

NUTRITION KNOWLEDGE, DIETARY DIVERSITY AND INTAKE AMONG PREGNANT ADOLESCENTS IN IBADAN METROPOLIS, NIGERIA

SAMUEL, FOLAKE O, AREMU, OLUWATOMI O AND *ARIYO, OLUWASEUN

Department of Human Nutrition and Dietetics, Faculty of Public Health, University of Ibadan, 200284, Ibadan, Nigeria.

Correspondence Address: Oluwaseun ARIYO, Department of Human Nutrition and Dietetics, University of Ibadan, Ibadan, Oyo State. *E-mail:* ariyoseun@gmail.com; *Phone No:* +234 803 795 0483

ABSTRACT

Objective: The study was designed to assess the nutrition knowledge, dietary diversity and intake among pregnant adolescents in Ibadan metropolis, Oyo state.

Methodology: This cross-sectional study involved 130 pregnant adolescents attending antenatal clinics in Ibadan. An interviewer-administered questionnaire was used to collect information on socio-demographic characteristics, nutrition knowledge and dietary intake. Nutrition knowledge was assessed using a nine-point scale categorized as poor (<4), fair (4-6.9) and good (≥7). Dietary intake was assessed using a multi-pass 24-hour dietary recall to calculate the Minimum Dietary Diversity for Women (MDD-W), energy and nutrients intake and adequacy of intakes using standard procedure. Data were analysed using Statistical Package for Service Solution version 21 at 0.05.

Results: Age was 18.61±0.64 years, 90.8% had secondary education, and 96.2% were primigravida. Knowledge score was 5.93±1.82, 46.2% and 40.0% had good and fair nutrition knowledge, respectively. Women dietary diversity Score was 4.34±1.13 and 43.1% achieved the MDD-W threshold of five food groups. Energy, calcium, iron and folate intakes were 1784.87±619kcal, 398.2±339.2mg, 16.0±8.3mg and 268.2±168.1µg, respectively, and >80% of the respondents had inadequate intakes of these nutrients. MDD-W not met increases risks of inadequate energy (AOR: 2.97, 95%CI: 1.21-7.31) and folate (AOR: 3.94; 95%CI: 1.99-15.6) intakes. Poor nutrition knowledge increases likelihood of inadequate energy (AOR: 2.8; 95%CI: 1.1-5.2) and iron (AOR: 1.7; 95%CI: 1.0-2.3) intakes.

Conclusion: Poor nutrition knowledge and low dietary diversity contributed to inadequate intakes of energy, iron, folate, zinc and calcium among pregnant adolescents in Ibadan, Nigeria.

Keywords:

Adolescent pregnancy, Minimum dietary diversity for women, Nutrient adequacy, Diet quality

INTRODUCTION

Adolescent pregnancy, defined as the occurrence of pregnancy in girls aged 10 to 19, remains a public health problem with a prevalence of 19.3% in sub-Saharan Africa.^{1,2} In Nigeria, 19% of female adolescents aged 15-19 years had begun childbearing and 14% have a live birth.³ Adolescent pregnancy contributes to the high burden of maternal and child malnutrition, morbidity, and mortality. These conditions often occur following inadequate nutrient reserves thereby increasing the risks of poor pregnancy outcomes including foetal growth restriction, preterm birth, and other adverse neonatal and maternal outcomes.⁴ Furthermore, inadequate maternal nutrient reserves endanger the first 1000 days of life of the unborn child and suggest a shaky foundation for infants' growth and development. Adolescence is characterised with rapid growth and development as well as increased nutritional requirements, hence inadequate nutrient intake and pregnancy-occasioned nutritional demands at this stage have a long-term effect on pregnancy outcome.^{5,6} Therefore deliberate efforts to ensure adequate nutrition must be promoted and sustained for pregnant adolescents.

Research has shown that malnutrition remains high among Nigerian adolescents. A national report has shown a four times higher prevalence of acute malnutrition among adolescents aged 15-19 years compared to adult women (20 to 49 years).³ In Ibadan, a study reported that one in every five female adolescents suffers malnutrition.⁷ This high burden of malnutrition could be attributed to poor nutrition knowledge, poor dietary practices and diet quality among these adolescents.^{8,9} Among adolescents from low and middle-income countries, poor diet quality is characterized by minimal dietary diversity, low fruit and vegetable consumption levels, and high intakes of high-fat and high-calorie foods.¹⁰ These practices predispose adolescents to micronutrient malnutrition and are not likely to change during pregnancy without appropriate intervention. Malnutrition among pregnant adolescents has debilitating consequences including premature birth, increased risks of small gestational

age babies, low birth weight, wasting, stunting, underweight, maternal, and neonatal mortality and morbidity.^{1,4,6,11,12,13} These consequences can be prevented by addressing the gaps in nutrition knowledge and practice amongst adolescents. It is therefore imperative to understand the extent and the peculiarities of the gaps in nutrition knowledge and practices, especially among the pregnant adolescents. Evidence has shown that good nutrition knowledge among pregnant women enhances adequate dietary intake.¹⁴

Dietary diversity is one of the recommended strategies to improve maternal diet and prevent malnutrition, particularly micronutrient deficiencies through increased daily intake from various food groups.¹⁵ It is a simple and qualitative method of dietary assessment that reflects access to a variety of foods. In Nigeria, there are limited information on the nutrition knowledge, dietary diversity, and intake of pregnant adolescents. This study was therefore designed to assess the nutrition knowledge, dietary diversity and intake among pregnant adolescents in Ibadan metropolis, Oyo State, Nigeria.

