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Determinants of dietary diversity among pregnant women in Laikipia County, Kenya: a cross-sectional study

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Abstract

Background: Dietary diversity has continued to gain widespread attention among the population since it has evidently been associated with nutrient adequacy. A diverse diet has been shown to reflect nutrient adequacy since no one food can meet the nutritional requirement of a person. Pregnant women have been considered vulnerable to malnutrition due to their increased nutrient requirement and therefore a variety of foods in their diet is considered imperative in ensuring adequate nutrient intake. To promote dietary diversity, it is important to understand the factors associated with it. This paper therefore assessed the determinants of dietary diversity among pregnant women in Laikipia County, Kenya.

Methods: The study was a cross-sectional analytical study consisting of 254 pregnant women attending antenatal clinic at Nanyuki Teaching and Referral Hospital in Laikipia County, Kenya.

Results: The mean Dietary Diversity Score (DDS) was 6.84 ± 1.46 Standard Deviation (SD), with cereals being the most (99%) commonly consumed food group. Adjusted Logistic Regression (AOR) analyses revealed education level (AOR = 2.78; (95% Confidence Interval (CI) 1.06, 5.32; $p < 0.001$), employment status (AOR = 2.29; CI 1.18, 4.14; $p = 0.003$), monthly income (AOR = 2.08; CI 1.32, 3.03; $p < 0.001$), household assets (AOR = 1.93; CI 0.73, 6.90; $p = 0.030$), land ownership (AOR = 0.64; CI 0.44, 2.25; $p = 0.040$), and morbidity (AOR = 0.78; CI 0.36, 2.34; $p = 0.010$) among the pregnant women as the variables that influenced their dietary diversity.

Conclusion: Socioeconomic factors (education level, employment status, monthly income, household assets and land ownership) have been shown to influence dietary diversity in this study. New policies and intervention programmes targeting these determinants of dietary diversity should therefore be enacted, while the existing ones should be supported and monitored particularly among the vulnerable populations. Such policies and programmes among pregnant women will ensure improved dietary diversity and adequate nutrient intake. Similarly, since morbidity incidence among pregnant women have been shown to significantly influence dietary diversity, public health awareness campaign on the importance of early detection and timely treatment of diseases among pregnant women should be launched by the relevant stakeholders.

Keywords: Determinants, Dietary diversity, Nutrients, Pregnancy

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Background

Adequate nutrient intake during pregnancy is important if satisfactory birth outcome and optimal health of the mother are to be realized [1]. Poor nutritional status during pregnancy has been associated with adverse birth outcomes such as low birth weight babies, intrauterine growth retardation and preterm delivery [2]. According to Lartey, [3] maternal malnutrition has been shown to be a major predisposing factor for maternal morbidity and mortality. Available scientific evidence demonstrates that nutrient intake during pregnancy has a critical role in foetal development [4] and better maternal nutritional status [5]. To ensure adequate nutrient intake, dietary diversification has been recommended as one of the best strategies. It is particularly highly recommended among pregnant women since they have increased nutrient requirements [6, 7]. Labadarios et al. [8] have argued comprehensively that the more food groups included in a person's daily diet, then the greater the chances of meeting nutrient requirements. Additionally, many studies have demonstrated that dietary diversity is indeed associated with nutrient adequacy [6, 9, 10].

Dietary diversity has been defined as the number of different foods or food groups that are consumed over a specific reference period [11]. According to Zainal-Badari et al. [12], adequate nutrient intake necessary for good nutrition has often been associated with food variety and diet quality of individuals. Regrettably, literature shows that micronutrient malnutrition remains a major public health concern in developing countries due to intake of monotonous, predominantly starchy based diets that are lacking in diversity [13]. Unfortunately, pregnant women in these countries are considered most vulnerable since they have higher nutrient requirements [7]. Dietary diversity is therefore considered very crucial in improving nutrient intake. Along the same line, establishing factors associated with dietary diversity is indispensable and can help in policy formulation which would ultimately enhance nutrient intake. Notably, despite the importance of dietary diversity being well acknowledged, there is limited information in Kenya on dietary diversity and its associated factors especially among the vulnerable populations. Therefore, the objective of this study was to determine dietary diversity and its associated factors among pregnant women in Laikipia County, Kenya. The paper undoubtedly provides knowledge necessary for evidenced based programming.

Methods

Study population and sampling

The study was a cross-sectional analytical study that comprised of 254 pregnant women attending antenatal clinic at Nanyuki Teaching and Referral Hospital in Laikipia County, Kenya. The county was purposively selected as one of the Arid and Semi-Arid areas in Kenya where minimal studies have been done. Similarly, Nanyuki Teaching and Referral Hospital was also purposively selected since it's the main and the only referral hospital in the County. A comprehensive sample size for a period of one month was used. One month was appropriate since the antenatal clinic in the hospital was on monthly basis.

