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AN ASSESSMENT OF MATERNAL DIETARY PATTERN IN A RURAL COMMUNITY IN SOUTH WESTERN KENYA

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ABSTRACT

In spite of strategies that has been put in place to achieve the 5th millennium goal of improving maternal health, maternal malnutrition continues to be a global problem. Women in poor rural communities often consume diets deficient in energy and therefore many other nutrients.. Population studies indicate that kilocalorie intake is usually less than recommended and pregnant women often do not show a significant augmentation in nutrient intake. This study aimed to investigate maternal dietary intake in Kamagambo, South Western Kenya. Objectives of the study included determining socio-demographic factors, nutrient intake, and testing for relationships between variables. The study expected to find no significant relationship between nutrient intake, and socio-demographic characteristics. A longitudinal design was adopted and comprehensive sampling obtained a sample of 100 pregnant women for the study. Data was collected by structured questionnaires, 24- hour recall and food weighing technique. Data was analyzed by SPSS, Nutri-survey and descriptive statistics. Pearson's Correlation Coefficient was used to test for significant relationships between variables, t test was used to test for significant difference between mean of nutrients. Pregnant women in this study consumed less calories than the value recommended as adequate. Most of the food nutrients did not meet the RDA. Diets had little variety with high repeatability of certain food items through the week. Most of the food energy came from carbohydrates which comprised the largest proportion of the women's diet. There were no significant differences between 24 hour recall and observed intakes. The study fills the knowledge gap, and is of benefit to future research work, various government departments, local and international agencies, the community and pregnant women. The government and health and nutrition organizations need to monitor pregnant women more closely in order to provide counselling as well as nutritional support to pregnant women in this region.

INTRODUCTION

Approximately 826 million people in the world are undernourished or chronically food insecure facing a shortfall in the energy requirement by between 100-400 kilocalories (FAO, 2001) while 790 million people in developing countries subsist on diets that are deficient in energy (FAO, 2001). Worldwide, the number of food insecure people has increased to 852 million from 800 million in 1996 when world leaders met in Rome and vowed to ensure food security (Barasa, 2006). Globally, more than 75 % of the hungry live in rural areas relying on their own means to feed their families (Barasa, 2006). The Horn of Africa is the most food insecure region of the world, 45% of the population lives in areas of food shortage and 13 million are in need of relief food (FAO, 2000).

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There is indication that the nutrition situation has worsened because of population growth and policy failures (Mwadime, 2001). In Sub-Saharan Africa alone, more than 200 million people (a third of the population) are malnourished. This number has been increasing by 30 million since 1996 (Barasa, 2006). In East Africa, food supply prospects are bleak in several countries of the sub-region following poor seasonal rains (FAO, 2004). In Kenya 50% of the rural population is food insecure. Nyanza, Rift Valley and Eastern provinces contributed 66% of the total rural food poverty (Barasa, 2006). Despite strategies put in to reduce malnutrition, maternal malnutrition continues to be a global problem. Population studies indicate that kilocalorie intake is usually less than recommended and pregnant women often do not show a significant augmentation in energy intake (Shaw, 2003). Maternal malnutrition alone is associated with both maternal morbidity and mortality in several ways. Maternal stunting is associated with a small birth canal and obstructed labour,

which is a main cause of maternal mortality. Maternal underweight, an outcome of maternal malnutrition is a key risk factor in low birth weight. This is in turn a risk factor for child stunting and underweight as well as some types of chronic disease during adulthood (SCN, 2004, Mwadime, 2001; Willis, 2003). Low birth weight infants are 4 times more likely to die from infections such as diarrhoea and pneumonia (Garza & Motel, 2000). Hence this study is timely for it determines dietary intake and findings may be used by policy makers in coming up with policies that will improve the nutrition and health of women and children in this community of Kamagambo Western, Kenya.

