemployed	Other Specify
What is your main Occupation?	1	2	3	4	5	6	7	8	9	10	11

	None	k sh.1-500	KSh 501-1000	Ksh.1001-3000	ksh.3001-5000	Ksh.5001-8000	Ksh.8001-10000	Over Ksh.10000	Don't know				
What is the total household income / month? Including wages,grants,sales ,	1	2	3	4	5	6	7	8	9				
	Alone	Spouse	Parents	Grand parents	Brother/ Sister	Aunt/ Uncle	Children	Friends	Other relatives				
Currently who are you living with?	1	2	3	4	5	6	7	8	9				
		Purchase/ market	Farm/ Garden	Welfare/ NGO	Relatives/ Friends	Other Specify							
What is your main source of food?	1	2	3	4	5								
	Ksh. 0-50	Ksh.50-100	Ksh101-150	Ksh.151-200	Ksh.201-250	Ksh.251-300	Ksh.300-350	Ksh.350-400	Ksh.401-450	Ksh.450-500	Over ksh. 500	Don't know	
How much money is spent on food weekly?	1	2	3	4	5	6	7	8	9	10	11	12	
	Brick	Traditional (mud)	Tin	Plank/ wood	stone	Other/ Specify							
Type of dwelling	1	2	3	4	5								
	Gas	Electricity	Firewood	Stove	Charcoal	Other/ Specify							
Main source of fuel (You can circle more than one)	1	2	3	4	5	6							

	Own tap	Communal tap	River/ ,Dam	Borehole/ Well	Other/ Specify
Where do you get water for drinking and cooking most of the time?	1	2	3	4	5
How many children do you have?	1	2	3	4	More than 4

### 5) HEALTH STATUS

Question	Yes	No	Remarks /other			
Have you been hospitalised during the past one-month (at least for a day or night)?	1	2				
Have you visited an outpatient clinic due to being sick at anytime during the past one month?	1	2	Record no of Hospital Visits			
Did you get encouragement from anyone while breastfeeding in the past month?			Spouse	Parent	Friend	Clinic health worker
			1	2	3	4
Do you follow any special diet?			Diabetic	Slimming	Allergies	Other specify
			1	2	3	4

**NUTRITION KNOWLEDGE QUESTIONNAIRE**

<b>NO</b>	<b>STATEMENT</b>	<b>YES/ TRUE</b>	<b>NO/ FALSE</b>	<b>DON'T KNOW</b>
<b>1</b>	Most vitamins and minerals cannot be made by the human body and must be obtained from the diet			
<b>2</b>	Vitamins and minerals are essential for growth of children.			
<b>3</b>	Vitamins provide energy			
<b>4</b>	Most vitamins and minerals are lost during cooking of food			
<b>5</b>	Maize meal(Fortified-Ugali) is a very good source of vitamins and minerals			
<b>6</b>	Most vitamins are not stored in the body and must be taken daily			
<b>7</b>	Minerals help to build strong bones and teeth			
<b>8</b>	Fruits and vegetable are the best sources of vitamins and minerals			
<b>9</b>	Vitamins losses from fruits and vegetables can occur as a result of poor conditions harvesting and storage			
<b>10</b>	There is more protein in a glass of whole milk than skimmed milk.			
<b>11</b>	Do you think intake of more water during breastfeeding increases the amount of milk			
<b>12</b>	A variety of food in the diet helps the body get enough vitamins and minerals everyday.			



**INTERVIEW SCHEDULE – FOCUS GROUPS**

**RESEARCH PROJECT**

**FOCUS GROUPS: GROUP INFORMATION**

**DATE**.....

**BEGIN (TIME)**.....

**ENDED (TIME)**.....

**FOCUS GROUP LEADER**.....

**GROUP MEMBERS:**

<b>0</b>	<b>NAME AND SURNAME OF THE MOTHER</b>	<b>CODE</b>	<b>MONTHS POSPARTUM</b>
<b>1</b>			
<b>2</b>			
<b>3</b>			
<b>4</b>			
<b>5</b>			
<b>6</b>			
<b>7</b>			
<b>8</b>			
<b>9</b>			
<b>10</b>			

**FOCUS GROUPS SCHEDULE**

GENERAL KNOWLEDGE ON LACTATION

1 Why are you breastfeeding?

.....

.....

.....

2. Who taught you on how to breastfeed your child in your very first experience?

.....

.....

3 How does breastfeeding benefit you as a mother?

.....

.....

.....

4 How long can one breastfeed a baby without giving anything else to eat or drink?(breast milk only)

.....

Why?.....

.....

5) What are the factors in your community that influence the way you breastfeed?

.....

.....

.....

**B) NUTRITION KNOWLEDGE**

6) Do you think there is food that should specifically be eaten during breastfeeding? **YES/NO**

Why?.....

.....

7 Do you think it is important to drink a lot of water and/or fluids when you are breastfeeding? **YES/NO**

Why do you think so?.....

.....

b) How much water/fluids should you drink per day when you are breastfeeding?.....

8) List examples of the foods in each of the following food groups.

