Nutrition Knowledge, Dietary Practices and Nutritional Status of Pregnant Women Attending Antenatal Clinics in a Semi-Urban Community in Southwestern Nigeria

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ABSTRACT

Introduction: *Pregnancy is a highly demanding period of varying physiological changes that can adversely affect the health of the mother and the foetus when unhealthy dietary practices are adopted.*

Objective: *This study aimed to assess the nutrition knowledge, dietary practices and nutritional status of pregnant women attending antenatal clinics in a semi-urban community in Southwestern Nigeria.*

Methodology: *This was a descriptive cross-sectional study among 122 pregnant women in Ile-Ife metropolis, selected using multi-stage sampling technique. The nutritional status of the respondents was assessed using BMI, MUAC and their most recent PCV. Significant findings were so judged at $p < 0.05$.*

Results: *The mean age of the respondents was 28.9 ± 4.4 years.Majority of the respondents were married and 82 (67.2%) had high dietary diversity. For the nutritional status, 3 (2.5%) and 12 (9.8%) were underweight using BMI and MUAC respectively. The PCV showed that Seven (5.7%) of the respondents were anaemic. The nutrition knowledge of the respondents was statistically associated with their level of education ($p = 0.018$), occupation ($p = 0.009$), husband's occupation ($p = 0.026$) and the husband's average income ($p = 0.010$).*

Conclusion: *This study found that factors associated with nutrition knowledge were mainly socio-demographic factors such as the level of education, husband's income, occupation of the respondents and their husbands. Nutritional interventions among pregnant women should ultimately target financial empowerment through sustainable income generating activities and saving strategies for this highly vulnerable group.*

Keywords: Nutrition, knowledge, dietary practices, pregnant women, antenatal clinics.

INTRODUCTION

Pregnancy is a highly demanding period of varying physiological changes that can adversely affect the health of the mother as well as the foetus especially when unhealthy dietary practices are adopted. This is because the developing foetus depends solely on the mother for its nutritional and energy requirements. Poor nutritional status of pregnant women could predispose future generations to the untoward effects of malnutrition, hence they constitutes a vulnerable group in the population (1, 2). Globally, the World Health Organization (WHO) reported that majority of women lacked adequate micronutrients in their diets during the reproductive stage of their life cycle, probably as a result of poor awareness of the deleterious outcomes that these could lead to, for themselves as well as their babies (3–5).

The incidence of dietary inadequacies as a result of dietary habits and patterns in pregnancy is reportedly higher during pregnancy when compared to any other stage of the life cycle. In Sub-Saharan Africa, the burden of nutritional deficiencies particularly among the pregnant women still remains persistently high and worrisome, with the lack of diet diversity reported as a major cause of micronutrient malnutrition (6). Nigeria has a high prevalence of both over nutrition and under nutrition, as well as nutrient

deficiencies, including iron, folate, vitamin D and vitamin A particularly among pregnant women (4, 7). Hence, in addition to sufficient energy, adequate supplies of macronutrients and micronutrients are also required to promote optimum growth during pregnancy.

The incidence of low birth weight is not only an important indicator of the prospects for child survival but also indirectly indicate the nutritional status of mothers. Annually, about 20 Million newborns in developing countries have Low Birth Weight (LBW) which has been attributed to poor maternal nutrition (3, 8). The intake of adequate nutrient during pregnancy was found to reduce the risk for low birth weight by 19%, small-for-gestational-age births by 8%, preterm birth by 16%, and infant mortality by 15%. In underweight women, the commencement of multiple micronutrient supplements before 20 weeks' gestation decreased the risk of preterm birth by 11% (9, 10). Furthermore, there is abundant epidemiological evidence that poor prenatal nutrition predisposes the foetus to diseases in its later life. In general, fetal exposure to malnutrition is associated with birth defects e.g neural tube defects of the spinal cord, intrauterine growth restriction, lower birth weight, stunting in childhood, shorter adult height, lower educational attainment, and reduced economic productivity. Also, stunted women often encounter greater risks during pregnancy and are prone to miscarriages, obstructed labor (11, 12).

