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RESEARCH ARTICLE

DIETARY INTAKE AND NUTRITIONAL STATUS OF LACTATING MOTHERS PRACTICING URBAN AGRICULTURE IN MWANAMUKIA, A PERI-URBAN AREA OF NAIROBI METROPOLIS

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ABSTRACT

This study was designed as baseline for an intervention to assess the effect supplementation of urban agriculture by production of traditional leafy vegetables on the dietary intake of protein, energy, vitamin A, iron and zinc, and the nutritional status of mothers of 0 to 3 months postpartum. Lactating mothers are likely to be nutritionally vulnerable and their low food intake and the poor nutrition is likely to negatively impact on the nutrition of the weaning children, especially during the period of exclusive breastfeeding. A cross-sectional study was carried out among 260 of the lactating mothers living in Mwanamukia peri-urban area in the eastern Nairobi County. Using the local administration, the population of such mothers was enumerated and from the population, the sample was randomly selected. Then using structured and pre-tested questionnaire information was collected on socio-demographic and socio-economic characteristics. A subsample of 53 mothers was randomly selected from the main sample and this was used to determine the dietary intake of protein, energy, vitamin A, iron and zinc in a 24-hour recall, and the nutrition status of the mothers. Data was analyzed using SPSS version 20 for descriptive data and Pearson correlation was used to determine associations. Results indicate that majority of the respondents fell within the age range of 36 – 40 years. On education, 44.6% had attained primary, while 16.8% had attained secondary. The household size ranged from 6 - 12 with average of 6 persons. The study further showed that majority of the respondents was from the lower socio-economic category. Most respondents had a high diverse diet, however dietary intake of vitamin A, iron and zinc were low, indicating unmet nutritional requirements. The nutritional status as determined by the BMI of majority of the respondents was underweight.

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INTRODUCTION

Pregnant and lactating women are especially at high risk of nutritional deficiencies mainly due to elevated dietary requirements (Cellic, 1999; Doran *et al.,* 1997). Nutrition is vitally important during the postnatal period (Silveira *et al.,* 2007) because breast milk has to supply the added nutrients for the infant requirements (Guthrie and Mary, 1995). Nutrition of the lactating woman affects milk composition and quantity (Silveira *et al.,* 2007) and depletion of nutrient stores during lactation poses a risk of malnutrition to the mother, which in turn compromises the quality and quantity the milk by the mother and impacts negatively on the nutrition of the infant (Mackey, 1998). Good nutritional intake supports the stamina, patience and self-confidence that nursing an infant requires. This emphasizes the need for continuous monitoring of the dietary intake and nutritional status of the mothers especially those among poor resource communities (Ukegbu, 2014, Brown, 2008). Adequate intake by lactating mothers of particularly protein, energy, vitamin A, iron and zinc is important as the nutrients are very crucial for health, growth and immune competence of the infant. Urban agriculture, though illegal is practiced in many towns of the World. The practice enhances income generation and reliability of access to nutritionally rich foods (Maxwell, 2003) Studies have shown that majority of the families who engage in urban agriculture are mostly from the low socio-economic category (Ruel *et al*., 2003). In Nairobi the practice of urban agriculture will be found mainly in the Peri-urban areas growing diversity of crops, but with leafy vegetables predominating. Also small animals such as rabbits and goats, and poultry may be kept. This study was therefore designed to assess the food, dietary intake of vitamin A, iron and zinc, and the nutritional status of lactating mothers with children 1 – 3 months old in a peri-urban setting with an established culture of urban agriculture, with a view to establishing the baseline for an intervention project.

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MATERIALS AND METHODS

This study was carried out between January 2015 and April 2015. The study constituted a baseline for a larger intervention study on elevation of the dietary intake and nutritional status of lactating mothers, by consumption of self-produced traditional vegetables.

Study setting: This study was set out in Mwanamukia, a peri-urban area in eastern Nairobi. Mwanamukia is a Sub-ward of Kasarani ward in Kasarani sub-county. Mwanamukia spans over an area 18.8km^2 and has a total population of 61,316 with 28,637 males and 32,679 female (G.O.K 2010). Mwanamukia was purposively selected because it had earlier hosted a project on urban agriculture.

Study design: This was a cross sectional study targeting lactating mothers with children 0 – 3 months old. The sampling unit was households with the children satisfying the criterion of selection.

Sample size calculation: This was based on the formula by Fischer *et al.* (1991):

$N= z^2pq/d^2$, where N is the sample size, z is the normal deviation (1.96) corresponding to 95% confidence intervals, p is estimated food insecurity in Nairobi at 32.9%, q is 1-p and d is the degree of the desired accuracy at 5%. The calculation yielded 236 households, plus 10% attrition giving a total sample of 260 households.

