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Dietary Diversity and Nutritional Status of Academic Staffs of Federal Polytechnic, Ilaro, Ogun State.

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Abstract: *Dietary diversity is associated with household or individual food availability and intake of nutrients from different food groups and is an essential component of the nutritional outcome. Since there is insufficient data on dietary diversity and nutrient intake adequacy among academic staff, this study was conducted to assess the dietary diversity, nutrient intake adequacy, and nutritional status of the academic staff of Federal Polytechnic, Ilaro, Ogun State, Nigeria. The study design was a cross-sectional design. The sample consisted of 100 academic staff. A semi-structured questionnaire was used to determine the socio-economic/demographic characteristics of the respondents, such as age, gender, marital status, the highest level of education attained, religion, and income level. Nutrient intakes were estimated from 24-hour dietary recalls and analyzed using Nutri-Survey software. Dietary Diversity Score (DDS) was created and categorized per the number of food groups consumed in the 24 hours preceding the study. Dietary Diversity Score was categorized as low DDS, consumption below 6 food groups, minimum DDS (6-10 food groups), and high DDS (11-15 food groups). Nutrient adequacy ratio (NAR) of energy was computed and categorized as low intake (intake < 60%), adequate intake (60%-80%), and high intake (80%-100%). Anthropometric measurements using weight and height to determine BMI and waist circumference to determine the risk of abdominal obesity were carried out to determine nutritional status. Data were analyzed using SPSS to determine descriptive and inferential variables. Statistical significance was established at $p<0.05$. Majority (58%) of the respondents were male. Prevalence of overweight and obesity among the respondents was 37% and 11%, respectively. 23% of the respondents were at high risk of abdominal obesity. A more significant proportion of the respondents (77%) had minimum DDS, and 6% had a high DDS. Also, most (65%) of the respondents had an excess nutrient intake, 21% had Adequate intake, and 14% had inadequate intake. There was no statistically significant association between the dietary diversity and nutritional status of the respondents. More respondents consumed cereals, white roots, tubers, vegetables, legumes, oil and fats, spices, and condiments than other food groups twenty-four (24) hours preceding the study. Prevalence of overweight and obesity in this study was higher than in previous studies. Therefore, Individuals should diversify their diet and eat more from other food groups and engage in enough physical activity to help reduce the rising prevalence of overweight and obesity.*

Keywords: *Dietary Diversity; Nutritional Status; Nutrient Adequacy; Academic Staff; Polytechnic*.

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I. Introduction

Physiological, social, cultural, psychological, genetic, metabolic, and behavioral factors influence poor nutritional status; a chronic condition [1]. The prevalence of poor nutritional status and adult obesity increases rapidly due to environmental and behavioral changes [2]. Imbalanced energy intake with energy expenditure and sedentary lifestyles causes over nutrition, which has been shown to lead to increased absenteeism from work, reduced productivity, chronic diseases, and reduced lifespan [3]. Obese workers were twice as likely to be less active and be absent from work than non-obese normal-weight workers [4].

Consumption of various foods in the diet is essential to ensure an adequate intake of diverse nutrients. Dietary diversity is referred to as a simple count of food items or food groups used in the household or by the individual over a reference period [5]. Dietary diversity can be used as a proxy measure of the nutritional quality of the diet and for the access dimension of household food security [6]. Urbanization is associated with several unhealthy dietary changes, such as increased saturated and trans fats, sugars, salt, and processed foods [7]. These dietary changes are occurring rapidly in developing countries and earlier stages of economic and social development. As a result, the global burden of obesity and other non-communicable diseases is shifting towards the poor [8].

