

Meal Pattern and Micro Nutrient Adequacy of Food Consumed by Secondary School Female Adolescents in Ibadan, Oyo State, Nigeria

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Abstract: Adolescents have high nutritional needs but usually engage in unhealthy eating which has resulted into an irregular meal consumption pattern especially skipping of breakfast which has a significant impact on their health in adulthood. This study assessed meal pattern and micro-nutrient adequacy of food consumed by secondary school female adolescents in Ibadan. A cross-sectional descriptive study design was conducted among female adolescents in selected secondary schools in two Local Government Areas in Ibadan, Oyo state, Nigeria. A total of 384 respondents were used, using a proportionate random sampling technique, a semi-structured questionnaire was used to collect socio demographic data, 24-hours dietary recall and food frequency questionnaire was used to collect information on meal pattern and food intake from respondents. Data was analyzed using descriptive statistics to analyze the demographic factors, Total Dietary Assessment was used to analyze the 24-hours dietary recall and Chi-square was used to determine the association between meal pattern and micronutrient adequacy, with level of significance set at ($p < 0.05$). More than half 57.8% of the female respondents were between the ages of 13-15 years, 62.5% of them ate thrice a day while 60.2% of them skip meals of which lunch was mostly skipped. The result revealed that Calcium (mg) 26.02% is the most deficient of all the micronutrient while Vitamin B6, Zn and Fe met the RDA intake. Therefore, female adolescents should consume calcium supplement and foods rich in calcium more, government should also create more nutritional programs to enlighten them on the benefits of eating healthy.

Keywords: Meal Pattern, Micronutrients Adequacy, Female Adolescents, Secondary School

1. Introduction

The nutritional requirements of an individual can be categorized into four (4) phases which are pregnancy and lactation, infancy and childhood, adolescence and adulthood, and lastly old age [1]. Adolescence is one of the fastest development stages of a person's life; due to the physical, mental, hormonal, reasoning and social transformation which take place during this growth period and led to fluctuation of the nutritional needs of the body, meal pattern and food choices [2]. These changes have effects towards the alarming rate of non-communicable diseases including obesity,

hypercholesterolemia, which are emerging public health complications globally particularly in developing countries [1, 2]. Adolescents have high nutritional needs but typically engage in dangerous habits such as unhealthy eating which lead to an irregular meal consumption phenomenon especially skipping of breakfast and has affected their immediate health having significant influence on their health in adulthood [3]. Although most of them had good nutritional status while growing up as a child but tend to deviate as they undergo certain body growth and physical development which in most cases leads to micronutrient deficiency known as hidden hunger for them. Adolescent girls also constitute one-fifth of

the total female population of the world [3]. For females, adolescence is transition phase from girlhood to womanhood, marked by a number of physiological, behavioural and psychological changes [4].

Meal pattern is the identification of patterns or ways that emerge from measured food-intake variables such as the temporal aspects of meals, their content, and the context in which they are consumed [5]. The female adolescents are specially treated as one of vulnerable group because of their reproductive health which is the first window opportunity to determine how nutritionally healthy an infant will be. According to a research conducted among Indonesian school-going adolescent girls in West Java, overall, the girls had poor dietary quality and diversity [6]. The findings therefore indicated the importance of improving dietary quality and diversity in a regular meal pattern, especially meal frequency and meal skipping, to reduce the risk of anaemia and overweight-obesity among adolescent girls. For example, the percentage of women consuming milk and yogurt within recommendations is very low [7]. In Western culture, it is a common idea that the daily food intake should be divided into three square meals: breakfast, lunch, and dinner. However, the number of meals is not a universal standard [8]. Meal skipping is the omission or lack of consumption of one or more of the traditional main meals (breakfast, lunch or dinner) throughout the day [5]. In children, the proportion of breakfast consumers was very high but declined with adolescence [9]. Breakfast is an important source of key nutrients in the diet and it has been shown that breakfast consumption has protective effect against obesity and overweight [10, 11]. Micronutrient deficiencies affect an estimated two billion people, or almost one-third of the world's population [12]. Vitamins and minerals, termed together as micronutrients, although required in small quantities, are essential for the normal growth, development and functioning of human body. These are vital throughout the life but the period of childhood and adolescence is more important, as it is marked by fast growth and development [13]. Adolescent girls have a high risk of developing anaemia due to low iron intake and absorption, blood loss during menstruation, and increased need for iron to support rapid growth [6]. Being anaemic can cause low productivity, decreased cognitive function and development, and higher vulnerability to infection [14]. Thus, healthy meal pattern plays an important role in growth and development during adolescence. As a result, this study assessed the meal pattern and micro nutrient adequacy of food consumed by secondary school female adolescents in Ibadan, Oyo State, Nigeria.

2. Methodology

2.1. Study Design

The study design was cross-sectional and descriptive.

2.2. Study Location

The study was conducted in government owned secondary schools in two Local Government Areas (LGAs) in Ibadan.

