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Original Research Article

Dietary Diversity, Nutrient Intake and Nutritional Status among Pregnant Women in Laikipia County, Kenya

Kiboi Willy, Kimiywe Judith, Chege Peter

Department of Food, Nutrition and Dietetics, Kenyatta University, Kenya.

Corresponding Author: Kiboi Willy

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ABSTRACT

Background/Aim: Pregnancy is a critical period during which adequate nutrition is considered an important factor that affects birth outcome and the health of the mother. Maternal diets during pregnancy have thus been deemed critical since the diet must meet the nutrient requirement for both the child and the mother for satisfactory birth outcome. Research has clearly shown that a diverse diet is strongly associated with nutrient adequacy and better maternal nutritional status. The purpose of this study was to assess dietary diversity, nutrient intake and nutritional status among pregnant women in Laikipia County, Kenya.
Methods: This was a cross-sectional analytical study. The study comprised of 254 pregnant women attending antenatal clinic at Nanyuki Teaching and Referral Hospital.
Results: The study revealed that the mean Dietary Diversity Score (DDS) was 6.84 ± 1.46 SD The mean intake of energy, carbohydrate, protein, fat, zinc, iron, folate and vitamin C was inadequate while those of Vitamin A and calcium were adequate. In respect to nutritional status, 19.3% were undernourished based on Mid-Upper Arm Circumference (MUAC) while 16.9% were anemic based on haemoglobin levels. The result further showed that dietary diversity was positively correlated with nutrient intake and nutritional status.
Conclusion: Dietary diversity is crucial in ensuring adequate nutrient intake and nutritional status among pregnant women.

Keywords: Dietary Diversity, Nutrient Intake, Nutritional Status, Pregnant Women.

INTRODUCTION

Good maternal nutrition is an important component of health and development. [1] Adequate dietary intake during pregnancy is needed to ensure satisfactory birth outcome and good health for the mother. [2-4] This is so because maternal nutrition has been shown to have a critical role in foetal development. [2] Furthermore, studies have shown a strong positive relationship between appropriate maternal nutrition and birth outcomes. [5] Notably, over time adequate nutrient intake necessary for good nutrition has been associated with food variety and diet quality of individual. [6]

Dietary diversity has been defined as the amount of different food groups or foods that are consumed over a specific reference period. [7,8] Available compelling scientific evidence demonstrates that dietary diversity is indeed strongly associated with nutrient adequacy. [9-12] This has been explained by the fact that there is no any single food which contains all the required nutrients for optimal health. [13] Additionally, it has been argued sufficiently that a diversified diet is associated with a good nutritional status. A variety of foods in the diet has therefore

been considered important in ensuring adequate intake of essential nutrients and in realizing an optimal nutritional status. [14,15]

Unfortunately, in most developing countries micronutrient malnutrition is still a major threat of public health attention. [16] This problem has been attributed to the intake of monotonous cereal based diets that are lacking in diversity. Diets in these countries lack fruits, vegetables and animal source foods. [16,17] Regrettably, pregnant women and other women of reproductive age are most vulnerable due to their increased nutrients needs. [18] Due to this inadequate nutrient intake among pregnant women, iron deficiency anemia and other micronutrient deficiencies has remained prevalent in developing countries. [19-21] To overcome this problem, food based strategies such as dietary diversification has been recommended and appears in most countries dietary guidelines. [13]

In most developing countries dietary diversity among the vulnerable groups has received little attention and therefore augments the need for further research. [22] Similarly, in Kenya there is paucity of scientific data on dietary diversity and nutritional status among pregnant women. This study was therefore conducted to assess dietary diversity, nutrient intake and nutritional status among pregnant women in Laikipia County, Kenya.

METHODOLOGY

This was a cross-sectional analytical study.

Study population

The study was comprised of 254 pregnant women attending antenatal clinic at Nanyuki Teaching and Referral Hospital in Laikipia County. The hospital was chosen since it's the main and referral hospital of the County. Respondent were identified and recruited at the hospital and then followed to their households for the face to face interviews. Both structured and semi-structured questionnaires were used in the process of data collection.