Purpose and Objectives

The purpose of this study was to investigate the maternal energy intake among pregnant women attending antenatal clinic at Kamagambo in Western Kenya. The specific objectives of the study were to determine socio-economic factors and the daily dietary intake of pregnant women at Kamagambo Western, Kenya. The study assumed a Natural attrition of not more than 10% and limited itself to pregnant women visiting Rongo Sub-District Hospital.

MATERIALS AND METHODS

Research Design and Sampling

Longitudinal and experimental design was used in the study. Experiment was done on a randomized food sample to obtain quantities of some selected nutrients. A sample of pregnant women were selected and were followed over a period of six months to obtain dietary intakes and socio-economic factors of the pregnant women. Rongo Sub-District hospital was purposively selected for the study. The hospital was selected for its credibility in offering antenatal services to the largest number of women in the Division (Migori District Medical Records, 2004). Comprehensive sampling was used to identify all women in their 2nd and 3rd trimesters of pregnancy that consented to participate in the study as they arrived at the hospital. A population of approximately 120 pregnant women visit the hospital in a month (Medical Records Migori District Hospital, 2004). This was used as the study population. The sample size was calculated as P1 = 0.7 +10% according to FANTA sampling guide (1997) recommendations. The study used 70% as a suitable representation and a further 10% in control of attrition to obtain a sample of 100 pregnant women. Because expected to visit the hospital in the following month except for a few drop outs (delivery cases) and a few first visits, therefore one month was used as the right time frame to obtain the required sample. Using a sampling interval was not practical because of the small population under study relative to the required sample size. Each pregnant woman visiting the hospital was therefore selected for the study based on their consent.

The study included pregnant women who suffered manageable chronic illnesses or who were on some form of medication and/or treatment. Pregnant women in their 1st trimester, those who did not give consent, those who were hospitalized or bedridden and those who were resident in the locality for less than six months were excluded. A Research Permit was issued by the Permanent Secretary Ministry of Education as clearance to carry out research. Permission was also sought from the Medical Officer of Health Migori District and Project administration was sought from the Medical Officer in Charge at Rongo Sub-District Hospital. Informed verbal consent was obtained from the women. Participation was purely voluntary. Confidentiality of data was maintained by coding the information obtained from every participant and no names were used.

Target Population

This study targeted pregnant women visiting Rongo Sub-district hospital for ante-natal clinic in their 2nd and 3rd trimesters during the period between the year 2006 and 2009.

The Study Area

The study area was Kamagambo, Western Kenya. The area is situated approximately 30 km from Lake Victoria and so falls within the lake region. It borders the Kisii highlands, which have greatly influenced its rainfall patterns. The major economic activities in this rural division are subsistence farming and sugarcane farming. The area was selected for study because the researcher was likely to build trusting relations with the participants during the study and also because data quality and credibility of the study were reasonably assured.

Procedures

Research instruments that were used included a semi structured four-part questionnaire that consisted of socio-demographic characteristics and 24 hour Recall to assess dietary intake. Laboratory analysis was used to test for selected nutrients and Food weighing was done on 10% of the sample. To enhance reliability and validity of the instrument, the instruments were pre-tested on 6% of the sample but who were not included in the study. Research tools were then revised and standardized as per the pre-test results. A face-to-face interview with a standardized semi structured questionnaire was administered to collect demographic data some of which were collected through observation. Dietary assessment was done by face-to-face interview using a 24-hour recall interview schedule and food weighing on 10% of the sample using a Digital Salter scale UK REG. Design No. 1049111 that was purchased for the study. The sample for observation was obtained based on consent of the women who would also select a day that they would be present in their homes.