The secondary schools are Eyini Grammar School and St Anne's High School in Ibadan South East Local Government Area and Oluyole Community Grammar School and Oke Ado High School in Ibadan South West Local Government Area.

2.3. Study Population

The population was comprised of female adolescents (13-19 years old) attending government owned secondary schools (public school) in each of the selected Local Government Areas in Ibadan, Oyo State, Nigeria.

2.4. Sample Size Determination

The minimum sample size was calculated using Crochan's formula.

$$n = \frac{z^2(p)(q)}{d^2}$$

Where; z is the z score value at 95% confidence interval (CI) = 1.96, p = prevalence was set at 50% of poor meal pattern was assumed, q = proportion (1-p); the precision (d) set at 5% (0.05).

Hence; $n = \frac{1.96^2(0.5)(1-0.5)}{0.05^2}$ n (sample size) = 384

When 2.7% (384) non response rate was added, the sample size was approximately 394 respondents used in the study.

2.5. Sampling Procedure

A proportionate sampling technique was used to select the number of students in the selected schools from each local government, while students were randomly picked for this study.

2.6. Research Instrument

A semi-structured questionnaire was used. It was sectioned into four, which are:

Section A: Socio-demographic characteristics of female adolescents.

Section B: Meal pattern of female adolescents.

Section C: Dietary Intake using a 24-hours dietary recall.

Section D: Factors that affect meal pattern of female adolescents.

Section E: Food consumption pattern of female adolescents using food frequency questionnaire.

2.7. Data Collection

Data was collected after seeking the female adolescents consent.

2.8. Data Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) version (20). Descriptive statistics (mean \pm standard deviation and percentages) was used to analyze the demographic factors, (TDA) Total Dietary Assessment version (3) was used to analyze the 24-hour dietary recall and Chi-square was used to explore the possible association between the variables of meal pattern and micronutrient

adequacy. A p-value of less than 0.05 was considered to constitute a statistically significant difference.

2.9. Ethical Approval

Ethical approval was gotten from LCU-REC (Lead City University Research Ethical Committee) office.

3. Result and Discussion

3.1. Socio-Demographic Characteristics of Female Adolescents

Table 1 revealed the socio-demographic characteristics of female adolescents in the study locations. More than half (57.8%) of the respondents are between 13-15 years old while 42.2% were within 16-19 years old. From the result, the mean age of female adolescents in the study location was 15.4 ± 1.4 years. In a similar research conducted in 2015, the mean age of the girls was 15.6 years while in a study conducted in Saudi Arabia among adolescent girls, the age of female students was between 16 -18 years old [15, 16]. Similarly, another research conducted in 2017 had a mean age range between 14 - 16 which was a bit in line with the present study [17]. Almost 91% of the female adolescents were mostly Yorubas by ethnic group. Majority (63.3%) of the female adolescents practiced Christianity as a religion, 36.5% practiced Islam and very few (0.3%) were traditional worshippers. In a study conducted in India, majority (71%) of the students practiced Hinduism and only 1% of the students are Christians [17]. This implies that country of origin influences religion to a greater percentage.

From the results, 65.4% of female adolescents lived with both biological parents, 17.2% of them lived with their mothers' only, 3.1% lived with their fathers' only, 8.9% lived with their grandparents only, 2.6% lived with other relatives and 2.9% lived with their guardians. This was consistent with the indications of a study in Delta State which revealed that more respondents were living with both parents and their parents have attained at least secondary education [18]. This finding was similar to the previous findings which revealed that larger percentage of the parents had one level of education [19]. The findings of the household size revealed that half (51.3%) of the female adolescents had between 6-10 people. The finding of this study was a bit in line to a study conducted in Saudi Arabia which showed that 59.6% of respondents specified that they have family size of between 7-11 [16]. Against the 1.6% that was observed for family size above 11 people, the study conducted in Saudi Arabia revealed that about 13.0% of the respondents stated that they had more than 11 people in their house hold [16]. The inconsistency can partly be justified by the fact that Arabians are mainly Muslims and they tend to have larger family size due to practice of polygamy.

Table 1. Socio-Demographic characteristics of Respondents (n=384).

Variables	Frequency	Percentage
Age (years)		
13 – 15	222	57.8

Variables	Frequency	Percentage
16 – 19	162	42.2
Mean \pm std.	15.4 \pm 1.4	
Ethnic group		
Yoruba	347	90.4
Igbo	32	8.3
Hausa	5	1.3
Religion		
Christianity	243	63.3
Islam	140	36.5
Traditional	1	0.3
Lived with		
Biological parents (both)	251	65.4
Mother only	66	17.2
Father only	12	3.1
Grandparents	34	8.9
Other relatives	10	2.6
Guardian	11	2.9
Parents educational level		
No formal education	9	2.3
Primary education	47	12.2
Secondary education	175	45.6
Tertiary education	153	39.8
Status of residence		
Owned	212	55.2
Rented	172	44.8
Father's occupation/male guardian		
Artisan/self employed	37	9.6
Business man/Trader	244	63.5
Civil servant	63	16.4
Clergy	18	4.7
Unemployed	11	2.9
Retiree	11	2.9
Mother's occupation/female guardian		
Artisan/self employed	20	5.2
Business woman/Trader	323	84.1
Civil servant	32	8.3
Clergy	1	0.3
Unemployed	4	1.0
Retiree	4	1.0
Household size		
1 – 5	181	47.1
6 – 10	197	51.3
11 – 15	6	1.6
Mean \pm std.	5.27 \pm 1.439	
Family structure		
Monogamy	299	77.9
Polygamy	85	22.1

