


Prevalence and Determinants of Obesity Among Healthcare Workers in a Nigerian Tertiary Hospital: A Cross-Sectional Study

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Abstract

Background: Obesity is a chronic complex disease defined by excessive fat deposits that can impair health. Obesity occurs as a result of an imbalance in diet (energy intake) and physical activity (energy expended), multifactorial diseases due to obesogenic environment (availability of convenience food, media influence, etc.), psycho-social factors (social support systems, cultural/environmental influence, etc.) and genetic variants. Other causes are a subgroup of etiological factors (medications, diseases, immobilization, iatrogenic procedures, monogenic disease/genetic syndrome). Obesity is measured clinically by several common tools apart from body mass index (BMI), such as waist circumference (WC), waist-to-hip ratio (WHR), waist-to-height ratio, and neck circumference. WC and WHR are common tools for measuring central obesity while BMI measures generalized obesity. **Aims:** The goal of this study is to assess the prevalence of obesity amongst health workers of David Umahi Federal University Teaching Hospital, Uburu, Ebonyi state, Southeast Nigeria and to note the prevailing factors. A reliable estimate of the prevalence of obesity among health workers will contribute to the statistics needed to sway policymakers in the country to take urgent and substantial action on the increasing prevalence of obesity, especially in the healthcare industry. **Methodology:** The study was carried out between May 2024 and June 2024 at the David

Umahi Federal University Teaching Hospital situated in Uburu, Ohaozara Local government area of Ebonyi state, Southeast Nigeria. The questionnaire was designed using the Finnish diabetic risk score (FINDRISC). It contained basic comprehending questions on age, gender, exposure to high blood pressure medication, and anthropometric measurement amongst others. Weight was taken with a portable weighing scale and height, with a stadiometer. Both were taken with shoes and headgear removed. The BMI was calculated using the weight (kg) divided by the square of the height (m²). **Result:** Generally, the prevalence of obesity (>30 kg/m²) in this study was low 17.6% (38), Overweight (BMI 25 - 30), 38.9%, (84) healthy Weight, (BMI 18.5 - 24.9), 43.5% (94). The study revealed that a family history of diabetes was significantly related to higher BMI, with participants more likely to be overweight or obese ($p = 0.00030$). Similarly, participants with a personal history of diabetes were predominantly in the obese category ($p = 0.00038$). Waist circumference also showed a strong association with BMI, as larger waist measurements were more common among obese individuals ($p = 9.2 \times 10^{-8}$). In contrast, the analysis found no significant relationships between BMI and age, gender, high blood pressure, or exercise habits. **Conclusion:** The socio-demographic determinants of obesity in this study were gender, age < 45 years and exposure to exercise. These determinants should form the areas of focus for interventions such as health education and the design of work environments as environments designed to promote physical activities while working will reduce the prevalence of obesity in tertiary institutions.

Keywords

Obesity, Healthcare Workers, Hospital, Ebonyi, Nigeria

1. Introduction

The Body Mass Index (BMI) is a measurement of a person's leanness or corpulence based on their height and weight. It is widely used as a general indicator of whether a person has a healthy body weight for their height as it categorizes whether a person is underweight, normal weight, overweight, or obese depending on what range the value falls between [1]. Obesity is a chronic complex disease defined by excessive fat deposits that can impair health [2]. Obesity occurs as a result of an imbalance in diet (energy intake) and physical activity (energy expended), multifactorial diseases due to the obesogenic environment (availability of convenience food, media influence, etc.), psycho-social factors (social support systems, cultural/environmental influence, etc.) and genetic variants. Other causes are a subgroup of etiological factors (medications, diseases, immobilization, iatrogenic procedures, monogenic disease/genetic syndrome) [2]. Obesity is measured clinically by several common tools apart from body mass index (BMI), such as waist circumference (WC), waist-to-hip ratio (WHR), waist-to-height ratio, and neck circumference. WC and WHR are common tools for measuring central

obesity while BMI measures generalized obesity [3] [4]. However, in most of the available studies, the protocols for measuring waist circumference were not the same. This makes it difficult to compare [3]. Obesity can lead to increased risk of type 2 diabetes and heart disease, it can affect bone health and reproduction [2], and is a risk factor for an expanding set of chronic diseases including cardiovascular disease [5] [6], chronic kidney disease [5], many cancers [7] and an array of musculoskeletal disorders [8] [9].