Inclusion and exclusion criteria

All pregnant women who consented to participate in the study and who had been residents of Laikipia County for at least one year prior to the period of the study were included. One year was appropriate as it covered the whole food security cycle. Pregnant women with chronic diseases such as cancer and diabetes were excluded from the study. This was because these conditions are known to impact on food intake and the nutritional status of an individual. This health information was obtained from the respondents, clinical notes in the mother child booklet and from the hospital records.

Research instruments

Pre-tested structured and semi structured questionnaires were used for collecting data on demographic and socioeconomic characteristics, dietary diversity and morbidity incidence of the study participants. The information was collected using face to face interviews. The demographic and socioeconomic data collected included: age, marital status, parity, trimester, household head, household sex, household size, level of education, occupation and income level. Data on dietary diversity was collected using a modified individual dietary diversity questionnaire as recommended by FAO [14].

Data collection procedures

A 24 h recall was used in assessing dietary diversity of the respondents. Using the information obtained from the 24 h dietary recall, DDS were computed based on the 2008 FAO guideline for measuring household and individual dietary diversity [14]. To determine dietary diversity scores, a single point was awarded to each food group consumed over the reference period and a sum total of all points calculated. In this study, 16 food groups were considered namely; Cereals, vitamin A rich vegetables and tubers, dark green leafy vegetables, other vegetables, white roots and tubers, vitamin A rich fruits, other fruits, flesh meat, organ meat, eggs, fish, pulses/legumes, nuts and seeds, milk and milk products, oils and fats, sweets and sugar and condiments and spices was used. For analyses purposes, the last two food groups (sweets and sugar and condiments and spices) were not considered. According to FAO [14], those two food groups may be used for additional analyses and

considerations of bioavailability of micronutrients but not part of the individual dietary diversity score. The Table 1 below shows the different food groups used to determine the individual dietary diversity score.

Operational definitions

Dietary diversity score

The number of food groups consumed by pregnant women out of the fourteen food groups. These food groups included; Cereals, vitamin A rich vegetables and tubers, dark green leafy vegetables, other vegetables, white roots and tubers, vitamin A rich fruits, other fruits, flesh meat, organ meat, eggs, fish, pulses/legumes, nuts and seeds, milk and milk products, oils and fats.

Minimum dietary diversity

Consumption of four or more food groups of the fourteen food groups used in this study.

Statistical analyses

Using the 14 food groups, dietary diversity categories were formulated namely; low dietary diversity category (≤3 food groups); medium diversity category (4 to 5 food groups) and high diversity category (≥6 food groups) [15]. The respondent's dietary diversity score were then categorized based on their position on the categories. Additionally, dietary diversity score variable was dichotomized as category 0 for those not meeting the minimum dietary diversity and category 1 for those meeting the minimum diversity. Data was entered and verified using CSPro software version 6.1. The data was then exported and subjected to statistical analyses using Statistical Package for Social Sciences (S.P.S.S) version 20.

Descriptive statistics were used to describe the study population. Crude Odds Ratios (COR) were estimated using binary logistic regression at 95% confidence level to assess the strength of association between dietary diversity (independent variable) and the dependent variables. All the variables with a p value of <0.3 in the binary logistic were considered and fitted in the multivariable logistic regression in order to control for confounding variables (Adjusted Odds Ratio: AOR). Results with a p value < 0.05 were considered statistically significant to be the predictors of minimum dietary diversity.

Table 1 Categories of food groups

	Food groups	Points
1	Cereals	1
2	White roots and tubers	1
3	Vitamin a rich vegetables and tubers	1
4	Dark green leafy vegetables	1
5	Other vegetables	1
6	Vitamin a rich fruits	1
7	Other fruits	1
8	Organ meat	1
9	Flesh meats	1
10	Eggs	1
11	Fish and seafood	1
12	Legumes, nuts and seeds	1
13	Milk and milk products	1
14	Oils and fats	1
	Total Points	14

FAO, 2008 [14]

Results

Participants' demographic characteristic

The mean age of the pregnant women was 26.81 ± 5.64 SD with the youngest and the oldest mother being 16 and 49 years respectively. Most of the women were married (89%) and their mean gestational age at the time of the study was 27 weeks. The mean parity of the study respondents was 2 children, with most mothers being primiparous. Additionally, most (54%) of the pregnant women were in their second trimester at the time of examination. In regard to household characteristics, the average household size was 3 persons. The smallest household had one person while the largest had ten people. Notably, majority of the households were male headed (89%) as reflected in Table 2.