Energy giving foods	proteins	Vitamins/minerals

9) Do you think it is important for breastfeeding mothers to take the following?

i) **Energy giving foods** YES/NO

Why do you think so?.....  
.....

ii) **Protein foods** YES/NO

Why do you think so?.....  
.....

iii) Foods that give **vitamins and minerals** YES/NO

Why do you think so?.....  
.....

10) Do you think it is necessary for a breastfeeding mother to take vitamin and mineral supplements?  
YES/NO Why?.....

.....

11) How many meals should a breastfeeding mother take in a day?.....

Why?.....

12) Do you think the food we eat increases the amount of milk for the baby to breastfeed? YES/NO

Why?.....

13) When you eat a well balanced meal is the milk better than when you do not? Or is the milk the same all the time? (The quality of the milk) YES/NO

Why do you think so?.....

.....

14) Do you think there are foods which affect the taste and/or smell of breastmilk? YES/NO

If YES which ones?.....

.....

15) Where did you get information on how best you should eat when you are breastfeeding?

.....  
.....

16) Do you think more information should be taught to women on how to eat when they are breast feeding?  
**YES/NO**

Why do you think so?.....  
.....  
.....

**D) CULTURE**

17) Are there foods that a breastfeeding mother should **not** eat in your community? **YES/NO**  
Which ones are they?.....

.....

b) If **yes**, why should a breastfeeding mother not eat these foods?

.....  
.....

C) Are there specific foods a breastfeeding mother should eat in your community? **YES/NO**  
Which ones?.....

Why?.....  
.....

18) What other things should a mother do/not do if she is breastfeeding?

**DO**.....  
.....

**NOT DO**.....

**NUTRIENT INTAKE AND NUTRITION KNOWLEDGE OF LACTATING  
WOMEN (0-6 MONTHS POSTPARTUM) IN A LOW SOCIO-ECONOMIC  
AREA IN NAIROBI, KENYA.**

**QUANTITATIVE FOOD FREQUENCY QUESTIONNAIRE**

--	--	--

Interviewee Code

FOOD	DESCRIPTION	QUANTITY/ Average serving	AMOUNT	PER DAY	PER WEEK	PER MONTH	PER 3 MONTHS	NEVER
UGALI	White	100 g						
	Brown	100g						
Porridge (Uji)	White (maize meal)	1 cup						
	Brown	1 cup						
Githeri (maize and beans)	With potatoes	½ cup						
	Without potatoes	½ cup						
Bread	White	1 Slice						
	With margarine							
	Jam		1 tsp					
	Honey							
	Peanut butter							
	Brown	1 slice						
	With Margarine							
	Jam		1 tsp					

FOOD	DESCRIPTION	QUANTITY/ Average serving	AMOUNT	PER DAY	PER WEEK	PER MONTH	PER 3 MONTHS	NEVER
	Honey							
	Peanut Butter							
<b>Rice (White)</b>	Boiled							
<b>Rice (White)</b>	Fried							
<b>Rice (Brown)</b>	Boiled							
	Fried							
<b>Macaroni</b>								
<b>Spaghetti</b>								
<b>Doughnut</b>								
<b>Mandazi</b>								
<b>Pancake</b>								
<b>Potatoes</b>	Boiled							
<b>Potatoes</b>	Mashed							
<b>Potatoes</b>	Fried							
<b>Sweet Potatoes (Boiled)</b>	Boiled							
<b>Arrow roots</b>	Boiled							
<b>Arrow roots</b>	Fried							
<b>Arrow roots mixed with Banana</b>	Fried							
<b>Cassava</b>	Boiled							
<b>Banana</b>	Boiled							





FOOD	DESCRIPTION	QUANTITY/ Average consumption	AMOUNT	PER DAY	PER WEEK	PER MONTH	PER 3 MONTHS	NEVER
<b>Beef, pork, goat, lamb as a mixed dish(e.g stew, casserole Lasagna)</b>	Beef							
	Pork							
	Goat							
	Lamb							
<b>Beef, pork, goat, Lamb as a main dish(e.g. Steak, Roast, Ham)</b>	Beef							
	Pork							
	Goat							
	Lamb							
<b>Matumbo (offals)</b>	Fried							
<b>Minced meat</b>	Fried/stewed							
<b>Beans or Lentil/n dengu</b>	Fried	½ cup						
<b>Mixed Dishes</b>								
<b>Mixed Bananas, carrots and Potatoes</b>		1 cup						
<b>Mukimo</b> (Mixed corn, mashed potatoes and indigenous vegetable)		1 cup						





FOOD	DESCRIPTION	QUANTITY/ Average serving	AMOUNT	PER DAY	PER WEEK	PER MONTH	PER 3 MONTHS	NEVER
<b>Muthokoi (Shelled Maize)</b>		1 cup						
<b>Pilau (Spiced Rice)</b>		1 cup						
<b>Irio</b>	Boiled	1 cup						
	Fried	1 cup						
<b>Rice and Potato</b>		1 cup						
<b>Rice Potato and carrots</b>		1 cup						
<b>VEGETABLES</b>								
<b>Kunde</b>	Fried	½ cup						
<b>Sukumawiki/kale</b>	Fried	½ cup						
<b>spinach</b>	Fried	½ cup						
<b>indigenious vegetable</b>	with cream/milk	½ cup						
<b>indigenious vegetable</b>	without cream/milk	½ cup						
<b>Peas Minji (fresh)</b>	cooked	½ cup						
<b>Dried</b>	cooked	½ cup						
<b>French beans</b>	Mixed with carrots	1 cup						
	Without Carrots	1 cup						
<b>carrots</b>	Raw	½ cup						
	Cooked	½ cup						
<b>cucumber</b>		½ cup						
<b>Kachumbari</b>		½ cup						



