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Dietary diversity and associated factors among pregnant women in urban Northern Ghana

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ABSTRACT

Background: Though low dietary diversity during pregnancy results in low nutrient intake and adverse pregnancy outcomes, information on dietary diversity and its associated factors among pregnant women in Ghana particularly Northern Ghana is scanty. This study therefore assessed dietary diversity and associated socio-demographic characteristics among pregnant women in urban Northern Ghana.

Methods: An analytical cross-sectional study design was used, involving 273 pregnant women randomly selected from 8 health facilities in Tamale Metropolis and Sagnarigu Municipality. Socio-demographic characteristics of participants were documented using a structured questionnaire. Dietary diversity of participants was assessed using a 24 hour dietary recall method and the dietary diversity score was calculated based on ten food groups. Chi-square test and binary logistic regression analysis were used to identify the factors associated with low dietary diversity.

Results: The mean age of the participants was 26.44 ±5.75 years with minimum and maximum ages of 16 and 44 years respectively. About 48% of the women had low dietary diversity. The mean dietary diversity score was 4.87 ± 2.04. Having no education at all [Odds Ratio (OR) = 5.5; 95% CI (2.09 –14.31); p = 0.001] and having only primary education [OR = 3.8; 95% CI (1.21 –12.09); p < 0.022] were significantly associated with low dietary diversity.

Conclusion: The study revealed that the prevalence of low dietary diversity is high among pregnant women in urban Northern Ghana. Improving the educational level of women is recommended to improve their dietary diversity.
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Keywords: dietary diversity, women, pregnancy, nutrition, Northern Ghana

INTRODUCTION

Pregnancy is a physiological state of increased dietary requirements as nutrients are needed for the mother as well as the developing foetus (King, 200). Multiple nutrient deficiencies are very common in women from low-income settings including Ghana (Torheim *et al.,* 2010; Kennedy and Meyers, 2005). A monotonous diet comprising mainly of plant-based foods which lack diversity and nutrient density however characterize the diets of pregnant women from developing countries (Lee *et al.,* 2013). Inadequate diets during pregnancy have been linked to adverse pregnancy outcomes such as retarded foetal growth, low birth weight, and preterm delivery (Abu-Saad and Fraser, 2010).

Adequate dietary diversity during pregnancy is shown to be associated with better pregnancy outcome (Saaka, 2013; Abubakari and Jahn, 2016). One way of ensuring adequate nutrient intake during pregnancy in resource poor settings is by consuming an adequately diversified diet comprising of different food groups (Arimond *et al.,* 2010).

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Dietary diversity is a relatively simple way of assessing diet quality of individuals and households. It relates to nutrient adequacy (coverage of basic needs with regards to macro and micro nutrients) and to diet variety/balance, which are two of the main components of diet quality (United Nation Systems, 2009).

Dietary diversity is defined as the number of different food groups consumed over a specified period, usually over a day or a week (Ruel, 2003). The more food groups included in one's daily diet, the higher the chances of meeting nutrient requirements since nutritional quality of the diet improves with diverse diet (Torheim *et al.,* 2003; Hatloy *et al.,* 1998). Dietary diversity has been validated as a proxy indicator for measuring nutrient adequacy among pregnant women (Saaka, 2013; Ali *et al.,* 20140).

Other studies have also established the association between dietary diversity and nutrient adequacy in pregnancy and other conditions (Arimond *et al.,* 2010; Tavakoli *et al.,* 2016; Kiboi *et al.,* 2016). Dietary diversification has therefore been highly recommended among pregnant women to meet nutrient requirements as nutrient demands increase during pregnancy (Lee *et al.,* 2013). Lack of diversity in a pregnant woman's diet will make it poor in essential nutrients and the foetus will therefore not be provided the right nutrition it needs for healthy growth (Neggers and Goldenberg, 2003).

Moreover, nutritional biodiversity ensures nutrient adequacy, in that the consumption of different varieties of foods allow for the intake of most essential nutrients to meet one's nutritional requirements as the nutrient composition between foods and among varieties/breeds of the same food differs. According to Negin *et al.* (2011), increasing the intake of a variety of foods across and within food groups, and within varieties ensure adequate intake of essential nutrients. Zainal-Badari *et al.* (2012) also revealed that adequate nutrient intake necessary for good nutrition is associated with food variety and diet quality of individuals. The body needs these essential nutrients (protein, carbohydrate, fat, vitamins and minerals) from the food we eat to stay healthy and productive. Dietary diversity scores have been shown to reflect micronutrient adequacy of women (Arimond *et al.,* 2010). As micronutrient deficiency remains an important public health problem in developing countries such as Ghana (Kennedy et al., 2007), promotion of the intake of an adequately diversified diet during pregnancy is a promising public health strategy to prevent nutrient deficiencies during pregnancy.