Academic Staffs constitute a significant fraction of the Nigerian workforce [9]. Academic staff as described by [10], are sedentary workers due to their work which allows for more sitting during the day, thereby

allowing for little physical activity. The prevalence of obesity was reported at 31.7% and 16.3% using waist circumference and Body Mass Index (BMI) respectively among Nigerian adults in Rivers State [11].
Several reports have shown significant benefits in productivity if adequate nutrition is ensured [12, 13]. Hunt reported that maintaining the normal nutritional status of populations can raise national productivity levels by 20% [14]. Despite all these pieces of evidence, few nutrition studies in Nigeria have focused on adults generally and staff specifically. Aside from being adults, evaluation of the nutritional status of staff is vital as many studies have reported that academic staffs have a more significant potential to influence a student's health than any other person outside the student's home [15]. For staff to serve as positive nutrition role models, they must understand and practice a healthy lifestyle and make healthy dietary choices that will ultimately reflect their good nutritional status and health. Studies have also shown that dietary diversity is strongly associated with nutrient intake adequacy [16].
As a result of this, coupled with the paucity of data on dietary diversity and nutrient intake adequacy among academic staff, this study was conducted to assess the dietary diversity and nutritional status of the academic staff of Federal Polytechnic, Ilaro, Ogun State, Nigeria.

II. Material And Methods

2.1 Study design
The study was a descriptive and cross-sectional study.
2.2 Study Area and Study Population
2.2.1 Study Area
The study was conducted in Federal Polytechnic, Ilaro, Ogun State. It is a higher institution of learning established by decree No 33 of July 25, 1979, and became opened to students on November 15, 1979. It is located along Oja-Odan Road, about 3km from Ilaro Township and about 60km from Idiroko, a Nigerian border town with the Republic of Benin. Ilaro town itself is an ancient town landlocked between Lagos and Abeokuta, the capital of Ogun State.
2.2.2 Population of the study
The target study population includes all the academic staff of Federal Polytechnic, Ilaro, Ogun State. At the time of the study, the institution's total population of academic staff was Three Hundred and Twelve (312).
2.3 Sample Size and Sampling Technique
2.3.1 Sample size
From the total population of the study target (312), 30% of academic staff was selected following Mugenda and Mugenda [17] procedure. A sample of 10-30% of the total population is considered reliable. Thus, the sample size was calculated as follows, and respondents were drawn from the population:
30% x 312 = 94 which was approximated to 100 participants.
2.3.2 Sampling Technique
Respondents were selected using a multi-stage sampling technique. The first stage involved a random selection of three schools out of the five schools in the Polytechnic by balloting. The second stage involved the random selection of three departments each from each of the schools, while in the third stage, respondents were selected randomly based on the population of respondents in each school.
2.4 Inclusive and exclusion criteria (criterion)
Only willing academic staff participated in the study, while pregnant staff and those with medical ill-health were excluded from the study. However, a total of 100 staff gave their informed consent to participate in the study after the study's objective has been explained to them.
2.5 Materials and Method of Data Collection
2.5.1 Materials for data collection
The following were used in the data collection of the respondents
1. Semi-structured questionnaire
2. Bathroom scale
3. Measuring tape
4. Height meter
5. 24-hour dietary recall

2.5.2 Method of Data Collection
Questionnaire
A validated self-administered questionnaire was used to elicit relevant information on the respondents' socio-economic/demographic characteristics, such as age, gender, marital status, the highest level of education attained, religion, and income level.
Anthropometric measurements (weight, height, and waist circumference) were taken using standard procedures. The weight was taken with a bathroom weighing scale and the height with a height meter, while the waist circumference was taken with a measuring tape. These measurements were used to calculate the Body Mass

Index (BMI), the Waist circumference class and compared to standards [18]. The BMI calculated was classified as underweight (< 18.5kg/m2), normal weight (18.5-24.9kg/m2), overweight (25.0-29.9kg/m2) and obese (≥ 30kg/m2) using WHO classification [18]. The waist circumference class was also classified using the WHO classification [18]. For men, low risk of abdominal obesity (≤ 0.94), medium risk (0.94-1.02), and values >1.02 were at high risk. Women, on the other hand, were classified low risk as (≤ 0.80), medium risk (0.80-0.88), and high risk at > 0.88.

24-hour Dietary Recall

The 24-hour diet recall method is a dietary assessment tool that consists of a structured interview in which the subjects are asked to recall all the food and drinks consumed in the past 24 hours. The information was recorded, analyzed, and used to determine the nutrient intake adequacy and the dietary diversity score.