Research assistants were trained on data collection techniques and were given work instructions on how exactly to perform the interview. Researcher and assistants then visited the clinic to obtain a sample of pregnant women. This was done daily for approximately 30 working days until the required sample size was obtained. The women were given appointments to be visited at home exactly one week from the day of the recruitments. Each woman was given a code and details of how to reach them in their homes were recorded. A combination of 24-hour dietary recall and weighed food intake were used to measure food intake. A 24-hour recall was used to estimate the daily intakes of the women. The food and drink eaten by the woman the previous day were recalled by her as she was being interviewed by the researcher and assistants. The intakes were recorded on 24 hour recall sheets which were coded for every woman. Quantities were estimated through the use of common household measures. The 24 hour recall

interview schedules were repeated during the home visitation. Each woman had three 24-hour recall data which were used for analysis. Observers were later on present in the households of 10% (9) of the respondents. A measure of household food preparation and consumption using a weighing scale for two days was done for the households. During observation days all foods were weighed before cooking on digital display scales and results rounded to the nearest gram. After the food was prepared but before it was served the whole dish was weighed. Ingredients of mixed dishes were weighed at the time of preparation and portions consumed by the woman were directly measured and recorded. The weight of any food left at the completion of the meal was deducted from the weight of the original serving. Snacks and other foods such as fruits consumed by the subject but not included in the main dish were also weighed and results recorded to the nearest gram. Foods prepared while the observer was absent were obtained by questioning and observing the woman.

At the end of the weighing procedure, samples of one day diets were collected from 10% of the women. These were 100g portions that were obtained from the women's left over portions and were randomly sampled to obtain two samples which were packed and submitted for analysis. Samples obtained were packed in coloured plastic containers, chilled for the night and transported to the Moi University Food Science and Technology laboratory for chemical analysis of protein, fat, moisture to obtain the energy content of one day's diet. Total energy content of the women's day diets were determined for the two samples and the mean was used as the kilocalorie value for the day's diet for the women. Total fat was determined by the Soxhlet method. The extracted fat was dried in an oven for 1 hour, cooled in a dessicator for 15 minutes then weighed and the weight recorded in grams Protein determination was done by the Kjeldohl procedure The mixture was titrated with standardized hydrochloric acid. The nitrogen was then measured and crude protein calculated (Nielsen, 2006). Moisture content was determined by weighing the sample in a moisture dish then putting in an air oven at 100°c until the weight was constant and new weight was taken as the difference being the moisture content (Nielsen, 2006). The work covered approximately 90 households by researcher and two assistants. Data collected was edited and coded immediately.

Data Analysis

Data for 100 pregnant women was available for analysis. All weights of foods consumed by the subjects from 24 hour recall and weighing method were converted from household measures into grams and then into intake values for energy, protein, fat, iron, zinc, fibre and vitamin C. Local measuring utensils were identified and their weights and volumes determined with by use of a variety of foods and beverages to ease analysis. Women's demographic characteristics were analysed using frequencies and descriptive statistics. After the estimation of the quantities of food recalled and weighed, they were converted into energy intakes by using Nutri-Survey package for windows. For laboratory analysis, Fat content was calculated as

$$\% \text{ Fat} = \frac{\text{Weight of fat residue}}{\text{Weight of sample}} \times 100$$

Protein content was calculated as:

$$\% \text{ Protein} = \frac{\text{Sample titre} - \text{blank titre}}{1000} \times \text{Molarity of acid} \times 14 \times \frac{100}{\text{sample weight}} \times 6.25$$

Carbohydrate was then calculated as the difference between the sample weight and total weight of protein, fat, water and ash. Finally energy (Kcal) was calculated by using specific energy values for protein, fat and carbohydrate (Nielsen, 2006). Results for the 100gm portions were then used to calculate the women's intake based on the weight of the dish consumed by the woman. Other data were coded and analysed by use of Statistical Package for Social Sciences (SPSS). Paired t-test was used to test for significant relationships between the means of nutrient intakes from recall and weighed intakes at $P < 0.05$. Pearson's product moment correlation coefficient (r) was used to measure correlations between energy intake, age, family size, occupation, morbidity and ($P < 0.05$).

