Nutritional Status and Adequacy of selected Micronutrients of Civil Servants in Ogun state, Nigeria

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ABSTRACT

Background: *Inadequate micronutrient intake can have a negative impact on physical and mental health causing several health consequences. People who are overweight or obese also fails to meet the majority of micronutrient recommendations*

Objective*: This study assessed the nutritional status and adequacy of selected micronutrients of civil servants in Ogun State, Nigeria.*

Methods*: The study design was cross-sectional in design. The sample consisted of 250 civil servants. A semi-structured questionnaire was used to determine the socio-demographic characteristics, family medical history and nutrition knowledge of the respondents. Nutrient intakes were estimated from 24-hour dietary recall and analyzed using Nutri-Survey software. Anthropometric measurements were carried out to determine nutritional status. Data was analyzed using descriptive and inferential statistics using SPSS version 20. Statistical significance was established at $p \leq 0.05$.*

Results*: Prevalence of overweight and obesity was 39.2% and 11.6% respectively. One-third (32.8%) of the population were at risk of cardiovascular diseases. Nutrient adequacy of micronutrients assessed were low except phosphorus (89.6%), zinc (86.8%), iron (68.8%) and sodium (50.0%) which were in excess. Macronutrients were above the recommended dietary allowances. A significance association ($p<0.05$) was observed between some micronutrient adequacy ratio (folic acid, Vitamin A and Vitamin E) and nutritional status assessed by Body Mass Index of the respondents.*

Conclusion: Micronutrient intake was inadequate and prevalence of overweight and obesity were higher than reported in previous studies. There is a need for nutrition education that emphasizes on the consumption of micronutrient dense foods.

Keywords: Civil Servants, Nutritional Status, Micronutrient, Overweight, Ogun State.

INTRODUCTION

For adequate growth and development, a proper diet is required from early life stages to remain active. By reducing infection vulnerability, morbidity, disability, and mortality, a proper diet also constitutes the basis for human development and promotes total lifelong learning capacities and adult productivity (1). Civil servants contribute to a more significant percentage of a nation's workforce and, due to their sedentary behavior and poor dietary practices, they are particularly prone to obesity (2). Given the significant role of civil servants in a country's

economy, the high prevalence of obesity among them could negatively affect their health, reduce productivity, and generally negatively affect the health and the economy of the country (3). Obesity is a public health challenge and has reached epidemic proportions globally. Based on the current report, 650 million adults are obese worldwide (4).

Although it is reported that the developed countries have the highest prevalence of obesity, evidence also shows that developing countries have an increased prevalence of obesity, including Nigeria (5). Aside from the psychological and social effects of obesity, it also contributes to the high risk of chronic diseases, increasing the overall disease burden (5). As genes contribute to obesity in an individual, several other factors are also responsible for the increasing epidemic of obesity and these factors include socio-demographic characteristics (6), societal changes, and communities' behavioral patterns brought about by economic growth, modernization, urbanization, and globalization of food markets (7). Nature of work may be a risk factor for obesity because of associated socioeconomic and behavioral factors such as physical activity and sedentary time (8).

Micronutrient disorders are a global challenge affecting about 2 billion people in developing and developed countries (9). They are silent wide-ranging vitamin and mineral deficiencies that affect individuals of all genders and age groups and certain at-risk groups (10). They complicate infectious and chronic diseases, significantly impacting morbidity, mortality, and quality of life and causing definite disease conditions (10). The Sub-Saharan African countries accounts for more than half of the global micronutrient malnutrition cases (11). Before they could solve the problems of undernutrition and micronutrient deficiencies, over-nutrition associated with overweight, obesity, and other non-communicable diseases (NCDS) already emerged, creating a triple burden of nutrition-related ill-health (11). The World Health Organization (WHO) reported that more than 2 billion people suffer from micronutrient deficiencies worldwide, primarily iodine, iron, vitamin A, and zinc, and all these come with their health consequences (12). The public health effects of micronutrient disorders are also potentially significant. In addition to causing visible clinical manifestations, they are also responsible for a wide range of non-specific physiological impairments, leading to high susceptibility to infections, metabolic disorders, and delayed physical and psychomotor development (10). They are also associated with the risk of several chronic diseases, including cardiovascular diseases (CVD), osteoporosis, and cancer in adults (10).

Unhealthy behaviors have been linked to high incidences of chronic diseases among civil servants in Nigeria during active service or immediately after retirement (13).