METHODS

The cross-sectional study was conducted in three out of the five urban Local Government Areas (LGAs) of Ibadan, namely Ibadan North East, Ibadan South West, and Ibadan South East. Ibadan is a cosmopolitan city, capital city of Oyo State and the third largest metropolitan area, by population in Nigeria with a population of 2,550,593 as at 2006. It is located approximately on longitude 3° 5' to 4° 36' east of the Greenwich Meridian, and latitude 7° 23' to 7° 55' north of the Equator. The economic activities in the city include agriculture, commerce, handicraft, manufacturing, and service industries.

A total of 130 pregnant adolescents aged 15-19 years attending antenatal clinics across the three sampled LGAs participated in the study. The respondents were apparently healthy without prior history of pregnancy complications and dietary prescriptions. Respondents were selected using a

three-stage simple random sampling to select four wards per LGA, one Primary Health Center (PHC) per ward and proportionately to select 130 respondents across the PHCs.

A semi-structured, interviewer-administered questionnaire was used to collect data on socio-demographic characteristics, knowledge of maternal nutrition, and dietary intake. Nutrition knowledge was assessed using a nine-point scale categorized as 1 poor (<4), fair (4-6.9) and good (≥7). Dietary intake was assessed using a multi-pass 24-hour dietary recall procedure. Dietary diversity was determined using the FAO's Minimum Dietary Diversity for Women (MDD-W).¹⁶ A pregnant adolescent with a score of five or more out of ten food groups was considered to have met the MDD-W. Energy and nutrients intake were analysed using locally adapted ESHA's Food Processor® Nutrition Analysis software version 11.7.1 (Salem, OR, USA).

Data were analysed using Statistical Package for Service Solution version 21 (SPSS 21.0). Descriptive statistics such as frequency, percentage, mean, and standard deviation were generated. Bivariable analysis was performed between the dependent variable (Nutrient intake) and independent variables. Variables with p-value less than 0.05 in bivariate logistic regression analysis was entered into multivariate logistic regression analysis as it controls confounders. The association between nutrient intake and independent variables was determined using adjusted odds ratio (AOR) at 95% confidence interval and variables with p-value <0.05 was considered statistically significant.

Participation in the study was voluntary as informed consent was obtained from respondents. Strict confidentiality was ensured throughout the study. Ethical approval for the study was obtained from the University College Hospital/University of Ibadan Ethics Committee (NHREC/05/01/2008a; UI/EC/19/0641).

RESULTS

Sociodemographic characteristics of respondents

The sociodemographic characteristics of the 130 pregnant adolescents in this study are presented in Table 1. Age was 18.61±0.64 years, 93.1% were aged 18-19 years and about 7 percent were aged 16-17 years. Most of the respondents (90.8%) had secondary education, 6.2% had no more than primary education and 3.1% had tertiary education. Of the respondents, 36.2% were married, 13.8% were co-habiting and 50.0% were single. Respondents in the first, second and third trimester of pregnancy were 6.2%, 47.7%, and 46.2%, respectively. Also, 96.2% were primigravida and 3.8% had experienced previous child mortality. Majority of the adolescents (63.8%) were semi-skilled, mostly artisans, 17.6% were either students or unemployed and 16.9% were traders. Other characteristics are as indicated in Table 1.

Nutrition knowledge of sampled pregnant adolescents

Nutrition knowledge variables and scores among the respondents are presented in Table 2. Most of the respondents (86.9%) had knowledge about the importance of good maternal nutrition during pregnancy. Of these, 69.2% had knowledge on the importance of iron supplementation, but only 5.4% knew the importance of folic acid supplement during pregnancy. About half of the respondents (53.8%) knew the health-risks associated with low-birth-weight babies while 77.7% knew the causes of undernutrition. Majority of the respondents (83.1%) correctly expressed the components of an adequate diet and 87.7% knew the sources of protein. Almost all the respondents (96.2%) were aware of the harmful maternal practices that should be avoided during pregnancy including alcohol intake, fasting, use of non-prescription drugs, and smoking. Also, only 33.1% knew the importance of childbirth spacing. Mean knowledge score was 5.93±1.82, 46.2% had good nutrition knowledge while respondents with fair and poor nutrition knowledge constituted 40.0% and 13.8%, respectively.