RESULTS

Socio-Demographic Factors of the Women

Table 1. Age distribution of the pregnant women

Age (in years)	Frequency (N = 98)	Percent
≤ 19	35	36
20 – 24	31	32
25 – 29	17	17
30 – 34	07	07
35 – 39	05	05
40 – 44	02	02
≥ 45	01	01
Total	98	100

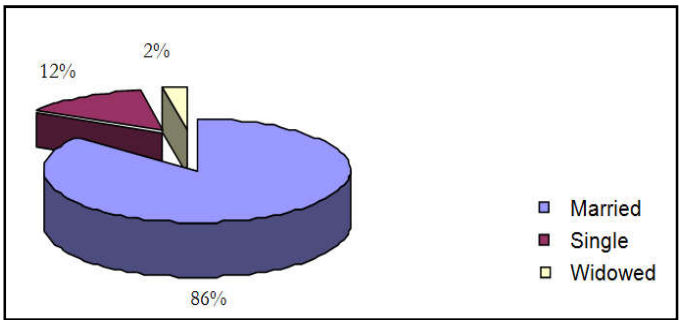

Figure 1. Marital status of the pregnant women

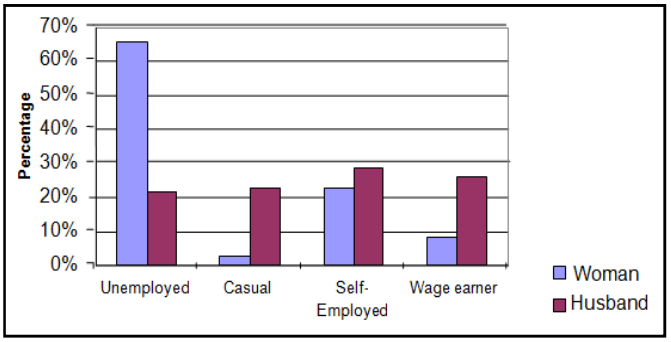

Figure 2. Employment status of subjects and husbands

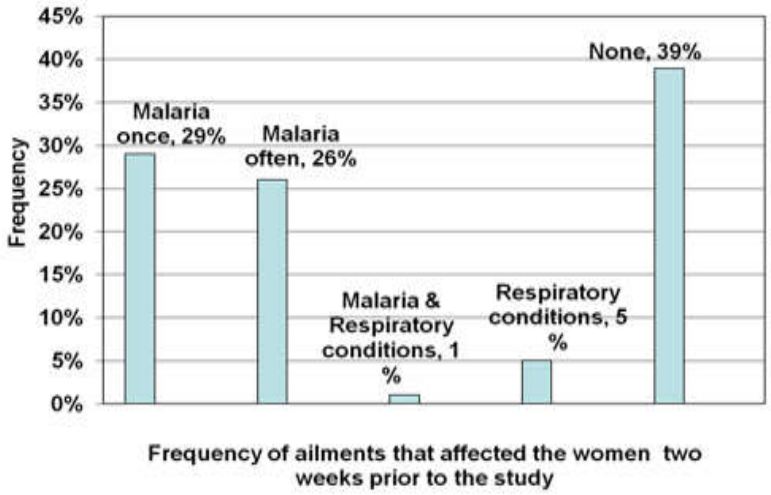

Figure 3. Frequencies of ailments that affected the women two weeks preceding the study

Table 2. Mean daily intakes of selected nutrients from recall and observed intakes compared with RDA and laboratory analysis

Nutrient/day	RDA	Recall	% RDA	P value t- test	Observed intakes	% of RDA	Lab Analysis
Energy (Kcal)	2500	1436.42	57.55	0.201	1515.60	60.6	1533.75
Protein (gm)	60	54.74	91.2	0.544	59.40	99.0	58.36
Fat(gm)	83374	38.6	21.5	0.624	38.20	46.0	38.47
CHO (gm)	27	237.00	63.4	0.835	247.44	66.2	247.10
Iron (mg)	100	13.35	49.	0.189	10.35	38.3	
Vitamin C (g)	400	122.73	122	0.848	137.73	137.7	
Folic acid (µ)	20	85.75	21.4	0.638	88.62	22.15	
Zinc (mg)	30	9.02	45.0	0.732	10.30	51.5	
Fibre (mg)		31.96	106	0.690	30.00	100.0	

RDA-Recommended Daily Allowances- based on RDA as published by the Food and Nutrition Board of the National Research Council of National Academy of Sciences; source (Allen, 2001)
CHO-Carbohydrates
Analysis done at the MIT/Moi University Food Technology Laboratory.