Though low dietary diversity during pregnancy results in low nutrient intake and adverse pregnancy outcomes, data on dietary diversity and its associated factors among pregnant women in Ghana particularly Northern Ghana is scanty. Therefore the present study was designed to assess the dietary diversity and associated factors among pregnant women attending antenatal clinic (ANC) in urban Northern Ghana.

MATERIALS AND METHODS

Ethical considerations

Approval to conduct this study was given by the Scientific Review Committee of the School of Allied Health Sciences, University for Development Studies, Tamale, Ghana. Permission was also granted by the management of the health facilities. Informed consent was obtained from all participants after providing them with sufficient information about the study and they were made to sign or thumb print a statement of an informed consent before being interviewed. For participants who were less than 18 years old, consent to participate in the study was obtained from their parents or legal guardians.

Study design

An analytical cross-sectional multi-centre study was conducted from 13th June to 8th July, 2016; and involved 270 pregnant women randomly selected through simple random sampling from 8 health facilities: Tamale West Hospital, St Lucy Polyclinic, Reproductive and Child Health Centre, Vittin, Choggu, Nyohini, Bulpiela and Kalpohini Health Centres in Tamale Metropolis and Sagnarigu

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District in Northern Region, Ghana.

Study participants
The eligible respondents were pregnant women who were booked and attended the health facilities on each ANC day during the period of the study. The eligible subjects who were without any illness (unstable vital signs/mental status) and consented to participate in the study were enrolled. Regarding the distribution of the total sample by health facility, 91,21,43,11,16,34,34 and 23 pregnant women were enrolled from Tamale West Hospital, St Lucy Polyclinic, Reproductive and Child Health Centre, Vittin Health Centre, Choggu Health Centre, Nyohini Health Centre, Bulpiela Health Centre and Kalpohini Health Centre respectively. According to Tabachnick and Fidell (2007), sample size (N) for performing a regression analysis is N> 50+8m. m is number of independent variables. Having 8 independent variables in the current study, N> 114. N was increased to 270 to give a better estimate of the population.

Data collection
Data were collected from the respondents with the aid of a structured questionnaire to document information on socio-demographic characteristics (age, ethnicity, marital status, religion, level of education completed, occupation and gestational age) and ANC attendance. Dietary intake data were collected using the FAO/FANTA III MDD questionnaire (FAO, 2016).

The dietary diversity scores (DDS) were calculated based on the 24-hour dietary recall information. The DDS was assessed by assigning a score of 1 to each food group consumed and a score of 0 to each food group not consumed in a 24-hour period prior to the survey and a sum total of all scores was computed. A total of 10 food groups were considered in this study: Grains, white roots and tubers, and plantains; Dark green leafy vegetables; Other vitamin A-rich fruits and vegetables; Other vegetables; Other fruits; Meat, poultry and fish; Eggs; Nuts and seeds; Pulses (beans, peas and lentils); and Dairy. Consequently, the minimum possible DDS score was 0 (no food group consumed) and the maximum possible DDS score was 10 (all food groups consumed). The DDS was used to construct a dichotomous variable Minimum Dietary Diversity – Women (MDD-W). Women who consumed food from at least 5 food groups were given a score of 1 otherwise they were given a score of 0 for the MDD-W.

Statistical analysis
Data analysis was done using SPSS (version 20). Chi-square test and binary logistic regression analysis were performed to determine the factors associated with low dietary diversity. $P < 0.05$ was deemed statistically significant at two tail tests. Responses were shown using percentages and cross- tabulations and presented in tables.

RESULTS

Socio-demographic characteristics of pregnant women
Table 1 presents the socio-demographic characteristics of the sampled pregnant women. The mean age of the women was 26.44 ± 5.74 years and most were aged 25 – 34 years (50.2 %), belonged to Dagomba ethnic group (85 %), were traders (47.6 %) and belonged to Islamic religion (51.3%). More than eight in ten pregnant women were married (87.5 %) and almost half of them had no formal education (49.8 %). Forty-eight percent of the women were in their second trimester (48.0 %) of pregnancy at the time of interview.

Consumption of food groups and dietary diversity of pregnant women
The food group that was widely consumed was grains, white roots and tubers and plantains (98.2 %). About two-thirds of the pregnant women consumed dark green leafy vegetables (65.9 %) and other vitamin A rich fruits and vegetables (65.6 %). Only about one quarter of the women ate other fruits (24.5 %), and two in ten women ate eggs (21.2 %) while over half of them ate meat, poultry and fish (53.1 %) and dairy products (53.8 %). Nearly half of pregnant women ate from the nuts and seeds group (49.5 %) and a little over forty one of them consumed foods from the beans, peas and lentils group (41.4 %). The mean women

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dietary diversity score was 4.87 ± 2.04 with a confidence interval (CI) of 4.64 to 5.12. Fifty – two percent of pregnant women met the minimum of consuming from at least five food groups during the previous day (Table 2).