The causes of malnutrition are multidimensional and multi-factorial with poverty, poor access to food in adequate quantity and quality, and lack of female education, being responsible for the enormous burden of under nutrition in Low and Middle Income Countries. Previous studies reported that many women in developing countries minimize their food consumption during pregnancy for various reasons; such as to have smaller infants because smaller babies carries reduced risk of delivery complications. Cultural reasons that places taboos and restrictions on certain food items also contributes to maternal malnutrition (1,4,11). Similarly, the Nigeria Demographic and Health Survey (NDHS 2018), also reported that women of reproductive age are especially vulnerable to chronic energy deficiency and malnutrition due to low dietary intakes, inequitable distribution of food within the household, improper food storage and preparation, dietary taboos, infectious diseases, and inadequate care practices (13).

Assessment of the nutritional status of pregnant women especially by using their anthropometric and biochemical indices has been shown to be a promising strategy in fetal growth monitoring (14). Hence, the nutritional interventions focused on woman's health during the reproductive stage particularly during pregnancy may help to achieve adequate newborn nutritional status which may have influence on future childhood health. More so, in most developing countries, including Nigeria, the onus lies on women to prepare food for their households, consequently, their knowledge or lack of what good nutrition entails can affect their health as well as the nutrition status of the family (4,11).

Therefore, this study aims to provide updated information on the nutrition knowledge, dietary practices and nutritional status of pregnant women attending antenatal clinics in a semi-urban community in Southwestern Nigeria. It is hoped that this study will provide the framework for policy makers and stakeholders to develop a nutrition education program and other interventions that will promote good maternal nutrition and reduce adverse outcomes of poor nutrition among pregnant women and their children.

Methodology

The study was carried out in the ancient city of Ile-Ife in Osun State, Nigeria. The study was a descriptive cross-sectional study, with the study population being pregnant women who were attending antennal-clinics in health facilities within Ife metropolis. Using the Leslie Fisher's formulae (Z^2pq/d^2) (15), the minimum sample size calculated was 122 and these were selected using multi-stage sampling technique.

Study instruments: A self-developed questionnaire was used to obtain information about the obstetrics history, nutrition knowledge and dietary practices of the respondents. The Camry® electronic bathroom weighing scale, standiometer and in-elastic tape measure were used to assess the nutritional status of the respondents.

Measurement of outcome variables: Correct responses to questions on nutrition knowledge were scored one, others 0. Respondents who scored up to or above the mean were categorized as having good nutrition knowledge, others as having poor nutrition knowledge. The nutritional status of the respondents was assessed using body mass index (BMI), mid-upper arm circumference (MUAC) and their most recent packed cell volume (PCV). Those with BMI less than 19.85, MUAC less than 23 and PCV less than 30% were regarded as undernourished. The respondents 24-hour dietary recall was done and used to calculate the dietary diversity score (DDS) for each respondent.(16) The respondents were then categorized into those with Low (≤ 9) and high (> 9).

Data analysis: Data were analyzed using IBM SPSS version 23. Chi-square test was used at bivariate analysis level to compare categorical data. Fisher's exact or likelihood ratio tests were used when an expected value was less than 5, while t-test for 2 independent samples was used for continuous variables Binary logistic regression was done to identify the predictors of the outcome variables. Significant findings were so judged at p-value less than 0.05.

Ethical considerations: Ethical clearance was obtained from the ethical review committee of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife. The respondents were informed about the nature of the study and that participation was completely voluntary. Verbal consent was obtained from all selected respondents. All information gathered was kept confidential and participants were identified using only serial numbers.