Dietary assessment

Nutrient intake information was generated using repeated 24 hour recalls (two week days and one weekend day). Using the information collected from the 24 hour recall, Dietary Diversity Score (DDS) of the study respondents were derived based on the 2008 FAO guideline for measuring household and individual dietary diversity. [23]

Nutritional status

Anthropometric measurements (MUAC) and Haemoglobin levels (Hb) were used to assess the pregnant women nutritional status. BMI for pregnancy was not used since most of the pregnant women attend antenatal clinic late and thus their pre-pregnancy BMI may remains unknown. [24]

Data analysis

Data was entered and verified using CSPro version 6.1 software. The data was then exported to SPSS version 20 for analysis. Data on dietary intake from the 24 hour recall was entered and analysed using the Nutri-survey software. In regards to dietary diversity score, a point was awarded to each food group consumed over the reference period (the immediate past 24 hours) and a sum of all points was computed. For analysis purposes, dietary diversity terciles were develop namely; low dietary diversity tercile (≤ 3 food groups), medium diversity tercile (4-5 food groups) and high diversity tercile (≥6 food groups). [25]

In respect to nutritional status, a Mid-Upper Arm Circumference (MUAC) value of less than 23cm was considered as under nutrition while that of above 23 cm was considered normal. [26,27] Similarly, respondents with Hb values of below 11.0 g/dl were considered anemic while those above it were considered as having adequate nutritional status. [28] For association between variables, Pearson moment correlation (r) was used to assess the association between respondent dietary diversity score and nutritional status based on both MUAC and Hb values.

Additionally, t-test and Analysis of Variance (ANOVA) were used to test for significant differences in the mean DDS among the different groups. Regression analyses were further carried out for predictions and in determining the contribution of dietary diversity to nutrient intake and nutritional status among the pregnant women.

Ethical consideration

Authority to conduct the research was obtained from the National Council for Science Technology and Innovation (NACOSTI) and from the authorities of Nanyuki Teaching and Referral Hospital. Ethical clearance was also obtained from Ethical Review Committee of Kenyatta University, Kenya. Further, informed consent was obtained from the respondents before the interviews were conducted.

RESULTS

Socio-Demographic and Economic Characteristics of the Respondents

Most of the pregnant women were young with majority (33.9%) being between the age of 20-24 years. Moreover, vast majority (88.6%) of the respondent reported being married. In regard to education most (51.6%) of the respondents reported secondary school as their highest level of education. A small percentage (3.9%) reported to have had no any formal education. In respect to occupation, most (33.5%) of the respondents were housewives. For households where the respondents were not the household head, majority (40.4%) of the household head were in formal salaried employment. The study further revealed that most (54.3%) of the women were in the second trimester and that the mean gestational age at the time of examination was 27 ± 6.99 SD.

Additionally, the study also showed that most (35%) of the mothers were primiparous.

Individual Dietary Diversity Score

The mean dietary diversity score was 6.84 ± 1.46 SD. Based on the established terciles, most (60.6%) of the respondents were in the high dietary diversity tercile (≥6 food groups). Additionally, 37% and 2.4% of the respondents were in the medium (4-5 food groups) and low dietary diversity tercile (≤3 food groups) respectively. In regard to consumption of foods by respondents based on food groups, the most commonly eaten foods were cereals (99.2%). Notably foods of animal origin were least consumed (Figure 1). In respect to food frequency, regrettably around 17.3% of the study respondents were noted to have a meal frequency of below 3 times per day. Both meals and snacks were considered as reported by the respondents.

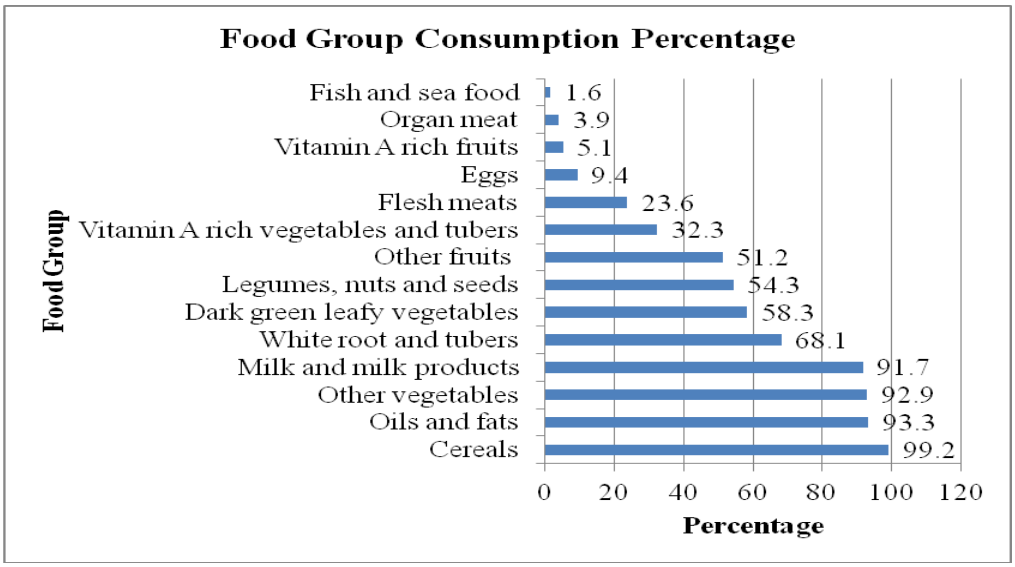

Figure 1: Food group consumption percentage.