Obesity influences the quality of living, such as sleeping or moving, thus there have been amplified concerns over the health risks associated with obesity, as the prevalence of obesity and overweight has increased significantly [2].

In Nigeria, some risk factors for obesity have been reported to include, gender, age, locality (urban community), decreased physical activity, educational status and high income [10] [11]. Also, we have the increase in dietary consumption of energy-dense foods, incorporation of high levels of refined sugar and saturated fats (as seen in fast food meal packs) and sedentary lifestyles as some of the major causes of the increased prevalence of obesity in Nigeria [12]. At the same time, the lack of an effective health system's response to identify excess weight gain and fat deposition in their early stages is aggravating the progression to obesity [13].

Obesity can be classified in terms of BMI values into three: The Class I, Class II and Class III. Class I has a BMI range between 30 - 34.9 kg/m². Class II obesity, BMI ranges between 35 - 39.9 kg/m² while class III obesity equals BMI values ≥ 40 (kg/m²) [12] [13].

We have a Strategic direction document in Nigeria captured in the country's health and nutritional policies that promotes physical activities, and nutritional counselling, ensures adherence to dietary guidelines, and the implementation of mandatory nutritional labelling. The challenge, however, is that more attention is focused on undernutrition [14]. Although a few reports on the prevalence of obesity among Nigerian professionals like bankers [15], lecturers [16], and civil servants exist [17], there is insufficient information as regards hospital workers, especially in Nigeria. This is unfortunate because hospitals, health systems and their employees are considered critical loci in their communities due to their expected leadership and mission [18]. Obesity among health workers (HW) may affect patients' perception of their credibility to give advice, especially regarding lifestyle modification among overweight or obese patients [19]. Also, obese HW have been found to be less confident when providing healthy nutrition and exercise advice to their patients [20]. Highlighting obesity as a serious public health concern in southeast Nigeria, with reliable statistics, is needed to convince policymakers to pay more attention to obesity.

The goal of this study is to assess the prevalence of obesity amongst health workers of David Umahi Federal University Teaching Hospital, Uburu, Ebonyi state, Southeast Nigeria and to note the prevailing factors. A reliable estimate of the prevalence of obesity among health workers will contribute to the statistics needed to sway policymakers in the country to take urgent and substantial action

on the increasing prevalence of obesity, especially in the healthcare industry.

2. Materials and Methods

Study Design, setting and population

The study was carried out between May 2024 and June 2024 at the David Umahi Federal University Teaching Hospital situated in Uburu, Ohaozara Local government area of Ebonyi state, South East Nigeria. The teaching hospital has about forty-five departments and a staff strength of seven hundred and fifty-six staff cutting across; Medical officers, nurses, nutrition officers, dieticians, scientific officers, nurses, pharmacists, physiotherapist, radiographers, administrative officers, etc. These staff were cut across all ages, genders, races and nationalities.

Sample size

The convenience sample method [21] was used to recruit members of staff. This was preferred due to ease of access to staff, especially those who were not on emergency services. The minimum sample size was determined with a standard normal deviation set at 1.96; which corresponds to 95% confidence level, a record of 15% prevalence of obesity in the southeast [21] [22] and the degree of accuracy desired set at 0.05.

Sample is as follows:

$$N = \frac{Z^2 pq}{d^2}$$

where: where N is the desired sample size, Z is the standard normal deviation set at 1.96, which corresponds to 95% confidence level, p is the proportion in the particular population estimated to have a particular characteristic (15% prevalence of obesity in the southeast) [21] [22] and q = 1.0 - p (1.0 - 0.22) d is the degree of accuracy desired. Usually set at 0.05.

$$N = \frac{1.96^2 \times 0.15 \times 0.85}{0.05^2}$$

This gives a minimum study population of 196 respondents.

Exclusion criteria

Cleaners, paramedics and other volunteer staff of the hospital were excluded from the study. Pregnant women, individuals on steroids as well as wasting substances were also excluded.

Ethical considerations

Approval to carry out this study was obtained from the Chairman, Medical Advisory Committee (CMAC), as the Research and Ethics Committee of the hospital had not been constituted as at the time this research was conducted. The assurance of utmost confidentiality of the staff medical records was given.

Interviews and physical examination.

