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ASSESSMENT OF DIETARY INTAKE OF VITAMIN A-RICH FOODS AND ASSOCIATED FACTORS AMONG LACTATING MOTHERS ATTENDING LUNGA LUNGA HEALTH CENTRE, IN SINAI SLUM, NAIROBI COUNTY, KENYA

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ABSTRACT

Vitamin A deficiency is a problem of public health significance among lactating mothers. Low dietary intake of vitamin A results in inadequate vitamin A concentration in breastmilk, thereby putting the life of the breastfed child at risk. Food availability is critical for quality nutrition that leads to a balanced diet. The poor in urban areas spend most of their income on food yet do not meet their dietary needs. This study aimed to assess the dietary intake of vitamin A rich foods, prevalence of undernutrition and household food insecurity among lactating mothers (15-49 years) attending Lunga Lunga Health Centre from Sinai Slum, Nairobi, Kenya. This cross-sectional study was undertaken using systematic random sampling for 384 lactating mothers from April to June 2017. A structured questionnaire was used to obtain socio-demographic information. Dietary intake was assessed using a 24-hour recall and Food Frequency Questionnaire (FFQ). Prevalence of undernutrition was determined through anthropometric measurements: Body Mass Index (BMI) and Mid Upper Arm Circumference (MUAC). Household food security was determined using food insecurity access scale and dietary diversity questionnaires. Statistical analysis was undertaken using Microsoft excel and SPSS. Chi-square test was used to determine for associations between inadequate intake of vitamin A, maternal undernutrition, household food security and socio-demographics. Logistic regression analysis determined the predictors of adequate dietary intake of vitamin A, undernutrition and food security. The mean age of the lactating mothers was 26.5 (SD 5.6) years. Majority (72.9%) had primary education while 57.6% were self-employed. Inadequate dietary intake of vitamin A was reported amongst 58.6% of the mothers, 31.3% had low MUAC<220mm while 13.8% had low BMI. Mothers who consumed dark green leafy vegetables were 26.6% compared to those consuming fruits like bananas (18.2%), mangoes (13.3%), pineapple (10.7%) and papaya (8.3%). Fish formed the main source of proteins (18.8%), followed by meat (16.7%) and eggs (14.8%). Vitamin A intake had a significant association with income ($p<0.001$), energy ($p<0.001$), food insecurity ($p<0.001$) and buying food ($p<0.001$). Household Dietary Diversity Score (HDDS) had a significant association with low MUAC ($\chi2 = 1.694$, $p =0.031$ and low BMI ($\chi2 = 3.039$, $p = 0.042$). Lactating mothers from Sinai slum had inadequate dietary vitamin A intake, were under nourished and food insecure. Food security interventions: food-based strategies and policies that include Vitamin A food fortification aimed at increasing intake of Vitamin A rich food, campaigns for increased dietary diversity, alongside routine nutrition education among mothers should be emphasized to enhance their nutritional status and reduce micronutrient deficiencies.

Key words: Vitamin A, Nutritional status, Slum, dietary diversity, Food Frequency

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INTRODUCTION

Women in developing countries spend a big part of their productive time pregnant, lactating, or both. Additionally, women between the ages of 15-45 years living in developing countries spend 30-48% of their time in this state coupled with certain environmental and social stressors. These stressors include: poor diet, diseases and compromised access to adequate food among other related stressors that affect the well-being of these women [1]. Notably, pregnancies alongside lactation affect the nutrition balance of mothers who are still in active reproductive age. Vitamin A, which is highly required during lactation and pregnancy, is the most affected [2]. More than 3.5 million women and children under five in developing countries die of malnutrition annually [3]. However, women have increased chances of facing malnutrition than men and this can be attributed to low living standards, child bearing, poverty and lack of proper education [4]. According to Kenya Demographic and Health Survey 2014, women aged 15-49 years had a mean Body mass Index (BMI) of 23.7 kg/m^2 and nine percent of women of reproductive age were reportedly thin or undernourished (BMI <18.5 kg/m^2) with younger women mostly affected [5].