Results

The mean age of the respondents was 28.9 ± 4.4 years, and majority of the respondents were Christians (95, 77.9%), married (120, 98.4%) and of Yoruba ethnicity (107, 87.7%). One hundred and thirteen (92.6%) of the respondents were from monogamous family settings, 93 (76.2%) of their husbands had tertiary education, 24 (19.7%) had secondary education and 2 (1.6%) had primary school education. For their husbands' occupation, 66 (54.1%) of the respondents' husbands were civil servants, 24 (19.7%) were traders and 18 (14.8%) were artisans. Fifty (41.0%) of the husbands earned 25,000 naira or less per month, 43 (35.2%) earned between 25,001 to 50,000 naira, while 29 (23.8%) earned more than 50,000 naira. For the family size of respondents, 53 (43.4%) had 2, 42 (34.4%) had 3 and 15 (12.3%) had 4. For the obstetric history of the respondents, 64 (52.5%) were in their first or second trimester, 58 (47.5%) had more than 3 months to delivery and 58 (47.5%) had not delivered before.

Only 27 (22.1%) correctly responded to the question on their understanding of adequate nutrition, 81 (66.4%) knew protein as a class of food but only 20 (16.4%) knew minerals and fats and oil as classes of food. For majority of the respondents, their source of nutrition-related information was the hospital (104, 85.2%). After scoring and categorization of respondents based on their responses to the questions on nutrition knowledge, 59 (48.4%) had poor, while 63 (51.6%) had good nutrition knowledge. (Table 1)

Table 1: Nutritional Knowledge of the Respondents (N = 122)

Variable	Frequency	Percentage
Definition of adequate nutrition		
Correct response	27	22.1
Incorrect response	54	44.3
I don't know	41	33.6
***Classes of food known**		
Carbohydrates	65	53.3
Protein	81	66.4
Vitamins	48	39.3
Minerals	20	16.4
Fats and oil	20	16.4
Water	24	19.7
Dietary intake in pregnancy affects pregnancy outcome		
Yes	90	73.8
No	21	17.2
I don't know	11	9.0
***Consequences of poor nutrition in pregnancy**		
Still birth		
Low birth weight children	58	47.5
Prolonged hospital stay after delivery	23	18.9
Sickness of the mother after delivery	59	48.4
Death of mother	49	40.2
	74	60.7
***Source of nutrition related information**		
Hospital	104	85.2
Internet	24	19.7
School/teachers/lecturers	12	9.8
Books/Magazines/Newspapers	8	6.6
Family/friends	9	7.4
TV/Radio	11	9.0
Categorized Nutrition Knowledge		
Poor	59	48.4
Good	63	51.6

*** Multiple responses allowed**

The dietary practices of the responses are as shown on Table 2. Ninety-two (75.4%) increased the dietary intake during pregnancy, 63 (51.6%) avoided some foods in pregnancy and 97 (79.5%) were satisfied with their eating habits. On the frequency of consumption of different food types (Table 3), 79 (64.8%) consumed carbohydrates daily, 29 (23.8%) consumed fruits daily and 22 (18.0%) consumed vegetables daily.

Using the BMI and MUAC to assess the nutritional status of the respondents, 3 (2.5%) and 12 (9.8%) were underweight respectively. Seven (5.7%) of the respondents were anaemic using their PCV and 40 (32.8%) had low dietary diversity. (Table 4)

Table 2: Dietary Practices of the respondents (N = 122)

Variable	Frequency	Percentage
Increased diet intake during pregnancy		
Yes	92	75.4
No	30	24.6
***Reasons for increased diet intake during pregnancy (n = 92)**		
To ensure a healthy baby	66	71.7
To ensure Safe delivery	26	28.3
Stress	10	10.9
Tradition	2	2.2
Meals taken per day		
Two	3	2.5
Three	58	47.5
More than three	61	50
Avoidance of some foods in pregnancy		
Yes	63	51.6
No	59	48.4
***Reasons for avoidance of some foods in pregnancy (n = 63)**	63	100.0
Cost/financial reasons	39	61.9
Not sure of their safety in pregnancy	20	31.7
Cultural belief	13	20.6
Religion	2	3.2
Poor tolerance		
Satisfaction with eating habits		
Satisfied	97	79.5
Indifferent	17	13.9
Not satisfied	8	6.6

***Multiple responses allowed**

The nutrition knowledge of the respondents was significantly associated with their level of education (p = 0.018), occupation (p = 0.009), husband's occupation (p = 0.026) and the husband's average income (p = 0.010). Those with tertiary education, civil servants and with husbands' earning 50,000 naira or more were more likely to have good nutrition knowledge than others (Table 5). None of the factors were however significant, when they were entered into a logistic regression model.