Source: Researcher Computation, (2022)

3.2. Meal Pattern

The meal pattern of female adolescents was presented in Table 2. Teenagers make countless more choices for themselves than they did as children. Also, since eating is a social act, social networks and family can influence their food choices even more [20]. The study conducted showed that 62.5% of the female adolescents eat three times a day, 12.8% of them eat more than three times a day, while 24.7% eat less than three times a day. Meanwhile, a similar research conducted among female adolescents in Delta State, reported that 56.70% consume meals three times daily, 17.40% takes more than three times per day while 25.40% takes less than three times per day [18]. A cross-sectional study carried out among adolescent girls of age group 10–19 years in Varanasi

reported a percentage that is slightly higher than the findings of this study. The study reported that 64.75% of the adolescent girls consumes meal thrice per day while another study found out that 49.3% of female adolescents consumes meal 2 to 3 times a day which is inconsistent with this study [21, 22].

Majority of the female adolescents (60.1%) skipped meals while 39.9% did not skipped meals. Out of 60.1% that skipped meals, most (21.9%) of them skipped lunch, 18.2% of them skipped breakfast, 10.2% skipped afternoon snack while 6.8% skipped dinner. This outcome was consistent with the report of a study in Ila Orangun on meal pattern of adolescents which showed that more of the respondents consumed both breakfast and dinner compared to lunch [23]. Similarly, the finding was supported by another study which showed that about one-fifth of the population did not consumed breakfast before attending school [24]. Another report was also similar to the outcome in Poland which was according to Health Behaviour in School-Aged Children (HBSC) Study Report [25]. Meanwhile, another study showed that 30.80% of adolescents consumed breakfast very often, 30.30% of the respondents consumed breakfast often while 34.40% and 4.50% were reported to consumed breakfast sometimes and never respectively [18]. According to a systematic review facilitated by the collaboration of United States Agency for International Development (USAID) and SPRING which evaluated 288 studies related to meal pattern among adolescents discovered that generally, breakfast skipping and snacking are highly prevalent among adolescent girls of all ages [26]. This study found out that 21.4% of the female adolescents skipped meals due to lack of time, 12.2% due to lack of appetite, 7.8% was as a result of self-perceived overweight. This is inconsistent with a study conducted among adolescents’ girls in Saudi Arabia that reported that larger percentage of the adolescents’ girls skipped breakfast due to lack of appetite rather than lack of time as indicated in this study [16].

The result on location of meal consumption indicated that majority (79.7%) of the female adolescents’ consumed their meals at home, 14.8% consumed their meals at school, 3.9% consumed their meals at shop and 1.6% consumed their meals at the eatery. It was also noted that 46.4% of the female adolescents eat alone, 45.6% eat with members of the household and 8.1% eat with their peers. A similar study showed that adolescents ate with their families frequently. At some point the adolescents do eat out of home either with family or with peers, and more healthful food are being consumed with family and more junk type of food with peers [27]. The finding revealed that larger percentage (80.2%) of the female adolescents snack in-between meals while 19.8% did not snack in-between meals. A similar study noted that 66% of participants consumed snacks between meals [24].

Table 2. Meal Pattern by Female Adolescents (n=384).

Variables	Frequency	Percentage
Consumption times per day		
Once	10	2.6
Twice	85	22.1
Thrice	240	62.5
More than thrice	49	12.8

Variables	Frequency	Percentage
Skipping of meal		
Yes	231	60.1
No	153	39.9
If yes, meals skipped		
Breakfast	70	18.2
Morning snack	12	3.1
Lunch	84	21.9
Afternoon snack	39	10.2
Dinner	26	6.8
Evening snack	0	0.0
If yes, reasons for skipping meals		
Lack of time	82	21.4
Lack of appetite	47	12.2
Self-perceived overweight	30	7.8
Easy to prepare food was not available	31	8.1
Very tired to eat	10	2.6
Angry with father/mother	3	0.8
I did not like the available food	28	7.3
Breakfast consumption time (am)		
Before 6:00	6	1.6
6:00-6:30	25	6.5
6:31-7:00	58	15.1
7:01-7:30	78	20.3
Above 7:30	217	56.5
Lunch consumption time (pm)		
12:00 - 1:00	40	10.4
1:01 - 2:00	54	14.1
2:01- 3:00	156	40.6
Above 3:00	134	34.9
Dinner consumption time (pm)		
18:00 - 19:00	91	23.7
19:01 - 20:00	120	31.3
20:01 - 21:00	111	28.9
Above 21:00	62	16.1
Location of meals consumption		
Home	306	79.7
Eatery	6	1.6
School	58	14.8
Shop	15	3.9
Consumption pattern		
Eat with members of household	175	45.6
Eat with peers	31	8.1
Eat alone	178	46.4
Snack in-between meals		
Yes	308	80.2
No	76	19.8
If yes, what do you snack on		
Biscuits	174	45.3
Chocolates	54	14.1
Fruits	41	10.7
Popcorn	14	3.6
Pastries	25	6.5