Sampling procedure: Using the local administration, the households satisfying the lactating mothers were identified and from the number, the sample of 260 mothers was selected by random sampling. . The selected mothers had also to meet the inclusion criteria in the questionnaire that included the following: 1. Currently breast feeding 2. Free from any chronic sickness and not on medication 3. Not pregnant at the time of study. From the sample of mothers, a subsample of 53 mothers was randomly selected for use in the determination of dietary intake and the nutritional status as Body Mass Index (BMI).

Data collection

A pretested structured questionnaire was administered to lactating mothers. Themes of interest to this study were developed and they formed the check lists which were used in two focused group discussions and among 4 key informants. The first focused group consisted of 8 lactating mothers while the second group comprised 5 lactating mothers, then 2 area elders and 1 headman. The key informants consisted of a hospital nutritionist, the sub-county Agricultural officer and the area ward administrator. The mothers' questionnaire was used to collect information on socio-demographic and socio-economic status, and dietary intake in a 24-hour recall of protein, energy, vitamin A, iron and zinc and nutritional status. The nutritional status was assessed by taking the height and weight of the subjects and calculating the Body Mass Index (BMI). The BMI values were used to categorize the subjects as underweight, normal and overweight. The respondents' consent was sort before administering the questionnaire and confidentiality was assured. The protocol of the study was approved by the University of Nairobi Post Graduate Studies and the Ministry of Agriculture, Livestock development and Fisheries, Kasarani Sub-county.

Data analysis

The questionnaires were coded and summarized according to the variables for each objective. Data was entered and cleaned using statistical packages for social sciences (SPSS version 20) for analysis. Frequencies mean, standard deviations, percentages were calculated and correlations were conducted to identify associations. Where the associations existed, chi-square was used to test their strength. Data on dietary intake was analyzed using Nutrisurvey software and the analysis was exported to Word as a report.

RESULTS

Socio-demographic and Socio-economic characteristics of the mothers

Age of the mothers

The age categories of the respondents are shown in Table 1.The minimum age of the respondents was chosen as 20 years because it is generally at that age that women in the country are expected to be married. The maximum age was chosen as 49, years the maximum for reproductive age. The highest number of mothers fell in the range of 36-40 years. The least number of mothers were within the age ranges of 20 – 25 years and 46 - 49 years; this may indicate low tendencies to have children below age 25 and age above 46 - 49 years.

Table 1. Distribution of mothers by age categories

Age categories (years)	Number of respondents (N=260)	Percent of mothers
20-25	18	6.7
26-30	43	16.5
31-35	45	17.3
36-40	86	33.1
41-45	52	20.1
46-50	16	6.3

Marital status of the mothers

Majority were married (62.7%), Single mothers were 25.4%. The remaining mothers were either divorced or widowed and each at less than 10%.

Table 2. Distribution of the mothers by marital status

Marital status	Number of respondents (N=260)	Percentage (%)
N/A	5	1.9
Divorced	16	6.2
Widow	10	3.8
Married	163	62.7
Single	66	25.4

Education level of the mothers

The education levels of the mothers are shown in Table 3. As the Results show that, 44.6% had primary and 40 % had secondary education. The remaining mothers had either college diploma or university degree. There were no illiterate mothers. That means that all the mothers participating in the study had at least primary level education. This means that they were all capable of accessing nutrition and health information from the common sources available. The main education level attained was primary at 44.6 % which is higher than the average of 43% indicated by KDHS study (2014)

Table 3. Distribution of mothers by education level

Education level	Number of respondents (N=260)	Percent of mothers
Illiterate	21	8.1
Primary level	116	44.6
Secondary (O level)	90	34.6
Secondary (A level)	14	5.4
College	17	6.5
University	2	0.8

Size of the household

The distribution of household sizes is as shown in table 4. In this study, the maximum house hold size was 12 while the average was 6. The number is higher compared to 3.9 the average household size in Kenya according to KDHS (2014).

Table 4. Distribution mothers by household size

Members in the household	Number of respondents (N=260)	Percent of households
1-5	146	56.3
6-10	94	36.2
11-15	20	7.5

Occupation of the mothers

The occupations of the mothers are shown in Table 5. As Table 4 shows, there were many differing occupations among the respondents. Majority were running small businesses mainly in the informal sector at 28.6%, while 23.9% were housewives and 21.2% were farmers, probably practicing urban agriculture.

Table 5. Distribution of the mothers by occupation

Occupation of the mothers	Number of mothers (N = 260)	Percentage (%)
Business	75	28.6
Housewives	62	23.9
Farmers	55	21.2
Teachers	20	7.8
Hairdresser	17	6.3
Tailor	8	3.1
House help	8	3.1
Laborer	5	2.0
Others	10	4.0

Distribution of the mothers' households by monthly income

The monthly income levels of the households in Kenya shillings (KES)* of the households are shown in table 6. As the Figure shows, the largest group of households had income of KES 11000 – 20000. About 27% of the families had income of between KES 1,000 – 10,000. These figures show that at least 18% fall within the lower socio-economic group of the country considering the cut-off of KES 15000. Also the incomes show that 68% of the households had income of less that KES 30,000, and therefore lived below the World Bank poverty line of $1 a day. It is possible that this number could go down considering that the communities do not necessarily entirely depend on the monetary income especially for food. Much of the food consumed is usually grown by the households under urban agriculture.