The number of people unable to afford healthy and nutritious meals in sub-Saharan Africa keeps rising. Asia and Africa have the highest number of people who cannot afford healthy and nutritious meals [6]. Such meals do not meet the nutritional requirements of various life stages, such as pregnancy and lactation. Rapid urbanization in sub-Saharan Africa has resulted in urban poverty, which is documented to be severe enough to put livelihoods and food security of the populations at risk [7]. Besides that, urban growth has also brought forth other problems such as unemployment and environmental degradation [7]. Malnutrition in urban slums is mainly attributed to the consumption of inadequate and often irregular meals, which do not meet the nutritional requirements of the various life stages including lactation. Maternal and child under-nutrition is prevalent in low-income and middle-income countries, resulting in significant rise in mortality and overall disease burden [8]. Notably, during pregnancy and lactation, women are more vulnerable to under nutrition due to increased energy and nutrient requirements [9].

Low dietary intake of vitamin A rich foods during lactation has been found to result in inadequate concentration in breast milk increasing the child's risk of becoming deficient. According to the Kenya Demographic and Health Survey 2014, 54% of women received 200,000 IU of vitamin A dosage in the first 6 months postpartum. The percentage of women receiving postpartum vitamin A supplementation was

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notably higher in urban areas (58 %) than in the rural areas (51%) [5]. The survey noted that women in the Central region were most likely to take vitamin A during the postpartum period (65%), while women in the North Eastern region were least likely to do so (27%). The prevalence of postpartum vitamin A supplementation was noted to increase with education. Additionally, women in the lowest wealth quintile were less likely to receive a postpartum vitamin A dose (38%) than their wealthier counterparts (54% or higher) [5].

Many studies have been conducted on the nutritional status of lactating mothers in Kenya, nevertheless, few have described their dietary intake of micronutrients especially vitamin A. Under-nutrition in addition to micronutrient deficiencies especially vitamin A and iron deficiencies are among the most common nutritional deficiencies in most developing countries, second to Protein- Energy- Malnutrition [10]. Inappropriate dietary practices characterized by poor dietary intakes, reduced number of meals and inadequate consumption of fruits and vegetables among pregnant and lactating women contribute to under nutrition [11]. The Kenya Demographic and Health Survey 2014 provides national and sub-national coverage estimates of vitamin A supplementation, however, no data is given on dietary intakes. Thus, less is known about dietary intakes among lactating women who may not only be undernourished and food insecure but are also at risk of vitamin A deficiency in low socioeconomic setting.

The results of this study will be useful in guiding policy formulation that will initiate intervention programs for increasing Vitamin A concentration in food for lactating mothers especially from low economic strata in the urban areas.

MATERIALS AND METHODS

Study Area

Lunga Lunga Health Centre is located East of Nairobi County, approximately 7 Kilometers from the City Centre. It is the only public health facility serving the nearby Sinai slum. It offers outpatient health services like Maternal and Child Health, community health, medical consultations and basic laboratory screening among other services. The slum has an approximate population of 90,000 residents mainly comprised of labour migrants working in the city's neighbouring industrial area. Nutrition services are offered by hospital nurses. The Health Centre is located at the periphery of the slum, hence inaccessible to many residents. The slum is characterized by poor access roads, inadequate clean drinking water, improper garbage and sewage disposal, high unemployment rates, insecurity and poverty among other societal deficiencies.

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Sampling Design and procedure

This was a cross-sectional study where lactating mothers attending routine Maternal and Child Health (MCH) clinic with their children were identified, recruited and interviewed through a systematic random sampling from April to June 2017. Every 3rd mother who visited the clinic and who also met the inclusion criteria was interviewed until the desired number was attained.