Factors associated with dietary diversity

A host of demographic factors that could potentially predict women's dietary diversity were explored in bivariate analyses. The bivariate analyses revealed that level of completed education was positively associated with dietary diversity. Women who had higher educational attainments were more likely to meet the minimum dietary diversity than those who had none or lower education. Other factors explored were not significantly associated with dietary diversity: gestational age (p = 0.74), frequency of ANC attendance (p = 0.45), marital

Table 1 Socio-demographic characteristics of pregnant women

Characteristic	Frequency (n)	Percent (%)
Age (years)		
15 – 24	107	39.2
25 – 34	137	50.2
35 – 49	29	10.6
Ethnicity		
Dagomba	232	85.0
Others	41	15.0
Religion		
Islam	140	51.3
Christianity	133	48.7
Marital status		
Currently married	239	87.5
Currently not married	34	12.5
Occupation		
Trader	130	47.6
Farmer	12	4.4
Civil servant	12	4.4
Service worker	41	15.0
Teacher	8	2.9
Health worker	13	4.8
Nothing	57	20.9
Educational status		
None	136	49.8
Primary	30	11.0
Middle/junior high school	45	16.5
Secondary	33	12.1
Tertiary	29	10.6
Gestational age		
First trimester	32	11.8
Second trimester	130	48.0
Third trimester	109	40.2
ANC attendance		
Less than 4 visits	173	63.4
At least 4 visits	100	36.6

Table 2 Consumption of food groups and dietary diversity of pregnant women

Food groups consumed	Frequency (n)	Percent (%)
Grains, white roots and tubers and plantains		
Yes	268	98.2
No	5	1.8
Dark green leafy vegetables		
Yes	180	65.9
No	93	34.1
Other vitamin A rich fruits and vegetables		
Yes	94	34.4
No	179	54.6
Other fruits		
Yes	67	24.5
No	206	75.5
Meat, poultry and fish		
Yes	145	53.1
No	128	46.9
Eggs		
Yes	58	21.2
No	215	78.8
Nuts and seeds		
Yes	135	49.5
No	138	50.5
Beans, peas and lentils		
Yes	113	41.4
No	160	58.6
Dairy products		
Yes	147	53.8
No	126	46.2
Minimum Dietary Diversity-W (MDD-W)		
< 5 food groups	131	48
≥ 5 food groups	142	52

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status of women (p = 0.33), ethnicity (p = 0.36) and the religion they practiced (p = 0.96). Other factors that were also not statistically associated with women's dietary diversity were occupation (p = 0.39) and age of women (p = 0.99) (Table 3).

Binary logistic regression analysis was performed to determine the strength of association (odd ratios) between maternal educational level and dietary diversity (Table 4). Compared to women who had attained tertiary education, women who had no education at all were 5.5 times more likely to have low dietary diversity [Odds Ratio (OR) = 5.5; 95% CI (2.09 –14.31); p = 0.001]. In addition, women who had only primary education were also 3.8 times more likely to have low dietary diversity [OR = 3.8; 95% CI (1.21 –12.09); p < 0.022] (Table 4).

DISCUSSION

The present study assessed dietary diversity and its associated factors among pregnant women receiving ANC in urban Northern Ghana. It was revealed in the present study that the mean women dietary diversity score was 4.87 ± 2.04 which is comparable to a mean of 4.2 +1.5 revealed in a study among pregnant women in Ghana by Saaka *et al.* (2017). The most consumed food group among pregnant women in Ghana is grains, white roots and tubers and plantains (Saaka *et al.,* 2017) and hence confirms the findings of the present