Table 3: Frequency of food consumption among the pregnant women (N = 122)

Food items	Food frequency (%)			
	Daily	< 4 times a week	[illegible]	Rarely/ Never
Fruits	29 (23.8)	61 (50)	28 (23)	4 (3.3)
Vegetables	22 (18.0)	60 (49.2)	35 (28.7)	5 (4.1)
Food from eateries	5 (4.1)	20 (16.4)	4 (3.3)	93 (76.2)
Pastries (cakes, meat/fish pie etc)	16 (13.1)	36 (29.5)	11 (9.0)	59 (48.4)
Sugar-sweetened drinks	8 (6.6)	61 (50.0)	4 (3.3)	49 (40.2)
Sweets (chocolate, candy, ice cream)	6 (4.9)	33 (27.0)	1 (0.8)	82 (67.2)
Animal protein	70 (57.4)	24 (19.7)	23 (18.9)	5 (4.1)
Non animal protein	42 (34.4)	38 (31.1)	23 (18.9)	19 (15.6)
Dietary fibres	34 (27.9)	36 (29.5)	16 (13.1)	36 (29.5)
Carbohydrates	79 (64.8)	15 (12.3)	28 (23.0)	0 (0)

Table 4: Nutritional Status and the Dietary Diversity of Respondents (N = 122)

Variables	Frequency	Percentage
Using Body Mass Index		
Undernourished	3	2.5
Normal	119	97.5
Using Mid-Upper Arm Circumference		
Undernourished	12	9.8
Normal	110	90.2
Packed Cell Volume checked within last 4 weeks		
Anaemic (<30)	7	5.7
Normal (≥30)	115	94.3
Dietary Diversity		
Low	40	32.8
High	82	67.2

Table 5: Factors associated with the Nutrition Knowledge of Respondents (N = 122)

Variables	Nutrition Knowledge (%)		Statistics
	Poor	Good	
Age group (in years)			
15-24	12 (20.3)	9 (14.3)	$X^2 = 5.750$
25-34	44(74.6)	42 (66.7)	df = 2
≥35	3 (5.1)	12 (19.0)	p =0.056
Level of Education			
No formal education	1 (1.7)	3 (4.8)	$X^2 = 10.124$
Primary	2 (3.4)	1 (1.6)	df = 3
Secondary	26 (44.1)	12 (19.0)	p =0.018*
Tertiary	30 (50.8)	47 (74.6)	
Occupation			
Nil/housewife	2 (3.4)	4 (6.3)	$X^2 = 15.356$
Student	9 (15.3)	12 (19.0)	df = 5
Trading	26 (44.1)	17 (27.0)	p =0.009*
Civil servant	12 (20.3)	26 (41.3)	
Artisans	10 (16.9)	2 (3.2)	
Others	0 (0)	2 (1.6)	
Respondent's monthly income (in naira)			$X^2 = 2.908$
≤50,000	56 (94.9)	54 (85.7)	df = 1
>50,000	3 (5.1)	9 (14.3)	p =0.088
Husband's level of Education			
No formal education	2 (3.4)	1 (1.6)	$X^2 = 6.177$
Primary	0 (0)	2 (3.2)	df = 3
Secondary	16 (27.1)	8 (12.7)	p = 0.103
Tertiary	41 (69.5)	52 (82.5)	
Husband's occupation			
Student	1 (1.7)	0 (0)	$X^2 = 12.707$
Farming	4 (6.8)	3 (4.8)	df = 5
Trading	9 (15.3)	15 (23.8)	p = 0.026*
Artisan	15 (25.4)	3 (4.8)	
Civil servant	28 (47.5)	38 (60.3)	
Others	2 (3.4)	4 (6.3)	
Husband's average income (in naira)			$X^2 = 6.574$
≤50,000	51 (86.4)	42 (66.7)	df = 1
>50,000	8(13.6)	21 (33.3)	p = 0.010*