Inclusion and Exclusion Criteria

Lactating mothers were included in the study if they reported breast feeding at least 3 times a day, if the lactating mothers had lived in the slum for a minimum of three months and if they did not report any medical complications as at the time of the survey.

Mothers who reported severe health conditions, mothers whose children had chronic illness, congenital malformations and other medical conditions like anemia, heart disease, HIV and AIDS or cancer were excluded from the study. This information was obtained from the mothers based on the medical history and child health cards.

Ethical approval and Consent

This study was approved by the Moi Teaching and Referral Hospital (MTRH), Institutional Research and Ethics Committee (IREC). The study objectives were explained to the mothers and their informed consent obtained verbally prior to commencement of the study.

Sample Size Determination and Data collection

The sample size of 384 was calculated using the Fisher's formula [12].

$$n = Z^2 (PQ) / D^2.$$

Where n is the sample size, Z is the Z-score for a 95% confidence interval in a normal distribution table, P being the prevalence dietary intake of vitamin A, Q as the compliment of P (1-P), and D as the sampling error.

To give $N = (1.96)^2 \times 0.5 (0.5) / (0.05)^2$

N =384 Respondents

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Two research assistants were recruited and trained for data collection, that is administration and interpretation of questionnaire in Swahili language which is commonly spoken and understood by the respondents. They also were responsible for taking anthropometric measurements and use of food models and household measuring instruments to estimate the quantity of foods consumed by mothers.

Nutritional value of all common foods was obtained using the Kenya Food Composition Table [13]. The foods were categorized into three portions: small, medium and large. Subsequently, photographs of the categories were taken and shown to the participants to indicate the consumption frequency of each category as well as the amount consumed. The 12 food groups were used to determine the Household Dietary Diversity Score (HDDS) [14].

Socio-Demographic Characteristics

A structured questionnaire was used to obtain information on socio-demographic characteristics of the mothers. A pre-test was carried out using mothers attending MCH clinic at the Makadara Health Centre which serves as the main Health Centre within the Sub-County.

Anthropometric Measurements

An electronic scale (SECA scale-Hammer Steindamm 3-25, designed in Germany, made in China) was used to measure weight of the respondents while their heights were measured using a stadiometer scale (distributed by Narula exports, India).

Dietary Intake Assessment

Locally available plant and animal sources of vitamin A rich foods were identified and substitution of food items in the Hellen Keller International Food Frequency Questionnaire made to come up with a Modified Food Frequency Questionnaire for the study. A list of common foods was developed and their nutritional value obtained from the food composition table.

Household Food insecurity and Dietary Diversity

A household food security and access scale questionnaires were administered to ascertain levels of food insecurity for the recall period of the previous one month. The questionnaire was mainly a frequency-of-occurrence based to determine whether availability of food (food characteristic/ condition) happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) or did not happen.

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The Household dietary diversity questionnaire was used to determine the number of different food groups consumed by the household based on the previous 24 hours as the reference period [14]. The 12 food groups in table 1 were used to calculate the Household Diversity Dietary Score (HDDS) value ranging from 0-12.

Data Analysis

Statistical analysis was undertaken using SPSS for windows version 21.0. Descriptive statistics were expressed as means and standard deviations, frequencies and percentages, while Chi Square test was used to determine relationship between the various variables explored by the study. Average nutrient intakes were compared to FAO/WHO reference values for lactating women [15]. The prevalence of inadequate intakes was examined through the probability approach which entailed classifying individual nutrient intake into six classes according to the estimated average requirement (EAR). A p-value of less than 0.05 was regarded as statistically significant.