Food consumption frequency

The frequency of food consumption by the mothers is shown in Table 7. As the results show, the most frequently consumed grains by the mothers were maize and rice. Wheat products were consumed at a frequency of 20% daily and at 12 % 3 to 6 times a week. These consumptions were probably in bread and chapattis. Root crops (potatoes, sweet potatoes and arrow roots) were consumed at average frequency of 12% daily.

Table 6. Distribution of mothers' households by income

Monthly income Categories	Number of respondents	Percentages
1000 – 10,000	39	27.2
11,000 – 20,000	103	40.6
21,000 – 30,000	24	9.4
31,000 – 60,000	28	10.2
>70,000	25	12.6

These foods therefore made significant contribution to energy intake. However this frequency differed with time, Irish potatoes were consumed at 18% 3 to 6 times a week compared to sweet potatoes that were consumed at a frequency of 16% 1-2 times a week while arrow roots were consumed at a frequency of 12% once a month. Pigeon peas were commonly consumed legumes and pulses daily at a frequency of 20% followed by ground nuts at a frequency of 10% daily. It was noted that most lactating mother fed on at least one of the following 1 - 2 times a week: pigeon peas, green grams and ground nuts. These foods were probably the main source of protein and was augmented by the little products eaten. Carrots were the most frequently consumed vegetables at 24% daily while tomatoes, amaranth, night shade and cowpea leaves. Except for tomatoes, the other vegetables are good sources of vitamin A, and the leafy vegetables are rich sources of iron and zinc (Whitney and Rolfer, 2016). Kales and spinach are also good sources of vitamin A and minerals and were consumed at a frequency of 12 % at least 1 to 6 times a week. Eggs had the highest frequency of consumption compared to other meats. Their frequencies stood at 44% daily, 34 % 3 to 6 times a week and 10% 1 to 2 times a week. Beef and chicken meats had a low consumption at 10% daily for beef. Goat meat was consumed at frequencies of 8% and 12% 3 to 6 times a week and 1 to 2 times a week respectively. Chicken and fish were the least consumed meats at a frequency of 10 % once a month. That means the contribution of protein intake by meats was low. Avocado fruit was the highest consumed at frequencies of 16% daily, 12% 3 to 6 times a week and at 10% 1 to 2 times a week. Fresh milk was the highest consumed dairy product at frequencies of 92% daily and at 4% 3 to 6 times a week while other daily products had very little consumption. The high frequency of consumption of fluid milk was probably that used with tea daily.

Dietary intake in a 24-hour recall

The results of the intake of energy, protein, and the consumption of carbohydrates and fat are presented in Table 8. As the results show, no group achieved a mean intake of energy of 100% or more, although within the groups, there is possibility of some individuals having done so. The group, less than 20 years of age had only one respondent who was taking very little energy, and was probably terribly underweight. Of the other groups, the intake of energy by the 20 – 25 years had the highest energy intake with mean RDA of 76.7%, while the group of 30 years and over had the lowest mean intake represented by mean RDA of 72.5%. However these mean RDAs were not significantly different from one another ($p \leq 0.05$).

Table 7. Frequency of food consumption among lactating mothers

Food item	Frequency (%)			
	Daily	3-6 times a week	1-2 times a week	Once a month
Grains				
Wheat	20	12		
Maize		18		
Rice		10	12	
Starch roots				
Irish potatoes	12	18		
Sweet potatoes	12		16	
Arrow roots	12			12
Legumes, pulses and nuts				
pigeon peas	10	10	18	24
Green grams	20		24	
Ground nuts		10	10	10
Vegetables				
Traditional leafy vegetables	12			
(Amaranth, night shades and cow pea leaves)				
Carrots	24			
Tomatoes	12			
Kales and spinach		12		
French beans		8	22	
Meats and eggs				
Beef	10			
Chicken	10			
Goat		8	12	
Fish				10
Eggs	44	34	10	
Fruits				
Avocadoes	16	12	10	
Dairy products				
Fresh milk	92	4		
Yoghurt		8	18	14

Table 8. Energy, protein, carbohydrate and fats intake for different age groups of lactating women