***Statistically significant**

The nutritional status of the respondents (using MUAC) was significantly associated with the family size of respondents (p = 0.020), such that those with larger family sizes were less likely to be undernourished. Their nutritional status (using their PCV) was also significantly associated with the household size (p = 0.024), with those with larger households also being less likely to be anaemic. The dietary diversity was not significantly associated with any factors, neither

was there any significant association between nutrition knowledge, dietary diversity and nutritional status.

Discussion

The knowledge about nutrition among our respondents in this study, revealed that nearly half of them did not know what adequate nutrition meant, although majority of them knew that poor dietary practices could predispose them to having adverse pregnancy outcomes. After scoring all responses for nutrition knowledge, and categorizing the respondents based on these scores, only about half of the respondents had good nutrition knowledge (51.6%). This finding is consistent with that of a study done in Ethiopia which also found that about 47% of their study participants did not know what adequate nutrition meant (1). It is however, much lower than that reported by a study conducted in Ankara, Turkey that found that 83.1% of their respondents had good nutrition knowledge (17). The marked difference in the finding from Turkey and Nigeria, despite the fact that the study populations in the studies had similar educational status is surprising. This suggests that the tertiary level of education attained by majority of the respondents and their husbands did not automatically translate into having good nutrition knowledge. More, therefore, needs to be done in Nigeria to ensure that pregnant women have good nutrition knowledge, because evidences from other studies suggest that women who have access to nutrition information are more likely to have good dietary practices than women without access to nutrition information (4,9).

The main source of nutrition information for more than three-fourths of the study participants was the hospital, followed by the internet. This finding is congruent with that reported by a study done in Lagos, South West Nigeria, where the source of nutrition related information for majority of their respondents was also the hospital. This could be from the health talks given at the antenatal clinics by health care workers, and this should be encouraged. The internet is becoming a very important and accessible platform for health information, and stakeholders in maternal health could consider the use of this in improving nutrition knowledge among women, especially the pregnant women.

A little over half of the respondents avoided certain foods in index pregnancy with the predominant reasons being cost/financial constraints, safety concerns/uncertainty in pregnancy and cultural beliefs. Similar findings were observed by other studies done in North-western Ethiopia, North-western and South-western Nigeria, where the respondents also avoided some foods during pregnancy due to cultural beliefs/food taboos handed down from one generation to another. This is a point of concern because adherence to food restrictions may contribute to poor dietary intake or diversity among pregnant women (4,7,9). This is more so among poor households, where the cheap and readily available sources of protein are among the food taboos or restricted foods for the pregnant women.

The Frequency of food consumption among the pregnant women in this study showed that the average daily intake of certain food groups, particularly dietary fibers, fruits and vegetables, was far from satisfactory. This result corroborates the findings of a study carried out in Borno State, North west Nigeria, which also found that only about 26.5% of their respondents ate fruits and vegetables daily (7). The daily consumptions of carbohydrates and animal protein among respondents in the present study were, however, adequate. This result is similar to that reported by a Chinese study in which their respondents also consumed more carbohydrates compared to protein, fats and other food groups (5). This food consumption pattern may not be surprising, especially in the Nigerian context, where most common food types are staple foods high in carbohydrates. However, majority of these staple foods do not significantly improve nutritional outcomes unless they are combined with other food sources rich in micronutrients.