Table 1: Background characteristics of respondents

| Variable | N | % | Variable | N | % |
|--|-----|------|-------------------------------------|----|------|
| Age (mean - 18.61±0.64 years) | | | Fathers' Educational status | | |
| 16-17 | 9 | 7.0 | No formal | 11 | 8.5 |
| 18-19 | 121 | 93.1 | Primary | 26 | 20 |
| Marital status | | | Secondary | 75 | 57.7 |
| Married | 47 | 36.2 | Tertiary | 12 | 9.2 |
| Cohabiting | 18 | 13.8 | Quranic education | 6 | 4.6 |
| Single | 65 | 50.0 | Mothers Educational status | | |
| Religion | | | No formal | 15 | 11.5 |
| Christian | 26 | 20.0 | Primary | 30 | 23.1 |
| Muslim | 99 | 76.2 | Secondary | 75 | 57.7 |
| Traditional | 5 | 3.8 | Tertiary | 10 | 7.7 |
| Ethnicity | | | Occupation of Respondent | | |
| Yoruba | 122 | 93.8 | Unemployed/student | 23 | 17.6 |
| Hausa | 3 | 2.3 | Trader | 22 | 16.9 |
| Igbo | 5 | 3.8 | Semi-skilled/Artisan | 83 | 63.8 |
| Educational status | | | Skilled/Teacher | 2 | 1.5 |
| Primary | 8 | 6.2 | Occupation of Fathers | | |
| Secondary | 118 | 90.8 | Unemployed/retiree/undeclared | 19 | 14.7 |
| Tertiary | 4 | 3.1 | Trader | 33 | 25.4 |
| Living Situation | | | Semi-skilled-Artisan/driver/clergy | 70 | 53.8 |
| Alone | 1 | 0.8 | Skilled-Teacher and civil servant | 8 | 6.2 |
| With husband | 62 | 47.7 | Occupation of Mothers | | |
| With family | 51 | 39.2 | Unemployed/undeclared | 11 | 8.5 |
| With in-laws | 16 | 12.3 | Trader | 99 | 76.2 |
| No of previous pregnancy | | | Semi-skilled-Artisan | 16 | 12.3 |
| None | 125 | 96.2 | Skilled-Teacher/civil servant | 4 | 3.1 |
| One | 5 | 3.8 | Occupation of Spouses | | |
| Had history of preterm delivery, miscarriage/child mortality | 5 | 3.8 | Unemployed/student/undeclared | 15 | 11.5 |
| Gestational Age | | | Trader | 22 | 16.9 |
| First Trimester | 8 | 6.2 | Semi-skilled-Artisan/driver/ clergy | 85 | 72.6 |
| Second Trimester | 62 | 47.7 | Skilled-Teacher and civil servant | 8 | 6.1 |
| Third Trimester | 60 | 46.2 | | | |

Table 2: Nutrition knowledge on various aspects of nutrition during pregnancy

| Knowledge variables | N | % |
|--|-----|------|
| Knew about maternal nutrition | 113 | 86.9 |
| Knew about intake of micronutrient supplements | 90 | 69.2 |
| Knew the importance of folic acid supplements | 7 | 5.4 |
| Knew the health risks of lowbirthweight babies | 70 | 53.8 |
| Knew the causes of undernutrition | 101 | 77.7 |
| Knew the component of adequate diet | 108 | 83.1 |
| Knowledge on the sources of protein | 114 | 87.7 |
| Knew the harmful maternal practices | 125 | 96.2 |
| Knew the importance of birth spacing | 43 | 33.1 |
| Knowledge score (mean - 5.93±1.82) | | |
| Poor | 18 | 13.8 |
| Fair | 52 | 40.0 |
| Good | 60 | 46.2 |

Dietary diversity among the pregnant adolescents

Food groups consumed as well as dietary diversity of the pregnant adolescents are shown in Figures 1 and 2. The Women Dietary Diversity Score of the pregnant adolescents ranged from 2 to

8 food groups during the previous 24 hours, with a mean of 4.34 ± 1.13 . Not up to half (43.1%) of the pregnant adolescents achieved the Minimum Dietary Diversity for Women (MDD-W) threshold of five food groups (Figure 1). The diet of the adolescents was mainly starchy staples with 100% consumption