Notably, in regard to maternal morbidity, the study found that 57% of the pregnant women reported some form of illness/disorder in the preceding two weeks prior to day of interview. The most commonly reported disorder was heartburn by 43% of the study participants.

Socioeconomic characteristics of the participants'

Education level is a key determinant of the type of occupation which one gets, which in turn is likely to influence the income of a person. Most (52%) of the respondents reported secondary education as their highest level of education. Assessments of the respondents occupation distribution revealed that majority (34%) of the women were housewives. For households where the respondents were not the household heads, about 40% of the household heads were in formal salaried employment. In respect to household monthly income, the study noted that most households had a monthly income of below KSh 10,000 (Table 3).

Additionally, fifty one percent (51%) of the respondents reported owning some livestock. Regarding land ownership, more than half of the participants (61%) reported to own a piece of land. However, the pieces of land were considerably very small. Notably, the major source of food among the respondents was found to be

Table 2 Demographic characteristics of the respondents

Category ($n = 254$)	n	%
Age group(Years)		
<20	14	6
20–29	164	65[a]
≥30	76	29
Mean age 26.81 ± 5.64 SD		
Marital status		
Married	225	89[a]
Unmarried	29	11
Parity of the respondents		
1	84	33
2	89	35[a]
≥3	81	32
Mean parity 2 ± 2 SD		
Trimester of the respondents		
First	13	5
Second	138	54[a]
Third	103	41
Household characteristic		
Household head sex		
Male	225	89[a]
Female	29	11
Household head		
Respondent	19	7
Husband	219	86[a]
Relative	12	5
Others (Not related)	4	2
Household size		
1–3	180	71[a]
4–6	71	28
>6	3	1
Mean size of household 3.02 ± 1.27 SD		

[a]Majority

Table 3 Socioeconomic characteristics of the respondents

Characteristic	$N = 254$	
	n	%
Respondent education		
None	10	4
Primary	62	24
Secondary	131	52[a]
Tertiary	51	20
Total	254	100
Occupation of respondents		
Farming	11	4
Unemployed	20	8
Casual labour	21	8
Employed(salaried)	50	20
Business	67	26
Housewife	85	34[a]
Total	254	100
Level of income		
<10000	133	52
10000–20000	72	28
20001–30000	29	11
30001–40000	11	4
>40000	9	4
Total	254	100

[a]Majority of respondents

purchases. Availability of durable consumer goods is a useful indicator of household socioeconomic status. Out of the possible 13 household assets assessed in this study, the mean ownership was 5.28 ± 1.86 SD and ranging from 0 to 11 assets.

Individual dietary diversity score of the pregnant women

Out of the 14 food groups, the study found the mean DDS was 6.84 ± 1.46 SD with scores ranging from 3 to 10 food groups. Based on the categories developed, most respondents (61%) were in the high diversity category (≥6 food groups) and medium diversity category [37% (4–5 food groups)]. About 2% of the participants were in the low diversity category (≤3 food groups). Moreover, in the present study, 15% of the pregnant women were found not to receive the minimum dietary diversity.

Consumption of foods by respondents based on food groups

In general, the most commonly eaten foods were cereals (99%), oils and fats (93%), other vegetables (93%) and milk and milk products (92%). Notably, foods of animal origin were minimally consumed (Table 4).

Factors associated with dietary diversity

In the present study, multivariable analyses revealed education level ($p < 0.001$), employment status ($p = 0.003$), monthly income ($p < 0.001$), household assets ($p = 0.030$), land ownership ($p = 0.040$) and morbidity ($p = 0.010$) among the pregnant women as the factors that were significantly associated with the minimum dietary diversity. The study observed that those who had tertiary (AOR 2.93; 95% CI 1.40, 8.63) and secondary education (AOR 2.78; 95% CI 1.06, 5.32) had greater odds of achieving the minimum dietary diversity as compared to those who had never attended school (Table 5). In regard to respondent occupation, those who were employed (salaried) (AOR 2.29; 95% CI 1.18, 4.14) and those who were farming

Table 4 Respondents by food group

Food group	*n* = 254	Percentage
Cereals	252	99
Oils and fats	237	93
Other vegetables	236	93
Milk and milk products	233	92
White root and tubers	173	68
Dark green leafy vegetables	148	58
Legumes, nuts and seeds	138	54
Other fruits	130	51
Vitamin A rich vegetables and tubers	82	32
Flesh meats	60	24
Eggs	24	9
Vitamin A rich fruits	13	5
Organ meat	10	4
Fish and sea food	4	2

(AOR 1.68; 95% CI 1.04, 3.65) had the highest odds of attaining the minimum dietary diversity. Further, the study revealed that as the household income increased, the chances of consuming the minimum dietary diversity also increased. Those with an income of between KSh 20, 000 and KSh30, 000 were 2.01 times more likely to attain the minimum diversity as compared to those who had an income of less than 10, 000.

