KNOWLEDGE OF RISK FACTORS OF OBESITY BY YOUNG FEMALE ADULTS (19 - 35 YEARS) IN OWO LOCAL GOVERNMENT AREA OF ONDO STATE, NIGERIA

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ABSTRACT
Background: The association between excess weight and cardio-metabolic disease is widely recognized by the medical profession as well as the general public
Objective: The study assessed the knowledge of risk factors of obesity among young females (reproductive age) in Owo Local Government Area (LGA) of Ondo State.
Materials and methods: The study was a descriptive cross-sectional study. A semi-structured questionnaire was used to elicit information on dietary habits and knowledge of risk factors from 500 young female adults. Knowledge of risk factors (RFs) was assessed on a 10-point scale and scored as low (≤ 3), average ($\geq 4 \leq 6$), and high ($\geq 7 \leq 10$). Central obesity was assessed using data from the waist and hip circumferences measured with non-flexible tape rule) waist-hip ratio was calculated. Data were analyzed using descriptive and inferential statistics. In all cases, a probability of <0.05 was considered statistically significant.
Results: Finding shows that 43.6% of the respondents were within the age range of 19-23years, 59.8% were single, about 28.6% were able to eat 3times daily while 22.4% skipped meal with 13.0% skipping breakfast. Lack of physical exercise (85%) and stress (47.5%) were the most identified risk factors of obesity. About 53.4% of the subjects had low knowledge, 33.4% had average knowledge, while only 13.2% had high knowledge scores of obesity risk. There was a significant difference between the mean waist circumference, waist circumference and waist-hip-ratio between the urban and rural participants (P<0.05). More than half (53.2%) and 48.0% of the respondents had central obesity using waist-hip ratio and waist circumference, respectively.
Conclusion: The study revealed that more than half of respondents display a lack of knowledge on risk factors of obesity. Public health education should be geared towards educating women of reproductive age on the risk of obesity.

Keywords: *Young Female Adult, obesity, stress, waist circumference, breakfast, meal skipping*

INTRODUCTION

World Health Organization (WHO) action plan for the global strategy for the prevention and control of non-communicable disease provide a roadmap to establish and strengthened initiative for the surveillance, prevention and management of non-communicable diseases, including obesity in low and middle-income countries and its serious implication for poverty reduction and economic development (1).

Obesity is one of the non-communicable diseases of public health concern globally, negatively impacting reproductive health (2, 3). Overweight and obesity, although sometimes reflects the social and economic status of an individual, often result from high energy consumption (energy-dense foods) without the corresponding level of physical activity. Research has shown that although nutrition, physical activity, and other behavioral factors interplay in the development of obesity. However, there are multiple ways in which excess weight gain occurs in women (3). Considering the trends in the global obesity rates compiled by the International Association for the study of Obesity

(IASO), it is apparent that women are driving the obesity pandemic among adult populations (4). In research conducted by World Health Organization (5), nearly 300 million women are obese globally, and the prevalence of obesity among adults in Nigeria was 8.1 % of the population of female adults in Nigeria. In Nigeria, about 8-22% of adults are obese (6). A recent study by the National Demographic and Health Survey (7) put obesity at 10% in Ondo State.

Studies have highlighted the risk of variable socio-economic factors in developing obesity (8, 9, 10, 11, 12). Obesity is more prevalent among Nigerian women of high socio-economic than those of low socio-economic (13), and also high among Ghanaian women in the higher wealth category (14). The study that assessed weight status in a national sample of Kenyan women concluded that overweight was high among women in the high-income group (15). Similarly, research has also shown that women belonging to low-income households also gain weight because they tend to be food-insecure and are therefore likely to consume large quantities of high-

energy staples and cheaper parts of meats because they are less expensive (16, 17). The type of occupation exposes a person to various levels of sedentary activity. It has been confirmed from cross-sectional surveys that sedentary workers tend to be more overweight or obese than their active counterparts (18, 19).