Several studies have been carried out on nutritional status among different population groups in Nigeria (14, 15, 16, and 17); however, there is limited data on the nutritional status of civil servants and micronutrient adequacy of civil servants in Ogun State. This study therefore sought to determine the micronutrient intake, prevalence of micronutrient deficiencies and nutritional status among civil servants in Abeokuta, Ogun State, Nigeria.

MATERIALS AND METHODS

Study Design

A cross-sectional descriptive design was employed for this study.

Study Area and Population

Civil servants in the State Secretariat, Oke-Mosan, Abeokuta, Ogun State.

Sample Size Determination

The sample size for this study was calculated using the formula used by (18) with prevalence of 20.7% resulting in 239 which was further approximately to 250 respondents.

Sampling Techniques and Procedures

The sampling procedure used was multistage sampling technique which involves;

- **Stage one**: Ogun State Secretariat complex in Abeokuta, the state capital of Ogun state was purposefully selected because it houses all the ministries where the civil servants could be reached.
- **Stage two**: Simple random sampling was used to select 5 (Ministry of Culture and Tourism, Agriculture, Forestry, Health and Environment) out of the 19 ministries in the State secretariat.
- **Stage three:** 250 respondents were randomly selected using simple random

sampling from the 5 ministries.

Data Collection

Semi-structured pre-tested interviewer administered questionnaire was used to obtain data on socio-demographic and economic characteristics, family medical history and general nutrition knowledge of the respondents. The general nutrition knowledge question was developed and consists of ten nutrition related questions to test the respondents' knowledge on food groups, micronutrients and disease caused by inadequate feeding. The questionnaire included multiple-choice questions about; the meaning of nutrition, why do humans eat?, What is an adequate diet?, Is there any disease caused by inadequate feeding? ways of managing weight, examples of body building foods, examples of protective foods, must adequate diet contain foods from different food groups?, Is fat is an important source of energy? and which mineral is needed for building strong teeth The overall knowledge was graded as Poor (1-4), Average (5-7) and Good (8-10) nutritional knowledge. Mean nutrient intakes were estimated from 24-hour dietary recalls which were conducted on two days of the week (one week-day and one week-end). Nutritional anthropometric parameters such as body weight, height, waist and hip circumferences were measured using weighing scale, height meter and metric tape respectively. Body Mass Index (BMI), Waist circumference and Waist to Hip Ratio (WHR) were calculated using standard procedures (19).
Nutri-Survey software was used to convert food intake of the respondents to nutrient intake. Statistical Package for Social Science (SPSS) version 20 was used for descriptive statistics (frequency count, percentages, mean and standard deviation) and inferential statistics (Chi square Test).

Informed Consent

Informed consent was taken from respondents before data collection and respondents' information were kept confidential and used strictly for research purposes.

RESULTS

Table 1 shows the socio-demographic characteristics of the respondents. More than half (58%) of the respondents were females, majority were Christians (79.2%), almost all (96.4%) of the respondents were Yoruba and 49.2% were between the age range 30-39 years. Majority (70.8%) of the respondents was mid-level staff, 80% were married and 86.8% completed tertiary education. Most (73.2%) of the respondents practice monogamy marriage and about half (49.6%) of the respondents had between 0-2 children. About 34.8% of the respondents have spent 2-5 years in service while 34.4% have spent 6-10 years in service, and respondents who have spent more than 10 years in service were 30.8%. Higher percentage (53.6%) of the respondents earned between ₦51,000-₦99,999 with 49.2% of the respondents having at least 3-5 people depending on their income.

The overall nutritional knowledge of the respondents (Table 2) shows that 59.6% had a good level of knowledge, 36.8% had average knowledge and only 3.6% had a poor knowledge of nutrition.

Table 3 shows the anthropometric characteristics of the respondents. The body mass index (BMI) of the respondents showed that 4.8% were underweight, 44.4% were of normal BMI category, 39.2% were overweight and 11.6% were obese. Using waist circumference classification, almost half (44.8%) of the respondents had low risk of abdominal obesity while 22.4% had moderate risk and 32.8 were at high risk of abdominal obesity.
Furthermore, the waist to hip ratio classification revealed that 60% of the female respondents were at high risk of cardiovascular diseases compared to the male respondents (1.9%). Majority (83.2%) of the male respondents were at low risk of cardiovascular diseases compared to the female respondents that only 21.4% were at low risk.

The table also revealed that there is a significant difference between the nutritional status of the male and female respondent's ($p<0.05$).

