Prevalence of Obesity among adolescents in Asaba, South Southern Nigeria

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ABSTRACT

Introduction: Obesity which has been regarded a global outbreak is one of the main causes of morbidity and mortality among children and adolescents. The study investigated obesity using BMI and WHR. It also aimed at correlating BMI and WHR of respondents.

Materials and methods: Four hundred male and female respondents aged 11-19 years were randomly selected using a multi stage sampling technique. BMI (kg/m^2) was calculated as the ratio of weight (kg) to height(m^2) while WHR was obtained from the ratio of waist to hip circumference (cm) for all respondents . Analysis was done with SPSS 23 Soft ware version ,T test compared means, pearson correlation determined the association between BMI and WHR. Significance was accepted at $P<0.05$.

Result : The prevalence of obesity using BMI was 6.80% of which 13 (6.90%) were males and 14(6.60%) were females while the prevalence using WHR was 5.30% of which 2(1.10%) were males and 19(9.00%) were females. The occurrence of underweight with BMI was 4.80% as compared to 79.30% with WHR . There was a significant correlation between body mass index and waist hip ratio ($r = -0.122$, $p = 0.015$). Findings from this study also showed a mean difference among males and females for BMI and WHR($t = 5.921$, $p = 0.000$; $t= -4.770$, $p =0.000$).

Conclusion : This study showed that body mass index was a better measure in assessing obesity while waist hip ratio was a better index in evaluating underweight in the studied population.

Keywords: Body Mass Index; Waist Hip Ratio ; Prevalence; Adolescents

INTRODUCTION

Obesity which was reported as one of the fastest growing health problems have been linked with non communicable disorders and cardiovascular diseases. [1] The increase in obesity prevalence observed among adults is now seen in children and adolescents .[1] The Center for disease control and prevention defined overweight adolescents has a BMI at the 85thpercentile and below the 95th percentile while obese adolescents has BMI equal to or greater than the 95th percentile .[2] According to World Health Organization ,the prevalence of obesity among children and adolescents within the ages of 5-19years drastically increased from 4% in 1975 to over 18% in 2016.[3] Further reports estimated that globally there were more obese individuals than underweight except in some parts of Sub-Saharan Africa and Asia.[3] The cause being an energy imbalance between calories consumed and calories expended.[3] Chukwunonso,(2014) reviewed the prevalence of obesity between the year 1983 to 2013 and discovered that the incidence of obesity in Nigeria was lower than those reported from other parts of the world but values were stable during the 30 year period. [4]

Several indicators had been used in estimating obesity among adolescents, BMI frequently used as a screening aid and predictor of obesity associated disorders.[5] World Health Organization recommendation states that other options such as WHtR ,WHR, and WC that reports abdominal obesity were discovered superior to BMI.[6] According to Qiao and Nyamdorj (2010) , WHR has been known to be more speculative of visceral and abdominal fat as compared to BMI that do not have the capacity to separate fatness as central or visceral.[7]

Several studies had evaluated obesity among children in Nigeria,[4,8] but few had estimated obesity among adolescents, hence this study investigated obesity among adolescents using BMI and WHR in Asaba, Delta North,South Southern Nigeria .The research also investigated the association between body mass index and waist to hip ratio in the studied population .

MATERIALS AND METHODS

This investigation which was a cross sectional study compared obesity among adolescents using BMI and WHR . A total of 400 students between the ages of 11 to 19 years from various public and private secoundary schools were investigated using multi stage sampling technique. Adolescent was defined based on World Health Organization guidelines which classified them within the ages of 10-19 years(WHO,1986). Body weight of participants measured to the nearest 0.1kg was obtained using a calibrated digital scale which was checked for precision after every 10th participants. Heights were obtained as the distance from the highest point of the head to the lowest point of the foot with a measuring tape. Participants were weighed before their mid day lunch , without shoes and in light clothing. The BMI (kg/m^2) was calculated as the ratio of weight (kg) to height (m^2) of respondents. The BMI was classified based on age and sex specific cutoffs from CDC-2000 growth charts for adolescents.[2] Obesity was determined by estimating the rate of central adiposity using measurement like waist and hip circumference alongside waist hip ratio. Waist circumference (in cm) was done with a flexible tape measured from midway between the lowest rib and the superior point of the iliac crest at the level of the umbilicus with the participant breathing and standing normally. Hip circumference (cm) was calculated from the widest diameter around the greater trochanter. The WHR was obtained from the ratio of waist circumference to hip circumference for all respondents.