Despite the recognition of obesity as a public health concern, it has been observed that understanding multiple factors influencing a person`s risk is still inadequate (20). However, curbing the menace of obesity among women remains one of the challenges facing the 21st century Nutritionist and health professionals because of the danger obesity poses in female lives, especially within their reproductive age. The association between excess weight and cardio-metabolic disease is widely recognized by the medical profession and the general public (3). Curbing the global obesity epidemic among women of reproductive age requires an evidence-based multi-sectorial, multidisciplinary, and culturally relevant approach to setting appropriate health intervention programs (21). Assessment of women's knowledge on the risk factors of obesity is crucial to such programs' success. The probability of an obese individual to lose weight or maintain a healthy weight may depend greatly on what he or she has known to have caused the condition. Individual responsibility can be assessed collectively only where people have access to a healthy lifestyle and are supported to make a healthy choice (21). Therefore, it is imperative to provide an evidence base health information on the knowledge of risk factors of obesity among young females (reproductive age) in Owo Local Government Area (LGA) of Ondo State.

MATERIALS AND METHOD
Study design
The study was descriptive and cross-sectional in design
Study area
The study was carried out in Owo Local Government Area of Ondo State, South-West Nigeria. Owo was one of the first local governments created when Ondo State was created in 1976 from the old western state. Owo is a city approximately between latitudes 7° 11^1 and $7^o 183^1$ and longitudes 5° 35^1 and $5^`$ 583^1 East of Greenwich meridian (22). It is situated in the southwest of Nigeria at the southern edge of the Yoruba hills (Elevation of 1,130ft (344m) and at the intersection of the road from Akure, Kabba, Benin city (22). Owo is situated halfway between the towns of Ile-ife and Benin City, about 45kilometer east of Akure, the state capital (22). The local government's total population is 218,886 of which 110,429 are males, while 108,457 are females (23). The majority

of the people are government workers. Christianity and Islam are generally the dominating religion practiced by the inhabitants of Owo.

Study Population
The study population consisted of apparently healthy young female adults aged 19-35 years.
Sample size determination
The sample size was determined using the formula for descriptive studies (24)
$$n = Z^2_{1-\alpha/2} P(1-P) \over d^2$$
P is the proportion of the factor under investigation i.e 10% (10% represents the prevalence of obesity among adult females aged 15-49years in Ondo state, Nigeria (25). A minimum sample size of 151 was calculated. We decided to increase the sample size to 500 to gather more respondents for a better quality research output.
Sampling procedure
The multistage sampling method was used to select the communities for the study in the local government. A total of six (6) communities were randomly selected from a total of 16 communities. Three (3) communities each were selected from the urban and three (3) from the local government's rural communities under investigation. A systematic sampling procedure was adopted in household selection of the young females for the study.
Informed consent
Prior to the survey, permission was obtained from Human Nutrition and Dietetics Department, Michael Okpara University of Agriculture, Umudike. Verbal consent from the participants was obtained after the objectives of the study were explained to them.
Data collection
Questionnaire
A pre-tested, structured questionnaire validated by lecturers in the Human Nutrition and Dietetics Department, Michael Okpara University of Agriculture, Umudike were used. The questionnaire was to elicit information on respondent's dietary habits, knowledge risk of factors of obesity, and source of information about obesity. A Modified version of the questions used were adapted from that developed by Ajayi and Oyewole (26) on knowledge of risk factors of obesity

Anthropometric measurements
Anthropometric measurements of waist and hip circumference were taken. Waist circumference measurement was taken using a non-stretchable tape placed at the midway between the lower rib margin and iliac crest. Measurements were taken and recorded to the nearest 0.1cm (27). Hip Circumference measurement was taken by placing the tape on horizontal plane around the hip at the point of the

greatest circumference, with the measurement taken to the nearest 0.1cm (27).

Data analysis

Waist –Hip- Ratio (WHR) was calculated by dividing the waist circumference by the hip circumference. Respondents whose WHR was >0.85 and waist circumference >88cm were considered to be at risk of central obesity (27).