FOOD	DESCRIPTION	QUANTITY/ Average serving	AMOUNT	PER DAY	PER WEEK	PER MONTH	PER 3 MONTHS	NEVER
<b>Eggplant (Biringani)</b>		½ cup						
<b>Cabbage</b>	fried	½ cup						
	steamed	½ cup						
<b>Pumpkin</b>	boiled	½ cup						
<b>Mushroom</b>	stewed	½ cup						
<b>Tomato</b>	Cooked	½ cup						
	Fresh	½ cup						
<b>FRUITS AND FRUIT JUICES</b>								
<b>Bananas</b>		1 medium						
<b>Sweet bananas</b>		1 medium						
<b>Pawpaw</b>		1 medium slice						
<b>Watermelon</b>		1 medium slice						
<b>pineapple</b>		1 medium slice or ½ cup						
<b>plum</b>		1 medium						
<b>Mango</b>		1 medium						
<b>Apricot</b>		1 medium						
<b>Pear</b>		1 medium						
<b>Apple</b>		1 medium						
<b>Orange</b>		1 medium						
<b>Tangerine (Sandara)</b>		1 medium						
<b>Passion</b>		1 medium						
<b>Grapes</b>		½ cup						
<b>Avocado</b>		½ medium fruit						
<b>lemon</b>		1 medium						
<b>Passion Juice</b>		1 cup						
<b>Pineapple juice</b>		1 cup						





**APPENDIX G**

**MASWALI KUHUSU ELIMU YA LISHE BORA**

Maswali	Yes/ Ndio	No/ Hapana	Don't know/Sijui
1. Vitamini nyingi pamoja na madini haziwezi tengenezwa na mwili wa binadamu na ni lazima zipatikane kwenye lishe.			
2. Vitamini pamoja na madini ni muhimu katika ukuaji wa watoto.			
3. Vitamini hupeana nguvu.			
4. Vitamini nyingi pamoja na madini hupotea chakula kinapopikwa.			
5. Ulaji wa unga wa ugali wa kusiaga ni chanzo bora cha vitamini na madini.			
6. Vitamini nyingi hazihifadhiwi mwilini na ni lazima ziliwe kila siku.			
7. Madini husaidia kuunda mifupa pamoja na meno yenye nguvu.			
8. Ulaji wa matunda na mboga ndiyo njia bora zaidi ya kupata madini na vitamini			
9. Upungufu wa vitamini katika mboga na matunda hutokana na hali duni ya mavuno na hifadhi.			
10. Unaweza kupata protini nyingi ukinywa glasi moja ya maziwa ya kawaida kuliko kutumia maziwa yaliyopitia viwandani.			
11. Je, wadhani mama anayenyonyesha akinywa maji mengi, maziwa yake huongezeka?			
12. Unapokula vyakula aina mbalimbali husababisha kuongezeka kwa vitamini na madini mwilini kila siku.			

**IDHINI YA KUSHIRIKI**

**UTAFITI KUHUSU LISHE BORA YA AKINA MAMA WALIO NA  
MAPATO YA CHINI WANAONYONYESHA WATOTO HADI  
UMRI WA MIEZI SITA NAIROBI, KENYA.**

Mimi.....nimekubali kushiriki  
katika utafiti huu .Ninaelewa kuwa utafiti huu ni wa kuthibitisha kama akina mama  
wanaonyonyesha wanapata vyakula bora na wanao maelezo kuhusu lishe bora.

Utafiti huu utanipasa:

- Kupimwa urefu na uzito wangu.
- Kutoa maelezo kuhusu makao yangu.
- Kutoa maelezo kuhusu ninavyokula
- Kushiriki katika majadiliano kuhusu wanavyokula akina mama  
wananyonyesha kwa kawaida.

Matokeo ya utafiti huu yatakuwa ya manufaa kwa akina mama wanaonyonyesha  
kwani baadaye yataweza kutumika Kwa miradi ya kuwafunza akina mama jinsi  
wanavyostahili kula ili wawe na afya bora wakati wananyonyesha.

Ninaelewa kuwa kushiriki katika utafiti huu ni kwa hiari yangu.

Ninaelewa kuwa majibu yote ya utafiti yatawekwa siri na hayatamjulishwa mhojiwa  
yeyote.

Sahihi.....

Tarehe.....

**MTAFITI**

Mimi .....nimemueleza mshiriki huyu kuhusu  
utafiti huu na nikampa ruhusa ya kuuliza maswali iwapo kuna jambo lolote  
hakuelewa.

Sahihi.....

Tarehe.....