RESULTS AND DISCUSSION

A quarter (26.5%) of the mothers were aged 20-24 years, 72.9% had primary level of education, two thirds (66.9%) were married, 57.6% were in self-employment/ casual labourers while 37.5% were unemployed. A third (32%) of the mothers were earning less than Kshs 2500/ USD 25 per month, compared to 5% who earned Kshs 7001-10000/ USD 71-100 per month. Mothers aged 20 – 24 years were two times likely to have inadequate intake of vitamin A compared to those aged 30 – 34 ($p=0.032$ and $p=0.047$ at 95% C.I), respectively. Mothers whose households lived below the poverty line/earning less than Kshs 2500/USD 25 were two times likely to have low intakes compared to those who earned more than Kshs 2500 /USD 25 per month/ living above the poverty datum line ($p<0.001$ at 95% C.I). Additionally, households that had 8-10 persons living together were two times likely to have inadequate intake of vitamin A compared to those who were less than 3 persons in the household ($p<0.001$, $p=0.044$ at 95% C.I). According to Kenya Demographic and Health Survey, these are some of the socio-economic and demographic factors that determine dietary intakes of lactating women which ultimately affect their nutritional status [5].

Nearly half (44.5%) of the households had their youngest children in the age group of 3-6 months. The mean number of times the respondents sought ante-natal and post-natal care services was 2.5 (SD=0.66) and 3.46(SD=0.68), respectively. Most mothers (64.2%) had their deliveries at a health facility. Even though majority (83.3%) of the mothers had not received health education on the importance of

vitamin A by a health professional, 75.0% of them reportedly received vitamin A supplementation. Lactating mothers should be empowered with nutrition education during MCH visits to enable them to make good food choices that meet their respective recommended dietary allowance for vital nutrients [16]. Such initiatives have the potential of enhancing the overall health and nutrition benefits of the breastfed infant. It is worth noting that nutrition services to pregnant and lactating mothers including counselling are offered alongside the general health education sessions by nurses at the health centre who may not have adequate knowledge of nutrition.

Adequacy of Dietary Intake of Vitamin A

One-third (31.3%) of lactating mothers in this study were undernourished, including inadequate intake of Vitamin A and overall poor dietary intake. Vitamin A intake during pregnancy and lactation (RDA of 900-2500 µg /day) is highly required as it has a significant impact on the health of the mother and child [17]. Although there is no documented data on the national prevalence of dietary intakes, findings from this study indicated that consumption patterns of vitamin A rich foods were low and therefore insufficient to provide for recommended daily intake. Majority (58.6%) of the mothers in this study failed to meet their RDAs for vitamin A. Similarly, the Kenya Demographic and Health Survey report in 2014, also found that lactating women had inadequate dietary intakes for micronutrients [5].

Protein intake was below the recommended daily intake as majority (71 .4%) reported a daily intake of below 65 grams. Besides, 72% of the mothers reported energy intakes below the recommended daily intakes of 2100kcal. Mothers with low protein intakes were likely to have inadequate intakes of vitamin A compared to those with adequate protein intakes ($p=0.043$ at 95% C.I). Those with inadequate energy intakes were also two times likely to have inadequate vitamin A intakes compared to those who had adequate intakes of the vitamin ($p<0.001$ at 95% C.I). Mothers who exclusively purchased food were 2 times more likely to have inadequate intakes compared to those who got food through a combination of food aid and by purchase ($p<0.001$ at 95% C.I). It is important to note that adequate dietary consumption especially for micronutrients can only be achieved through dietary diversity that increases chances of adequate nutrient consumption.

Monthly consumption of animal sources of vitamin A was low as indicated by the following patterns; eggs (14.8%), small/whole fish (18.8%) and liver (8.9%). Near similar consumption patterns were reported in studies from Ethiopia where eggs were consumed (16.0%), and foods of animal origin such as liver (13.9%), fish (31.9%) by the lactating mothers [18]. Lactating women can produce milk with

enough protein, carbohydrate, fat and most minerals even when their intake is low [19]. This implies that their maternal stores of minerals and nutrients are used. However, a prolonged low intake of the nutrients means that the maternal stores get depleted hence negatively affecting the quality and nutritional content of the breast milk [20]. Evidence supports that Vitamin A intake of mothers influences their Vitamin A status, the quality and quantity of breast milk, the mother's health outcomes, and the health status of the breastfeeding child [21]. This indicates that the Vitamin A intake of lactating mothers is a crucial determinant of mother's and child's health.