2.6 Dietary Diversity Score Categorization

Based on a 15-food group model designed by FAO [19], Dietary Diversity Score (DDS) was created and categorized per the number of food groups consumed in the 24 hours preceding the study. Dietary Diversity Score was categorized as low DDS, consumption below 6 food groups, minimum DDS (6-10 food groups), and high DDS (11-15 food groups).

According to Schaetzel [20], the Nutrient adequacy ratio (NAR) of energy is computed and categorized as low intake (intake < 60%), adequate intake (60%-80%), and high intake (80%-100%).

NAR = (Nutrient intake ÷ Recommended intake) × 100

2.7 Statistical Analysis

Nutri Survey Software was used to convert food intake to nutrient intake. Actual nutrient intake was compared to the Recommended Dietary Allowances (RDA) [21].

Statistical Package for Social Sciences (SPSS, version 16.0) was used for data analysis. Descriptive statistics (mean, standard deviation, frequency, percentages) and inferential statistics (chi-square and correlation) were done.

III. Result

3.1 Socio-demographic Characteristics of the respondents

Table 2 shows that 58% males and 42% females took part in the study. Most (85%) of them were married with more than half (53%) between the age of 30-39years while 31% were between the ages of 40-49years. Most (85%) of them practiced Christianity and only 15% were Muslims. The highest level of education attained indicated that about 31% had MBA/MSC, 62% had HND/BSC while 7% PHD. Only 7% earned above N200,000 monthly while 69% earned between N100,000 – 200,000.

Table no 1: Socio-demographic Characteristics of the respondents

Variables	Frequency	Percentage	Variables	Frequency	Percentage
Age group			**Marital Status**		
20 – 29	8	8.0	Single	13	13.0
30 – 39	53	53.0	Married	85	85.0
40 -49	31	31.0	Separated/Divorced	2	2.0
>50	8	8.0	**Religion**		
Highest Education Level			Christianity	85	85.0
HND/BSC	62	62.0	Islam	15	15.0
MBA/MSC	31	31.0	**Income**		
PHD	7	7.0	50000-99999	24	24.0
Gender			100000-200000	69	69.0
Male	58	58.0	>200000	7	7.0
Female	42	42.0			

3.2 Nutritional Status of Respondents

As shown in Table 2, almost half (46%) of the respondents had normal body weight, 11% were obese, 37% were overweight and 6% were underweight. Using waist circumference classification, more than half (59%) of the respondents had low risk of abdominal obesity while 18% had moderate risk and 23% were at high risk of abdominal obesity.

Table no 2: Nutritional Status of Respondents

Variables	Frequency	Percentage
BMI (Kg/m^2)		
Underweight	6	6.0
Normal weight	46	46.0
Overweight	37	37.0
Obesity	11	11.0
Waist Circumference		
Low Risk of abdominal obesity	59	59.0
Moderate Risk of abdominal obesity	18	18.0
High Risk of abdominal obesity	23	23.0

3.3. Dietary Diversity Score and Nutrient Adequacy Ratio

As shown in Table 3, a larger proportion of the respondents (77%) had minimum DDS and 6% of the respondents had a high DDS. Also, most (65%) of the respondents had excess intake of nutrient, 21% had Adequate intake and 14% had inadequate intake.

Table no 3: Dietary Diversity Score and Nutrient Adequacy Ratio

Variables	Frequency	Percentage
Dietary Diversity Score		
Low Dietary Diversity Score	17	17.0
Minimum Dietary Diversity Score	77	77.0
High Dietary Diversity Score	6	6.0
Nutrient Adequacy Ratio		
Inadequate Intake	14	14.0
Adequate Intake	21	21.0
Excess Intake	65	65.0

3.4 Food groups consumed and Nutrient Adequacy Ratio

Table 4 shows that there was no significant relationship between the Nutrient Intake Adequacy and consumption of foods from all the food groups.