Table 3. Nutrient Intake as percentage of RDA of rural pregnant women compared with intakes of pregnant women at Rongo Sub-District Hospital

Nutrient	*2nd trimester	*3rd trimester	Rongo women intakes
(N – 61)	(N – 80)	(N- 100)	
Calories	59	49	56.3
Protein	6o	46	91.2
Iron	79	72	49
Vitamin C	399	187	122

*(Sehmi, 1993)

Table 4. Frequency of consumption of foods by food groups in one week by 10% of the women

Category	Food Item	Frequency /week)	Food Item	Frequency (/week)	%/ (week)
Carbohydrates	Ugali	140	English potatoes	04	
	Rice	18	Sugarcane	11	57.5
	Bread (white)	03	Chapati	04	
	Porridge	58	Mandazi	09	
	Sweet potatoes	06	Cake	01	
	Nyoyo (maize & beans)	09			
Proteins	Fish	09	Eggs	05	
	Small fish	20	Beans	07	12.2
	Meat	08	Ground nuts	01	
	Chicken	03	Liver	01	
Vegetables	Local vegetables	31	Cabbage	05	
	Kales	49			19.2
Fruits	Bananas	06	Pears	02	
	Citrus fruits	13	Mangoes	03	5.8
	Avocado	05	Guavas	04	
	Pawpaw	02	Pineapple	01	
Beverages	Tea (with milk)	72	Sour milk	04	19.5
	Black tea	08	Soda	02	

NB: Multiple responses were provided by the subjects.

Table 5. Analysed and calculated nutrient values of selected mixed dishes consumed by the women

Dish Name	N	Calorie Kcal/100g		Protein g/100g		Fatg/100g		Carbohydrates g/100g	
		A*	C	A	C	A	C	A	C
Maize Meal(*Ugali*)	140	134	144	3.5	3.3	1.5	1.7	30	27.6
Porridge	58	47	46	1.0	1.1	0.11	0.7	8.4	8.9
Tea	72	28	26	0.5	0.7	1.0	1.3	0.5	0.7
Rice	18	105	110	5.6	6.5	0.5	0.5	33.0	31.4
Sweet potatoes	06	133	133	1.0	1.2	0.1	0.1	20.1	17.5
Maize & Beans	09	135	147	4.5	5.1	1	1.6	30	29.6
Drop Scones	09	300	305	7.0	6.7	6.75	6.7	3	54.4
Kales	49	53	36	1.8	1.6	2	2.1	3.0	3.4

N- Number of times dishes were reported.
A – Analysed values
C - Calculated values: Nutrient values were calculated from nutrient values of each ingredient and are based on a standard composition by FAO/WHO food composition tables.
* Calculated using specific energy factors (Nielsen, 2006)

Correlation Results between Dietary Intake and Maternal Variables

Table 6. Pearson's Product Moment Correlations between Dietary intake and Maternal variables

Variable	Dietary Intake	Significance level (p value)
Age	-0.027	0.061
Family size	-0.031	0.052
Women's occupation	0.274*	0.045
Husbands' occupation	.0 117	0.053
Morbidity	0.061	0.056

**Ssignificant at p<0.05,*

DISCUSSION

Socio-Demographic Factors

The social, economic and health factors that were considered include, age, marital status, employment status, source of food, main provider of food and morbidity.

The Women's Age

The average age of the women was 23.4 at the time of the study (Table 1). Majority (64%) of the women had their first pregnancy at below 19 years while 36% had their first pregnancies at over 19 years. The women's parity was averagely 2.7.

Marital Status

Most (86%) of the respondents were married, some (12%) were single while 2% were widowed (Figure 1).