Table 3: Factors associated with low dietary diversity of pregnant women

		Women's dietary diversity			
Variable	**N**	**<5 food groups, n(%)**	**≥5 food groups, n(%)**	**Test statistic**	**p-value**
Gestational age					
First trimester	32	17 (53.1)	15 (46.9)	$\chi2$ = 0.60,	p = 0.74
Second trimester	130	64 (49.2)	66 (50.8)		
Third trimester	109	50 (45.9)	59 (54.1)		
ANC attendance					
Less than 4 visits	173	86 (49.7)	87 (50.3)	$\chi2$ = 0.53,	p = 0.45
At least 4 visits	100	45 (45.0)	55 (55.0)		
Educational status					
None	136	80 (58.8)	56 (41.2)	$\chi2$ = 18.30,	p = 0.001
Primary	30	15 (50)	15 (50)		
Middle / Junior School	45	16 (35.6)	29 (64.4)		
Secondary/ Vocational	33	14 (42.4)	19 (57.6)		
Tertiary	29	6 (20.7)	23 (79.3)		
Marital status					
Currently married	239	112 (46.9)	127 (53.1)	$\chi2$ = 0.97,	p = 0.33
Currently unmarried	34	19 (55.9)	15 (44.1)		
Ethnicity					
Dagomba	232	114 (49.1)	118 (50.9)	$\chi2$ = 0.82,	p = 0.36
Others	41	17 (41.5)	24 (58.5)		
Religion					
Islam	140	67 (47.9)	73 (52.1)	$\chi2$ = 0.002,	p = 0.96
Christianity	133	64 (48.1)	69 (51.9)		
Occupation					
Trader	130	59 (45.4)	71 (54.6)	$\chi2$ = 1.95,	p = 0.39
Other occupations	86	40 (46.5)	46 (53.5)		
Nothing	57	32 (56.1)	25 (43.9)		
Age group (years)					
15 – 24	107	51 (47.7)	56 (52.3)	$\chi2$ = 0.01,	p = 0.99
25 – 34	137	66 (48.2)	71 (51.8)		
35 – 49	29	14 (48.3)	15 (51.7)		

Categorical variables compared using Chi-square test statistics. P<0.05 considered statistically significant

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Table 4: Strength of association between low dietary diversity and level of education

Variable	95% CI			p-value
	OR	Lower	Upper	
Education status				
Tertiary	1			
Secondary/vocational	2.83	0.91	8.77	0.072
Middle/Junior high	2.13	0.71	6.27	0.177
Primary	3.83	1.21	12.09	0.022
None	5.48	2.09	14.31	0.001

study as grains, white roots and tubers and plantains was also identified as the most consumed food group among the pregnant women. The high consumption of these foods among pregnant women may be as a result of the fact that, these foods are the staple foods in Ghana.

The present study showed that adequate maternal dietary diversity during pregnancy is determined by higher educational attainment. This finding is consistent with a study among pregnant women in Kenya (Kiboi *et al.,* 2017). Similar results are also reported in a study among South African households (Taruvinga *et al.,* 2013) and in Ghana using demographic and health survey data (Amugsi *et al.,* 2016).

Lower educational level has also been reported to be associated with inadequate intakes of macronutrients as well as calcium, phosphorus and niacin among pregnant women in Thailand (Sukchan *et al.,* 2010). This is consistent with our findings as adequate dietary diversity is associated with adequate nutrient intake (Arimond *et al.,* 2010). The higher odds of consuming an adequately diversified diet by women with higher educational level may be explained by the fact that they are more likely to be exposed to appropriate dietary practice information and may also understand and use nutrition information during antenatal care services.

In addition, educated women are more likely to have better paid jobs, earn better and therefore have improved access to nutrient-rich foods (Burchi and De Muro, 2007) and health care. The lack of association between gestational age and dietary diversity was also reported in a study among pregnant women in Ghana (Abubakari and Jahn, 2016) where gestational age was not associated with mean dietary diversity. This finding may suggest that dietary intake does not vary by age of pregnancy.

The frequency of attendance to antenatal care was not associated with dietary diversity in the present study. Contrary to our finding, a previous study reported a relationship between antenatal care attendance and mean dietary diversity (Saaka, 2013). Our finding highlights the need to intensify the nutrition information given during antenatal care sessions in health facilities. The association between dietary diversity and the demographic characteristics (occupation, age, marital status and religion) was not statistically significant in the present study. Likewise, a study by Ali *et al.* (2014) revealed no relationship between demographic characteristics and dietary diversity. In contrast, other studies (Taruvinga *et al.,* 2013; Clausen *et al.,* 2005) showed otherwise.

The following limitations should however be kept in mind while interpreting the results of the pre sent study. The cross-sectional nature of the study does not provide a good basis for establishing causality as both exposure and outcome were assessed simultaneously. Also, dietary diversity was assessed using recall which might be affected by recall bias. Moreover, malnutrition, anaemia and clinical outcome of pregnancy were not measured, and therefore could not be related to dietary diversity. In spite of these, the present study has given light on the factors associated with dietary diversity among pregnant women in urban Northern Ghana.

CONCLUSION

The results of the present study showed that prevalence of low dietary diversity is high among pregnant women in urban Northern Ghana. Lower maternal education was found to be associated with low dietary diversity among the pregnant women. Improving the educational level of women is therefore recommended to improve their dietary diversity.

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COMPETING INTEREST

Authors declare that they have no competing interests.

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