At least one-quarter (26.6%) of the mothers consumed adequate dark green leafy vegetables, mangoes (13.3%), pumpkin (11.7%), papaya (8.3%), yellow sweet potatoes (23.2%), oranges (16.2%), bananas (18.2%), carrots (8.6%), pineapples (10.7%), eggs (14.8%), small/whole fish (18.8%), liver (8.9%), meat (16.7%), cod-liver oil (6.0%), chicken (4.7%) which are good sources of Vitamin A. Majority of the mothers in this study did not consume fruits rich in vitamin A. This is attributable to the high prices of fruits in the market thereby compromising their daily consumption. Similar findings in Iran also reported that fruits were consumed in low quantities because of economic constraints [22]. The months that preceded the study were months of dry season and the availability of these foods at the household level was more dependent on the purchasing power due to the high prices in the markets. Dietary studies in Nepal similarly reported that purchasing power limited the food portion sizes [23]. Animal foods as sources of vitamin A are often too expensive for low-income people [24]. At the time of the study, the county was experiencing food shortage exacerbated by failed rains and drought hence most households especially in the slums could not afford the high prices of the foods in the markets.

A study conducted in Niger identified pregnant and lactating mothers to be at risk of lacking essential intakes of multiple micronutrients including vitamin A [25]. In this study, half of the mothers from Sinai slum were at risk of multiple micro nutrient deficiencies including vitamin A. Dietary intake of Vitamin A determines its overall content in milk in lactating mothers [26]. Breast-fed babies rely on the supply of vitamin A solely from breast milk and serum concentration of vitamin A in new born babies is about half that of mothers. As long as the mother has adequate milk levels of vitamins, the baby's vitamin A status will improve in the first 12 months [27].

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Prevalence of Undernutrition

Mothers aged between 15-19 years were undernourished compared to the other age groups in this study. This indicates the influence of age in dietary patterns and nutritional status of the respondents. This could be explained by the fact that during adolescence, maximum growth and development has not been fully achieved. Additionally, at this age, the mothers are largely unemployed/ have no source of income hence low purchasing power to meet dietary needs for themselves and those of their children. The lactation period coupled with bodily needs for growth to maximum bone mass for the mother leads to depletion of nutrients hence resulting in malnutrition. Similarly, a study done in Kenya showed that lactating mothers between the age of 15-19 years had more chances of malnutrition compared to mothers of other age groups [28]. However, different factors explain this, including the knowledge level of the mothers on nutrition.

A third (31.3%) of the mothers had MUAC < 22.0 cm (low MUAC). Protein and Energy intake, parity and length of breastfeeding had statistically significant association with low MUAC ($p=0.035$, $p<0.001$, $p=0.025$ and $p=0.0197$ at 95% C.I), respectively. Majority (79.7%) of the mothers had normal BMI in the range of 18.5-25kg/m^2 compared to 13.8% with low BMI and 6.5% overweight with BMI>25. Logistic regression results indicated a statistically significant association between energy intake and low BMI ($p=0.033$ at 95% C.I). The association between BMI and MUAC in mothers lactating for a period of more than six months indicates a significant depletion of maternal energy stores in this study. A longer lactation period affects the milk concentration of Vitamin A as well as the long-term preservation of energy and protein reserves [29]. This often results in malnutrition of the mothers. Studies in Kenya, Zambia and Ghana showed that household income is a key determinant of the ability of lactating mothers to consume the recommended nutrients, including adequate proteins, appropriate energy intake, animal source foods of vitamin, and other recommended nutrients [30]. Besides, the leading causes of undernutrition in pregnant and lactating mothers is physiological vulnerability and inadequate intake of recommended nutrients [31].

