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Research article

An Assessment of Dietary Diversity in Six Nigerian States

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ABSTRACT: Diet quality (DQ) has been receiving increased attention because of its relationship to diet-related chronic non-communicable diseases. A diverse range of foods has been shown to increase energy and micronutrients intake in the developing countries. Diversity or variety in Nigerian diets is not known. A cross-sectional descriptive study design was adopted and a semi-structured questionnaire with in-built 24-hour diet recall section was the tool for data collection. A 14-food group model was used to evaluate diet diversity (DD). DD was based on the number of food groups consumed in the previous 24hours period. A DD score (DDS) ranging from 0 to 14 was constructed. A DDS terciles for low, medium and high was also constructed. DD of Nigerian diet was evaluated in six states representing the three Agro- ecological zones, rural and urban sectors of Nigeria. 1,472 women with a mean age (SD) of 27.9(6.2) years participated in this study. Majority (97.1%) were married, occupation included traders (21.5%), civil servants (23.9%), artisans (19.1%) and farmers (15.4%). Overall, mean dietary diversity score (DDS) was 5.81 (1.4). This varied from 6.61 in Akwa-Ibom state to 4.98 in Kaduna state .Overall 83% of the participants had average/medium DDS (5-9) while 16.5% had low (1-4) DDS. These varied significantly among the states. Low DDS (1-4) was 25% and 33% in the states in the dry Savanna zone but 12.8% and 10% in the states in moist Savanna zone and 6.4 and 6.2 in humid forest. These differences are significant ($p<0.05$). In conclusion dietary diversity is poor in Nigeria and efforts to improve nutritional status must address the issue of dietary diversity.

Key Word: diet quality, diet diversity, dietary recall, diet-related diseases

INTRODUCTION

Information about the individual or household dietary diversity in populations can serve as a simple but effective indicator of various parameters that affect the nutrition of people in such groups. Food security entails three important aspects (availability, access and utilization) in the relationship between man and food, necessary to ensure that nutrition plays its optimum role in human health. However, dietary diversity has been positively linked with these three pillars of food security (Hillbruner and Egan, 2008; Bernal et al, 2003; Styen et al, 2006).

Seasonality, location with its climate and agricultural practices are among factors that affect food availability in any locality (Hillbruner and Egan, 2008). Individual and household access to food has also been shown to be affected by demographic and socio-economic factors, accounting for variations in diet quality (Bernal *et al*, 2003). Nutritional status is considered an outcome of biological processes that involve food utilization while dietary diversity ensures adequate nutrient intakes among groups (Styen *et al*, 2006). Furthermore, while inverse relationships have been found between dietary diversity and chronic non-communicable diseases (Azadbakht et al, 2006), it has a direct relationship with favorable nutritional status (Styen et al, 2006). It is not surprising that, eating a large variety of foods, across and within major food groups has been recommended in most dietary guidelines (Jeanene et al, 2006), since it is associated with a number of improved outcomes such as nutrient adequacy, anthropometric indices and improved hemoglobin concentrations (Swindale and Bilinsky, 2005).

Nutritional problems are common in poor populations, since their diets are predominantly based on starchy staples (Styen et al, 2006) and these plant-based diets are low in micronutrient contents,high in phytate and dietary fibre which inhibits the absorption of micronutrients (Lopez et al, 2004). Protein-Energy

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Malnutrition and micronutrients deficiencies continue to be a significant public health problem in developed countries (NFCNS, 2001) among women of reproductive age, infants and children. Maternal malnutrition is a major predisposing factor for morbidity and mortality among African women (Lartey, 2008), some of the causative factors are inadequate food intake, poor diet quality and frequent infections.

The quality of diets has been shown to be directly related to dietary diversity and inversely related to malnutrition in terms of faltered growth in children, nutrient deficiencies and the risk of chronic diseases (Azadbakht et al, 2006; Styen et al, 2006). While a lot of studies have documented the prevalence of malnutrition in mothers and children and reported inadequate dietary intakes, very little information exists on the dietary quality and or diversity of the diets of Nigerians. This study was therefore designed to assess the dietary diversity in six selected states in Nigeria.

MATERIALS AND METHODS

Study Design: This was a descriptive cross sectional study to assess dietary diversity in six selected states of Nigeria .Data were collected as part of the study of the intake of vitamin A-fortified food products by mothers and vitamin A supplementation amongst the under-five children in Nigeria. The study also assessed serum retinol, serum ferritin, serum zinc and C - reactive protein among the subjects.