Table 1: Respondent intake of selected nutrients.

Nutrient	Mean intake (SD)	Reference values	% contribution to total energy intake (SD)	% of respondents meeting the RDA's
Energy (kcal)	1890.59 ± 898.19	2300		28
Protein (g)	57.17 ± 29.96	74 (10-15%)	11.15(3.82)	46.5
Fat (g)	43.54 ± 25.41	94(20-30%)	18.72(9.71)	8.7
Carbohydrate(g)	415.98 ± 311.67	175(55-75%)	70.17(11.293)	75.6
Vitamin A (µg)	1595.81± 3874.73	800		46.5
VitaminC (mg)	96.38 ± 68.21	55		70.5
Calcium (mg)	475.52 ± 308.54	800[a]		18.1
Folic Acid (µg)	178.97 ± 103.99	600		8.3
Iron (mg)	28.48 ± 48.33	30[b]		16.9
Zinc (mg)	4.48 ± 2.82	20[c]		5.1

FAO/WHO 1981; [29] *FAO/WHO 2001;* [30] *WHO/FAO 2004* [31]

[a] Based on a low animal protein intake. [b] Based on a 10% bioavailability level. [c] Based on a low bioavailability level.

Dietary intake of selected Nutrients

Estimates of nutrient intake are necessary in monitoring the nutritional status of an individual. The mean contribution of macronutrients (Protein, Fat and Carbohydrate) in the diet to total energy intake was found to be adequate except for fats 18.72% against the recommended 20-30%. Further, the mean intake of Vitamin A and C were adequate. Unfortunately the mean intake of Energy, Calcium, Folic acid, Iron and Zinc was found to be inadequate (Table 1).

Maternal Health Profile

Most women (30.3%) had attended their antenatal clinic thrice. Only 22.4% indicated to have attended the antenatal clinic more than thrice. Interestingly, results revealed that majority (70.1%) of the participants were under micronutrient supplementation. Notably, for those under supplementation, majority (98.9%) reported intake of iron and folic supplements. In regard to maternal morbidity, more than half of the respondents (57.5%) reported to be unwell in the immediate two weeks preceding the interviews. The main disorders/sickness reported were heartburn (42.9%) and anorexia (15.4%). Others included vomiting, constipation, abdominal pain, fever and diarhoea.

Nutritional status

Based on Mid-upper arm circumference, 19.3% of the study participants were found to be undernourished (MUAC <23cm). Along the same line, based on haemoglobin levels, 16.9% of the respondents were found to be anemic (Hb<11.0g/dl).

Relationship between Dietary Diversity and Nutrient Intake, Morbidity Pattern and Nutritional Status

Pearson correlations revealed positive associations between dietary diversity score and the intake of all the selected nutrients. However, in this study correlation were only statistically significant for Protein (r=0.134, p= 0.031) and Calcium intake (r=0.143, p=0.023). In regard to association between dietary diversity score and morbidity pattern, t-test showed that there were significant differences (P=0.01) in the mean dietary diversity score among those who had reported being sick two weeks prior to the day of the interviews and those who had not fallen ill in the same period.

Association between dietary diversity and respondent nutritional status were also established. A positive linear relationship between dietary diversity and the pregnant women nutritional status were noted based on both MUAC (r=0.362, P<0.001) and Haemoglobin values (r=0.152, p=0.016). In light of this finding, the following regression equations were formulated to enable prediction of MUAC and haemoglobin level based on dietary diversity score.

MUAC= *20.504 (constant) + 0.909 (DDS)*

HB= *11.375 (constant) + 0.167 (DDS)*

Furthermore, t-test revealed significant differences on the mean dietary diversity score among those with adequate and inadequate nutritional status. Those with inadequate nutritional status had a lower dietary diversity score as compared to those who had satisfactory nutritional status.