Mean WDDS = 4.34 ± 1.13

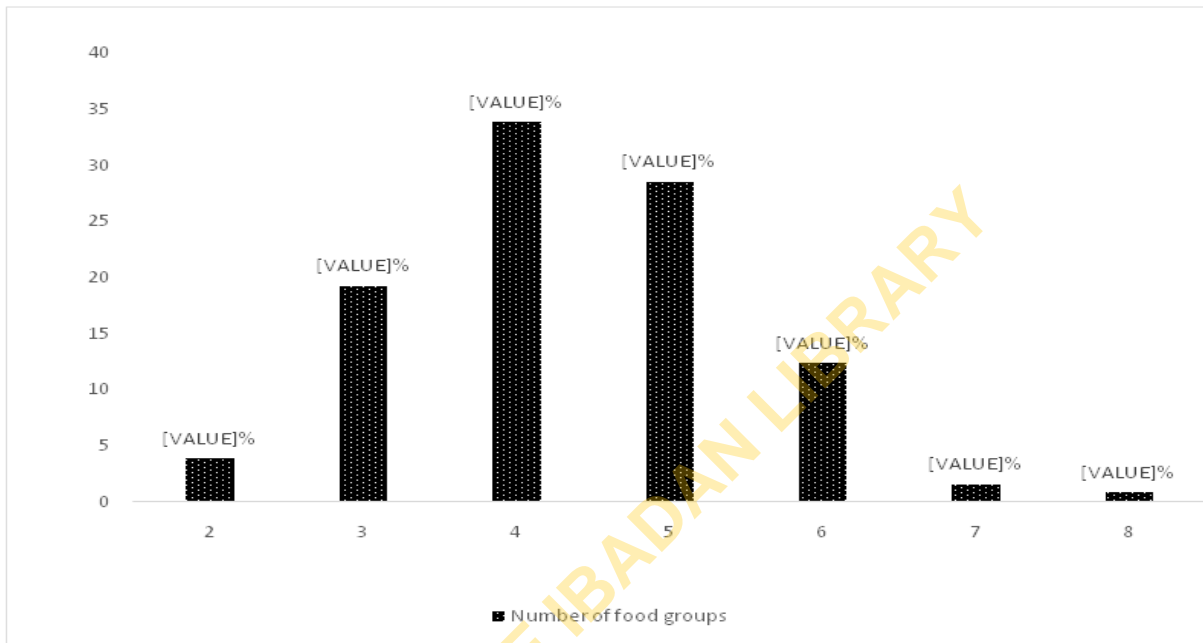


Figure 1: Dietary diversity among the pregnant adolescent

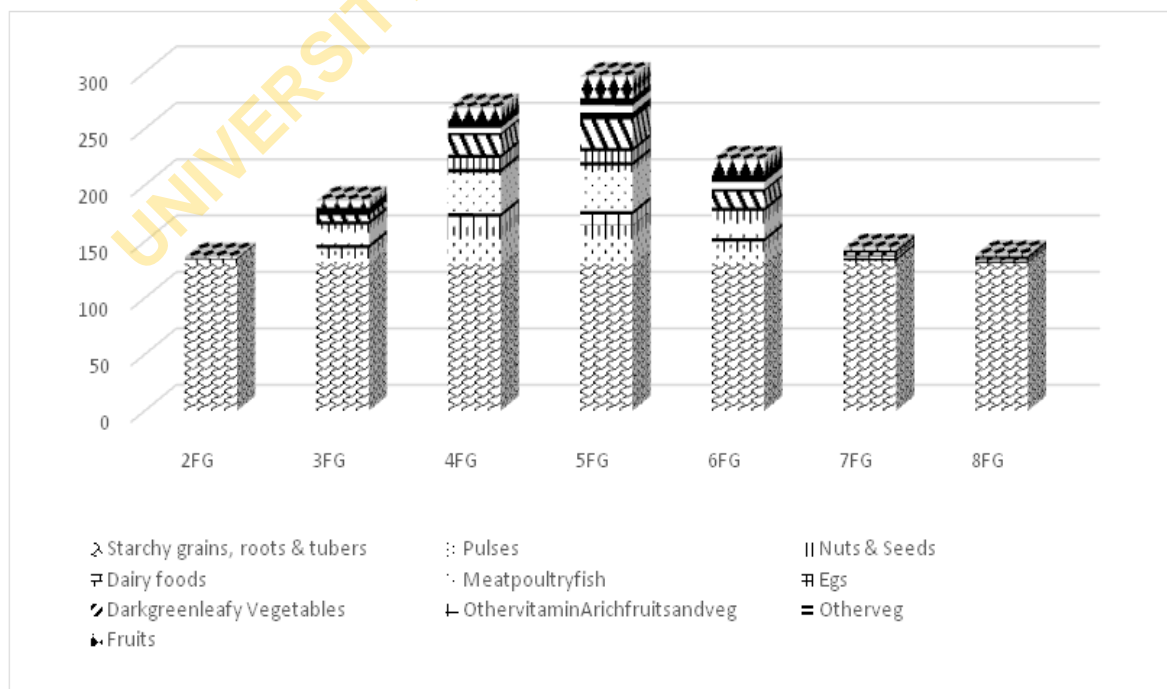


Figure 2: Cumulative frequencies of the pregnant adolescents' consumption on various WDDS score

(Figure 2). Pregnant adolescents with WDDS of 2 largely consumed starchy grains or roots and tubers complemented with either pulses (60%), meat, poultry or fish (20%) and fruits (20%). As the WDDS increased from 2 to 3, either eggs or dairy products complemented the diet, followed by dark green vegetables and fruits for WDDS of 4. At WDDS of 5, other vegetables complemented the diets, and nuts and seeds became more prominent constituents of the diet. Other information is represented in Figure 2.