Table 4 shows the micronutrient adequacy of the respondents. It shows that the majority of the respondents had inadequate intake of Vitamin A, E, B1, B9, C, Potassium, Calcium and Magnesium. Almost half (45.2%) of the respondents had inadequate intake of Vitamin B6, 50% had excess intake of Sodium, 89.6% had excess intake of Phosphorus, 68.8% had excess intake of Iron and 86.8% had excess intake of Zinc.

Table 1: Socio-demographic and socioeconomic characteristics of Respondents

Variables	F	%	Variables	F	%
Age group(years)			**Number of Children**		
20 – 29	29	11.6	0-2	124	49.6
30 – 39	123	49.2	3-5	79	31.6
40 -49	81	32.4	>6	4	1.6
50 – 59	17	6.8	None	43	17.2
Job Cadre			**Number of years in service**		
Junior (1-6)	41	16.4	2-5 years	87	34.8
Mid-Level (7-12)	177	70.8	6-10 years	86	34.4
Senior (13-17)	32	12.8	> 10 years	77	30.8
Gender			**Total number of dependents**		
Male	105	42.0	0-2	89	35.6
Female	145	58.0	3-5	123	49.2
Marital Status			6-8	27	10.8
Single	43	17.2	>9	11	4.4
Married	200	80.0	**Estimated monthly income (₦)**		
Separated/Divorced	4	1.6	<18,000	14	5.6
Widow/Widower	3	1.2	18,001-50,999	83	33.2
Educational Status			51,000-99,999	134	53.6
Primary	5	2.0	>100,000	19	7.6
Secondary	28	11.2	**Religion**		
Tertiary	217	86.8	Christianity	198	79.2
Type of Marriage			Islam	46	18.4
Monogamy	183	73.2	Traditional	3	1.2
Polygamy	24	9.6	Others	3	1.2
Nil	43	17.2	**Ethnic group**		
			Yoruba	241	96.4
			Igbo	2	0.8
			Hausa	7	2.8

Table 2: General Nutrition Knowledge of Respondents

General Knowledge Scale	F	%
0-4 (Poor Knowledge)	9	3.6
5-7 (Average Knowledge)	92	36.8
8-10 (Good Knowledge)	149	59.6

F=Frequency, %= Percentage

Table 3: Nutritional Status of Respondents

Variables	Male	Female	Total	P-value
	F (%)	F (%)	F (%)	
BMI (Kg/m^2)				
Underweight (<18.5)	6 (5.7)	6 (4.1)	12 (4.8)	
Normal weight (18.5-24.9)	60 (57.1)	51 (35.2)	111 (44.4)	0.000
Overweight (25-29.9)	35(33.3)	63 (43.4)	98 (39.2)	
Obesity (>30)	4 (3.8%)	25 (17.2)	29 (11.6)	
Waist Circumference (cm)				
Low Risk of abdominal obesity (male; <94, female; <80)	85 (81.0)	27 (18.6)	112 (44.8)	
Moderate Risk of abdominal obesity (male; 94-102, female; 80-88)	15 (14.3)	41 (28.3)	56 (22.4)	0.000
High Risk of abdominal obesity (male; >102, female; >88)	5 (4.8)	77 (53.1)	82 (32.8)	
Waist to Hip Ratio (cm)				
Low Risk of cardiovascular disease (male; <0.85, female; <0.75)	88 (83.2)	31 (21.4)	119 (47.6)	
Moderate Risk of cardiovascular disease (male; 0.85-0.90, female; 0.75-0.80)	15 (14.3)	27 (18.6)	42 (16.8)	0.000
High Risk of cardiovascular disease (male; >0.90, female; >0.80)	2 (1.9)	87 (60)	89 (35.6)	

F= Frequency, %= Percentage

DISCUSSION

A large proportion (70.8%) of the respondents were mid-level staff, 80% were married and 79.2% of the respondents were Christians. This finding agrees with the study by (6) on civil servants in Lagos state which discovered that 60.7% of the respondents were mid-level staff, 80.4% were married and 85.4% were Christians. Most of the respondents (86.8%) had tertiary education, 96.4% were Yoruba and this is because the study was carried out in a Yoruba speaking state and 73.2% of the respondents were from monogamous family structure as this is in close accordance with the study conducted by (20) on civil servants in Oyo State.

According to (21), poor knowledge of nutrition may affect eating habits and nutritional status of people. Based on the general nutritional knowledge assessment of respondents in this study, higher percentage (59.6%) of the respondents had good nutrition knowledge while only 3.6% had poor knowledge of nutrition and this was in contrast to the study conducted by (22)

among adults in Lagos state in which only 24.9% had good nutrition knowledge whereas a study among non-academic staff in Tamale Campus, Ghana (23) found 55.9% to have good nutrition knowledge. This high level of good knowledge may be because of the level of education of the respondents.