Source: Researcher Computation, (2022)

3.3. Micronutrients Adequacy

Table 3 revealed the dietary intake and micro nutrient adequacy of female adolescent using 24-hour dietary recall. Micronutrient deficiencies affect an estimated two billion people, or almost one-third of the world’s population [12]. Micronutrient malnutrition is a persistent problem among the low-and middle-income countries [28]. Nutrient adequacy during adolescence is very essential for many reasons [29]. According to the Recommended Dietary Allowance (RDA) percentage fulfilment results, some of the micronutrients that

were not adequate in the diet of the female adolescents include Calcium (26.0%), Vitamin C (40.2%), Folic acid (49.0%), Sodium (85.06%), Vitamin B2 (70.0%), Vitamin E (90.8%) and Potassium (93.2%). However, some of the micronutrients that were adequate in abundance in the diet of the female adolescents include Vitamin A (103.4%), Magnesium (117.3), Phosphorus (118.40%), Iron (134.0%), Vitamin B1 (150.0%) and Vitamin B6 (200.0%).

The findings of this study showed that certain micronutrients are not present in adequate amount in the female adolescents' diet. The mean calcium intake among the female adolescents was found to be 338.3 mg which means that RDA percentage fulfilment was 26.02%. A study raised similar concern as the analysis of different sub-categories of adequacy of micronutrient showed that the majority (65.2%) of the adolescent girls had substantially inadequate calcium intake [8]. In fact, another study stated that more than half the population had deficiency of calcium [13]. The majority of the adolescents did not meet the recommended allowance for calcium [23]. This was also observed in another study which reported on the low calcium status of adolescent girls [30].

Vitamin C (40.2%) and Folic acid (49.0%) were also identified in the study to be low among female adolescents' diet based on their RDA percentages. In a study conducted in Abia State among adolescent girls in Secondary Schools and Universities, it was discovered that secondary school adolescents consumed an average of 94.15 mg of Ascorbic acid as against this study that indicated an average of 40.2 mg. In a study conducted in Abia State among adolescents' girls in Secondary Schools and Universities, it was discovered that secondary school adolescents consumed sufficient quantity of vitamin A, vitamin C and iron an average of 6296.10µg of retinol, 94.15mg of Ascorbic acid and 31.68mg of iron [29]. Meanwhile this study showed 724.8µg of Vitamin A, 40.2mg of Vitamin C and 20.1 of iron which mean the results in regards to Vitamin A is inconsistent.

According to cross sectional study, majority of the female adolescents were substantially inadequate in their micronutrients intake. It was further noted that majority of the

micronutrients (calcium, iron, zinc, folate, vitamin B6, niacin, riboflavin, and vitamin C) in the diet of adolescent girls was found to be lesser than the RDA value [22]. Larger percentage (90.5%) of the adolescent girls had substantially inadequate iron intake and 98.8% of the adolescent girls had substantially inadequate zinc intake. Likewise, Vitamin B6 intake was greatly inadequate among 98.6% of the adolescent girls. The findings also revealed that Thiamine intake (24.6%) among adolescent girls was marginally inadequate while it was greatly inadequate among 54% of the adolescent girls [22]. Similarly, most (47.2% and 52.4%) of the adolescent girls' diets were inadequate in Niacin and Vitamin C nutrients [22]. Although, the results are similar to the findings of this study, however they are inconsistent regarding vitamin B6, vitamin B2 and vitamin B1.

A review done on the dietary intake of school children and adolescents in developing countries revealed that the most common reported vitamins with inadequate intake were vitamin A, B3, B12, folate and β-carotene. This was supported by another finding which stated that intake of vitamin C (95.0%), B2 (97.0%), B1 (83.0%) and B6 (100%) was adequate in the diet of the adolescents [31]. In term of adequacy, the result of this review is consistent with the findings of this study except for vitamin C that's below average as against 95% indicated in the review.

Another study that established the fact that micronutrients inadequacy is high among adolescents was a study conducted in India to assess the prevalence of micronutrient deficiency among school children aged 6–11 and 12–16 years, studying in urban schools observed that almost one fourth of children had deficiency of one or more vitamin among vitamin D, B12 and folate. Vitamin A deficiency was found in less than 2% of them [13]. More than half the population had deficiency of calcium and iron whereas zinc and selenium deficiencies were found in about 10%. The vitamin A result is notably similar with the findings of this study among some other micronutrients [13]. Overall, the result revealed that Calcium (26.0%) was the most deficient of all the micronutrient while Vitamin B6 (200.0%) was the most consumed micronutrient.