Table 2: DDS mean difference by nutritional status (MUAC) of the respondents

	MUAC STATUS	N	Mean DDS	SD	Std. Error Mean	Df	Sig. (2 tailed)
DDS	Undernourished	49	5.9	1.48	0.211	252	<0.001
	Normal	205	7.07	1.36	0.095		

Table 3: DDS mean difference by nutritional status (Hb) of respondents

	HB levels	N	Mean DDS	SD	Std. Error Mean	df	Sig. (2 tailed)
DDS	Anemic	43	6.30	1.389	0.212	252	0.007
	Normal	211	6.95	1.450	0.100		

DISCUSSION

The present study revealed that the mean DDS was 6.84± 1.46 SD. The finding of this study compare with those of a study done in Northern Ghana where a mean DDS of 6.81 was reported. [5] Most respondents had a good dietary diversity which could be explained by the fact that the study was conducted in the season of plenty. The high consumption of food items from the grains and grains product by almost all respondents (99.2%) confirms that diets of the pregnant women were predominantly based on starchy staples. The findings agree with those of other studies that most diet in developing countries is predominantly cereal based. [9,16,32] Notably, diets in developing countries have also been reported to be lacking or having little animal source foods. [17] This was confirmed by this study since only 27.5% of the total respondents had consumed animal source foods. This study finding of inadequate nutrient intake during pregnancy is agreeable with those of a study conducted among pregnant women in Nakuru, Kenya. [33] Literature has also argued conclusively that micronutrient deficiencies are highly prevalent among pregnant women. [34] The present study inadequate intake of nutrients despite high dietary diversity could be explained by the low quantities of food consumed by the pregnant women as was established by the 24 hour recalls. This could further be explained by high morbidity noted among the pregnant women. Literature has clearly demonstrated that illness affect food intake due to factors such as loss of appetite. Result of this study pinpointed gastrointestinal disorders such as heartburn, anorexia, constipation, vomiting and diarhoea as the most common disorders among pregnant women. These finding compare well with those of studies done by Patel et al [35] and Singh et al [36] which reported abdominal pain and gastrointestinal disorders as the most common disorders among pregnant women respectively.

This study showed that 19.3% and 16.9% of the study respondents were undernourished based on both MUAC and Hb respectively. In comparison with other studies, a study in South Eastern Nigeria among pregnant women reported 40.4% of the respondent as being anemic. [37] Another study done in Nairobi, Kenya revealed that 36.2% of the participants as being anemic. [38] The relatively low levels of malnutrition detected in this study would be explained by the high dietary diversity reported by the pregnant women. Similarly, despite the inadequate dietary intake of iron revealed in this study the relatively lower cases of anaemia in this study may be attributed to the high number of respondents who were under the iron-folate supplementation.

In the present study, positive correlations were noted between dietary diversity and all the selected nutrients. This suggests that nutrient intake increases with increase in dietary diversity. These findings are consistent with those of studies done by Mirmiran et al [12] and Acham et al. [39] Based on these findings, to ensure adequate nutrient intake among populations and more so among those with high nutrient requirements, high dietary diversity should be widely recommended. The need and importance of a highly diversified diet should also be captured in all food based dietary guidelines.

When morbidity experience among the respondents was associated with dietary diversity, t-test revealed significant differences among the sick and those not sick (p=0.01). Those not sick had a higher

dietary diversity as compared to those who were sick. This finding therefore adds evidence that indeed illness affects dietary diversity of an individual.

In this study positive association were also established between dietary diversity and the pregnant women nutritional status. Pregnant women with an adequate nutritional status were noted to have a higher mean DDS as compared with those who had unsatisfactory nutritional status (t-test: MUAC, p=<0.001; Hb, p=0.007). The above finding similarly adds evidence to the existing literature that dietary diversity is associated with the nutritional status of an individual. Maternal nutritional status is a key determinant of the pregnant women birth outcome. In agreement with this study, Ey et al [15] in their study revealed significant relationship between dietary diversity and nutritional status.

Limitation

The data collected was from a cross-sectional study and therefore the reported dietary diversity score may vary over time.

CONCLUSION

The study showed that dietary diversity of the pregnant women was generally good. Despite the improved dietary diversity being reported, inadequate intake of both macro and micronutrients was noted due to inadequate quantities of foods that were being consumed by the pregnant women. Additionally, positive associations between dietary diversity and nutrient intake noted underscore the importance of a diversified diet in meeting the nutrient requirements among pregnant women. Morbidity burden among the pregnant women was also high and was shown to affect their dietary diversity. Based on this public health awareness campaign among pregnant women on the importance of early detection and treatment of diseases/disorders is very paramount. In regard to nutritional status, the result suggests that pregnant women with a diverse diet were more likely to have a better nutritional status. Nutrition education on the importance of diversified diet should therefore be enhanced as a strategy to improve nutrient intake and nutritional status among pregnant women.

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