Ethical approval was obtained from the Research and Ethics Committee of the Faculty of Basic Medical Sciences, Delta State University, Abraka , Nigeria (DELSU/CHS/ANA/18/05). Consent was sought from school authorities, parents and those 18years and above. Data were analysed using SPSS 23 Software Version while T test was used to compare means. Pearson correlation was used to determine the association between BMI and WHR. Statistical significance was accepted at $P<0.05$.

RESULTS

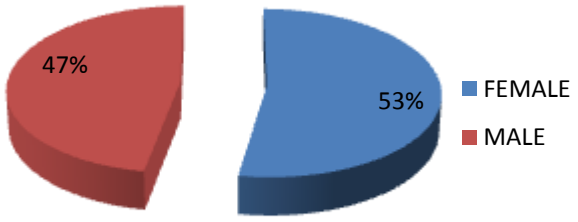

Figure 1: Gender Distributions of the Respondents

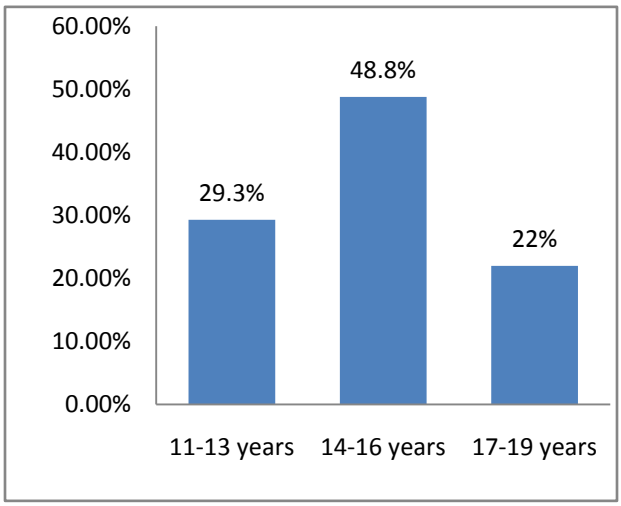

Figure 2: Age Distributions of the Respondents

Table 1: Descriptive statistics of the respondents

Variable	Minimum	Maximum	Mean ± Std
Weight (kg)	26.00	97.00	51.87± 11.32
Height (m^2)	1.35	1.95	1.64 ± 0.11
Waist circumference (cm)	20.20	40.50	27.15 ± 2.56
Hip circumference(cm)	22.50	49.80	33.79 ± 3.73

Table 2: Prevalence of Obesity Using Body Mass Index (*Body Mass Index* for Age Percentile

Gender	Variable	Frequency	Percent
Female	Underweight (Below 5th Percentile)	12	5.70
	Normal (5th – 85th Percentile)	162	76.80
	Overweight (85th – 95th Percentile)	23	10.90
	Obese (95th Percentile and above)	14	6.60
	Total	211	100.00
Male	Underweight (Below 5th Percentile)	7	3.70
	Normal (5th – 85th Percentile)	159	84.10
	Overweight (85th – 95th Percentile)	10	5.30
	Obese (95th Percentile and above)	13	6.90
	Total	189	100.0
Female and Male Combined	Underweight (Below 5th Percentile)	19	4.80
	Normal (5th – 85th Percentile)	321	80.30
	Overweight (85th – 95th Percentile)	33	8.30
	Obese (95th Percentile and above)	27	6.80
	Total	400	100.00

Table 3: Prevalence of Obesity Using Waist Hip Ratio

Gender	Variable	Frequency	Percent
Female	Underweight (0.80 or lower)	131	62.10
	Normal (0.81 - 0.85)	61	28.90
	Obese (0.86 or higher)	19	9.00
	Total	211	100.00
Male	Underweight (0.95 or lower)	186	98.40
	Normal (0.96 - 1.0)	1	0.50
	Obese (1.0 or higher	2	1.10
	Total	189	100.00
Female and Male Combined	Underweight	317	79.30
	Normal	62	15.50
	Obese	21	5.30
	Total	400	100.00