Table 3. Dietary Intake and Micro Nutrient Adequacy of Female Adolescents Using 24-Hour Dietary Recall.

Nutrient content	Nutrient Intake (Mean)	Recommended value/day	Percentage fulfilment
Vitamin A (mcg)	724.8	700	103.43
Vitamin E (mg)	10.9	12	90.83
Vitamin B1 (mg)	1.5	1.0	150
Vitamin B2 (mg)	0.7	1.0	70
Vitamin B6 (mg)	2.4	1.2	200
Folic acid (mcg)	196.1	400	49.03
Vitamin C (mg)	40.2	100	40.20
Sodium (mg)	1245.9	1500	85.06
Potassium (mg)	2144.4	2300	93.24
Calcium (mg)	338.3	1300	26.02
Magnesium (mg)	422.2	360	117.30
Phosphorus (mg)	1479.8	1250	118.40
Iron (mg)	20.1	15	134
Zinc (mg)	16.7	9	185.60

Source: Researcher Computation, (2022)

3.4. Factors That Affect Meal Pattern of Female Adolescents

Factors that affect meal pattern of female adolescents in the study location was revealed in Table 4. Healthy and unhealthy dietary patterns and practices are shaped by numerous factors at socio-cultural, personal and economic levels. Dietary choices made by adolescent girls are influenced by their socioeconomic status along with many other circumstantial factors [32]. Nutrition transition in developing countries has also resulted in high popularity of western style diets among youths [33].

Based on the findings of this study, majority (70.3%) of the meal pattern of female adolescents were affected by food availability while 29.7% were not affected by that. Other factors that were noted to highly affect the meal pattern of the female adolescents were; time considerations of adolescents and parents (66.9%), cost of food (52.6%), convenience of food (62.5%), hunger and food cravings (53.9%), appeal of food or taste preference (58.9%), family finances (55.5%), and family meals (64.6%). A similar nutrition study conducted among 201 female adolescents aged 12 - 18 in a secondary school in Delta State discovered that nutritive values of foods (35.3%) was the leading factor that motivated the food choice of female adolescents in the study, followed by taste (26.90%),

popularity of the food (7.50%), cost (10.40%), time (7.0%), preparation (8.0%) and appearance (7.0%) [18]. A study conducted among 470 adolescent girls with the objective of identifying and exploring the factors affecting food consumption patterns and dietary practices of adolescent girls in Pakistan showed that food consumption patterns and dietary practices of adolescent girls are determined by family trends, beliefs and taboos, taste preferences, lifestyle patterns and finance [32]. Majority of these factors were observed to be key players in the meal patterns of the female adolescents. This study also showed that vegetarianism does not affect the meal pattern of 74.0% adolescents. Meanwhile, a cross-sectional study done among adolescent girls of age group 10-19 years in Varanasi reported that only 48.25% of the adolescent girls were non-vegetarians [21]. Another study also reported that in multivariate model, living in a two-parent family compared to living in a single-parent decreased the odds of breakfast but in this study even though lunch was mostly skipped, female adolescents who lives with both parent skipped meal the most however which was contrary to this same study which discovered there was no significant difference between students with respect to family size. It was discovered that there was a p-value of 0.008 which showed significant relationship between meal skipping and family size [34].

Table 4. Factors that affect Meal Pattern of Female Adolescents (n=384).

SN	Variables	Yes Freq. (%)	No Freq. (%)
1.	Time considerations of adolescents and parents	257 (66.9)	127 (33.1)
2.	Cost of food	202 (52.6)	182 (47.4)
3.	Convenience of food	240 (62.5)	144 (37.5)
4.	Food availability	270 (70.3)	114 (29.7)
5.	Hunger and food cravings	207 (53.9)	177 (46.1)
6.	Appeal of food or taste preferences for other foods	226 (58.9)	158 (41.1)
7.	Parental influence on eating behaviours	205 (53.4)	179 (46.6)
8.	Culture or religion of the family	208 (54.1)	176 (45.8)
9.	Personal health	231 (60.2)	153 (39.8)
10.	Mood/Frame of mind	258 (67.2)	126 (32.8)
11.	Conscious of body structure	174 (45.3)	210 (54.7)
12.	Habit	177 (46.1)	207 (53.9)
13.	Vegetarian beliefs	100 (26.0)	284 (74.0)
14.	Family finances	213 (55.5)	171 (44.5)
15.	Family meals	248 (64.6)	136 (35.4)

Source: Researcher Computation, (2022)

3.5. Food Consumption Pattern of Female Adolescents

Table 5 presented the food consumption pattern of female adolescents in the study area. About 17.7% of the female adolescents consumed milk every day. This finding was inconsistent with a study that discovered that almost one-third (32.9%) of participants consumed milk and dairy products once a day, whereas 20.8% consumed such products several times a day [24]. Only 31.5% of the respondents consumed milk rarely. This result is similar to the findings of a study that reported that two thirds of the adolescents consumed milk and milk products (a significant source of calcium) infrequently [9]. Another study showed that milk and natural yogurt were

consumed several times a day by 20% and 11% of primary school pupils respectively [33, 35].