A study in Ethiopia indicated that undernutrition is a leading cause of morbidity and mortality among women in Ethiopia [32]. The underlying causes of undernutrition in pregnant and lactating women include poverty, poor hygiene, lack of nutritional knowledge, poor housing among other factors. This study found that household income is significantly associated with intake of vitamin A ($p<0.001$) hence income is a major determinant of how animal source foods of vitamin A are consumed. Undernutrition in pregnant and lactating mothers is common among the economically challenged women [33]. This is because of the surrounding

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conditions that make it challenging for such mothers to access proper diets. In this study, the intakes of protein and energy were low and more than 70 % of the mothers had inadequate intakes for both protein and energy.

Food Insecurity

Food insecurity at the household level limits the capacity to meet nutritional needs of lactating mothers living in low-income settings. The interaction between food insecurity and dietary intake has been recognized and interventions to address this issue continue to emerge. Slightly more than one-third (37%) of the mothers reported consuming more than 6 types of foods from the 12 food groups while 63% consumed less than 6 of the 12 food groups.

The Household Dietary Diversity Score (HDDS) was 5.2 (SD=1.75). Household Food Insecurity Access Prevalence was determined to ascertain the level of food insecurity status of the households. A small percentage (5.1%) of the households reported experiencing none of the food insecurity conditions, or just experienced worry, though rarely. The 10.6% mildly food insecure households were worried about not having enough food and/or were unable to eat the preferred foods. The 39.1% moderately food insecure households sacrificed quality more frequently and may have cut back on quantity by reducing size and number of meals. Forty-five percent severely food insecure households were likely to often cut back on meal size and number of meals eaten, and or go a whole day without eating, go to bed hungry, or run out of food. These findings indicate that food availability and food cost were key factors that affected food consumption including vitamin A rich foods. The Demographic and Health Survey reported similar results on the factors that determine dietary consumptions of households with children less than five years in Kenya where most food consumption is based on food availability and market prices [1].

Access to proper food in urban areas is greatly determined by the ability of the household to afford it [24]. In this study, majority of lactating mothers were unemployed hence with limited purchasing power. Additionally, more than 70% of the lactating mothers in Sinai slum had low protein and energy intake. A study conducted on pregnant and lactating mothers in Malawi also found that 66·7% and 68·6%, respectively, reported experiencing food insecurity [33]. Mothers who reported experiencing severe food insecurity at the household had a 0.36 lower dietary diversity score compared to those from the food secure households. Among the mothers who had low MUAC and low BMI, 44% and 50%, respectively were severely food insecure. Households that were moderately food insecure had low MUAC and low BMI at 23% and 20%, respectively. There was a significant association between household dietary diversity scores (HDDS), low MUAC ($\chi 2$ =

1.694, df = 1, p =0.031 and low BMI ($\chi 2$ = 3.039, df = 1, p = 0.042). The severely food insecure households as noted by the HDDS were 84% more likely to have low MUAC compared to the food secure households (p=0.031 at 95% C.I) while the severely food insecure households were 2 times more likely to have low BMI compared to the food secure households (p=0.042 at 95% C.I). The significant association noted could be attributed to low dietary diversity in the households.

Similarly, studies in informal urban settlements have also shown widespread improper eating practices for infants (IYCF) and high levels of food insecurity as an indicator that even the mothers could be at a higher risk of food insecurity [34]. A study conducted to examine household food security and IYCF practices in two informal urban settlements in Nairobi, Kenya, also found food insecurity amongst infants [35]. This can be interpreted to be as a result of food insecurity within the households which consequently lead to poor infant/young child feeding practices. Most lactating mothers from Sinai Slum did not meet the recommended dietary diversity score given that their consumption of items in a food group was less than four times a week. Consumption of foods rich in vitamin A did not meet the FAO recommendations for adequate/regular consumption frequency.