Energy and nutrient intake of pregnant adolescents

The energy and nutrients intake, quartile distribution and percentage of respondents with inadequate intakes are presented in Table 3. Intake of selected nutrients among the respondents was

and 92.3% had inadequate intake. Iron intake was 16.0 ± 8.3 mg and about 80% had inadequate intake. Zinc and folate intakes were 8.87 ± 5.41 mg and 268.2 ± 168.1 ig, respectively, while 66.2% and 91.5% had inadequate intakes.

Determinants of energy and nutrients intake

The determinants of nutrient intake among the sampled pregnant adolescents are presented in Table 4. Dietary diversity constitutes major determinants of energy and folate intake levels while nutrition knowledge determines energy and iron intake levels. Respondents that did not meet the minimum dietary diversity for women had three times higher risks of inadequate energy intake than those who met the MDDW (AOR: 2.97, 95%CI:1.21-7.31). Respondents that did not meet the MDDW had four times higher risks of inadequate folate intake

Table 3: Energy and selected nutrient intakes and percentage of inadequacy

| Energy and selected Nutrients | Mean | SD | Q1 | Q2 | Q3 | RDA reference | Percent inadequate intake |
|---------------------------------------|---------|--------|---------|---------|--------|---------------|---------------------------|
| Energy (kcal) | 1784.87 | 619.0 | 1320.51 | 1809.65 | 2141.0 | | 102 (78.5) |
| Energy in the first trimester (kcal) | 1674.3 | 400.75 | | | | 2368 | |
| Energy in the second trimester (kcal) | 1836.56 | 618.46 | | | | 2708 | |
| Energy in the third trimester (kcal) | 1746.21 | 646.06 | | | | 2820 | |
| Protein (g) | 64.11 | 30.02 | 42.66 | 58.28 | 77.94 | 71.0 | 61(64.9) |
| Calcium (mg) | 398.2 | 339.2 | 133.86 | 309.17 | 541.91 | 1000 | 120(92.3) |
| Iron (mg) | 16.0 | 8.3 | 10.43 | 14.23 | 19.9 | 27.0 | 103(79.2) |
| Zinc (mg) | 8.87 | 5.41 | 5.77 | 7.57 | 10.02 | 12.0 | 86(66.2) |
| Folate (ig /d) | 268.2 | 168.1 | 161.6 | 262.0 | 348.0 | 600.0 | 119(91.5) |

*Q – Quartile

^RDA – Recommended Daily Allowance

relatively low. Energy intake was 1784.87 ± 619 kcal and most of the respondents (80%) had inadequate energy intake. Energy intake in the first, second and third trimester of pregnancy was 1674.30 ± 400.75 kcal, 1836.56 ± 618.46 kcal, and 1746.21 ± 646.06 kcal, respectively. Protein intake was 64.11 ± 30.02 g and about 65% did not meet the dietary protein requirements. Calcium intake was 398.2 ± 339.2 mg

compared to those who met the MDDW (AOR: 3.94; 95%CI: 1.99-15.6). In addition, respondents with poor nutrition knowledge had three times higher likelihood of inadequate energy intake compared with those with good knowledge (AOR: 2.8; 95%CI: 1.1-5.2). Also, respondents with poor knowledge had about two times risks of inadequate iron intake compared with those with good knowledge (AOR: 1.7; 95%CI: 1.0-2.3).

Table 4: Determinants of energy and selected nutrients intake

| | Energy | | Protein | | Iron | | Folate | | Zinc | | Calcium | | | | | | | | |
|------------------------------------|--------|-----------|---------|------|-----------|------|--------|-----------|------|------|------------|------|------|-----------|------|------|------------|------|---|
| | AO | 95%CI | A | AO | 95%CI | Á | AO | 95%CI | α | AO | 95%CI | α | | | | | | | |
| Mother's Education | 0.72 | 0.16-3.25 | 0.67 | 0.61 | 0.17-2.13 | 0.43 | 1.35 | 0.33-5.53 | 0.67 | 1.17 | 0.12-11.36 | 0.90 | 1.61 | 0.49-5.32 | 0.43 | 0.50 | 0.06-4.06 | 0.52 | |
| Primary & below | | | | | | | | | | | | | | | | | | | |
| Secondary & above | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Father's Education | 4.17 | 0.87-200 | 0.08 | 1.81 | 0.47-7.03 | 0.39 | 1.78 | 0.39-8.13 | 0.46 | 3.56 | 0.32-40.70 | 0.30 | 2.49 | 0.70-8.82 | 0.16 | 3.29 | 0.41-26.50 | 0.26 | |
| Primary & below | | | | | | | | | | | | | | | | | | | |
| Secondary & above | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Respondent's Education | 2.10 | 0.18-244 | 0.55 | 0.57 | 0.09-3.77 | 0.56 | 1.24 | 0.11-13.7 | 0.86 | 2.77 | 0.18-42.11 | 0.46 | 0.44 | 0.07-2.75 | 0.38 | 2.32 | 0.17-32.28 | 0.53 | |
| Primary & below | | | | | | | | | | | | | | | | | | | |
| Secondary & above | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Living situation | 1.69 | 0.65-4.39 | 0.28 | 0.78 | 0.35-1.74 | 0.54 | 1.79 | 0.70-4.60 | 0.23 | 2.66 | 0.61-11.70 | 0.20 | 1.31 | 0.59-2.92 | 0.50 | 1.35 | 0.33-5.47 | 0.68 | |
| Living with husband & cohabitating | | | | | | | | | | | | | | | | | | | |
| Living with in-laws and family | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| MDD-W | 2.96 | 1.21-7.31 | 0.02 | 0.24 | 0.11-1.65 | 0.22 | 0.55 | 0.20-1.47 | 0.23 | 3.94 | 1.99-15.6 | 0.03 | 0.73 | 0.30-1.73 | 0.47 | 2.20 | 0.43-11.16 | 0.34 | |
| Umet | | | | | | | | | | | | | | | | | | | |
| Met | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Nutrition Knowledge | 2.8 | 1.1-5.2 | 0.03 | 0.43 | 0.11-1.65 | 0.22 | 1.7 | 1.0-2.3 | 0.05 | 0.21 | 0.02-2.86 | 0.24 | 0.44 | 0.11-1.73 | 0.24 | 0.33 | 0.02-4.64 | 0.41 | |
| Poor | | | | | | | | | | | | | | | | | | | |
| Fair | 1.3 | 0.85-2.30 | 0.08 | 0.79 | 0.34-1.83 | 0.58 | 1.1 | 0.9-1.4 | 0.65 | 0.48 | 0.10-2.20 | 0.48 | 0.67 | 0.29-1.56 | 0.35 | 0.80 | 0.19-3.38 | 0.76 | |
| Good | | | | | | | | | | | | | | | | | | | |
| Good | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