Study Location: This study was carried out in six selected states of the country. The six states were selected using stratified random sampling technique: two states each from the three agro-ecological zones (Dry Savanna, Moist Savanna and Humid forest). Borno and Kaduna States from the dry savanna, Taraba and Kwara States from the moist savanna and Osun and Akwa Ibom States from the humid forest zones. Within each state, two Local Government Areas (LGA) were selected using simple random sampling technique. These were (a) Ikot Ekpene and Ikono LGA (Akwa Ibom state) (b) Maiduguri and Biu LGA (Borno state), (c) Kaduna South and Kajuru LGA (Kaduna state)(d) Irepodun and Oyun LGA (Kwara state) (e) Osogbo and Ola Oluwa LGA (Osun state) and (f) Jalingo and Gassol LGA (Taraba state),

Time and Duration of Study: Data collection was carried out from September to December 2008.

Subjects: Subjects were women of reproductive age and their under-5 children.

Sample size: The sample size was calculated from the formula

$n = (Z^2)$

n = minimum sample size

Z = 1.96 (a constant)

P = prevalence of poor quality diet

Q = 1-P

d = tolerance/error

The minimum sample size was 1,049.79;however, 1472 subjects participated in the study.

Sample Selection: Systematic random sampling was used to select each household used in all enumeration areas in each Local Government Area. These were chosen from the list of the total number of eligible households identified during household listing exercise in the enumeration areas. The eligible households were those with mothers who had U-5 children. Any selected household that was inaccessible during the data collection was replaced with the next eligible household on the list.

Inclusion criteria: The study included all subjects;

1. who gave informed consent to participate in the study,
2. who were healthy and not on medication,
3. who have been resident in that location for the past three years,
4. whose consumption was not affected by ill-health, fasting, national holidays, and festive celebrations.

Data Collection: Interviewer- administered questionnaire was used to collect information used in this study. Data collected included the following:

Demographic And Socioeconomic Factors: This included household identification, household composition, age, household size, highest educational level attained by head of the household, primary occupation of the household head, method of refuse disposal, and estimated monthly income of the house hold head.

Dietary Assessment: 24-hour dietary recall was conducted to obtain information on subjects' food intake. It was conducted by trained interviewers at the home of the subjects. Subjects were asked to recall all foods eaten and beverages taken in the previous twenty-four hours prior to the interview.

Dietary Diversity:A scale of fourteen food groups was used in assessing the dietary diversity of subjects. Using information collected from the 24-hour dietary recall,the dietary diversity scores for individuals were derived using the FAO guidelines for measuring household and individual dietary diversity (FAO, 2007). The dietary diversity was assessed based on the number of food groups consumed over the immediate past 24 hours. A point was awarded to each food group consumed over the reference period, and the sums of all points were calculated for the dietary diversity score for

each individual. Dietary Diversity terciles was derived from the 14 food groups into; low, medium and high dietary diversity terciles. Individual DDS were then judged based on their position on the scale.

Anthropometric Measurements: Heights were measured using the stadiometer, while weights were measured using a sensitive bathroom scale. Each subject was made to stand erect on the scale with light clothing and without shoes. The readings were taken in kilogramme(kg). The scale reading was always allowed to return to zero before the subject was asked to stand on it. Individual heights and weights were then used to calculate Body Mass Index (BMI = Weight/Height^2 kg/m^2).

Statistical Analysis: All data collected were analyzed using statistical package for social sciences (SPSS version 10).Dietary Diversity Scores (DDS) for individuals were derived using the transform and compute section of the SPSS package. The mean Dietary Diversity Scores from the six states were compared using One-way ANOVA.The independent-sample t-test was used to compare the mean DDS between urban and rural sectors. Pearson chi square was used to test for association between the DDS and the socio-demographic factors.

RESULTS

This study included 1,472women with their Under-5 children, of which 204 (13.9%) were from Akwa Ibom state, 261(17.7%) were from Borno state, 277(18.8%) were from Kaduna state, 230(15.6%) were from Kwara state, 258(17.5%) were from Osun state and 242(16.4%) were from Taraba state. Almost equal number of subjects was recruited from the urban and rural sectors. Majority (97%) of the mothers were married, about half (49.9%) had completed primary and secondary education.