Grading of knowledge of respondents on risk factors of obesity

A modified version of Ajayi and Oyewole (26) on Knowledge score of risk factors was adopted for this study. Knowledge of Risk factor was assessed on a 10-point scale and scored as low (≤ 3), Average ($\geq 4 \geq 6$), and High ($\geq 7 \geq 10$)

Statistical analysis

Statistical analysis was performed using the statistical package for social science (SPSS version 20). Descriptive statistics such as frequencies, percentages, mean and standard deviation were used to analyze dietary patterns, risk factors of overweight/obesity, and all anthropometric data. Chi-square test was used to determine the relationship between knowledge of risk factors and waist-hip ratio, while t-test was used to test the differences between the anthropometric status of the urban and rural respondents. A probability of (<0.05) was taken to indicate the level of significance.

RESULTS

Dietary Practices of the respondents

Table (1) below shows that nearly half (46.8%) does eat twice a day; only (28.6%) of them ate three times daily. While (34.6%) ate 4times or more daily. About (47.6%) insisted that their lunch was the largest meal of the day, compared to (46.8%) who claimed to have enjoyed a large meal in the morning. Only (18.8%) said their dinner is the largest portion of their meal, while 24.4% skip meals. Furthermore, about 67.6% ate in-between meals in which carbonated drinks and groundnut topped the list of the most consumed in-between snacks (26.6%) and (18.0%). Few (6.4%) of them consumed pastries as their in-between snacks.

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Table 2 below shows that majority of the participants (85.8%) identified lack of physical exercise as the major risk factor of obesity, followed by stress (47.4%), being affluent (45.4%), and hereditary (40.2%). A disturbing large proportion of the participants failed to mention excessive eating (68.4%), carbonated drinks (68.4%), and energy-dense foods (61.8%) as contributing to the developments of obesity. However, 16.4%, 31.2%, and 32.8% identified being a female, excessive television viewing, and being old, respectively, as factors in overweight and obesity development.

Table 3 revealed the knowledge score of all risk factors together. About 53.4% had low knowledge scores; that is, they could not identify over four or more correct risk factors to the development of obesity. Some (33.4%) had average knowledge, while about 13.2% had high knowledge.

Table 4 showed the mean anthropometric measurement, such as waist circumference was significantly ($p<0.05$) higher in rural participants compare to the urban participants (78.39 ± 7.90 vs. 80.16 ± 6.195). Similarly, the mean waist-hip ratio in urban (0.85 ± 0.108) respondents was lower than their rural (0.88 ± 0.461) counterpart but not statistically significant (($p>0.05$). Fifty-two percent (52.0%) of the respondents had an abnormal waist-hip ratio, while 48.0% were centrally obese.

Table 5 revealed the Relationship between knowledge of risk factors and anthropometric status. About 53.4% had a low knowledge score, of which 29.5% had abnormal waist-hip ratio, and a significant difference was observed between the respondent's waist-hip ratio and knowledge score ($P<0.05$). Similarly, central obesity was more prevalent among those with low knowledge scores (28.0%). The knowledge score of risk factors decreased with increased central obesity