DISCUSSION

This present study focused on the nutrition knowledge, dietary diversity and dietary intake among pregnant adolescents in an urban setting in Nigeria. Overall, poor nutrition knowledge was discovered among these young expecting mothers; knowledge of folic acid supplementation during pregnancy and child birth spacing was particularly deficient. Earlier studies have reported that a high proportion of women of child bearing age and of pregnant women in Southwest Nigeria had good nutrition knowledge.^{17,18} The findings of the present study suggest that pregnant adolescents are worse off in nutrition knowledge compared to other categories of women of child bearing age and pregnant women. This observation agrees with the submission of Oluleke *et al.*¹⁸, who reported that older women had better knowledge of nutrition during pregnancy compared with younger women and attributed it to better experience among the older women. Studies from Kenya and America have reported similarly low level of nutrition knowledge among pregnant adolescents.^{19,20} The low level of nutrition knowledge predisposes to poor dietary practice and poor compliance to the recommended iron and folate supplementation with consequences on maternal health and pregnancy outcomes. One striking feature of poor nutrition knowledge in this study is the low knowledge of respondents on the importance of folic acid during pregnancy. Poor knowledge of the importance of folic acid in pregnancy among pregnant women in Nigeria have been reported by earlier studies.^{21,22} and this may be responsible for the reported low use of folic acid in Nigeria.²³ Folic acid deficiency is associated with increased risk of neural tube defect, spontaneous abortion and pregnancy complications, pre-term delivery, infant low birth weight, and foetal growth retardation.²⁴ Promoting nutrition knowledge on the importance of folic acid in maternal and infant's health is important to improve compliance to iron folate supplementation. Platforms to promote nutrition knowledge include the ante-natal care education, schools, and other community-based health promotion platforms. Furthermore, the poor

knowledge of the linkage between child spacing and nutrition calls for the need to make family planning education more robust by emphasizing on the nutritional benefits to households, mothers, and children. This may contribute to compliance to child spacing among the pregnant adolescents and women.

The mean dietary diversity score in this study fell below the recommended five food groups and less than half of the pregnant adolescents achieved the Minimum Dietary Diversity for Women (MDD-W). This result suggests that generally, the quality of diet among the pregnant adolescents is poor and the micronutrient intake may be inadequate. Low dietary diversity has been shown to predispose to iron deficiency among Nigerian female adolescents.²⁵ This may be a consequence of poor nutrition knowledge which was found among the respondents. The study reports a lower dietary diversity than the reports of other researchers who assessed diet of adult women in Nigeria.^{26,27,28} It is therefore imperative to intensify efforts to educate the adolescents on quality diets and encourage dietary diversification to prevent micronutrient malnutrition and its consequences especially among pregnant adolescents. In this study, the major limiting food groups in the diet of the respondents were nuts and seeds, dairy, eggs, fruits and pulses. Foods across these food groups are widely grown and physically accessible in Nigeria, although economic cost may be a barrier to consumption. In a global study, fruits and vegetables, legumes and nuts, meat, eggs and fish and dairy were found to cost more and were largely not affordable for the world's poor.²⁹ Considering the high prevalence of poverty in Nigeria,^{30,31} the poor representation of these food groups in the daily diets of these adolescents may be due to poor affordability.