Table 4: Comparison of variables between Male and Female

Variables	Female (N=211) Mean±SD	Male (N=189) Mean±SD	T-value	P-value
Weight (kg)	52.39±10.54	51.28±12.14	0.977	0.329
Height (m^2)	1.62±0.08	1.67±0.14	-4.526	0.000*
Body Mass Index (kg/m^2)	20.05±3.50	18.24±2.47	5.921	0.000*
Waist Circumference (cm)	27.52±2.75	26.75±2.25	3.028	0.003*
Hip Circumference (cm)	34.48±3.50	33.01±3.85	4.006	0.000*
Waist Hip Ratio (cm)	0.79±0.05	0.82±0.06	-4.770	0.000*

***Indicates statistical significant difference**

Table 5: Correlation between Waist Hip Ratio and Body Mass Index

Variable	Mean ± Std. Deviation	Pearson Correlation Coefficient	P-value
Waist Hip Ratio (cm)	0.81±0.06	- 0.122	0.015
Body Mass Index (kg/m^2)	19.19±3.18		

*** Correlation is significant at the 0.05 level (2-tailed).**

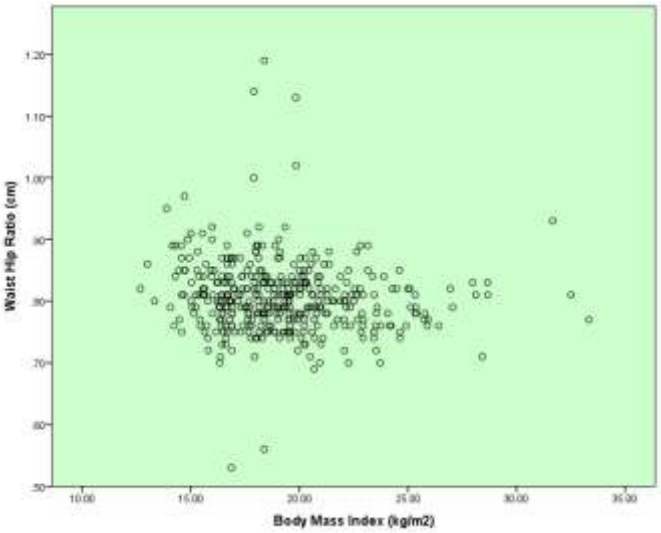

Figure 3: Scatter graph between Waist Hip Ratio and Body Mass Index

The study investigated 400 adolescents of which 47% were males and 53% were females (fig 1) Fig 2 presented age intervals among adolescents and findings showed that 29.3% were between the ages of 11 to 13years , 48.8% aged 14 to 16 years while 22% of the population were aged 17 to 19years. Table 1 presented the mean and standard deviation of weight and hip circumference as 51.87±11.32 and 33.79±3.73. Findings from this investigation showed that the prevalence of obesity among adolescents using BMI was 6.80% while that of waist to hip ratio was 5.30% (table 2 and 3). The occurence of obesity among females with BMI was 6.6% as compared to 9.00% with WHR. Adolescent males showed 6.9% with BMI while using WHR the prevalence of obesity was 1.10% (table 2,3). Using BMI for the total population, reports presented 4.80% adolescents who were underweight in contrast to 79.30% for WHR (table 2 and 3) . Table 2 reported 5.70% males and 3.70 females who were underweight from BMI measure as compared to 62.10% and 98.40% with WHR indicator (table 3). Findings from table 4 showed a significant difference in the mean height ,BMI, WHR, HC and WHC between male and females at $p < 0.05$. Findings from this investigation present a significant correlation between BMI and WHR (table 4).

DISCUSSION

Obesity which has been a universal scourge has increased globally, presenting it as one of the most frequent chronic

disorders among adolescents.[9] According to Jaja and Alex,(2016) adiposity which trails from childhood and adolescent has been associated with adult health outcome.[10] The international obesity task force presented 30- 40 million children and adolescents worldwide as obese.[11] Findings from this study showed that minority of the participants were obese with BMI presenting higher values than WHR . Body mass index from this investigation was a better measure in assessing obesity in adolescents . Findings were not in concordance with Adedayo and Ebenezer ,(2013) who investigated the occurrence of obesity among adolescents in Ile Ife Osun State ,Nigeria.[12] Thier reports presented a high prevalence rate of obesity using WHR with a significant difference observed among the females.[12] Findings were also not similar to Senbanjo and Oshikoya (2012) study in Abeokuta ,Nigeria .[13]