The questionnaire was designed using the Finnish diabetic risk score (FINDRISC) and was pre-tested. It contained basic comprehending questions on: 1) sociodemographic factors; 2) anthropometric measurement, including weight, height, waist

circumference; 3) eating habits; 4) lifestyle including exercising, exposure to blood pressure drugs, and 5) family history, including T2D. The average time taken to fill out each questionnaire was three minutes. Weight was taken with a portable weighing scale and height, with a stadiometer. Both were taken with the person standing upright with shoes and headgear removed. The BMI was calculated using the weight (kg) divided by the square of the height (m²).

Data collection

The consenting health workers were sorted automatically with interest in filling out the questionnaire. Also, the questionnaire contained the purpose and objectives of the study. Questionnaires were hand-distributed to participants at their workstations in the hospital, administered on a face-to-face, read and fill basis and collected back on the same day after completion.

Statistical analysis and Data Processing

Data was captured and analyzed using the Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel. Descriptive statistics, including frequencies, means, and standard deviations, were used to summarize the demographic and anthropometric characteristics of the study population.

A binary logistic regression model was performed to determine predictors of overweight and obesity (BMI \geq 25 kg/m²) among staff. Independent variables included were age group, gender, use of hypertension medication (yes/no), physical activity (yes/no), and history of diabetes (yes/no). Age was collected as a continuous variable but was categorized into the age groups <45, 45 - 54, and 55 - 64 years. Chi-square was used for analysis of categorical variables. Where at least one of the cells had an expected frequency of five or less, the Fisher exact test was used. Overall and gender prevalence of overweight and obesity were determined by generation of frequency tables. Calibration of this model was done using the Hosmer-Lemeshow goodness-of-fit test for the observed data range, and values greater than 0.05 indicated a good fit. A p-value of <0.05 was considered statistically significant for all analyses. Graphs and tables were drawn using Microsoft Excel 2016.

3. Results

3.1. General Overview

There was a total number of 216 staff who participated in the study, with varying ages ranging from age groups <45, 45 - 54 and 55 - 64 years and an average age of 36 ± 12 years. 47.7% (103) of the staff were male while 52.3% (113) were female. Generally, the prevalence of obesity (BMI \geq 30 kg/m²) in this study was 17.59% (38), Overweight (BMI 25 - 30), 38.89%, (84) healthy Weight, (BMI 18.5 - 24.9), 43.52% (94) (**Figure 1**).

3.2. Prevalence among Genders

43.7% (45) of males had a healthy BMI (BMI of 18.5 - 24.9 kg/m²), 42.7% (44) were overweight (BMI of 25.0 - 29.9 kg/m²), and 13.6% (14) were obese (BMI of 30 - 34.9 kg/m²).

Among females, 43.4% (49) had a healthy BMI, 35.4% (40) were overweight, and 21.2% (24) were obese. The relationship between gender and BMI was not statistically significant ($\chi^2 = 2.53$, $p = 0.28$) (See **Figure 2**).

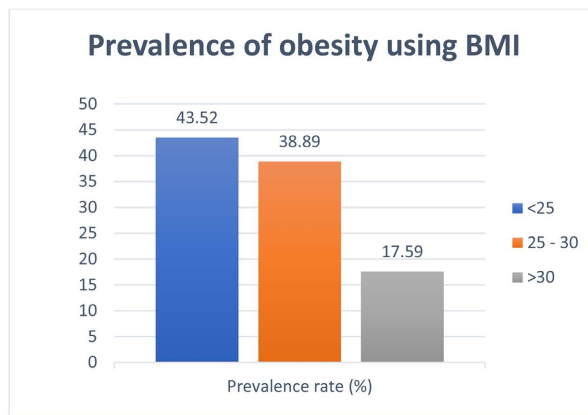


Figure 1. Showing prevalence of obesity using the BMI among the study population.