This study revealed that 46.4% of the female adolescents consumed chicken rarely (1-2 times a week), 31% of the female adolescents consumed chicken between 2-4 times per week, 10.9% consumed it between 5-6 times per week and 6.5% consumed it on a daily basis. Another study reported similar findings which indicated that 43.2% of participants consumed poultry products between 1-2 times per week, 37.3% consumed it between 3-4 times per week, and 8.4% consumed it between 5-6 times per week [24]. The outcome of this study further revealed that 28.6% of the respondents rarely consumed meat (1-2 times a week). A similar study showed an inconsistent result as majority of the participants (45.8%)

consumed red meat between 1–2 times per week, 30.4% consumed it between 1–2 times per month because meat is an important source of high-quality protein, zinc, iron, and vitamins of the B-group [24].

A similar study agreed with the findings of this research which noted that the food consumption pattern of the female adolescents indicated that starchy foods such as cereals and grains, fast food items, meat and fatty foods, fruits and vegetables, milk and dairy products, soft drinks, canned fruit juice and sweets were included in the daily dietaries of the adolescent girls [16]. The majority of participants (42.3%) consumed Coca-Cola and sugar-sweetened beverages (SSB) between 1–2 times per month [24]. Meanwhile this study

indicated that about 32.8% of the respondents drank soft drink between 2-4 times per week, 29.4% of them rarely drank soft drinks, 13.8% drank between 5-7 times per week, and 22.4% drank soft drinks daily while 1.6% had never drank soft drinks.

An analysis of more than 300,000 participants aged 12–18 years old revealed that frequent consumption of breakfasts, fruit, vegetables, and milk was associated with better school performance, whereas higher consumption of soft drinks, instant dishes, fast food, and confectionery was negatively associated with school performance [36]. Snacks and biscuits had the highest percentage of daily consumption as observed in the study (55.5%) while beer is the least of all items consumed daily (0.8%).

Table 5. Food Consumption Pattern of Female Adolescents (n=384).