Table no 4 : Foods groups consumed and Nutrient Adequacy Ratio

Food groups	Inadequate intake n (%)	Adequate Intake n (%)	Excess Intake n (%)	Total n (%)	P-value
Cereals	13 (13.0%)	20 (20.0%)	61 (61.0%)	94(94.0%)	0.995
White roots & Tubers	10 (10.0%)	12 (12.0%)	39 (39.0%)	61(61.0%)	0.671
Vitamin A- Rich Vegetables	7 (7.0%)	11 (11.0%)	32 (32.0%)	50(50.0%)	0.969
Other vegetables	14 (14.0%)	21 (21.0%)	63 (63.0%)	98(98.0%)	0.577
Vitamin A- rich fruits	3 (3.0%)	3 (3.0%)	4 (4.0%)	10(10.0%)	0.171
Other Fruits	1 (1.0%)	3 (3.0%)	7 (7.0%)	11 (11.0%)	0.799
Organ Meats	3 (3.0%)	2 (2.0%)	6 (6.0%)	11 (11.0%)	0.405
Flesh Meat	5 (5.0%)	11 (11.0%)	31 (31.0%)	47(47.0%)	0.615
Eggs & Poultry	7 (7.0%)	4 (4.0%)	23 (23.0%)	34(34.0%)	0.154
Fish	6 (6.0%)	16 (16.0%)	36 (36.0%)	58(58.0%)	0.113

Legumes, Nuts and Seeds	8 (8.0%)	10 (10.0%)	22 (22.0%)	40(40.0%)	0.197
Milk & Milk Products	6 (6.0%)	3 (3.0%)	20 (20.0%)	29(29.0%)	0.164
Oils & Fats	14 (14.0%)	21 (21.0%)	63 (63.0%)	98(98.0%)	0.577
Sweets	7 (7.0%)	8 (8.0%)	33 (33.0%)	48(48.0%)	0.592
Spices, Condiments & Beverages	14 (14.0%)	21 (21.0%)	65(65.0%)	100 (100.0%)	----------

3.5 Association between Dietary Diversity Score, Nutritional Status and Nutrient Adequacy Ratio

As shown in Table 5, the dietary diversity score did not significantly affect the nutritional status of the respondents. Also, there was no significant relationship between the Nutrient Adequacy Ratio (NAR) of all the participants and their Dietary Diversity Score. Out of the 37 respondents that were overweight, 26 (70.3%) of them had minimum DDS and 2 (5.4%) had high DDS and 9 (24.3%) had low DDS.

Table no 5: Association between Dietary Diversity Score, Nutritional Status and Nutrient Adequacy Ratio

Variables	**Low DDS n (%)**	**Minimum DDS n (%)**	**High DDS n (%)**	Total	**P-value**
Body Mass Index					0.592
Underweight	0 (0.0%)	5(83.3%)	1 (16.6%)	6	
Normal	6 (13.0%)	38(82.6%)	2 (4.3%)	46	
Overweight	9 (24.3%)	26 (70.3%)	2 (5.4%)	37	
Obese	2 (18.2%)	8 (72.7%)	1 (9.1%)	11	
Nutrient Adequacy Ratio					0.498
Inadequate Intake	1 (7.1%)	12(85.7%)	1 (7.1%)	14	
Adequate Intake	3 (14.3%)	18(85.7%)	0 (0.0%)	21	
Excess Intake	13 (20.0%)	47 (72.3%)	5 (7.7%)	65	

IV. Discussion

The respondents of this study consist of more males (58%) than females (42%). The higher male to female ratio in the study is similar to the study among the staff of federal polytechnic, Ilaro, Ogun state by Adebayo et al., [22]. The educational status of the respondents showed that most are well educated with qualifications of B.Sc./HND, M.Sc./MBA, and Ph.D. The high level of education reported could also be because the study was carried out in a tertiary institution that is expected among the staff. However, the reverse was the case among public-sector workers in Angola, where there was a low education level in 34.6% of the respondents of study despite working in an institution of higher education [23].