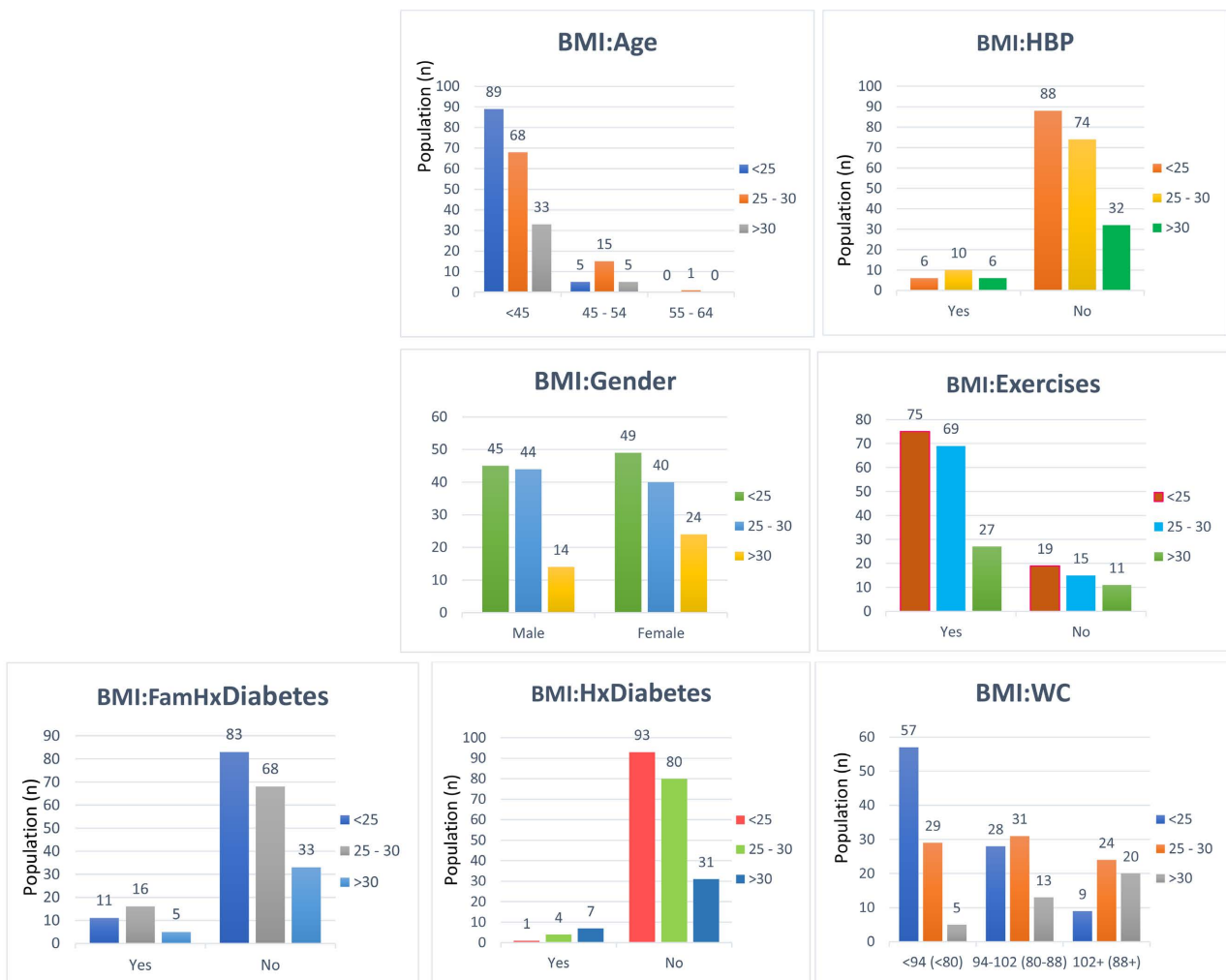


Figure 2. Graphical representation of BMI against Age, HBP, Gender and exercise.

3.3. Prevalence among Age Group

Among the age groups, those under 45 years had a higher proportion of participants with a healthy BMI, 89 (46.8%), compared to 35.8% (68) of overweight and 17.4% (33) obese. In the 45 - 54 years age group, the majority were overweight, 15 (60.0%), while 20.0% (5) were either healthy or obese. In the 55 - 64 age group, all participants were overweight (1). The association between age groups and obesity was not significant ($\chi^2 = 8.65$, $p = 0.07$) (see **Figure 2**).

3.4. Relation to Blood Pressure History

For staff who were on/had taken any form of high blood pressure (HBP) medication, 27.3% (6) of participants had a healthy BMI, 45.45% (10) were overweight, and 27.3% (6) were obese. Among participants who said “No” to HBP medication, 45.4% (88) had a healthy BMI, 38.1% (74) were overweight, and 16.5% (32) were obese. There is no association between high blood pressure and BMI ($\chi^2 = 3.06$, $p = 0.216$), see **Figure 2**.