Energy (Kcal)	N=53	Minimum	Maximum	RDA for age	Mean intake	Mean RDA intake percent
Less than 20 years	1	506	506	2037	506	24.8
20 - 25 years	15	856	2189	2037	1563	76.7
26 - 30 years	13	878	2153	2036	1476	72.5
31- 35 years	16	922	2185	2036	1506	74.1
36 -40 years	5	350	612	2036	517	67.8
41-45 years	2	900	1934	2038	1417	69.5
45-49 years	1	1523	1523	2038	304	74.7
Protein (g)						
Less than 20 years	1	13.8	13.80	60.4	13.8	22.9
20 to 25 years	15	20.4	75.40	60.4	47.4	78.8
26 to 30 years	13	21.5	62.00	60.4	39.0	64.8
31-35 years	16	20.1	74.10	60.4	38.4	63.9
36-40 years	5	18.3	67.00	60.4	32.1	53.4
41-45 years	2	23.2	43.40	60.4	33.3	55.4
45-49 years	1	29.4	29.40	60.4	29.4	48.9
Carbohydrates (g)						
Less than 20 years	1	84.60	84.60	290.6	84.6	29.1
20 to 25 years	15	146.30	386.30	290.6	269.5	92.7
26 to 30 Years	13	132.60	516.00	290.6	265.0	91.2
31-35 Years	16	161.10	375.80	290.6	274.7	94.5
36 -40Years	5	72.40	289.60	290.6	235.6	81.1
41-45 years	2	114.6	316.40	290.6	215.5	74.2
45-49 years	1	389.9	389.9	290.6	389.9	134.2
Fat (g)						
Less than 20 years	1	12.60	12.60	69.2g	12.6	18.2
20 to 25 years	15	19.30	51.50	69.2	38.0	54.9
26 to 30 Years	13	20.10	51.20	69.2	32.7	47.3
31-35 Years	16	17.60	44.30	69.2	32.1	46.4
36-40 Years	5	9.60	79.50	69.2	37.4	54.0
41-45 years	2	39.60	54.30	69.2	47.0	67.8
45.49 years	1	62.1	62.1	69.2	62.1	89.7

Table 9. Dietary intake of vitamin A, iron and zinc for different age groups of lactating women

Vitamins						
Vitamin-A	n (N=53)	Minimum	Maximum	RDA	Mean	Mean RDA intake percent
Less than 20 years	1	177.50	177.50	3000µg	177.5	3.9
20 to 25 years	15	18.30	1710.70	3000µg	520.8	17.4
26 to 30 Years	13	30.50	1132.60	3000µg	497.3	16.6
31-35 Years	16	46.60	1689.50	3000µg	634.8	21.2
36-40 Years	5	113.4	1867.10	3000µg	537.4	17.9
41-45 years	2	384.6	753.2	3000µg	568.9	19.0
46-49years	1	167.9	167.9	3000µg	167.9	5.6
Minerals						
	n (N=53)	Minimum	Maximum	RDA for age	Mean	Mean RDA intake percent
Iron						
Less than 20 years	1	3.50	3.50	18 mg	3.5	19.4
20 - 25 years	15	4.00	20.00	18 mg	8.3	46.1
26 -30 years	13	7.2	45.6	18 mg	6.4	35.6
31-35 years	16	6.50	16.70	18 mg	7.6	42.2
36 -40years	5	3.6	21.3	18 mg	5.3	29.4
41-45 years	2	6.7	13.2	18mg	10.1	55.3
45-49 years	1	8.7	8.7	18mg	8.7	48.3
Zinc						
Less than 20 years	1	2.30	2.30	8 mg	2.30	28.8
20 - 25 years	15	2.50	7.30	8 mg	3.2	40
26 - 30 years	13	3.70	4.1	8 mg	3.9	48.8
31-35 years	16	3.60	8.6	8 mg	4.1	51.3
36-40 years	5	3.4	7.8	8mg	3.8	47.5
41-45 years	2	2.4	4.2	8mg	3.3	41.3
46-49 years	1	4.6	4.6	8 mg	4.6	57.5

Table 10. Distribution o the nutritional status of the lactating mothers by age

	BMI Categories n(percent)		
Age of the mothers in years	<18.5	18.5-25	>25
<20	1(1.9)	0	0
20-25	8(15.1)	4(7.5)	3(5.7)
26-30	6(11.2)	4(7.5)	3(5.7)
31-35	8(15.1)	5(9.4)	3(5.7)
36-40	2(3.8)	2(3.8)	1(1.9)
41-45	0	1(1.9)	1(1.9)
46-49	0	0	1(1.9)

Table 11. Distribution of lactating mothers BMI and socio-economic status

	BMI Categories n(percent)		
Monthly income of the HH	<18.5	18.5-25	>25
1,000 - 10,000	12(22.6)	3(5.7)	1(1.9)
11,000 - 20,000	10(18.8)	9(17)	3(5.7)
>21,000	3(5.7)	4(7.5)	8(15.1)

Table 12. Distribution of lactating mothers by household size and nutritional status

	BMI Categories n(percent)		
HH Size	<18.5	18.5-25	>25
1 - 4 Persons	28(11.02)	48(18.89)	25(9.84)
5 -9 Persons	6(2.36)	59(23.22)	47(18.50)
>9 Persons	0	9(3.54)	32(12.59)