Table 1: Dietary practices of the respondents

Dietary habits	Urban (%)	Rural (%)	Total (%)
Number of meals eaten daily			
Once	51(17.0)	30(15.0)	81(16.2)
Twice	143(47.7)	91(45.5)	234(46.8)
3 times	83(27.7)	60(30.0)	143(28.6)
>4times	23(7.6)	19(9.6)	173(34.6)
Total	**300(100.0)**	**200(100.0)**	**500(100.0)**
Meal eaten largest			
Breakfast	98(32.7)	70(35.0)	108(33.6%)
Lunch	145(48.3)	93(46.5)	238(47.6)
Dinner	57(19.0)	37(18.5)	94(18.8)
Total	**300(100.0)**	**200(100.0)**	**500(100.0)**
Consumption of in-between meal			
Yes	201(67.0)	137(68.5)	338(67.6)
No	89(33.0)	63(31.5)	162(32.4)
Total	**300(100.0)**	**200(100.0)**	**500(100.0)**
***(n=338)**			
Always	37(17.9)	21(16.0)	58(17.2)
Once in a day	57(27.5)	35(26.7)	92(27.2)
Occasionally	113(54.6)	75(57.3)	181(48.5)
Total	**207(100.0)**	**131(100.0)**	**338(100.0)**
Foods eaten as in between meals			
Fruit	33(15.9)	20(15.3)	53(15.6)
Vegetables	20(9.7)	10(7.6)	30(8.9)
Pastries	42(22.2)	30(22.9)	72(21.3)
Groundnut	40(19.5)	21(16.0)	61(18.0)
Carbonated drink	50(24.2)	40(30.5)	90(26.6)
Others (roasted corn)	22(10.6)	10(7.6)	32(9.5)
Total	**207(100.0)**	**131(100.0)**	**338(100.0)**
Skipping of meal			
Yes	70(23.3)	52(26.0)	122(24.4)
No	230(76.7)	148(74.0)	378(75.6)
Total	**300(100.0)**	**200(100.0)**	**500(100.0)**
If yes, which meal of the day			
Breakfast	40(57.1)	25(48.1)	65(53.2)
Lunch	20(28.6)	15(28.8)	35(28.7)
Dinner	10(14.3)	12(23.1)	22(18.1)
Total	**70(100.0)**	**52(100.0)**	**122(100.0)**
Method of food preparation			
Boiling	155(51.7)	111(55.5)	266(53.0)
Frying	65(21.7)	42(21.0)	107(21.4)
Smoking	23(7.7)	16(8.0)	39(7.8)
Baking	17(5.7)	9(4.5)	16(5.2)
Others (steaming)	40(13.3)	22(11.0)	62(12.4)
Total	300(100.0)	200(200.0)	500(100.0)
Fried food eating			
Chin-chin	112(37.3)	83(41.5)	195(39.0)
Puff- Puff	19(6.3)	16(8.0)	35(7.0)
Eggroll	32(10.7)	21(10.5)	53(10.6)
Meat-pie	9(3.0)	7(3.5)	16(3.2)
Buns	31(10.3)	13(6.5)	44(8.8)
Fish-pie	42(14.0)	26(13.0)	68(13.6)
Potato- pie	17(5.7)	8(4.0)	25(5.0)
Doughnut	17(5.7)	11(5.5)	28(5.6)
Others (biscuit)	21(7.0)	15(7.5)	36(2.2)
Total	**300(100.0)**	**200(100.0)**	**500(100.0)**

Table 2: Knowledge of respondents on the risk factors of obesity

Risk factors	Urban (%)		Rural (%)		Total (%)	
Risk factors	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**
Hereditary	115 (23.0)	185(37.0)	86 (17.2)	114(22.8)	201 (40.2)	299(59.8)
Lack of physical exercise	256 (51.2)	44(8.8)	173 (34.6)	27(5.4)	429 (85.8)	71(14.2)
Being A female	48 (9.6)	252(50.4)	34 (6.8)	166(33.2)	82 (16.4)	418(83.6)
Eating Too Much	90 (18.0)	210(42.0)	66 (13.2)	134(26.8)	156 (32.8)	344(68.4)
Excessive TV Viewing	94 (18.8)	206(41.2)	70 (14.0)	130(26)	164 (32.8)	336(67.2)
Excessive carbonated drinks	92 (18.4)	208(41.6)	64 (12.8)	132(27.2)	156 (31.2)	344(68.4)
Inadequate Sleep / Stress	146 (29.2)	154(30.8)	91 (18.2)	111(21.8)	237 (47.4)	263(52.3)
Eating Energy Dense Food	119 (23.8)	181(36.2)	72 (14.4)	128(25.6)	191 (38.2)	309(61.8)
Being Affluent	140 (28.0	160(32.0)	87 (17.4)	113(22.6)	227 (45.4)	273(54.6)
Being Old	99 (19.8)	201(40.2)	57 (11.4)	143(28.6)	156 (31.2)	344(68.4)

Table 3: Knowledge score of risk factors of obesity

Score point	Indication	Urban (%)	Rural (%)	Total	X^2	P-value
≤ 3 point	Low knowledge	167(55.6)	100(50.0)	267(53.4)	0.941	0.508
≥4≤ 6point	Average knowledge	100(33.3)	66(33.5)	167(33.4)		
≥7≤10point	High knowledge	43(14.3)	23(11.5)	66(13.2)		
Total	**Total**	**300(100.0)**	**200(100.0)**	**500(100.0)**		