3.5. Relation to Exercise

Participants who said “Yes” to at least, thirty minutes of daily exercises had 43.9% (75) with a healthy BMI, 40.3% (69) overweight, and 15.8% (27) obese. For those said “No”, 42.2% (19) had a BMI, 33.3% (15) were overweight, and 24.4% (11) were obese. The association between exercise and BMI was also not statistically significant ($\chi^2 = 1.99$, $p = 0.370$). See **Figure 2**.

3.6. Relation to Family History of Diabetes

Study participants with a family history of diabetes, who responded “Yes” had 33.3% (19) within the healthy BMI, 47.4% (27) overweight, and 19.3% (11) as obese. For those who responded “No”, 47.2% (75) had a healthy BMI, 35.8% (57) were overweight, and 17.0% (27) were obese. There was no association between family history of diabetes and BMI ($\chi^2 = 3.41$, $p = 0.182$).

The study participants were accessed for personal history of diabetes. Participants who said “Yes” with a healthy BMI was 1 (1.06%), overweight was 4 (4.76%) and obese was 7 (18.42%) while those who responded “No” had 93 (98.94%) within healthy BMI, 80 (95.24%) overweight and 31 (81.58%) obese. There was an association between diabetes and BMI ($p < 0.05$) as ($\chi^2 = 15.70$, $p = 0.00038$). See **Figure 2**.

3.7. Relation to Waist Circumference

Study participants had their waist circumference (WC) recorded with healthy BMI recording 57 (60.64%), overweight recording 29 (34.52%) and obese recording 5 (13.16%) amongst the Category 1 (Male < 94 and female < 80). The category 2 (Male 94 - 102, female 80 - 88) recorded 28 (29.79%) for healthy BMI, 31 (36.90%) for overweight and 13 (34.21%) for obese participants. Category 3 (Male,

102+ and female 88+) recorded 9 (9.57%) for healthy BMI, 24 (28.57%) for overweight and 20 (52.63%) for obese study participants. See **Figure 2**, **Figure 3**.



Source: Authors.

Figure 3. Images of measuring equipment.

4. Correlation

The relationship between the participants' socio-demographic and clinical parameters with BMI is presented in **Table 1**. The study revealed that a family history of diabetes was significantly related to higher BMI, with participants more likely to be overweight or obese ($p = 0.00030$). Similarly, participants with a personal history of diabetes were predominantly in the obese category ($p = 0.00038$).

Waist circumference also showed a strong association with BMI, as larger waist measurements were more common among obese individuals ($p = 9.2 \times 10^{-8}$).

In contrast, the analysis found no significant relationships between BMI and age, gender, high blood pressure, or exercise habits.

5. Following Binary Logistic Regression Analysis

A family history of diabetes mellitus (DM) was found to be associated with increased odds of obesity (OR = 3.947, 95% CI: 0.816 - 19.080), although this result was not statistically significant ($p = 0.088$). Conversely, having a personal history of DM significantly decreased the odds of obesity (OR = 0.054, 95% CI: 0.010 - 0.289, $p = 0.001$).

The Hosmer-Lame shows goodness of fit test indicating that the dataset was a good fit for the model. These findings suggest that while a family history of DM may elevate the risk of obesity, individuals with a history of DM were more likely to be obese in this study population.” (See **Table 2**)

Table 1. Relationship between socio-demographic, high blood pressure and exercise and BMI category of participants (n = 216).