Women's Employment Status

Most of the women (66%) were not employed while some (23%) were self-employed with most of them involved in small businesses like hawking and selling in the market. Small proportions (3%) were casual labourers. Only a small percentage (8%) had some employment (wage earner) where they obtained wages at the end of the month (Figure 2). Employment status of members of a household is vital because it is an important indicator of the economic status of the household (Ministry of Medical Services &Ministry of Public Health and Sanitation, 2009) and hence a key determinant of the dietary energy intake of the household. Employment is a means by which money comes into the household which in turn is used to obtain food which may be adequate or not adequate depending on the type of employment.

Husbands' Employment Status

More men than the women tended to be involved in some income generating activity. Fewer men (21.8%) than women (66%) were un-employed; some (23%) were casual labourers, and more of the men (26.4%) were employed (wage earner) while most (28.7%) were self-employed (Figure 2). Husbands who are employed have a means of providing for the requirements including food for their households. Households where husbands have some form of income may not lack food even if the wife is not employed. Traditionally men are supposed to be the household provider.

Morbidity

Ailments that are commonest causes of illness among pregnant women in Kenya are malaria, respiratory disease, diarrheal disease, skin infection and intestinal worms (Ministry of medical services & ministry of Public Health and Sanitation, 2009). Ailments that were observed among the women were selected based on this report. The study found the women to have reported the following illnesses in the order of their frequencies, malaria followed by respiratory conditions such as coughs, chest pain and flu. Twenty nine percent of the women had suffered one or more incidences of malaria during the pregnancy, 26% had suffered from malaria once during the pregnancy, 5% had suffered from respiratory conditions and 39% had not suffered from any disease condition during the four weeks preceding the study (Figure 3). About 10% of the women were actually found to be suffering from malaria related symptoms during the periods of visitation as observed in hospital records. This implies that malaria continues to be a major problem within the region. Malaria may therefore be a major contributing factor towards the low weight gains observed, working through the malnutrition–infection complex to create a multi related conditions such as compromised body defence due to lack of several other nutrients. The deficiencies may be initiated by poor dietary intake and continued under-nutrition due to food intolerance and lack of satiety caused by

illness as observed among several women. In an effort to prevent malaria, 74%, of the women slept under mosquito nets This is in contrast to the Figure of mosquito net use obtained by the 2003 Kenya Demographic Health Survey (CBS, 2004) of 17% by pregnant women and may imply that the malaria prevention campaign by the government and UNICEF has made tremendous achievement. Morbidity may influence dietary intake, activity levels and therefore maternal nutritional status.

Dietary Intake

Most of the women's diets consisted of three meals a day and majority did not snack in between the meals. Energy intake among the pregnant women was 1436.42 Kcal/day and 1515.602 Kcal/day from recall data and weighed intakes respectively (Table 2). All the nutrients measured by the 24 hour recall and weighed intakes varied only slightly. Intakes of energy, carbohydrates and proteins, vitamin C, folic acid and zinc tended to be slightly underestimated by the 24-hr recall method but the differences were not significant ($P< 0.05$). The 24 hour recall method has been reported to be cheaper and easier than other techniques and has been found to yield reliable information if carefully planned and well executed (Ferguson *et al,* 1989).

Data from this study (Table 2) supports this observation

The lack of significant differences in intake of all nutrients assessed by the weighed food method and the recall technique in this study group show that 24 hour recalls can produce reliable data. Laboratory analysis results did not also vary much from the other two results for the nutrients that were analysed although they tended to be closer to the weighed intakes than the recalled intakes. This may imply that the weighed method had more precision than the recall data. The three data sources serve to validate the intakes obtained because of the closeness of the results although no significant testing was practical with the laboratory assessment and the other outcomes. It is possible that the difference in the intakes of some nutrients obtained by the recall and weighed intakes in this study may have been reflections of actual variations because they represented mean values for intakes on different days of the week and differences in the sample sizes for the two methods. The comparability of data collected by the two methods may have been due to the use of local utensils and similar ingredients during recall interview and observation in which the amounts of food ingredients used during preparation and serving of the previous day's meals were estimated. The meals in this study sample were simple and varied little from day to day and this may also have contributed to the insignificant differences.