The BMI result was higher than the result obtained from a study in Maiduguri, which reported a prevalence of 8.1%; 22.8% for obesity and overweight, but similar to findings in Lagos with (22.2% obesity and 32.7% overweight [24]. These higher values in the subject of study could be attributed to the perceived sedentary nature of their work. Certain occupations characterized by sitting for long periods predispose individuals to sedentary lifestyles, and these individuals spend most of their adult working lives less engaged in physical activity [25]. Abdominal obesity determined by waist circumference of the respondents recorded in this study was lower than a study carried out by Fadupin et al. [9] on teachers in Nigeria, which majority of the teachers (60.3%) in this study had abdominal obesity. This difference is due to a high percentage of the respondents being female compared to this study, in which most of the respondents are male.

A majority (77%) of the respondents had a minimum dietary diversity. This result is against the study by Akinlua et al. [26] among undergraduate students, which observed that most participants had a poor dietary diversity score. This minimum diversity could be associated with the employment status of our respondents. They can diversify their diet to some extent as they have a regular source of income. The mean Dietary Diversity Score (DDS) from the study was 7.89 ± 1.54. This is higher than other studies by Jayawardena et al. [27], which recorded 6.35 ± 1.55 among adults, and Kiboi et al. [28], which recorded 6.84 ± 1.46 among pregnant women. This difference in the mean maybe as a result of the educational levels among our respondents. This could also be due to the difference in the locations. As recorded, most of the respondents had higher education. This supports other studies indicating that educational level influences dietary diversity [28, 29]. As an individual's educational level increases, their knowledge about food choices increases, and they tend to diversify their diet.

The mean energy intake of the respondents recorded in this study shows that most (65%) of them had an excess intake. It has been stated that the group mean intake of most nutrients must exceed the reference values to achieve an acceptably low prevalence of inadequate nutrient intake [30]. This indicates that the respondents' nutrient intake is adequate, which might be the result of variation in the diet of the study population. Studies have shown that a diverse diet is a proxy for nutrient intake adequacy [16, 31, 32].

The respondents' diet of this study mainly consisted of cereals, spices, condiments and beverages, vegetables, oils and fats, other vegetables, white roots, and tubers but a poor intake of fruits and Milk products which conforms with the study of Oladoyinbo et al. [5]. There is no significant association between the food groups consumed and the nutrient adequacy of the respondents.

This study recorded no statistically significant association between dietary diversity and nutritional status, but most respondents (82.6%) had a minimum dietary diversity and a normal weight. This indicates no association between diversity in diet and nutritional status, which is in contrast with other findings suggesting that dietary diversity is associated with the nutritional status of adults [33]. This difference could be attributed to the difference in study types. The study conducted by Steyn and McHiza [33] was a systematic review, whereas the present study employed a cross-sectional study design. In other related studies, the authors did not determine an association between dietary diversity and nutritional status [34, 35].

Furthermore, there was no statistically significant association between nutrient intake adequacy and dietary diversity score, which contrasts with the study conducted by Oladoyinbo et al [5] who reported a significant association between the respondents' nutrient adequacy and dietary diversity score.

V. Conclusion

The majority of the respondents had a minimum dietary diversity score. More respondents consumed foods from the following food groups; cereals, white roots, tubers, vegetables, legumes, oil and fats, spices, and condiments than other food groups; fruits, milk and meats, twenty-four (24) hours preceding the study. The prevalence of overweight and obesity in this study is 37% and 11%, respectively. The majority of the respondents had their estimated nutrient intake adequacy for energy above the RDA. Dietary diversity was not associated with nutritional status, and there was no association between dietary diversity and nutrient intake adequacy. The generalization of these findings is limited to this study setting because the findings need to be interpreted considering that the study setting is a higher institution of learning and may not be similar to the general society. However, Individuals should diversify their diet and engage in enough physical activity to help reduce the rising prevalence of overweight and obesity. Government and other agencies should intensify intervention efforts to educate the public on good nutrition to improve good health. Therefore, there is a need for further study in this area to determine nutrient intake adequacy for all nutrients and its association with dietary diversity and nutritional status.

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