Additionally, in respect to land ownership, those who reported not owning any piece of land were 0.64 less likely to attain the minimum diversity as compared to those who reported owning a piece of land. Interestingly, the number of household assets was also shown to be positively associated with the pregnant women dietary diversity (AOR 1.93; 95% CI 0.73, 6.90). Furthermore, this study observed that those women who had reported some illness in the period of the study were 0.78 less likely to attain the minimum dietary diversity as compared to those who had not been sick. This finding therefore confirmed that maternal morbidity affects maternal dietary diversity.

Discussion

In the present study, a mean DDS of 6.84 ± 1.46 SD was reported. The finding of this study compares with that done in Pakistan among pregnant women, where a mean DDS of 6.17 ± 0.99 was recorded [16]. Similarly, in another study carried out in South Africa among women, a mean DDS of 6.70 ± 2.22 SD was observed [17]. Interestingly, many studies in developing countries have documented that diet in these countries is predominantly cereal based [13, 18]. The finding of this study adds evidence to this argument since almost all participants (99%) of this study reported having consumed food items from the grain and grain products.

In regard to the association between dietary diversity and the selected maternal demographic factors (age, marital status, trimester of the pregnancy, house headship, and household size), this study did not find any statistically significant association. Similar findings were also documented by Ali et al. in Pakistan [16]. Contrary to this study, associations between dietary diversity and demographic factors have been reported in other studies [19, 20].

In respect to socioeconomic status, this study found compelling evidence that dietary diversity is indeed associated with the socioeconomic status of the household or individual. Regression analyses revealed association between dietary diversity and the level of education (Table 5). Those women with higher education had greater odds of attaining minimum dietary diversity. This might be so because women with higher education might have acquired essential information on appropriate feeding practices. Similar observations on the impact of education on dietary diversity were also made in a study done in South Africa [19]. Along the same line, in regard to occupation, those who reported being employed (salaried) had the highest odds (2.29 times) of attaining minimum dietary diversity as compared to the non-employed. This would be explained by the fact that those who are employed (salaried) have regular income which increases their chances of access to food.

Another factor which was found to be significantly associated with the minimum dietary diversity was the household level of income. Those households with higher income had better chances of having diversified diets. The possible reason is that higher income is associated with increased purchasing power which can help in promoting dietary diversity. In respect to household assets, positive associations were noted between household assets and dietary diversity. This would be attributed to the fact that household assets have been associated and used as a proxy indicator of the socioeconomic status of a household. Since household assets are critical in establishing the household wealth index, the finding of this study is comparable with that done by Saaka [1] which reported that household wealth index was a major determinant of maternal dietary diversity in Northern Ghana. Further, the study revealed that those who had no access to any piece of land were 0.64 times less likely to attain a diversified diet as compared to those who had reported owning a piece of land. The difference could be due to the fact that those with land could grow some food which may supplement what they acquire through purchases. This finding is consistent with a study conducted in Bangladesh [21] where land ownership was reported to positively influence women dietary diversity.

Table 5 Multivariable logistic regression analyses showing factors associated with minimum dietary diversity among pregnant women in Laikipia County, Kenya