Table 4: Anthropometric status of the Respondents

Variable	Urban	Rural	Total	P-value
Waist circumference (cm)	78.39 $\pm$ 7.90	80.16 $\pm$ 6.195	79.275$\pm$ 7.0475	0.002*
Hip circumference (cm)	90.82 + 7.827	91.21$\pm$ 7.210	91.015$\pm$ 7.5185	0.668
Waist – hip ratio	0.85 $\pm$ 0.108	0.88 $\pm$ 0.461	0.865$\pm$ 0.2845	0.19
Waist-hip ratio				
Normal ($\leq$ 0.84)	150(50%)	82(41.0)	232(46.8)	0.002*
High($\geq$0.85) fat accumulation	150(50%)	118(59.0)	268(53.2)	
Total	**300(100.0)**	**200(100.0)**	**500(100.0)**	
Waist circumference (cm)				
<88cm (No risk)	140(46.7)	120(60.0)	260 (52.0)	0.001*
$\geq$88cm (central obesity)	160(53.3)	80(40.0)	240(48.0)	
Total	**300(100.0)**	**200(100.0)**	**500(100.0)**	

*significant (P<0.05)

Table 5: Knowledge of risk factors on the anthropometric status of the respondents

Parameters	Low knowledge	Moderate Knowledge	High Knowledge	Total	X^2; P-value	
Waist-hip ratio	**F (%)**	**F (%)**	**F (%)**	**F (%)**	X^2	**P-value**
≤ 0.84	120(24.0)	72(14.4)	40(8.8)	232(46.8)	15.167	0.002*
≥0.85	147(29.4)	95(19.0)	26(4.4)	268(53.2)		
Total	267(53.4)	167(33.4)	66(13.2)	**500(100.0)**		
Waist Circumference						
<88cm(normal)	127 (25.4)	87(17.4)	46(9.2)	260 (52.0)	15.550	0.004*
≥88cm (at risk)	140 (28.0)	80(16.0)	20(4.0)	240(48.0)		
Total	**267(53.4)**	**167(33.4)**	**66(13.2)**	**500(100.0)**		

*significant (P<0.05)

DISCUSSION

The respondents' in-between meals consumption patterns show that less than twenty percent consumed unhealthy meals (carbonated drinks). This means that they might be predisposed to health challenges related to the excessive consumption of these unhealthy drinks. On the other hand, the respondents who took healthy in-between meals such as fruits and vegetables were very low and not encouraging as conferring to its numerous health and protective benefits. This low consumption of fruits and vegetables seen among participants in this study was also observed among teachers in a study conducted by Fadupin *et al.* (28), where 31.2% of the study population regularly consumed fruits and vegetables as their snacks. Consumption of fruits and vegetables as in-between meals and as a formidable part of our diet is associated with a lowered risk of degenerative diseases, such as obesity, cancer, cardiovascular diseases, cataract, brain and immune dysfunctions (29). Fruits and vegetables are good sources of vitamins, minerals, and dietary fiber known to improved health and prevent chronic non-communicable diseases in adulthood. This result also showed a high prevalence of unhealthy pastries consumption among the participants. This is of serious concern, apart from the fact that they are highly processed; they are also dense in energy. Chin-chin, buns, and puff-puff top the most highly processed; they are also dense in energy. consumed unhealthy pastries considering the havoc this unhealthy, empty-calorie does to body, it increased glucose impairment with age advancement (30). Skipping of meals has been identified as a lifestyle that inhibits good nutrition and results in inadequate nutrient intake and can promote reliance on junk foods (31). In this study, meal skipping was higher in urban than rural participants. The observation that breakfast was the most skipped meals in this study does not agree with an earlier report by Fadupin et al. (28) that lunch was the most skipped meal among teachers in urban Nigeria, but consistence with a similar study by Bolajoko et al. (31). Consumption of a healthy breakfast is important to health; eating breakfast has been associated with improved nutrients intake and lower body mass index (32). Regular breakfast consumption is also associated with reduced stress, depression, and emotional distress. Skipping breakfast interferes with memory and attention (33). The low consumption of fruits and vegetables, coupled with the skipping of meals observed in this study, may cause micronutrient deficiencies. It may affect the metabolism of macronutrients like carbohydrates and protein.