Table 13. Distribution of lactating mothers by education and nutritional status

	BMI Categories n(percent)		
Education level	<18.5	18.5-25	>25
None	3(5.7)	2(3.8)	3(3.8)
Primary	16(30.1)	11(20.7)	4(7.5)
Secondary	4(7.5)	2(3.8)	3(5.7)
Tertiary	2(3.8)	1(1.9)	2(3.8)

Table 14. Correlation between some socio-demographic characteristics and dietary intake of nutrients

Variables	dietary intake of iron, zinc and vitamin A, protein and energy
Education	0.126
Occupation	0.012**
Age	0.028*
Income	0.385
Ethnicity	0.425

The highest mean energy intake was 2189kcal. As the results show the group of 20-25 attained energy intake of 76.7%, this was the highest energy intake achieved in all age groups. The lowest energy intake was at 24.9% from the lactating mother whose age is below 20 years. All the groups had dietary intake below the recommended level this means that lactating mothers at all ages were not meeting their energy requirements. The recommended protein intake is 60g and the respondents of the ages between 25-30 years had achieved 78.8% this was the highest attained protein intake in all groups. The lowest protein intake was at 22.9%, this was achieved by the under 20 years respondent. In the carbohydrate dietary intake the group between 45-49 years had attained the highest percentage intake of carbohydrates at 134.2% while the lowest attained percentage was 29.1% by the respondent below 20 years. All groups met their recommended carbohydrates intake. Respondents' dietary intake for fat was highest at 89.7% by the group of 45-59 years. This means this group was at high risk of becoming obese. It was lowest at 18.2 for the lactating mother under 20 years of age. The results of the intake of vitamin A, Iron and Zinc are shown in table 9. Most women were very far from meeting their Vitamin A requirements. None of the age groups had intakes close to half compared to iron and zinc that had at least one of the age groups having met half of the requirements

The women were very far from meeting their Vitamin A requirements. None of them had intakes close to half. The highest Vitamin A intake among the respondents was 635 µg while the lowest was 177µg. The recommended intake is 3000µg. The highest Vitamin A intake was meeting 21% of the allowances. The highest Iron intake among the respondents was 13.7mg while the lowest was 3.5mg. The recommended intake is 18mg. The highest Iron intake was meeting 76% of the allowances. The highest Zinc intake among the respondents was 7.5mg while the lowest was 2.3mg. The recommended intake is 8mg. The highest Zinc intake was meeting 94% of the allowances. Women in this study were most deficient in vitamin A.

Nutritional status of the mothers

The nutritional status is shown in table 10. Majority of the respondents (47%) was underweight. 30% of the respondents was normal while 23% of the respondents were also at risk of being obese (BMI >25). All these were found in the category of women aged above 36 years.

Lactating mothers BMI and socio-economic status

The association between lactating mothers BMI and their socio economic status is shown in table 11. The highest percentage 22.6%, of Ksh1,000-10,000 were underweight while 15.1% of respondents with an income of Ksh >21,00 were at risk of becoming obese. This means that the association between income and nutritional status of lactating mothers is significant. The highest percentage of 19% means that an income of 11,000 to 20,000 was highly associated with a normal BMI.

Lactating mothers BMI and household size From the study households with 1-4 people had the highest number of lactating mothers with normal BMI at 20.8%. These same households also had a high number of mothers at risk of overweight. At the same time, households with the most number of people had no underweight mothers. Households with the least number of people had the highest percentage of them with normal BMI. As seen from the table above, households with 5-9 people had the highest number of lactating mothers with normal BMI. These same households also had a high number of mothers at risk of overweight. At the same time, households with the most number of people had no underweight mothers. Households with the least number of people had the highest percentage of them with normal BMI.

Lactating mothers education and their nutritional status

The association between lactating mothers BMI and education is shown in table 13. Lactating mothers with primary school education had the highest percentage of underweight at 30.1% than any other level of schooling. They were also had the highest percentage of lactating mothers who had normal BMI. Those with secondary school education (O level) were more likely to have normal BMI.

Correlation between some socio-demographic characteristics and dietary intake of nutrients

The Correlation between some socio-demographic characteristics and dietary intake of nutrients is shown in table 14. There was a positive and significance relationship between occupation of the respondents and their dietary intake of iron, zinc, vitamin A, energy and protein. This was true in households of lactating mothers who practiced urban farming. They were able to get food from their farm to meet their dietary requirements however those who depended on income from manual labor proceeds had negative and insignificant relationship in meeting their dietary needs in this study. There is also a positive correlation and significant relationship between dietary intake of iron, zinc, vitamin A, protein and energy and Age of the respondents. However, the study shows a positive but insignificant relationship between dietary intake and income, and ethnicity of respondents. This means that, occupation and age determined a lot about the dietary intake of iron, zinc, vitamin A, protein and energy.