Variables	n (%)	COR (95% CI)	AOR (95% CI)[b]	*P* value
Minimum dietary diversity				
Education level				
Primary	62 (24)	1.45 (0.82, 3.33)	1.69 (0.95, 3.67)	
Secondary	131 (52)	2.24 (1.49, 5.83)[a]	2.78 (1.06, 5.32)[a]	<0.001
Tertiary	51 (20)	2.61 (1.75, 7.25)[a]	2.93 (1.40, 8.63)	
None	10 (4)	1	1	
Marital status				
Unmarried	29 (11)	0.76 (0.53, 1.11)[a]	1.49 (0.93, 3.00)	
Married	225 (89)	1	1	
Occupation				
Casual Labour	21 (8)	0.74 (0.36, 1.12)	0.66 (0.33, 1.20)	
Housewife	85 (34)	1.00 (0.56, 2.13)	1.08 (0.88, 2.45)	
Business	67 (26)	1.55 (0.68, 3.01)	1.39 (0.73, 3.23)	
Farming	11 (4)	1.83 (0.82, 2.92)	1.68 (1.04, 3.65)	
Employed (Salaried)	50 (20)	2.35 (1.11, 3.96)[a]	2.29 (1.18, 4.14)[a]	0.003
Unemployed	20 (8)	1	1	
Level of income (KSh)				
<10000	133 (52)	1	1	
10000–20000	72 (28)	1.73 (1.27, 4.33)	1.65 (1.22, 5.39)	
20001–30000	29 (12)	1.81 (0.96, 2.66)[a]	2.08 (1.32, 3.03)[a]	<0.001
30001–40000	11 (4)	2.32 (1.33, 3.56)	2.22 (1.15, 4.89)	
>40000	9 (4)	3.63 (2.00, 6.75)[a]	3.90 (1.93, 9.44)	
Land ownership				
No	100 (39)	0. 50 (0.56, 2.07)[a]	0.64 (0.44, 2.25)[a]	0.040
Yes	154 (61)	1	1	
Livestock ownership				
No	124 (49)	0.45 (0.11, 0.66)[a]	0.23 (0.28, 1.47)	
Yes	130 (51)	1	1	
Total household assets		1.73 (0.90, 2.41)[a]	1.93 (0.73, 6.90)[a]	0.030
Morbidity				
Yes	146 (57)	0.56 (0.17, 1.39)[a]	0.78 (0.36, 2.34)[a]	0.010
No	108 (43)	1	1	
Source of lighting				
Electricity	199 (78)	1.69 (1.10, 3.98)[a]	1.80 (1.22, 5.85)	
Solar	20 (8)	1.37 (0.86, 4.77)	1.55 (1.01, 4.63)	
Pressure lamp	4 (2)	1.13 (0.64, 3.90)	1.04 (0.72, 2.12)	
Kerosene lamp	31 (12)	1	1	
Household head				
Male	225 (89)	1.35 (0.75, 1.82)	1.29 (0.73, 2.12)	
Female	29 (11)	1	1	

AOR Adjusted Odds Ratio, *COR* Crude Odds Ratio, *CI* Confidence Interval. [a]Statistically significant association between minimum dietary diversity and the variable at $p < 0.05$. [b]Adjusted for socioeconomic and demographic characteristics (education level, marital status, occupation, household head, level of income, source of lighting, livestock ownership and household assets) and morbidity incidence

Findings of this study are in agreement with findings of several other studies which have reported that dietary diversity is associated with socioeconomic status [19, 22–25]. For instance, a study by Vakili et al. [25] in Ahvaz-Iran showed a significant relationship between DDS and the economic situation of the respective respondents ($p < 0.05$). Similarly, another study in Bangladesh found significant association between relative wealth, land ownership, livestock ownership and women dietary diversity [21]. It is evidently clear from the present study that women of a higher socioeconomic status had a higher DDS as compared to women of a lower socioeconomic status. Further in this study, morbidity status among the pregnant women was also shown to affect their respective dietary diversity. Pregnant women who had reported some illness at the period of the study were 0.78 times less likely to have a diversified diet. This might be because illness affects food intake due to loss of appetite associated with the illness.

Conclusion

The study has demonstrated that dietary diversity is indeed associated with the socioeconomic status of the pregnant women. The finding has explicitly showed the critical role of education, occupation, monthly income, household assets, land ownership and maternal morbidity status in the attainment of the minimum dietary diversity and ultimately improved nutrient intake among pregnant women. In light of this finding, there is need to support existing and come up with new policies targeting these variables especially among the poor and vulnerable populations. Focus should therefore be on introduction of viable interventions and programmes that would support these variables. Such interventions would play a significant role in enhancing dietary diversity particularly among pregnant women who have increased nutrients needs. Intensive public health awareness campaign on the importance of early detection and timely treatment of diseases/disorders among pregnant women also highly recommended.

Abbreviations

AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio; DDS: Dietary diversity score; SD: Standard deviation

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Availability of data and materials

All the relevant data supporting the findings of this article are contained within the document.

Authors' contributions

WK conceived and designed the study, data collection, data analyses and writing the manuscript. JK and PM assisted in designing the study. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not Applicable.

Ethics approval and consent to participate

Before embarking on the data collection process, ethical clearance was obtained from Kenyatta University Ethical Review Committee (PKU/376/1348) in Kenya. Research permit was also obtained from the Kenya National Council for Science, Research and Innovation (NACOSTI). Permission to conduct the research was similarly sought from the County and hospital administration. Moreover, informed consent was obtained from each of the study participants and they were at liberty to stop the interview at any time.

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