Nutritional anthropometric indicators reflect the nutritional status of the community and hence add to the information obtained by other approaches (24). The prevalence of overweight and obesity in this study was higher among females (43.4% and 17.2%) than males (33.3% and 3.8%) $p<0.05$, and this was similar to the study conducted by (25) on teachers in Ibadan where the prevalence of overweight and obesity was also higher among females (39.8% and 30.1%) than males (25% and 2.1%). High risk of abdominal obesity determined by waist circumference of the respondents was higher among females (53.1%) than males (4.8%) $p<0.05$, and this was against the result of the research conducted on civil servants in Lagos (6).

Furthermore, the study revealed the percentage of the recommended dietary allowance met by the respondents for both macronutrient and micronutrients which shows that the respondents exceeded their recommended nutrient intake for energy, protein, carbohydrates, phosphorus iron and zinc but were not able to meet the recommended nutrient intake for Fat, Vitamin A, Vitamin E, Vitamin B1, Vitamin B2, Vitamin B6, Vitamin C, Calcium and Magnesium. This finding is in concurrence with the research on adults in Ebonyi and Abia States (26) where all the population groups within both states had low micronutrient intake. According to (27), niacin, thiamin and riboflavin intake were low in both South African and Kenyan women. The causes of inadequate micronutrient intake could be because a large percentage of the population in south eastern Nigeria depended almost entirely on starchy staples like cassava, yam and rice which are poor sources of so many micronutrients. Micronutrient adequacy of the respondents showed that the majority of the respondents had inadequate intake of the micronutrients except for Sodium (50%), Phosphorus (89.6%), Iron (68.8%) and Zinc (86.8%). A research by (28), agreed with the iron and zinc intake where 96% and 80% of the respondents had excess intake of the nutrients respectively but the high intake of sodium by most of the respondents was similar to the study by (29).

This present study revealed the association between the micronutrient adequacy and the nutritional status of the respondents assessed by Body Mass Index (BMI). It was observed that there was no significant association between micronutrient intake and BMI category for vitamin B1, B2, B6, C, Sodium, Potassium, Calcium, Magnesium, Phosphorus, Iron and Zinc ($p>0.05$), and a significant association was observed between Vitamin A, E and Folic acid intake and BMI of the respondent's ($p<0.05$). This finding was in contrast with the study of (30) on association of micronutrient adequacy and BMI in young adults who reported that a negative correlation was between micronutrient intake and BMI category for vitamin C and vitamin K, and a positive correlation between sodium intake and BMI of the respondents.

Perhaps this study failed to reveal more correlations due to many respondents failing to meet the Recommended Dietary Allowance (RDA) which caused a little range of intake levels for each nutrient. A larger sample size with more respondents meeting and exceeding the RDA may reveal associations with more micronutrients because there would be greater differentiation within the range of participant intake.

CONCLUSION

Although participants had good nutrition knowledge, the prevalence of overweight and obesity among civil servants is increasing as well as risk of abdominal obesity and cardiovascular diseases which was predominantly higher in females than males in this present study. Also, the majority of the respondents had excessive intake of macronutrients, sodium, iron, phosphorus and zinc and inadequate intake of micronutrients. There is a need for nutrition education that emphasizes on the consumption of micronutrient dense foods and different weight management methods.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

Table 4: Micronutrient Adequacy of the Respondents

Nutrients	RDA	Mean±SD	Inadequate		Adequate		Excess	
			N	%	N	%	N	%
Vitamin A (mcg)	625	1.54±0.79	162	64.8	40	16.0	48	19.2
Vitamin E (mg)	12	1.18±0.53	221	88.4	13	5.2	16	6.4
Vitamin B1 (mg)	1.2	1.42±0.71	178	71.2	39	15.6	33	13.2
Vitamin B2 (mg)	1.3	2.00±0.89	99	39.6	51	20.4	100	40.0
Vitamin B6 (mg)	1.3	1.86±0.86	113	45.2	60	24.0	77	30.8
Folic Acid (mcg)	400	1.03±0.23	245	98.0	2	0.8	3	1.2
Vitamin C (mg)	90	1.14±0.47	226	90.4	12	4.8	12	4.8
Sodium (mg)	1500	2.12±0.93	95	38.0	30	12.0	125	50.0
Potassium (mg)	4700	1.11±0.38	229	91.6	15	6.0	6	2.4
Calcium (mg)	1000	1.12±0.42	230	92.0	11	4.4	9	3.6
Magnesium (mg)	420	1.76±0.85	127	50.8	57	22.8	66	26.4
Phosphorus (mg)	700	2.84±0.49	13	5.2	13	5.2	224	89.6
Iron (mg)	8	2.55±0.72	34	13.6	44	17.6	172	68.8
Zinc (mg)	11	2.81±0.52	14	5.6	19	7.6	217	86.8