Food items	Never Freq. (%)	Rarely Freq. (%)	2-4 times per week Freq. (%)	5-7 times per week Freq. (%)	Daily Freq. (%)
Meat and poultry, and allied products					
Fried/boiled Fish	18 (4.7)	112 (29.2)	154 (40.1)	37 (9.6)	63 (16.4)
Fried/boiled egg	11 (2.9)	128 (33.3)	148 (38.5)	49 (12.8)	48 (12.5)
Roasted/boiled meat	25 (6.5)	110 (28.6)	135 (35.2)	60 (15.6)	54 (14.1)
Ice cream/frozen yoghurt	26 (6.8)	155 (40.3)	110 (28.6)	44 (11.5)	49 (12.8)
Milk (tin, sachet, etc.)	17 (4.4)	121 (31.5)	132 (34.4)	46 (12.0)	68 (17.7)
Cheese	115 (29.9)	148 (38.5)	73 (19.0)	17 (4.4)	31 (8.1)
Chicken	20 (5.2)	178 (46.4)	119 (31.0)	42 (10.9)	25 (6.5)
Starchy roots, tubers, grains and refined cereals consumption					
Oat bran meal	187 (48.7)	136 (35.4)	39 (10.2)	9 (2.3)	13 (3.4)
Whole wheat bread	89 (23.2)	156 (40.7)	79 (20.6)	23 (6.0)	37 (9.6)
White bread	29 (7.6)	97 (25.3)	144 (37.5)	61 (15.9)	53 (13.8)
Pap/Koko	52 (13.5)	160 (41.7)	107 (27.9)	30 (7.8)	35 (9.1)
Eko	114 (29.7)	163 (42.5)	70 (18.2)	16 (4.2)	21 (5.5)
Gari	16 (4.2)	98 (25.5)	115 (29.9)	73 (19.0)	82 (21.4)
Lafun	91 (23.7)	133 (34.7)	85 (22.1)	39 (10.2)	36 (9.4)
Cooked/Roasted Maize grain	61 (15.9)	189 (49.2)	81 (21.1)	28 (7.3)	25 (6.5)
Cooked/Boiled Beans	36 (9.4)	110 (28.6)	147 (38.3)	54 (14.1)	37 (9.6)
Akara	19 (4.9)	152 (39.6)	130 (33.9)	40 (10.4)	43 (11.2)
Moinmoin	14 (3.6)	161 (41.9)	138 (35.9)	34 (8.9)	37 (9.6)
Snacks and biscuits	6 (1.6)	55 (14.3)	65 (16.9)	45 (11.7)	213 (55.5)
Spaghetti and noodles	12 (3.1)	105 (27.3)	140 (36.5)	70 (18.2)	57 (14.8)
Roasted/Boiled Yam	24 (6.3)	161 (41.9)	138 (35.9)	35 (9.1)	26 (6.8)
Pounded Yam	61 (15.9)	230 (59.9)	56 (14.6)	20 (5.2)	17 (4.4)
Yam porridge	53 (13.8)	199 (51.8)	75 (19.5)	37 (9.6)	20 (5.2)
Yam flour	57 (14.8)	135 (35.2)	103 (26.8)	38 (9.9)	51 (13.3)
Boiled/Fried Irish potatoes	93 (24.2)	148 (38.5)	70 (18.2)	33 (8.6)	40 (10.4)
Boiled/Fried Sweet potatoes	32 (8.3)	147 (38.3)	110 (28.5)	44 (11.5)	51 (13.3)
Jollof rice	4 (1.0)	108 (28.1)	1120 (31.3)	81 (21.1)	71 (18.5)
Fried rice	14 (3.6)	151 (39.3)	118 (30.7)	39 (10.2)	62 (16.1)
Boiled rice	22 (5.7)	62 (16.2)	80 (20.8)	91 (23.7)	129 (33.6)
Plantain	14 (3.6)	121 (31.5)	127 (33.1)	53 (13.8)	69 (18.0)
Sugary beverages, fruit juices and whole fruits consumed					
Bournvita/Milo	17 (4.4)	125 (32.6)	127 (33.1)	40 (10.4)	75 (19.5)
Soft drinks	6 (1.6)	113 (29.4)	126 (32.8)	53 (13.8)	86 (22.4)
Malted drinks	48 (12.5)	166 (43.2)	108 (28.1)	24 (6.3)	38 (9.9)
Fruit juice	36 (9.4)	157 (40.9)	109 (28.4)	41 (10.7)	41 (10.7)
Mangoes	22 (5.7)	137 (35.7)	118 (30.7)	46 (12.0)	61 (15.9)
Banana	30 (7.8)	158 (41.1)	106 (27.6)	43 (11.2)	47 (12.2)
Sugar cane	47 (12.2)	201 (52.3)	80 (20.8)	29 (7.6)	27 (7.0)
Pawpaw	41 (10.7)	168 (43.8)	112 (29.2)	27 (7.0)	36 (9.4)
Water melon	13 (3.4)	127 (33.1)	130 (33.9)	48 (12.5)	66 (17.2)
Apple	16 (4.2)	158 (41.1)	114 (29.6)	45 (11.7)	51 (13.3)
Orange	13 (3.4)	116 (30.2)	152 (39.3)	53 (13.8)	51 (13.3)
Pineapple	18 (4.7)	168 (43.8)	119 (30.9)	38 (9.9)	41 (10.7)
Fat and oil rich foods consumed					
Vegetable oil	25 (6.5)	73 (19.0)	112 (29.2)	55 (14.3)	119 (31.0)
Butter/Margarine	45 (11.7)	141 (36.7)	113 (29.4)	43 (11.2)	42 (10.9)

Food items	Never Freq. (%)	Rarely Freq. (%)	2-4 times per week Freq. (%)	5-7 times per week Freq. (%)	Daily Freq. (%)
Soybeans cheese	141 (36.7)	148 (38.6)	55 (14.3)	16 (4.2)	24 (6.3)
Boiled/roasted peanut groundnut	49 (12.8)	95 (24.7)	104 (27.1)	47 (14.8)	79 (20.6)
Peanut butter	103 (26.8)	164 (42.7)	48 (12.5)	36 (9.4)	33 (8.6)
Alcoholic drinks					
Beer	311 (81.0)	52 (13.5)	16 (4.2)	2 (0.5)	3 (0.8)
Wine	160 (41.6)	163 (42.4)	39 (10.2)	11 (2.9)	11 (2.9)
Gin (sachet, glasses or bottles, etc.)	307 (79.9)	43 (11.2)	13 (3.4)	5 (1.3)	16 (4.2)
Traditional drinks (ogogoro, palm wine etc.)	282 (73.4)	79 (20.6)	16 (4.2)	2 (0.5)	5 (1.3)

3.6. Relationship Between Meal Pattern and Micronutrient Adequacy of Female Adolescents

The relationship between meal pattern and micronutrient adequacy of female adolescents was displayed in Table 6. From the data analysis, result showed that there was a significant relationship ($p < 0.05$) between meal pattern and micronutrient adequacy (Vitamin A, Vitamin B1, Vitamin B6, Magnesium, Phosphorus, Iron and Zinc) of female adolescents in the study area. Findings revealed that almost all the micronutrients were consumed thrice per day which was in accordance with the recommended daily requirements. From

the table, 12.2% and 12.8% of the female adolescents consumed more than 1000 mcg food which was adequate in vitamin A thrice and more than thrice per day. The result further indicated that 32.6% of the female adolescents consumed diet which was adequate in vitamin B6 more than thrice per day. Moreover, it was observed from the result that 20.6% of the female adolescents consumed diet which was adequate in Magnesium thrice per day, and 57.6% consumed diet which was also adequate in Phosphorus thrice per day. Furthermore, 31.0% of female adolescents consumed diet which was adequate in iron whereas 24.7% consumed diet which was adequate in zinc.