Most of the food nutrients presented in Table 2 did not meet the recommended daily values. Only vitamin C and fibre were taken in excess of the recommended values. The quantity of protein consumed was not very low although it did not reach 100% adequacy. The nutrient intakes for most nutrients among this study sample were inadequate except for vitamin C and fibre. High intake of fibre foods is good for these pregnant women because it provides a variety of beneficial phytochemicals and a hefty measure of protection against constipation (Brown *et al.*, 2005). These findings compare with a 2006 Nakuru study of dietary quality of pregnant women (Mbuthia and Elmadfa, 2007) in which there was inadequate intake for energy, folic acid, calcium, iron and zinc but adequacy was obtained for fibre and vitamin C. Dietary iron and folic acid intakes were well below adequacy levels i.e. 49% and 21.4% respectively. Body requirements for these nutrients may have been boosted by supplements given at the hospital as a government's intervention program for these nutrients (MOH, 2000) although this study did not investigate whether the women were actually taking the supplements or not. Another study by Steyn and Nel (2006) on dietary intake of adult women in South Africa, Nigeria and Kenya found Kenyan women's dietary intake of carbohydrate and fat to be almost similar to findings from this study. Kenya diets lack in energy intake for most age groups and intake of most nutrients of pregnant women in Kenya is alarming (Sehmi, 1993). The percentage of daily nutrient intakes of some selected nutrients have been compared with Sehmi's (1993) findings of pregnant women's percentage of daily nutrient intakes in rural Kenya (Table 3). Diets of pregnant women in Kenya is insufficient in many aspects in that it fails to supply the nutrients in the required amounts as indicated by findings from the two studies compared in Table 3.

A list of the frequency of reports of all foods consumed was generated from 10% of the sample reports. Table 4 gives a list of food items that were consumed and the frequency in which they were eaten in a week. Most of the foods consumed by the women were carbohydrates which accounted for 57.5% of the weekly diet, followed by vegeTables 19.2%, proteins 12.2 %, fruits 5.8% and lastly beverages accounting for 5.2 %. Consumption of proteins was relatively low but the strong point is that they were mostly of animal sources enabling the women to obtain superior quality protein as single source foods in terms of meeting essential amino acid requirements. The relatively high consumption of animal proteins was due to the high intake of small fish and other fish types which are easily available in the area of study. There was high consumption of tea and this may be a disadvantage because it may have taken the place of more nutritious food items yet it is limited in calories. Beliefs about food cravings and food aversions may have influenced the food choices of these women so that the frequency of consumption of certain foods as observed in Table 4 may not be necessarily a result of types of food available in the locality.

Women's diets had little variety with high repeatability of certain food items through the week. A large proportion of food consumed were home produced or purchased locally, diets were therefore monotonous and simple because they may have been dictated by what was available in the home or local markets and the prices of these foods. The pregnant women may also have consciously chosen not to consume certain foods for personal reasons (food avoidances), hence the high frequency of consumption of certain foods and the low frequency of others (Table 4). Majority of the food items consumed were home prepared mixed dishes. Frequently consumed dishes were selected for analysis and the analysed values compared with calculated values from food composition Tables (Table 5). Calorie, protein, fat and carbohydrate values are comparable for most foods, therefore values for these nutrients agree well for most of the mixed dishes consumed. Drop scones (*Mandazi*) had the highest amount of calories (305Kcal/100g) followed by Maize and Beans (*Nyoyo*) (147Kcal/100g) then Maize meal (*Ugali*) (144Kcal/100g). Tea had the least amount of calories (26/Kcal/100g) followed by kales (36/ Kcal/100g).