Likewise, consumption of energy and nutrients were largely inadequate particularly calcium, folate, iron and zinc. This finding is not surprising following poor nutrition knowledge and low dietary diversity among these adolescents. Similar nutrients have been reported to be limiting in the diets of adolescents and women in Nigeria, Egypt and India.^{13,32,33} Inadequate calcium intake could be

attributed to the poor consumption level of dairy foods while iron, folate and zinc inadequacies could be due to low consumption of seeds and nuts, dairy, fruits and eggs. Dietary diversity constitutes major determinants of energy and folate while nutrition knowledge determines energy and iron intake levels in this study. This implies that low dietary diversity could impact energy and folate intake levels and precipitate malnutrition. In addition, efforts should be intensified on improving nutrition knowledge among pregnant adolescents as it could impact on the adequacy of both energy and iron intakes. This suggests the need to build the capacity of the relevant stakeholders at the health facility and community levels. If done, this could promote nutrition education and support pregnant adolescents to make informed food choices and dietary decisions that will ultimately promote health and ensure good pregnancy outcomes.

CONCLUSION

Poor nutrition knowledge and low dietary diversity contributed to inadequate intakes of energy, iron, folate zinc and calcium among pregnant adolescents in Ibadan, Nigeria. Dairy, fruits, eggs, seeds and nuts are poorly represented in the daily diets of the pregnant adolescents in Ibadan. Adolescent nutrition focused intervention is hereby proposed to address the gaps in nutrition knowledge and understanding of quality diets.

REFERENCES

1. Ganchimeg T, Ota E, Morisaki N, Laopaiboon M, Lumbiganon P, Zhang J, Yamdamsuren B, Temmerman M, Say L, Tunçalp Ö, Vogel JP. Pregnancy and childbirth outcomes among adolescent mothers: a World Health Organization multicountry study. *BJOG: An International Journal of Obstetrics and Gynaecology*. 2014;121: 40-48.
2. Kassa, G. M., Arowojolu, A. O., Odukogbe, A. A and Yalew, A. W. Prevalence and determinants of adolescent pregnancy in Africa: a systematic review and meta-analysis. *Reproductive Health*; 2018, 15(1), 1-17.
3. National Population Commission (NPC) [Nigeria] and ICF. *Nigeria Demographic and Health Survey 2018 Key Indicators Report*. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF, 2019.
4. Johnson W, Moore SE. Adolescent pregnancy, nutrition, and health outcomes in low and middle income countries: what we know and what we don't know. *British Journal of Gynaecology*. 2016; 123 (10) :1589.
5. Viner, R. M., Ross, D., Hardy, R., Kuh, D., Power, C., Johnson, A., Wellings, K., McCambridge, J, Cole, T. J., Kelly, Y., & Batty, G. D. Life course epidemiology: recognising the importance of adolescence. *Journal of Epidemiology and Community Health*; 2015, 69: 719–720.
6. Nguyen, P. H., Sanghvi, T., Tran, L. M., Afsana, K., Mahmud, Z., Aktar, B., Haque, R., Menon, P. The nutrition and health risks faced by pregnant adolescents: insights from a cross-sectional study in Bangladesh. *PloS one*. 2017 8;12(6):e0178878.
7. Omobuwa, O., Alebiosu, C.O., Olajide, F.O, and Adebimpe W. O. Assessment of nutritional status of in school adolescents in Ibadan, Nigeria. *South African Family Practice*; 2014; 56.4: 246-250.
8. Otuneye, A. T., Ahmed, P. A., Abdulkarim, A. A., Aluko, O. O. and Shatima, D. R. Relationship between dietary habits and nutritional status among adolescents in Abuja municipal area council of Nigeria. *Nigerian Journal of Paediatrics*; 2017, 44(3), 128-135.
9. Ezezika O, Oh J, Edeagu N, Boyo W. Gamification of nutrition: A preliminary study on the impact of gamification on nutrition knowledge, attitude, and behaviour of adolescents in Nigeria. *Nutrition and health*. 2018 Sep;24(3):137-144.