CONCLUSION, AND RECOMMENDATIONS FOR DEVELOPMENT

Lactating mothers in Sinai slum had inadequate dietary intake of vitamin A and undernutrition was prevalent among low-income earners and young lactating mothers. However, laboratory-based procedures to determine serum levels of vitamin A are needed to complement dietary studies. Food insecurity alongside limited purchasing power compromised positive nutritional outcomes for lactating mothers hence they were at risk of multiple micronutrient deficiencies.

Household income played an important role in the dietary intakes and nutritional status of lactating mothers residing in Sinai slums. The higher the income, the better the nutritional status, and the more food secure the household becomes.

There is need to put more effort in targeted food-based strategies such as food fortification and nutrition education aimed at increasing dietary diversity and more so micronutrient intake.

Such strategies targeting women of reproductive age will go a long way in improving nutritional status not only of the mother but also for neonates. Further, there is need to undertake randomized control studies in the future to test identified strategies to inform implementation policies.

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Table 1: Socio-demographic characteristics of respondents

Variables	Categories	Frequency (N=384)	Percent
Age	15-19	90	23.1
	20-24	103	26.5
	25-29	87	24.1
	30-34	51	13.1
	35-39	30	7.6
	40-44	17	4
	45+	6	1.6
Education Level	None	20	5.3
	Primary	280	72.9
	Secondary/ Tertiary	84	21.8
Marital status	Married	257	66.9
	Single	61	15.9
	Widowed	42	10.9
	Separated/Divorced	24	6.3
Employment	Employed	60	15.7
	Self employed	201	52.3
	Un-employed	123	32.0
Household income (Kshs per month)	<2500	121	32
	2501-5000	187	49
	5001-7500	55	14
	7501-10000	21	5
Length of breastfeeding	0-3months	115	29.9
	3-6 months	171	44.5
	>6months	95	25.5
Household Size/Number of people living in the household	2	67	17.4
	3-5	187	48.7
	6-8	112	29.2
	8-10	18	4.7
Number of biological children living in the household	0-2	95	24.7
	3-5	217	56.5
	>5	72	18.8

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Table 2: Prevalence of Dietary vitamin A intake

Individuals' intake as % of EAR	Frequency	Probability of vitamin A deficiency	Vitamin A deficient individuals
<54	114	1	119
54-65.5	52	0.93	62
65.6-77	36	0.69	28
77.1-88.5	23	0.31	11
88.6-100	49	0.07	5
>100	110	0	0
Total	384		225

Note: EAR-Estimated Average Requirement, %PINI-Percent Prevalence of Inadequate Nutrient Intake

Table 3: Mothers consuming Vitamin A rich food sources

	Number of mothers consuming adequate sources	Percentage
Vitamin A source		
Dark green leafy Vegetables	102	26.6
Yellow fruits and vegetables		
Mango	51	13.3
Pumpkin	45	11.7
Papaya	32	8.3
Yellow sweet potato	89	23.2
Oranges	62	16.2
Avocado	55	14.3
Bananas	70	18.2
Carrots	33	8.6
Pineapple	41	10.7
Foods of Animal origin		
Egg	57	14.8
Small/whole fish	72	18.8
Liver	34	8.9
Meat	64	16.7
Cod liver oil	23	6.0
Chicken	18	4.7

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Table 4: Interrelationship between dietary intakes of Vitamin A to demographic variables

Variables	Categories	Inadequate Vitamin A Intake (As a % PINI)	Chi square	P-Value
Age	15-19 20-24 25-29 30-34 35-39 40-44 45+	53(23.6) 60 (26.7) 51 (22.7) 30 (13.3) 18 (8) 10 (4) 4 (1.7)	χ^2 = 12.598 df = 6	0.049
Employment status	Employed Self employed Un- employed	12(5.3) 118(52.9) 94(49.3)	χ^2 = 7.672 df= 2	0.022
Household income (Kshs)	<2500 2500-4000 4001-6000 6001-8000 8001-10000 >10000	55(24.4) 118(52.4) 33(14.7) 12(5.3) 5(2.2)) 2(0.8)	χ^2 = 11.224 df= 5	0.047
Awareness on vitamin A rich foods	Yes No	184(81.8) 41(18.2)	χ^2 = 2.552 df= 1	0.110
No of children	0-2 3-5 >5	43(19.1) 132(58.7) 50(22.2)	χ^2 =2.393 df=2	0.302
Length of breastfeeding	<3months 3-6 months >6months	70(31.1) 103(45.8) 52(23.1)	χ^2 =5.503 df= 2	0.064
Household Size/Number of people living in the household	2 3-5 6-8 8-10	26(11.6) 102(45.3) 82(36.4) 15(6.7)	χ^2 =7.879 df= 3	0.049