	BMI (kg/m ²)			Total	Test statistics	p-value
	Healthy weight (18.5 - 24.9)	Moderate overweight (25 - 30)	Class 1 Obesity (>30)			
Age groups (years)					$\chi^2 = 8.65$	0.070
<45	89 (94.68)	68 (80.95)	33 (86.84)	190		
45 - 54	5 (5.32)	15 (17.86)	5 (13.16)	25		
55 - 64	0 (0.0)	1 (1.19)	0 (0.00)	1		
Gender					$\chi^2 = 2.53$	0.282
Male	45 (47.87)	44 (52.38)	14 (36.84)	103		
Female	49 (52.13)	40 (47.62)	24 (63.16)	113		
Hx of High Blood Pressure					$\chi^2 = 3.06$	0.216
Yes	6 (6.38)	10 (11.90)	6	22		
No	88 (93.62)	74 (88.10)	32	194		
Exercise					$\chi^2 = 1.99$	0.370
Yes	75 (79.79)	69 (82.14)	27 (71.05)	171		
No	19 (20.21)	15 (17.86)	11 (28.95)	45		
Fam Hx of Diabetes					$\chi^2 = 16.19$	0.00030
Yes	11 (11.70)	16 (19.05)	5 (13.16)	57		
No	83 (88.29)	68 (80.95)	33 (86.84)	159		
Hx of Diabetes					$\chi^2 = 15.70$	0.00038
Yes	1 (1.06)	4 (4.76)	7 (18.42)	12		
No	93 (98.94)	80 (95.24)	31 (81.58)	204		
Waist Circumference					$\chi^2 = 38.41$	9.2×10^{-8}
<94 (<80)	57 (60.64)	29 (34.52)	5 (13.16)	91		
94 - 102 (80 - 88)	28 (29.79)	31 (36.90)	13 (34.21)	72		
>102 (>88)	9 (9.57)	24 (28.57)	20 (52.63)	53		

Table 2. Binary logistic regression analysis for determining the predictors of obesity in the study population (n = 217).

Variables in the Model	Coefficients (B)	OR (95% CI)	p-value
Family history of DM	1.373	3.947 (0.816 - 19.080)	0.088
History of DM	2.923	0.054 (0.010 - 0.289)	0.001*
Constant	0.072		

*p-value significant at 0.05; OR—Odds Ratio; CI—Confidence Interval; DM—Diabetes mellitus. Hosmer-Lame shows goodness of fit test = 0.912.

6. Discussion

Obesity is a globally epidemic, even among health workers and getting a white-collar job has become a source for overweight and obesity. Such obesity can reduce work ability as manifested through sickness and absenteeism [23].

Although the prevalence of 17.6% found in this study is not so much of an

alarming rate, a similar study by Wahab *et al.* and Ojofeitimi *et al.* in northern and southwest Nigeria in their separate research reported a prevalence of 21% and 21.2% respectively [24] [25]. Wahab *et al.* accessed 300 healthy adults noting that the prevalence results may be linked to both nutritional and epidemiologic transitions as fast food outlets are rapidly springing up in many cities with high patronage, leading to the consumption of energy-dense foods. Ojofeitimi *et al.* while assessing 236 women, attributed the prevalence to respondents' perception as 30.5% of respondents perceived being obese as a sign of respect. In another study [23] done in South Africa among employees of a health institution like ours. Among 344 staff studied, results indicated a total of 33.7% were obese at the start of employment, which increased to 43.0% over a median 6.8 years employment duration. This was a trend amongst health workers with the reasons being unknown. Our study showed a higher number of staff with normal weight as well as that for overweight. This could be due to the vibrant and young workforce we currently have, attributed to ours, being a new institution with new employees.

The association between age groups and obesity was not significant ($p > 0.05$) this could be due to 87.96% of the entire study population being in the age group, less than 45 years as predominantly the workforce population of the civil service job. This is however similar to the study conducted by Adienbo [26] (whose study was amongst a mono-ethnic population; the Kalahari community of Delta state, South-south Nigeria) and contrary to studies by Jura [27] (which asserts that ageing is associated with an increase in percentage body fat by approximately 1% per decade) and Barzilai [28] (who reported that ageing is associated with the increase in abdominal white adipose tissues as well as fat deposits in the skeletal muscles). The same age group (younger than 45 years) recorded the highest moderate overweight, 80.95% (68) and obesity, 86.84% (33). The prevalence of obesity has been reported to be on the increase in recent times [29]. It is possible that the rate is catching up with that seen among older adults thus accounting for the lack of significant association with age.

Females in most studies have a higher prevalence of obesity when compared with their male counterparts. A percentage of 63.16% of obesity, was recorded for females while 36.84% was recorded for males. This has always been sustained as studies conducted by Ono [30] and Neupane [31] showed weight and obesity figures to be higher in women than in men. Ojofeitimi *et al.* [25] showed that women preferred obese status because "it makes one look mature", "It makes clothes fit better" and "it is evidence of good living".