Table 1:
Socio-Demographic Factors

Factor	Akwa Ibom	Borno (%)	Kaduna (%)	Kwara (%)	Osun (%)	Taraba (%)	Total
Sector							
Rural	56.9	32.6	40.4	60.4	60.1	46.6	49.4
Urban	43.1	67.4	59.6	39.6	39.9	50.4	50.6
Marital status							
Married	89.7	98.5	98.9	98.3	98.1	97.9	97.1
Single	7.4	0.8	0.7	1.3	1.9	1.2	32.0
Widowed	2.5	0.4	0.4	0.0	0.0	0.0	0.5
Divorced	0.5	0.4	0.0	0.4	0.0	0.8	0.3
Educational level							
University degree	2.5	10.0	6.1	5.7	7.8	4.1	6.2
Polytechnic degree	5.9	18.0	18.4	13.9	18.2	3.6	15.1
Secondary completed	18.1	18.8	50.9	36.9	43.0	15.3	31.1
Secondary not completed	17.6	5.7	5.8	7.4	7.8	9.1	8.6
Primary school	44.1	8.0	6.5	29.6	18.2	13.2	18.8
No formal education	11.8	39.5	12.3	7.4	5.0	44.6	20.3
Primary Occupation							
Farmer	10.8	13.4	10.1	23.9	7.0	28.1	15.4
Trader	23.0	29.1	15.2	24.8	16.7	21.1	21.5
Civil servant	13.2	33.3	37.9	16.1	12.8	26.0	23.9
Artisan	25.5	3.8	15.9	16.5	39.5	14.5	19.1
Unemployed	10.3	0.4	13.4	3.5	4.7	2.5	5.8
Others	17.2	19.9	7.6	15.2	19.4	7.9	14.4
Monthly Income (N)							
Less than 5,000	4.9	0.0	0.0	5.7	6.6	0.0	2.7
5,000-14,999	27.0	41.0	20.6	49.6	46.9	31.0	35.9
15,000-24,999	11.8	22.6	17.5	15.7	9.3	19.0	16.5
25,000-34,999	3.4	8.4	8.7	4.8	3.5	11.2	6.8
35,000-44,999	3.9	4.2	4.3	0.9	2.3	12(5.0)	3.5
45,000-54,999	0.5	0.8	1.4	1.3	1.2	2.9	1.4
55,000 and above	0.5	0.0	1.1	0.0	0.4	5.0	1.2
No idea	48.0	23.0	44.4	22.2	29.8	26.0	32.1

Figures are expressed in percentages within the states.

Table 2:
Percentage Consumptions of food Groups among Subjects

Food groups	Akwa Ibom (%)	Borno (%)	Kaduna (%)	Kwara (%)	Osun (%)	Taraba (%)	Total (%)
Cereals	67.6	99.6	96.8	85.7	98.1	98.9	92.1
Vitamin A vegetables and tubers	24.9	60.2	30.3	65.7	64.0	27.3	46.4
White tubers	91.2	27.2	39.4	87.0	86.8	36.8	59.7
Dark green leafy vegetables	75.5	15.7	22.0	49.1	48.8	26.0	37.9
Other vegetables	84.3	67.0	41.9	18.7	27.9	57.9	48.8
Vitamin A fruits	2.0	0.1	0.0	3.0	0.4	0.4	1.0
Other fruits	3.9	18.4	4.0	10.0	14.7	6.0	9.7
Organ meat	0.0	0.4	0.7	0.0	1.2	0.0	0.4
Flesh meat	42.2	24.1	23.8	45.2	27.5	42.1	33.4
Egg	2.5	0.4	5.4	4.3	8.5	6.2	4.6
Fish	91.7	31.0	45.5	47.4	67.1	68.2	57.1
Legumes, nuts and seeds	38.7	50.6	63.9	77.8	83.3	62.8	63.5
Milk and milk products	33.8	28.7	26.7	17.4	18.6	37.6	27.0
Oils and fats	98.0	100.0	97.8	99.1	99.6	99.2	99.0

92.1% of the subjects consumed foods from cereal products.46.4% ate foods from Vitamin A vegetables and tubers group, 59.7% ate foods from white tubers groups, 37.9% ate from dark green leafy vegetables, 0.1% ate from Vitamin A fruits, 9.7% ate from other fruits, 0.4% from organ meat, 33.4 from organ meat, 4.6% from eggs, 57.1% from fish, 63.5% from legumes, nuts and tubers, 27.0% from milk and dairy products and 99.0% consumed from foods with oils and fats.