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Table 5: Interrelationship between dietary intakes of Vitamin A to other related variables

Variables	Categories	Inadequate Vitamin A Intake (As a % PINI)	Chi square	P-Value
Awareness on vitamin A rich foods	Yes No	184(81.8) 41(18.2)	χ^2 = 2.552 df= 1	0.110
How food is acquired/got	Purchase Aid (Relatives, Government, NGOs)	208(92.4) 17(7.6)	χ^2 =3.645 df=1	0.056
Length of breastfeeding	<3months 3-6 months >6months	70(31.1) 103(45.8) 52(23.1)	χ^2 =5.503 df= 2	0.064
Protein intake	Adequate Inadequate	11(4.9) 214(95.1)	χ^2 =4.853 df= 1	0.028
Energy intake	Adequate Inadequate	13(5.7) 212(94.2)	χ^2 =4.749 df=1	0.029
Food security	Food secure Mildly insecure Moderately insecure Severely insecure	7(3.1) 14(6.2) 82(36.4) 122(54.2)	χ^2 =4.171 df=3	0.041
Dietary diversity (HDDS)	Diverse Mild Less	8(44.4) 40 (59.2) 185(68.9)	χ^2 =4.381 df=2	0.037

Table 6: Predictors of vitamin A intake among Lactating mothers

Variables	OR	95.0%	C.I	P-Value
Age		0.487		
20 – 24	2.743	0.421	3.611	0.032
30 – 34	0.854		2.894	0.047
Income				
<2500	2.655	0.370	3.162	0.001
No of Children				
>5	2.659	0.833	3.615	0.030
Protein Intake				
Inadequate	0.839	0.307	2.297	0.043
Energy Intake				
Inadequate	1.524	0.714	3.439	<0.001
Food Security				
Food Insecure	2.488	0.291	3.545	0.001
Dietary Diversity (HDDS)				
Low	2.042	0.655	4.111	0.003
How food is obtained				
Buying/Purchase	1.542	0.702	3.043	<0.001

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Table 7: Logistic regression results for Low MUAC

Variables	OR	95.0%	C.I	P-Value
No of children >5	2.218	0.834	3.760	0.025
Protein Inadequate	0.604	0.217	1.342	0.035
Energy Inadequate	0.492	0.114	0.801	<0.001
Length of breastfeeding >6months	1.272	0.180	2.430	0.0197

Table 8: Household perceptions on the ability to access food in the previous month

Indicator	Frequency of occurrence			
	Never	Rarely	Sometimes	Often
Worried about insufficient food.	17(4%)	34(9%)	122(32%)	211(55%)
Not able to eat preferred foods	8(2%)	38(10%)	108(28%)	230(60%)
Ate limited variety of foods	19(5%)	35(9%)	96(25%)	234(61%)
Ate no preferred foods	7(2%)	31(8%)	127(33%)	219(57%)
Ate smaller meals	27(7%)	50(13%)	100(26%)	207(54%)
Ate fewer meals	31(8%)	54(14%)	115(30%)	184(48%)
Ate no food at all	177(46%)	61(16%)	69(18%)	77(20%)
Slept hungry	230(60%)	50(13%)	69(18%)	35(9%)
Went a whole day without food	254(66%)	38(10%)	61(16%)	31(8%)

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