Among healthcare workers in studies by Skaal and Pengpid, female still remained as the highest population of obese people when compared to their male counterpart [32]. This could be attributed to men being more engaged in strenuous work than women [33]. Same way, Obesity in women has been found to be significantly associated with being married, probably because married women eat a lot in the process of cooking for the family and are less likely to engage in sporting activities or take a walk [34].

The relationship between gender and obesity was not statistically significant ($p > 0.05$) in this research which could be attributed to the vibrant workforce that is predominantly young people who are eager to work and haven't developed default patterns to get work done as work-related stress and burnouts are still minimal in the teaching hospital currently.

There was no statistical significance ($p > 0.05$) between exercises and improved body mass, despite being a prominent risk factor. This could be because, individuals assume that work lifestyle is part of exercise routine as engaging in physical activity for health reasons conflicts with their social values (*i.e.*, family, friendships) or with work-related values [35].

On the part of blood pressure derangement or individual with chronic or acute elevated blood pressure, there was no prediction of obesity with consumption of HBP drugs, in our study. This is contrary to the study done by Egbi *et al.* who documented that obesity was independently predicted by hypertension. [18] This could be because the tertiary health institution, Federal Medical Centre (FMC) Yenagoa, was an older institution with an increased work-related stress routine unlike this study population that is new and has predominantly younger age groups that are physically active, usually trek to their destination and have a little or reduced sedentary lifestyle. Current studies have shown that obesity control can lead to control of hypertension [18] [34].

Individual with family history of type-two diabetes (T2D) had a lower BMI score; 11 (11.70%) for healthy BMI, 16 (19.05%) for overweight and 5 (13.16%) for obese, compared to those without family history of T2D; 83 (88.29%) for healthy BMI, 68 (80.95%) for overweight and 33 (86.84%) for obese study population. These findings are at variant with that documented by Scott [35] [36] and Cederberg³⁷ who recorded associated higher BMI with positive family history of T2D.

Although this study had no interactions with families as detailed family background and shared lifestyle/environment other than Yes/No classifications, however, Cederberg's [37] study was limited to random middle-aged men.

There was a low prevalence of T2D 1.06% (1) amongst the healthy BMI study group and 7 (18.42%) amongst the obese study population. This study has shown an association between T2D and increase in BMI ($p < 0.05$, as $p = 0.00038$). This is same as some studies [38] [39] which show that there is a direct (or linear) relationship between T2D and obesity, unlike a study carried out by Alegre-Díaz [40] in Mexico which disapprove the finding. Though this study didn't capture any relationship between obesity and insulin resistance, it captured the risk exposure to T2D.

7. Conclusion

The prevalence of obesity in the southern geopolitical zones is multifactorial. The increased patronage of fast food in southern Nigeria increased sedentary lifestyle due to more affluence and industrialization, differences in dietary habits and a

higher level of education in the southern region may also be part of the risk factors. Analysis of the data in this study has shown the prevalence of obesity was low 17.6% and Overweight, 38.9% respectively. The study has highlighted the socio-demographic determinants of obesity as gender, age < 45 years, history of diabetes, exposure to HBP drugs, family history of diabetes and exposure to exercise as factors that may increase risks of obesity and overweight. Obesity is associated with fat retention due to the number of meals per day, snacking, the addition of salt to meals, alcohol consumption and the practice of exercising or other sporting activities. HBP is also associated with snacking, sporting activities for at least 30 minutes, alcohol consumption and obesity. These determinants should form the areas of focus for interventions such as health education and the design of work environments as environments to promote physical activities while working, thus reducing the prevalence of obesity in tertiary institutions.

Limitations

The use of BMI as the sole measure of obesity may not fully capture body fat distribution, particularly in individuals with higher muscle mass or visceral fat.

Lastly, this study didn't capture any relationship between obesity and insulin resistance, while comparing BMI values to both family and patient history of T2D. Defective insulin metabolism can lead to decreased synthesis of lipids and proteins and facilitates energetic catabolism, which may explain why patients lose weight over time.

Recommendations

Recommending more policy changes like establishing workplace wellness programs that target obesity prevalence reduction among workers (staff) e.g. "walk for life" events, encouraging breaks for physical activities to limit sedentariness, and implementing policies on healthy food supplies in the hospital cafeterias.

Conflicts of Interest

There is no conflict of interest with respect to authorship, and/or publication of this article.

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