Using the Mid Upper Arm (MUAC) and BMI, only about 1 in 10 respondents were undernourished. While this is similar to the findings from a study done in China, that reported 11.8% of their pregnant women being undernourished (18). It is lower than that reported by studies done in Indian and Japan which found about 23.6% and 26.1% of their respondents underweight respectively (12,19). These differences may be explained by racial and socio-economic variations. Previous studies have also used BMI to classify the

nutritional status pregnant women. This is in spite of concerns that a number of factors such as weight of the fetus and placenta, increase in size of maternal organs especially the breasts and the uterus, accumulation of fluid in the extra cellular spaces in pregnancy as well as Lordosis with associated decrease in height could all significantly contribute to increase in maternal BMI (20,21).

Inadequate iron intakes during pregnancy associated with the increase iron demand makes pregnant mothers at even greater risk of iron deficiency. The present study found that Packed Cell Volume (PCV) checked within 4 weeks prior data collection revealed that 5.7% of the study participants had anemia. This result is much lower than that obtained from an Ethiopian study which found as much as 21.4% of their respondents being anemic (22). The implication of this is that mothers with low PCV are more likely to deliver Low Birth Weight (LBW) babies (22).

The factors that were found to be significantly associated with the nutritional knowledge in the current study were the level of education, the occupation of the respondents as well as that of their husbands' occupation and income. Similarly, studies done in Nepal and Ethiopia also corroborate the findings that educational status and socio-economic status are associated with nutrition knowledge, which in turn significantly affects dietary diversity (1,10,23). This might be due to the fact that, the more money the women or their husband earns, the more they invest in family nutrition and health which could in turn contribute to good dietary practices of the family in general, and the pregnant woman in particular. There was no statistically significant association between the nutritional knowledge, dietary diversity and the nutritional status of the study participants. This differs from the findings of other studies that reported a positive association between the nutrition knowledge and dietary diversity (9,24,25). This difference may be due to the relatively small sample size in this study compared to the quoted studies.

Conclusion and Recommendation.

This study found that only about half of the respondents had good nutrition knowledge, two-thirds had high dietary diversity, and majority had normal nutritional status. Nutrition knowledge was significantly associated with socio-demographic and socio-economic factors such as the level of education, occupation of the respondents and their husbands' income and occupation. Stakeholders in women health should target hospitals and the internet to provide balanced and correct information on nutrition in pregnancy.

Limitations

A limitation of this study is the fact that the responses were self-reported, which makes them prone to social desirability bias. This was however minimized by assuring the respondents of absolute confidentiality of their responses.

Conflicting interests

None

References

1. Aliwo S, Fentie M, Awoke T, Gizaw Z. Dietary diversity practice and associated factors among pregnant women in North East Ethiopia. BMC Res Notes. 2019;12(1):1–6.
2. Ochogu JO. Nutritional Knowledge and Practices among Expectant Mothers in Onitsha North and South Local Government Areas of Anambra State. Nnamdi Azikiwe University, Awka; 2010.
3. Omilola B. Patterns and trends of child and maternal nutrition inequalities in Nigeria. ResearchGate. 2010;(January 2010):1–61.
4. Fasola O, Abosede O, Fasola FA. Knowledge , attitude and practice of good nutrition among women of childbearing age in Somolu Local Government , Lagos State. J Public Health Africa. 2018;9(793):42–6.
5. Cheng Y, Dibley MJ, Zhang X, Zeng L, Yan H. Assessment of dietary intake among pregnant women in a rural area of western China. BMC Public Health. 2009;9:1–9.
6. Gaiha, Raghav Mathur S. Production Diversity, Diet Diversity and Nutrition in Sub -Saharan Africa. Inter Press Service. 2017;
7. Kever R, Martins S, Lola N, Dathini H, Habu H, Fatima A, et al. Knowledge and attitude of pregnant women towards