A Kenyan Energy economic survey defines food poor households as those not meeting a minimum calorie requirement of 2250 Kcal/day/adult (GOK/UNICEF, 1998). The Figures obtained in this study therefore describe the women investigated as falling well below the energy requirement level. For these women this deficit is even higher since pregnant women's recommendation is normal requirement plus 300 Kcal/day (FAO, 2001). The finding from this study (1436.4 Kcal/day) is only about 57.5% of the Recommended Daily Allowances for energy. This translates into a deficit of about 1113.6 Kcal/day. Shetty (2002) describes women's energy intake in developing countries to be between 1200 – 1800 Kcal/day and observed that dietary intake remained low throughout pregnancy. This observation supports the findings from this study because energy intake falls within this range. This is an indication that the situation in developing Nations and especially in Kenya has not improved but may have become worse as problems of poor rural women have common roots in many regions and have broad applicability rather than isolated to the setting under study (Leslie, 1991). A FAO report states that high poverty levels interfered with farming in Nyanza and that many farmers could not access loans due to lack of collateral (Barasa, 2006). This may explain why dietary intake from this study (carried out in the same region) remains fairly low. A recent study of the Lake Victoria region in Kenya (Waudo *et al*, 2005) where this study area falls found kilocalorie intake of women to be 1505 Kcal/day. This is very close to the findings from this study and further confirms the state of energy deficiency in the region. This finding is, however, synonymous with the finding obtained from weighed food intake and may be a reflection of the greater accuracy of food weighing over 24 hour recall for individual intakes.

A study of energy intake conducted in Ethiopia (Huffman, 1998) showed that pregnant women consumed diets that contained ≈1600 Kcal/day. Huffman's finding is close to that from this study and further confirms the situation of women in the Horn of Africa. This study was carried out during the long rains (during the months of March to august) a period also known as the hungry season during planting and weeding with depleted stocks of food. The situation was made worse following a period of drought and famine that affected the whole country meaning extreme food shortage and inflated food prices that were far beyond the means of most families who survive on less than a dollar a day (Barasa, 2006). This may explain why energy intake was slightly lower than that from Waudo *et al.* (2005) study carried out in the same region. A study that compared energy stress in rural women from India, Berlin and Ethiopia found a consistent although not a remarkable (6-8%) decline in intake during the lean season. A similar study carried out during the period of food abundance may or may not elicit a significant difference as shown by this comparative study (Ferro-Luzzi, 1990). Chalterjee *et al*. (1989), however, argues that seasonal shortfall in food availability tends to affect women disproportionately since their already inadequate intake will be curtailed drastically and further states that even if food is available; it tends to be preferentially allocated to men.

Therefore if another similar study was carried out in the same region during the period of food abundance there may not be a remarkable increase in energy intake. Results presented on Table 6 show that dietary intake, had a significant and positive correlation with women's occupation ($r=0.274$, $p < 0.045$). Husbands' occupation had a positive and close but not significant correlation with dietary intake ($r = 0.117$, $p < 0.053$). Dietary intake did not depend much on husbands' occupation. Other selected maternal variables such as age, family size and morbidity had no relationship with women's dietary intake.

Conclusion

In conclusion, this study found women attending ante-natal clinic at Rongo Sub-District hospital to consume less nutrients than the values recommended as adequate except for vitamin C and fibre. Women's diets had little variety with high repeatability of certain food items through the week. This finding agrees with the findings from Waudo *et al's* study (2005) of dietary intake of women in the same region and confirms several observations in developing countries that the extra energy cost of pregnancy is imposed upon a limited supply of food and that pregnant women may not have the possibility of increasing their energy intake very much (Vinoy, Rossetta and Taylor, 2000). Most of the food energy came from carbohydrates which took up the largest portion of the women's diet. There were no significant differences between 24 hour recall and observed intakes. This study found dietary intake to have a significant and positive correlation with women's occupation. The government and other agencies need to support the women to increase their dietary intake in two ways; Supplementation as an emergency measure on those women who are at greatest risk where the type of supplement is determined by stage of pregnancy in which supplementation would be effective and secondly helping the women to become food secure and to diversify their diets by use of one or a combination of several strategies at the community and government levels e.g. developmental activities that are complimentary to health services aimed at preventing under nutrition, improved food production strategies and income generation projects and credit facilities for women at Kamagambo in Western Kenya to improve their economic base.

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