Table 3:
Dietary Diversity Scores in the Six States and Dietary Diversity Terciles

Dietary Diversity Scores	Akwa Ibom (%)	Borno (%)	Kaduna (%)	Kwara (%)	Osun (%)	Taraba (%)	Total (%)
2	1.0	0.0	1.4	0.0	0.0	0.0	0.4
3	1.0	6.9	8.7	2.6	0.4	1.7	3.7
4	4.4	18.8	23.5	7.4	5.8	11.2	12.4
5	19.1	34.9	36.1	21.7	14.3	31.8	26.8
6	20.1	26.1	19.5	29.1	28.7	32.6	26.0
7	24.5	10.7	0.9	25.2	32.2	17.8	19.5
8	19.6	1.9	1.4	12.2	14.7	4.1	8.5
9	9.3	0.8	0.1	1.7	3.5	0.8	2.5
10	1.0	0.0	0.0	0.0	0.4	0.0	0.2
Dietary Diversity Terciles							
Low (1-4)	6.4	25.7	33.6	10.0	6.2	12.8	16.5
Medium (5-9)	92.6	74.3	66.4	90.0	93.4	87.2	83.3
High (10-14)	1.0	0.0	0.0	0.0	0.4	0.0	0.2

Predominant occupation included: civil servants (23.9%), traders (21.5%) and artisans (19.1%).

About a third (35%) reported a monthly income of between 5,000 and 15,000 Naira while another 16% had a monthly income between 15,000 and 25,000 Naira (Table 1).

The predominant food groups in the diet were: cereal/grains (92%), root/tubers (59%), legumes/nuts (63.5%), fish (57.1%), vegetables (48%), meat (33%), while a large majority (99%) consumed oils/fat in soups/stews (Table 2).

The Dietary Diversity Scores (DDS)of individual subjects ranged from 2 to 10. The proportion of the subjects with the scores and in each of the three categories of low (1-4), medium/average (5-9) and high (10-14) are shown on Table 3.

The overall mean DDS among subjects was 5.81 with a standard deviation of 1.4. The highest Dietary Diversity Score was recorded for subjects from Akwa Ibom(6.61$\pm$1.5 SD), followed by Osun (6.47$\pm$1.2), and Kwara (6.10$\pm$1.3). Others were Taraba (5.69 $\pm$1.1), Borno (5.24$\pm$1.2), and Kaduna (4.98 $\pm$ 1.2). There is a significant difference between the mean DDS in the six states ($p<0.05$). The mean DDS for Akwa-Ibom state (6.61), Osun state (6.47), and Kwara state (6.10) were higher than the overall mean DDS (5.81) while the

mean DDS for Taraba state (5.69), Borno state (5.20) and Kaduna (4.98), were lower. Furthermore the DDS for the rural sector (5.90) was also different to that of the urban (5.70) {$p<0.05$}. Table 4.

DISCUSSION

Dietary diversity consists of the total number of foods or food groups that contribute to the overall diet of an individual over a reference period (FAO, 2007), but dietary diversity in terms of food groups better predicts diet quality than that based on individual food items (Ruel, 2003). Dietary diversity assessed in this study consisted of simple count of food groups that individuals consumed over a 24-hour reference period. This study revealed a minimum and maximum DDS to be 2 and 10 respectively, a mean DDS of 5.81 was derived in this study involving 1472 women of reproductive age with their U-5 children in six selected states of Nigeria. One of the methods employed in defining cutoff points for assessing varying levels of dietary diversity in populations is to create terciles and sometimes quintiles (Ruel 2003). Terciles of DDS based on 14 food groups were adopted in this study to determine the proportion of subjects scoring low, average and high DDS.

Table 4:
Comparison of Dietary Diversity Scores in the Six States and Sectors

State	Number	Mean DDS	SD	Minimum DDS	Maximum DDS
Akwa Ibom	204	6.61	1.5	2	10
Borno	261	5.24	1.2	3	9
Kaduna	277	4.98	1.2	2	9
Kwara	230	6.10	1.3	3	9
Osun	258	6.47	1.2	3	10
Taraba	242	5.69	1.1	3	9
Total	1472	5.81	1.4	2	10
Sector					
Rural	727	5.90	1.4	2	10
Urban	745	5.71	1.4	2	9
Total	1472	5.81	1.4	2	10

SD- *Standard deviation*

Table 5:
BMI of Subjects in the six states

BMI	Akwa Ibom (%)	Borno (%)	Kaduna (%)	Kwara (%)	Osun (%)	Taraba (%)	Total (%)
Underweight	6.4	17.6	5.8	10.9	14.3	12.4	11.3
Normal	56.9	49.8	49.5	67.4	66.3	63.2	58.6
Overweight	30.4	23.4	30.7	17.0	14.7	16.1	22.0
Moderate obesity	5.9	8.8	13.9	3.9	4.3	7.4	7.5
Severe obesity	0.5	0.4	0.4	0.9	0.4	0.8	0.5

862(58.6%) were classified as normal, 167(11.3%) as underweight, 324(22.0%) as overweight. 111(7.5%)were considered as having Grade I Obesity, 8(0.5%) as having Grade II Obesity. The highest BMI was recorded to be 58.30kg^{-2} while the lowest was 10.25kg^{-2}. The mean BMI was (23.34kg^{-2} $\pm$4.75 SD).