dietary practices in Yerwa Clinic, Maiduguri Metropolitan Council; Borno State. J Res Nurs Midwifery. 2015;4(12):9–15.
8. Almurshed K., Bani I., Al-Amri M. A Study of Maternal Dietary Intake During Pregnancy in Riyadh, Saudi Arabia. J Family Community Med. 2007;14(1):9–13.
9. Diddana TZ. Factors associated with dietary practice and nutritional status of pregnant women in Dessie town, northeastern Ethiopia: A community-based cross-sectional study. BMC Pregnancy Childbirth. 2019;19(1):1–10.
10. 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. Hindawi J NutrMetab. 2019;2019:7–10.
11. Adinma J, Umeononihu O, Umeh M. Maternal nutrition in Nigeria. Trop J ObstetGynaecology. 2017;34:79–84.
12. Mudhaliar MR, Ghouse ISM, Neppali J, Asavadi D, Uppara V, Chinnakotla V. Nutritional Status of Pregnant Women and Newborns in a Secondary Referral Health Care Setting of India. Indian J Pharm Pract. 2017;10(1):14–9.
13. National Population Commission (NPC) Nigeria, Federal Republic of Abuja N. Nigeria Demographic and Health Survey. 2018.
14. Prodhan U., Islam M., Alam MR, Vasker TK, Kabir H, Alim MA. Assessment on Nutritional Status of Pregnant Women and their New Born Baby in the Hospitalized Care System. Am J Heal Res. 2016;4(6):194–8.
15. Olawuyi JF (ed. Biostatistics: A foundation course in health sciences: formulas for calculating sample size. 1st ed. Toyin Alabi Printing Co; 1996. 114–115 p.
16. Food and Agriculture Organization. Guidelines for measuring household and individual dietary diversity. Kennedy G, Ballard T, MarieClaude D, editors. Italy: Food and Agriculture Organization of the United Nations; 2010. 1–60 p.
17. Ülger TG, Akçali Ç, Yardimci H. Evaluation of Nutrition Education During Pregnancy and Nutritional Knowledge of Pregnant Women. ResearchGate. 2018;(November).
18. Gao H, Stiller CK, Scherbaum V, Biesalski HK, Wang Q, Hormann E, et al. Dietary intake and food habits of pregnant women residing in urban and rural areas of Deyang city, Sichuan Province, China. Nutrients. 2013;5(8):2933–54.
19. Erika O, Megumi H, Motoi S, Dang DA, Le Huu T, Nguyen T, et al. Maternal body mass index and gestational weight gain and their association with perinatal outcomes in Vietnam. Bull World Health Organ. 2011;89(2):81–160.
20. Okereke C, Okeke TC, Anyaehie BU, Nwagha UI, Iyare EE, Nwogu-Ikojo E, et al. The effect of gravidity on anthropometric indices of pregnant women in Enugu, South East, Nigeria. African J Biomed Res. 2012;15(3):165–70.
21. Okereke CE, Anyaehie UB, Dim CC, Iyare EE, Nwagha UI. Evaluation of some anthropometric indices for the diagnosis of obesity in pregnancy in Nigeria: A cross-sectional study. Afr Health Sci. 2013;13(4):1034–40.
22. Woldeamanuel GG, Geta TG, Mohammed TP, Shuba MB, Bafa TA. Effect of nutritional status of pregnant women on birth weight of newborns at Butajira Referral Hospital, Butajira, Ethiopia. SAGE Open Med. 2019;7:1–7.
23. Lama N, Lamichhne R, Bhandari R, Shrejana KC, Sharma D. Factors Influencing Dietary Diversity of Pregnant Women Attending Antenatal Care in Western Regional Hospital , Nepal : A Cross-sectional Study. JounalKarnaliAcad Heal Sci. 2019;2(3):189–96.
24. Williams L, Campbell K, Abbott G, Crawford D. Is maternal nutrition knowledge more strongly associated with the diets of mothers or their school-aged children? Public Health Nutr. 2012;15(8):1396–401.
25. Spronk I, Kullen C, Burdon C, O'Connor H. Relationship between nutrition knowledge and dietary intake. Br J Nutr. 2014;111(10):1713–26.