Table 6. Relationship between Meal Pattern and Micronutrient Adequacy of Female Adolescents.

Meal pattern	Vitamin A (mcg RAE)			χ^2	df	P value	
	100-500	501-1000	>1000				
Once	10 (2.6)	0 (0.0)	0 (0.0)				
Twice	85 (22.1)	0 (0.0)	0 (0.0)				
Thrice	73 (19.0)	120 (31.2)	47 (12.2)	308.712	6	.000*	
More than thrice	0 (0.0)	0 (0.0)	49 (12.8)				
Meal pattern	Vitamin B1 (mg)			χ^2	df	P value	
	0.1-1.0	1.01-2.00	>2.00				
Once	10 (2.6)	0 (0.0)	0 (0.0)				
Twice	85 (22.1)	0 (0.0)	0 (0.0)				
Thrice	7 (1.8)	186 (48.4)	47 (12.2)	504.832	6	.000*	
More than thrice	0 (0.0)	0 (0.0)	49 (12.8)				
Meal pattern	Vitamin B6 (mg)			χ^2	df	P value	
	0.1-1.0	1.01-2.00	>2.00				
Once	10 (2.6)	0 (0.0)	0 (0.0)				
Twice	62 (16.1)	23 (6.0)	0 (0.0)				
Thrice	0 (0.0)	115 (29.9)	125 (32.6)	332.993	6	.000*	
More than thrice	0 (0.0)	0 (0.0)	49 (12.8)				
Meal pattern	Magnesium (mg)				χ^2	df	P value
	50-150	151-250	251-350	>350			
Once	10 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)			
Twice	8 (2.1)	72 (18.8)	5 (1.3)	0 (0.0)			
Thrice	0 (0.0)	0 (0.0)	79 (20.6)	161 (41.9)	577.981	9	.000*
More than thrice	0 (0.0)	0 (0.0)	0 (0.0)	49 (12.8)			
Meal pattern	Phosphorus (mg)			χ^2	df	P value	
	100-500	501-1000	>1000				
Once	6 (1.6)	4 (1.0)	0 (0.0)				
Twice	0 (0.0)	85 (22.1)	0 (0.0)				
Thrice	0 (0.0)	19 (4.9)	221 (57.6)	518.776	6	.000*	
More than thrice	0 (0.0)	0 (0.0)	49 (12.8)				
Meal pattern	Iron (mg)			χ^2	df	P value	
	1-10	11-20	>20				
Once	10 (2.6)	0 (0.0)	0 (0.0)				
Twice	38 (9.9)	47 (12.2)	0 (0.0)				
Thrice	0 (0.0)	121 (31.5)	119 (31.0)	277.612	6	.000*	
More than thrice	0 (0.0)	0 (0.0)	49 (12.8)				

Meal pattern	Zinc (mg)		x ²	df	P value
	1-10	11-20	>20		
Once	10 (2.6)	0 (0.0)	0 (0.0)		
Twice	62 (16.1)	23 (6.0)	0 (0.0)		
Thrice	0 (0.0)	145 (37.8)	95 (24.7)	355.933	6
More than thrice	0 (0.0)	0 (0.0)	49 (12.8)		.000*

Source: Researcher Computation, (2022)

4. Conclusion

In conclusion, findings revealed that female adolescents in government owned secondary schools in Ibadan lack the intake of some micronutrients such as Calcium, Vitamin C, Folic acid, Vitamin B2, Vitamin E, Sodium and Potassium in their diet which are very essential for reproductive health and well-being of female adolescents. This could be as a result of their place of residence and household size which has affected their meal pattern and micronutrient adequacy. However, intake of other micronutrients such as Iron, Zinc, Magnesium, Phosphorus, Vitamin B1, Vitamin B6 and Vitamin A are adequate when compared with the RDA. Some of these micronutrients improves, regulate and fertilize female germ cell growth prior to pregnancy. Also, these micro nutrients will make the uterus more receptive to the factors of pregnancy, and lowers the risk of ovulatory infertility, and promotes and increases energy and performance in athletic women. It was further discovered that there was a significant relationship between meal pattern and micronutrient adequacy in female adolescents in the study area.

5. Recommendation

Based on the findings of this study, government should ensure that government secondary schools have good tuck-shops where healthy fruits and foods are sold during lunch time. Also, female adolescents need to be enlightened on the benefits of healthy eating and adoption of healthy dietary pattern. Furthermore, parents should guide their children and educate them on their nutrition health.

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