Reports stipulated that the benefits of the BMI as an indicator for obesity in developing countries includes its directness, strong association with body fat, weak correlation with height alongside specificity and sensitivity at the 85th or 95th percentile for age and sex .[14] According to Chukwunonso, (2014) who reviewed the prevalence of obesity for three decades in Nigeria , BMI was the most used measure for assessing obesity.[4] However other authors are on the contrary, that WHR or WC are better indicators for obesity.[15-16] The WC has been considered a proxy marker for measuring abdominal fat despite not taking height into consideration while WHR has been a measure for predicting insulin resistance, dyslipidemia, hyperinsulinemia, pro-inflammatory and prothrombotic clinical states.[17-18] Obesity which has been regarded as a global epidemic because of its associated health outcome has been linked with inadequate physical activity and unrestrained intake of high energy diet .[19]

Females from this investigation were more obese with WHR than BMI as compared to males who were more obese using BMI than WHR, which depicts that WHR was a better scale for assessing obesity among female adolescents while BMI was a stronger measure in estimating obesity among male adolescents. Findings were different from that of Kowsalya and Paimalana (2014) who investigated Indian adolescent girls using BMI indicator.[20] Weight , height and age from their study were the major contributing factors to obesity.[20] Obese adolescents are seldom victims of poor self-esteem , self image, depression ,stigmatization and persistent diseases attributable to surfeit of adiposity.[21] Longitudinal studies on obesity had shown that majority of obese adolescents become obese adults.[22] Therefore it is highly imperative that a routine and consistent monitoring of the prevalence of obesity among children and adolescents be carried out with views of keeping this public health threat at bight.

It was also observed from this study that sex had a significant effect on height , BMI, WHR, HC and WHC ,indicating that gender has a strong association with the occurrence of obesity. Findings were not different from Claudio et al.(2010). Their investigation reported a strong link between gender and the occurrence of abdominal obesity among adolescents in Pernambuco, Brazil.[23] it was also similar to that of Adedayo and Ebenezer,(2013).[12] Their study showed that sex had a significant effect on WHR and BMI among adolescents from Ile Ife,Osun State, Nigeria.[12]

Using body mass index in the studied population, findings showed that the prevalence of obesity among adolescents was high as compared to other parts of the world. According to Due et al.(2009) ,the occurence of obesity in adolescent male vs. females in France, Scotland and Canada were 1.6 versus 1.4%, 3.0 versus 2.7% and 4.4 versus 3.5%.[24] However male adolescents from USA , Malta and Italy showed a higher prevalence as compared to what was obtained from this investigation.[24-25] It was also depicted from this study that female adolescents were more obese than those from USA, Malta and Italy. [24-25]

Reports from other studies in Nigeria showed that the occurrence of obesity was very low among rural adolescents as compared to those in the urban areas. In a study carried out among adolescents in South Western Nigeria, Omolola et al.(2009) reported no adolescents overweight or obese among rural adolescents while in Lagos Nigeria, Ben-Bassey et al.(2007) reported the incidence rate of overweight and obese adolescents in urban and rural areas as 3.7% and 0.4%, and 3.0% and 0.0%, respectively.[26-27] Findings were similar to our reports which observed obesity among adolescents in Asaba city. This showed that obese adolescents are more in urban areas than rural areas which could be attributed to nutritional transition, socioeconomic status and environmental factors. Further findings from this study showed that there was a significant correlation between body mass index and waist hip ratio. The result was in concordance with Adedayo and Ebenezer,(2013) ; Farida et al.(2012).[12,28] The study also showed that majority of the respondents were underweight using waist hip ratio as compared to body mass index, which is an indication that WHR was a better measure in assessing underweight than BMI in the studied population. Popkin,(2002) reported that obesity has been known to coexist with undernutrition in the same population.[29] Mak and Tan,(2012) stipulated that underweight status were linked with osteoporosis, puberty delay, scoliosis and psychiatric disorders.[30]

Conclusion:

Findings from this study showed that body mass index was a better measure in assessing obesity while waist hip ratio was a better index in evaluating underweight in the studied population. Findings also depicted that WHR was a more useful indicator in estimating obesity among the females in the studied population. There was also a

significant correlation between body mass index and waist hip ratio.

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