Table 6:
BMI and Dietary Diversity Scores

BMI	Low DDS (%)	Medium DDS (%)	High DDS (%)	Total (%)
Underweight	8.2	12.0	0.0	11.3
Normal	55.6	59.1	66.7	58.6
Overweight	25.9	21.2	33.3	22.0
Moderate obesity	9.9	7.1	0.0	7.5
Severe obesity	0.4	0.6	0.0	0.5

No significant differences in DDS between terciles were observed for subjects in BMI grades (P>0.05). There was no correlation between individual Dietary Diversity Scores and maternal BMI (r= -0.017, P=0.507).

The result showed that 16.5% scored low, 83.3% scored average and 0.2% scored high DDS. It is noted that the mean DDS obtained in this study was at the lower end of the range for "average",therefore, more subjects are likely to have consumed between 5 to 6 food groups. More than 50% of the subjects scored 5 to 6 in their dietary diversity assessment. Although dietary diversity of populations has been reported to range from 3 to 6 (Savy et al, 2006, Oldewage and Kruger, 2008), different numbers of food groups and scoring systems have been employed in different countries to assess dietary diversity, making it difficult to compare DDS between countries (Savy et al, 2008; Kennedy et al, 2007 and Drescher et al, 2007). However, Styen et

al, 2006; in a study to assess whether dietary diversity is a good indicator of dietary adequacy used 9 food groups to measure dietary diversity and obtained a mean DDS of 3.6. A mean DDS of 3.6 derived from 9 food groups is comparable to the 5.81 from 14 food groups in this study.

When comparing the mean DDS between states, all other states were found to have significantly different DDS except for Akwa Ibom and Osun states found to have similar DDS (6.61 and 6.41) respectively. Also the DDS in different sectors and LGA were significantly different. The effect of states, sectors and LGAs on DDS underscores the importance of location on food intakes. The higher DDS for the rural sector is in contrast to previous findings (Arroyo and Mendez, 2007 and Clausen et al, 2005), that reported higher DDS in the urban settings. People who reside in the rural areas are more likely to adopt their traditional food culture and this has been found to be associated with a more diversified diet (Roche et al, 2008; Wahlquist, 2005).

The mean BMI of 23.34 $\pm$ 4.8SD found in this study is lower to that found by (Savy et al, 2008), but higher than the mean BMI of 20.8kg^{-2} found in the study to assess the relationship between dietary diversity and nutritional status (Savy et al, 2005). No significant correlation was found between Dietary Diversity Scores and BMI in this study ($p = 0.307$). This is consistent with previous findings (Savy et al, 2008). Although, most studies have established a direct relationship between DDS and nutritional status in different age groups (Arimond and Ruel, 2004, Savy et al, 2005, Styen et al, 2006), BMI is regarded as an outcome of energy balance, with particular reference to weight. While DDS is associated with adequate macro and micronutrients intakes (Kennedy et al, 2007 and Styen et al, 2006), portion size has been shown to be stronger predictor of adequate nutrient intakes (Kennedy et al, 2007; Azadbakht, 2005), highlighting its importance in establishing the contribution of each foods to the overall diet quality.

Significant differences in DDS were observed in relation to family size, educational levels and estimated household incomes. These findings are consistent with previous reports (Bernal et al, 2003; Thiele et al, 2004; Clausen et al, 2005 and Torheim et al, 2004). The associations between these parameters and dietary diversity scores point to the firm relationship of socio-economic status on food intake. Educational levels, household size and income usually interact to have a positive effect on food intake, because higher educational attainment in households is likely to be associated with higher income and increased income is linked to more expenditure on food (Hoddinot and Yohannes, 2002). Even in poorer households, increase in income is usually reflected in more diversified diets as this makes meals more palatable (Ruel, 2003).

In conclusion, most of the subjects when assessed on individual DDS do not score up to average based on 14 food groups. It is thus considered that the average number of food groups consumed by the subjects over the reference period is poor. Considering the importance of dietary diversity to nutrition and health, these results show the need to mobilize efforts for ensuring that people have better access to and knowledge about adequate nutrition. Nutrition education and food aid are two effective programmes that have recorded success in bids to improve dietary diversity in populations (Sarrafzadegan et al, 2009; Lachat et al, 2009).Also location is very important for access to and intake of foods by individuals. Finally,socio-economic status of individuals continues to have significant influence on food intake, hence nutritional status and health.

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