DISCUSSION

Age

The results in this study show that majority of the respondents were young people. As it appears, urban farming is not restricted to certain age groups as stated by, Stevenson *et al.,* (1994). It is however most probable that since urban agriculture is small scale and far from having commercial drive, majority of the farmers are women. A study in Ghana found that 63% percent of the urban farmers were in the age bracket of 21-40 years (Ackerson and Awuah, 2010). In this study, the farmers in the age range 20 – 40 years were 73.6%. In Namibia as well, majority of the respondents 66.3% were young people falling in the age range of 21-40 (Dima *et al.,* 2002). A study in Eldoret, the mean age of urban farmers was 28 years (Kadenyeka *et al.,* 2013). In Gweru city, Zimbabwe, the average age was 41 years (Jongwe 2014). Salau and Attah (2012) working in Nasarawa state Nigeria found that the mean age of the farmers was 50 years, although 35.56% were within the age range of 41–50 years followed by those within the range of 51–60 years at 24.44%. In their study Yusuf *et al*., (2015) found that the majority of farmers (76.1%) were aged

41-60 years. In Accra Ghana, 83% of the farmers were aged 40 years and over, only 17% were between 20-29yrs of age. None of the farmers was below 30 years (Danso *et al*., 2004). As it appears, urban farming is not restricted to certain age groups as stated by, Stevenson *et al.,* (1994). It is however most probable that since urban agriculture is small scale and far from having commercial drive, majority of the farmers are women.

Marital status

Majority were married (62.7%), Single mothers were 25.4%. The remaining mothers were either divorced or widowed and each at less than 10%. The marital status of the mothers was shown to contribute to their nutritional status. Most women who were married had a normal BMI. This could have been attributed to the fact that their partners gave them information on their nutrition status compared to single women who might have lacked the information. Results of a study in Nigeria compare quite well with those of the current study where 90% of the respondents were married and only 7.78% were single (Salau and Attah, 2012). However, a study in Namibia found that only 23.4% of the respondents were married while 58% respondents were single, 13.5% were cohabiting, 4% divorced and 6% separated (Dima *et al.,* 2002). In Samre Woreda, Ethiopia, 92.3% of the respondents were married, 5.8% divorced and 2% widowed (Haileslassie *et al.,* 2013). Again in Ibadan, Oyo states, Nigeria 90.9% of the farmers interviewed were married (Yusuf, Balogun, & Falegbe, 2015).

Education level

There were very few numbers of illiterate mothers contributing to 8.1% of the respondents. That means that all the mothers participating in the study had at least primary level education and that they were capable of accessing nutrition and health information from the common sources available. Most mothers with a higher education level had a normal BMI. A study in Nigeria by Salau and Attah (2012) reported that 33.33% of the respondents had primary education, while 22.22% had secondary education. A study in Kumasi Ghana showed that 67% of the respondents had dropped out or completed basic education (Ackerson and Awuah, 2010). A study in Eldoret, Kenya showed that the respondents with primary education level of education were 25% and Secondary 15% (Kadenyeka *et al.,* 2013). Another study in Nigeria showed that majority of the respondents (50.5%) had tertiary education while 25.4% had only secondary (Yusuf *et al*., 2015). In Accra Ghana a study showed that 33% of the respondents had primary education, 37% secondary and only 6% had Tertiary education (Danso *et al.,* 2004).

Household size

The household size in this study was higher compared to 3.9 the average household size in Kenya according to KDHS (2014), According to Stevenson *et al.,* (1994), farm families are generally bigger than the average town families. Larger households have a higher demand on family income and are thus using their resources to produce own food (Stevenson *et al.,* 1994). In Ibadan, Oyo state, Nigeria, majority of the respondents (92.3%) had a household size of 4-8. The household size affects the nutritional status of lactating mothers as seen in table 10 where lactating mothers households with the highest number of members, had lactating mothers who were underweight 29% and household whose members were less had 80% of lactating mothers with normal BMI. According to Stevenson *et al.* (1994), farm families are generally bigger than the average town families. Larger households have a higher demand on family income and are thus using their resources to produce own food (Stevenson *et al.,* 1994). In Ibadan, Oyo state, Nigeria, majority of the respondents (92.3%) had a household size of 4-8. In Pretoria, South Africa the average household counted 4.4 members (Averbeke, 2007). In a study in Eldoret, the Mean household size was also 4 (Kadenyeka *et al*., 2013). In Gweru city, Zimbabwe, the average household size was 4.62 (Admire, 2014). In a study in Namibia, majority of respondents had household sizes ranging from 3 to 8 persons. In Windhoek 76% of the respondents had family sizes of 3-8 persons, 22% had less than 3 persons per household and only 2% had members greater than 8. In Oshakati the respective figures were 71% with 3-8 persons, 11% with less than 3 persons and 18% with more than 8 persons living in their families (Dima *et al*., 2002).