10. Keats, E. C., Rappaport, A. I., Shah, S., Oh, C., Jain, R., and Bhutta, Z. A. The Dietary Intake and Practices of Adolescent Girls in Low- and Middle-Income Countries: A Systematic Review. *Nutrients*; 2018, 10(12), 1978.
11. Kozuki, N., Katz, J., Lee, A. C. C., Vogel, J. P., Silveira, M. F., Sania, A. *et al.*, and the Child Health Epidemiology Reference Group Small-for-Gestational-Age/Preterm Birth Working Group. Short Maternal Stature Increases Risk of Small-for-Gestational-Age and Preterm Births in Low- and Middle-Income Countries: Individual Participant Data Meta-Analysis and Population Attributable Fraction, *The Journal of Nutrition*, 2015, 145 (11), 2542-2550, <https://doi.org/10.3945/jn.115.216374>
12. Wemakor, A., Garti, H., Azongo, T., Garti, H. and Atosona, A. Young maternal age is a risk factor for child undernutrition in Tamale Metropolis, Ghana. *BMC Research Notes*; 2018, 11(1), 877.
13. Mahmoud, N. M. and Ghaly, A. S. Dietary Knowledge, Practices and Adequacy among Bedouin Pregnant Women. *International Journal of Nursing*, 2019, 6(2), 68-83.
14. Nana, A. & Zema, T. Dietary practices and associated factors during pregnancy in northwestern Ethiopia. *BMC Pregnancy Childbirth*; 2018, 18(1):183.
15. Desta, M., Akibu, M., Tadese, M., & Tesfaye, M. Dietary diversity and associated factors among pregnant women attending antenatal clinic in Shashemane, Oromia, Central Ethiopia: a cross-sectional study. *Journal of Nutrition and Metabolism*, 2019, 1-7.
16. FAO and FHI. Minimum Dietary Diversity for Women A Guide to Measurement. Rome; 2016.
17. Fasola, O., Abosede, O and Fasola, F. A. Knowledge, attitude and practice of good nutrition among women of childbearing age in Somolu Local Government, Lagos State. *Journal of Public Health in Africa*, 2018, 9(1), 42-46.
18. Oluleke, M. O., Ogunwale, A. O., Arulogun, O. S., and Adelekan, A. L. (2016). Dietary intake knowledge and reasons for food restriction during pregnancy among pregnant women attending primary health care centers in Ile-Ife, Nigeria. *International Journal of Population Studies*. 2016: 2(1); 103-116.
19. Abdirahman, M., Chege, P., & Kobia, J.. Nutrition Knowledge and Dietary Practices among Pregnant Adolescents in Mandera County, Kenya.. *Food Science Nutrition Research*, 2019; 2(2): 1-8.
20. Vander Wyst, K. B., Vercelli, M. E., O'Brien, K. O., Cooper, E. M., Pressman, E. K and Whisner, C. M. A social media intervention to improve nutrition knowledge and behaviors of low income, pregnant adolescents and adult women. *PloS one*; 2019, 14(10), e0223120.
21. Lawal, T. A. and Adeleye, A. O. Determinants of folic acid intake during preconception and in early pregnancy by mothers in Ibadan, Nigeria. *The Pan African Medical Journal*, 2014, 19.
22. Adebo, O. O., Dairo, D. M., Ndikom, C. M., & Adejumo, P. O. Knowledge and uptake of folic acid among pregnant women attending a secondary health facility in Nigeria. *British Journal of Midwifery*, 2017, 25(6), 358-364.
23. Anzaku, A. S. Assessing folic acid awareness and its usage for the prevention of neural tube defects among pregnant women in Jos, Nigeria. *Journal of Basic and Clinical Reproductive Sciences*, 2013, 2(1), 13-17.
24. Scholl, T. O and Johnson, W. G. (2000). Folic acid: influence on the outcome of pregnancy. *The American Journal of Clinical Nutrition*, 2000, 71(5), 1295S-1303S.
25. Olumakaiye, M. F. Adolescent girls with low dietary diversity score are predisposed to

- iron deficiency in southwestern Nigeria. *ICAN: Infant, Child, and Adolescent Nutrition*; 2013, 5(2), 85-91.
26. Ajani, Sanusi. An assessment of dietary diversity in six Nigerian states. *African Journal of Biomedical Research*, 2010, 13(3), 161-167.
27. Agada, M. O., & Igbokwe, E. M. Dietary diversity of rural households in North Central Nigeria. *European Journal of Nutrition and Food Safety*, 2015, 150-155.
28. Oladoyinbo, C. A., Ugwunna, U. M., & Ekerette, N. N. Dietary diversity and nutrient intake adequacy among women in Iwo Local Government Area, Osun State Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*; 2017, 17(4), 12641-12656.
29. Hirvonen K, Bai Y, Headey D, Masters WA. Cost and affordability of the EAT-Lancet diet in 159 countries. *Lancet*. 2019 Jun 17 Available at SSRN: <https://ssrn.com/abstract=3405576> or <http://dx.doi.org/10.2139/ssrn.3405576>
30. Omotayo AO, Ogunniyi AI, Tchereni BH, Nkonki-Mandleni B. Understanding the link between households' poverty and food security in South West Nigeria. *The Journal of Developing Areas*. 2018; 52(3):27-38.
31. Eigbiremolen GO, Ogbuabor JE. Measurement and determinants of food poverty: A dynamic analysis of Nigeria's first panel survey data. *African Development Review*. 2018 Dec;30(4):423-433.
32. Harika, R., Faber, M., Samuel, F., Mulugeta, A., Kimiywe, J. and Eilander, A. Are low intakes and deficiencies in iron, vitamin A, zinc, and iodine of public health concern in Ethiopian, Kenyan, Nigerian, and South African children and adolescents? *Food and Nutrition Bulletin*, 2017, 38(3), 405-427.
33. Abu-Saad, K., Shahar, D. R., Fraser, D., Vardi, H., Friger, M., Bolotin, A and Freedman, L. S. Adequacy of usual dietary intake and nutritional status among pregnant women in the context of nutrition transition: the DEPOSIT Study. *British Journal of Nutrition*, 2012, 108(10), 1874-1883.