Assessment of young female Adults' knowledge of risk factors of obesity is crucial to the implementation of any intervention to curb the epidemic status of obesity in Nigeria and other parts of the world. Unfortunately,, more than half of the subjects in this study demonstrated a low knowledge score of risk factors of obesity. This result was contrary to Ajayi and Oyewole (27) report on knowledge of risk factors of obesity among women of reproductive age in Ibadan, where 62% had high knowledge score. Although, majority of the respondents were able to identify lack of exercise as one of the culprits to the development of obesity but knowledge of lack of exercise as a risk without the corresponding knowledge of poor dietary habits such as consumption of excess energy-dense food, carbonated drinks, eating too much may not produce a desirable result when used as intervention strategies. Physical exercise enhanced heart function, improved balance a reduced risk of falling, better sleep habits, and healthier body composition (less body fat, more muscle mass), and reduced injury to the muscle, tendons, and joints; physical exercise aids in weight control, both by raising resting energy expenditure for a short period after exercise and by increasing overall energy expenditure (34,35). Regular physical exercise is very important for everyone, especially people trying to lose weight or maintain lower body weight (36, 37).

However, more than half of the young females could still not identify hereditary, excessive viewing of TV, excess consumption of carbonated drinks, overeating, and excess consumption of energy-dense food as a risk factor. Poor dietary habits and nutrition such as overeating (31.2%), excessive carbonated drink (31.2%), and eating energy-dense foods were not considered a threat to becoming overweight or obesity by most of the respondents. There were misperceptions about the role of diet as a major player in the development of obesity and overweight and the fact that they are a serious obstacle to weight reduction programs in the community and therefore require proper education through special awareness programs and personal counseling for weight reduction through diet and exercise (38). In order to combat obesity and wear it off, strict measures such as a healthy lifestyle that includes the maintenance of low energy intake and physical activity have been the best and most healthy approaches to obesity control. Abnormal value for Waist-Hip Ratio (WHR) and Waist Circumference (WC) was 53.2% and 48%, respectively. All these parameters confirmed that truncal obesity was prevalent among respondents in the study area. The waist- hip ratio is thought to be a good measure of abdominal adiposity because of different fat depots' distinct physiologic characteristics. Abdominal adiposity was more significant among the female respondents. Big waist circumference and waist-hip ratio are independent risk factors for non-communicable disease (NCDs) (39). It has been reported that women who have waist circumference ≥88cm are at higher risk of developing hypertension, diabetes, elevated cholesterol levels, and cardiovascular diseases (39, 40). In the study, central obesity was significantly higher in urban participants than their rural counterparts. This difference could be attributed to the fact that the urban nature of the study area and the change in dietary patterns of populations of the developing world could have resulted in the high prevalence of high obesity among the urban participants. The relationship between knowledge of risk factors and waist-hip ratio and waist circumference showed a clear significant difference (P<0.05). More than half of the respondents could not identify more than three (3) risk factors (had low knowledge score), of which 29.5% of them had abnormal waist-hip ratio. Similarly, central obesity was more prevalent among the low knowledge score (28.0%). The knowledge score of risk factors decreased with increase in central obesity. This result did not conform to a similar study conducted by Ajayi and Oyewole (27), in Ibadan, where knowledge of risk factors of obesity was not associated with waist-hip-ratio and body mass index.

CONCLUSION

This study found that the prevalence of central obesity and knowledge of risk factors of obesity among the participants was very low. Physical exercise and stress were the most identified risk factors of obesity. The study showed that urban participants were more centrally obese than their rural counterparts. Knowledge of risk factors was associated with WHR and WC. Nearly one-third of the respondents skipped meals. There was an inadequate intake of fruits among the participants suggesting that many young female adults could be at risk of micronutrient deficiency. Health program that involves nutrition screening, physical activity and talk on relevance of fruit and vegetable consumption, causes of obesity, periodic assessment of body weight and the need to reduce weight gain should be advocated among the young female adults to avert the impending danger of obesity.

Declaration of interest

The authors declared no conflicts of interest. The authors alone are responsible for the design, data collection, writing and funding of this research

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