Occupation

Majority of the respondents in this study were small scale business people (28.6%) in the informal sector and housewives (23.9%). These findings concur with those of Foeken and Mwangi (2000) who established that farming activities in the urban areas were mostly carried out on a part time basis by people in other livelihoods. Their participation in urban agriculture was to supplement their family food or income. These results concur with the result of a study done in Kibera a slum in Nairobi by Karanja (2013) where the respondents used sack gardening as a source of income and home consumption. This study agrees with research conducted by the Planning Commission and the Ministry of Labor and Youth Development of Daresalaam (1995) which found that, about 30% of the urban population gains an income in the informal sector and about 6.5% of the informal urban workforce works in urban agriculture. Stevenson *et al*. (1996) found that, for 90% of interviewed periurban farmers, agriculture was their primary economic activity. Farming was the primary occupation of most (90%) farmers, although they all had other sources of supplementary income, such as trading, teaching, etc (Danso *et al.,* 2004). The results of Salau and Attah's study (2012), showed that majority (63.33%) of the respondents were civil servants, 22.22% with trading as their major occupation while 14.45% were full time farmers. In Zimbabwe, Mudzengerere's study (2014) showed that 55% of the respondents were unemployed whilst 24% worked in the informal sector. Only 13% were formally employed. In total, 87% of the interviewed people were unemployed and they were dependent on the informal sector for employment. In Pretoria, South Africa the contribution to mean total household income of employment was 67.1%, public welfare grants 16.0%, service provision 7.2%, trade 7.0%, transfers by kin 2.5% and agriculture 0.2% (Averbeke, 2007).

Food frequency

The respondents in this study mainly consumed maize, rice, wheat and potatoes food items as starchy staples. Findings from this study also indicate that green peas and green grams were the commonly consumed pulses and carrots were the frequently consumed vegetables. Beef and chicken were the most commonly consumed meats and eggs were often consumed at a frequency of almost 50%. This is because

lactating mothers household kept local chicken which could be providing with eggs and poultry. These are common foods consumed in Kenya. Their availability and accessibility are considered synonymous with food security. Foods that were less frequently consumed include ground nuts, Green peas, arrow roots, yoghurt, Chicken and fish, probably influenced by affordability, familiarity and acceptability. For example majority of the communities in the area are not habitual eaters of fish. According to Whitney and Rolfes (2016), wheat is rich in calcium and iron. Maize is rich in iron Carrots are rich in vitamin A. Dark green leafy vegetables are rich in calcium vitamin A and many other minerals including zinc. Orange flesh sweet potatoes are rich in Vitamin A, Milk is rich in calcium and vitamin A. These foods were eaten frequently, and if the eaten quantities were adequate, then there was low likelihood of insufficient intake of the nutrients targeted. Studies indicate that women can produce milk with adequate protein, carbohydrate, fat, and most minerals, even when their own supplies are limited (Whitney and Rolfes, 2016). For these nutrients milk quality is maintained at the expense of maternal stores. For calcium for example dietary calcium has no effect on the calcium concentration of breast milk, but maternal bones lose some density during lactation if calcium intakes are inadequate. Vitamins A in breast milk is likely to decline if inadequate dietary intakes are prolonged.

Vitamin A and mineral intakes

This study indicated that most respondents' sources of Vitamin A came from dark green leafy vegetables agreeing to what Sanusi and Adebiyi (2009) reported that the diets of populations in tropical countries rarely contain large amounts of milk, eggs and liver which are rich sources of preformed vitamin A. This thus makes people depend on carotenoids particularly from leafy vegetables and palm oil as sources of vitamin A. Affordability of animal food items that contain vitamin A is also a challenge to the study population which contains majority of them who have low income since it's a slum area. Whitney and Rolfes (2016) state that dark green, deep orange vegetables and fruits and fortified foods such as milk contribute large quantities of vitamin A. Some foods are rich enough in vitamin A to provide the RDA and more in a single serving. Carrots and sweet potatoes are two of the best sources per kcal which the respondents took almost every day. The deficiency may have been because they were not taking enough of Vitamin A rich foods to cater for the demand of both mother and baby. Majority of those lactating mothers who had own land kept local chicken and this contributed to their high frequency of eggs consumption. They also consumed the chicken they kept as a source of protein after delivery.

Energy

A study of energetics in exclusively breastfeeding women cited a total energy cost of approximately 623 Kcal per day assuming 750 grams of milk produced at 0.67 Kcal/g and 80% efficiency. With mobilization of approximately 170 kcal per day, net energy needs were estimated at approximately 450 Kcal per day (Brown, *et al.,* 2011). According to Whitney and Rolfes (2016), most women need at least 1800 kcal a day to receive all the nutrients required for successful lactation. The women with the lowest energy intakes in this study took 612 Kcal, while others were higher than the recommendation. This could have been contributed by the fact that most lactating mothers consumed the food they produced which were largely maize and beans in this baseline study. They also had avocado trees planted on their farm and most of them consumed avocado and 'githeri' which is a mixer of maize and beans this is according to the observation by the researchers. This means they were within the recommended range. The respondents' distribution of total calories from carbohydrate ranged from 29.1% to 134.25%. This shows that carbohydrates consumption was high in this study.