N= Frequency, %= Percentage, SD= Standard Deviation

Table 5: Relationship between Micronutrient Adequacy and Nutritional Status of the Respondent's

Nutrient		Underweight		Normal		Overweight		Obese		P-value
		N	%	N	%	N	%	N	%	
Vitamin A (mcg)	Inadequate	2	0.8	78	31.2	64	25.6	18	7.2	
	Adequate	5	2.0	18	7.2	11	4.4	6	2.4	0.007
	Excess	5	2.0	15	6.0	23	9.2	5	2.0	
Vitamin E (mg)	Inadequate	10	4.0	103	41.2	87	34.8	21	8.4	
	Adequate	1	0.4	5	2.0	5	2.0	2	0.8	0.038
	Excess	1	0.4	3	1.2	6	2.4	6	2.4	
Vitamin B1 (mg)	Inadequate	8	3.2	80	32.0	71	28.4	19	7.6	
	Adequate	3	1.2	21	8.4	12	4.8	3	1.2	0.274
	Excess	1	0.4	10	4.0	15	6.0	7	2.8	
Vitamin B2 (mg)	Inadequate	1	0.4	41	16.4	46	18.4	11	4.4	
	Adequate	3	1.2	28	11.2	17	6.8	3	1.2	0.074
	Excess	8	3.2	42	16.8	35	14.0	15	6.0	
Vitamin B6 (mg)	Inadequate	3	1.2	50	20.0	50	20.0	10	4.0	
	Adequate	4	1.6	26	10.4	22	8.8	8	3.2	0.570
	Excess	5	2.0	35	14.0	26	10.4	11	4.4	
Total Folic Acid (mcg)	Inadequate	10	4.0	111	44.4	95	38.0	29	11.6	
	Adequate	1	0.4	0	0.0	1	0.4	0	0.0	0.008
	Excess	1	0.4	0	0.0	2	0.8	0	0.0	
Vitamin C (mg)	Inadequate	9	3.6	103	41.2	89	35.6	25	10.0	
	Adequate	1	0.4	4	1.6	4	1.6	3	1.2	0.318
	Excess	2	0.8	4	1.6	5	2.0	1	0.4	
Sodium (mg)	Inadequate	5	2.0	41	16.4	40	16.0	9	3.6	
	Adequate	0	0.0	17	6.8	11	4.4	2	0.8	0.545
	Excess	7	2.8	53	21.2	47	18.8	18	7.2	
Potassium (mg)	Inadequate	11	4.4	100	40.0	91	36.4	27	10.8	
	Adequate	0	0.0	10	4.0	4	1.6	1	0.4	0.372
	Excess	1	0.4	1	0.4	3	1.2	1	0.4	
Calcium (mg)	Inadequate	11	4.4	102	40.8	92	36.8	25	10.0	
	Adequate	0	0.0	6	2.4	3	1.2	2	0.8	0.719
	Excess	1	0.4	3	1.2	3	1.2	2	0.8	
Magnesium (mg)	Inadequate	3	1.2	59	23.6	52	20.8	13	5.2	
	Adequate	5	2.0	27	10.8	17	6.8	8	3.2	0.340
	Excess	4	1.6	25	10.0	29	11.6	8	3.2	
Phosphorus (mg)	Inadequate	0	0.0	5	2.0	8	3.2	0	0.0	
	Adequate	0	0.0	6	2.4	5	2.0	2	0.8	0.549
	Excess	12	4.8	100	40.0	85	34.0	27	10.8	
Iron (mg)	Inadequate	1	0.4	12	4.8	17	6.8	4	1.6	
	Adequate	3	1.2	12	4.8	21	8.4	8	3.2	0.110
	Excess	8	2.4	87	34.8	60	24.0	17	6.8	
Zinc (mg)	Inadequate	0	0.0	4	1.6	8	3.2	2	0.8	
	Adequate	0	0.0	8	3.2	9	3.6	2	0.8	0.611
	Excess	12	4.8	99	39.6	81	32.4	25	10.0	

N= Frequency, %= Percentage

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