Proteins

The mean protein intake of the lactating women was low compared to the recommended intakes by Nutrisurvey and WHO/FAO/UNU (2007). According to Chen *et al.* (2012) lactating women require dietary protein for synthesis of the protein in breast milk, and for the growth, maintenance and repair of cells. With this deficiency, there is possibility of lowered protein intake by the child from the milk, leading to poor growth of the children in exclusive breast feeding.

Nutritional status

Findings from this study show that the highest percentage (47%) of the respondents had a underweight BMI. The DRIs for normal-weight lactating women are based on the assumption that the energy spent for milk production is 500 Kcal per day in the first 6 months and 400 Kcal afterward (Butte & King, 2005). Severe energy restriction may hinder milk production. The fact that 23% of the respondents were overweight could be due to the weight gained during pregnancy which they may not have managed to shed off. It could also be due to the fact that some women tend to overeat while breastfeeding (Brown *et al.,* 2011). In addition, the BMI recommendation for normal adults was used in classifying the lactating women in this study, since there is no recommended standard for the category. This could have positioned a good number of the women in the overweight and obese categories (WHO, 2000). Jayawardena *et al.* (2013) argue that diets that offer a greater variety of energy-dense foods could increase food intake and body weight. The large proportion of the mothers who were underweight (47%) could probably due to the fact that the mothers did not raise their intake to match the increased needs so the losses occurred and may have led to them being underweight. The results of the present study do not agree with the study among a group of Brazilian lactating women which showed a high prevalence of overweight despite a lower energy intake below the recommended level (Tavares *et al.,* 2013). Food consumption frequencies subsume that the respondents consumed larger quantities of energy foods more frequently. Majority of the respondents who were underweight had low levels of education and were housewives. This concurs with the results of research published by CFSVA (2005) that state that households with no education are most likely to be considered food insecure. There is a positive and significance relationship between the nutritional status of lactating mothers and the level of income. Households with high income had majority of lactating mothers with a normal BMI 83%, while those with low income had lactating mothers who were underweight 61%. In this study lactating mothers whose households had least members had a normal BMI 80% while those with members above nine were underweight 29%. This is supported by the fact that the study area is a slum area with most people depending on manual labor for a living making it difficult to get enough resources for food and other needs of the family such as education and health. This study

concurs with the study done by Maswikaneng, (2007) in Atteridgeville, Peritoria, which found a positive and significance correlation between households which participated in urban farming and their dietary intake. Focus group discussions and key informers showed that majority of respondents started giving complementary feeds to their children between two to three months. They gave lack of food to eat after breast feeding and lack of breast milk as reasons for giving supplementary feeds before six months. Lactating mothers also gave lack of space for farming as reasons why they did not participate in urban farming. They also required advice on how to grow vegetables and fruits for own consumption and for sale. Majority of them did not keep small animals like rabbits and goats due to lack of space. Some respondents kept chicken in form of local and broilers for sale and also for consumption. The respondents also had a poor health seeking behavior since majority of them gave birth at home and did not seek advice from the local clinic especially on how to feed their infants thus failing to follow exclusive breastfeeding for six months as per WHO recommendation. Due to their low income majority of the respondents left their infants under the care of relatives and neighbors to go look for manual jobs to get money to purchase food and buy other facilities for the family.

More than half of the respondents had achieved primary education and they had a normal BMI while those who were underweight were those with little or no education. This is because people who are literate are more likely to understand the reasons for a balanced diet for the purpose of their health and that of their infants. Majority of the respondents participated in urban agriculture and this is used to improve food access in the study population which is a slum area with majority of respondents with low income making it difficult for them to purchase food for their households from the available markets. Most of the respondents were not meeting their dietary intake for the selected micronutrients in the study. This could be attributed to the fact that in poor environments people have a tendency of consuming energy and carbohydrates rich foods which are cheap and readily available in bulk unless fruits, vegetables and protein food. The dietary intakes of energy and protein were found to be moderate as represented by mean percent RDAs for each group. The intakes of vitamin A showed there were deficiencies among the lactating women of all age groups studied as well as the intakes of iron and zinc. The nutritional status as represented by BMI was found to be unmet for majority of the mothers and comparison among the age groups showed that some women met their requirements though still at low percentages, while comparison among the socio-economic categories showed that the nutritional status of women with low income highly affects the women and most of these women do not meet their requirements and end up being underweight. The dietary intake was found to be positively correlated with intake of minerals, carbohydrates, proteins and fats while the nutritional status was found to be correlated with occupation and education.

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