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The Pattern and Determinants of Overweight and Obesity among Adult Patients at the General Outpatient Clinic of Federal Medical Centre Makurdi: The Family Perspective

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ABSTRACT

Background: This study examined the prevalence, patterns, and determinants of overweight and obesity among adult patients attending the general outpatient clinic at Federal Medical Centre (FMC) Makurdi, Benue State, Nigeria.

Methods: This was a cross-sectional study of two hundred and ninety-six adult patients aged 18 years and above, selected by systematic random sampling method. Data was collected using an interviewer-administered questionnaire. Weight and height were measured. The non-modifiable, modifiable risk factors of obesity and body mass index were assessed. Chi-square was used to test for significant association between categorical variables and multivariate logistic regression to verify the independent factors associated with overweight and obesity. All statistical analysis was done using SPSS version 21 and were significant at $p<0.05$ and a 95% confidence interval.

Results: The mean age of participants was 39±13 years. The prevalence of overweight and obesity among the study participants was 40.9% and 30.4%, respectively. Overweight and obesity were significantly associated with age (P=0.017) marital status (P=0.017), employment status (P=0.014), monthly income (P=0.040), exercise (P=0.002) and frequency of exercise (P=0.001). Being in government employment (6.945, P=0.035, CI 1.141 – 42.2777) and earning between ₦54,000.00 and ₦90,000.00 monthly (11.097 P=0.017 CI 1.541 - 79.927) were independent determinants of overweight and obesity.

Conclusion

The study showed that a significant proportion of adults in the study population were overweight and obese. Most of the study participants did not routinely engage in healthy lifestyle. It is therefore vital for Family Physicians to routinely screen for overweight and obesity and offer health education and counselling on lifestyle modification to individuals and their families.

Keywords: Determinants, Lifestyle, Obesity, Overweight, Pattern.

INTRODUCTION

The prevalence of overweight and obesity has reached an alarming rate globally, posing a significant public health challenge (Koliaki et al., 2023). According to the World Health Organization (WHO), About 16% of adults aged 18 years and older worldwide were obese in 2022. The worldwide prevalence of obesity more than doubled between 1990 and 2022 and is expected to quadruple in 2035 (WHO, 2022) This rising trend is not confined to developed nations; it is increasingly present in low-and middle-income countries, including Nigeria

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(Iwuala et al., 2015). Understanding the pattern and determinants of overweight and obesity within certain populations with the family lens is crucial for developing targeted interventions and mitigating the associated health risks.

Obesity is abnormal or excessive fat accumulation that presents a health risk to the individual (WHO, 2022). Numerous chronic diseases, such as heart disease, type 2 diabetes, musculoskeletal disorders, and some malignancies, are significantly increased by obesity (Dankyau et al., 2016). Overweight and obesity have a variety of underlying causes, including the complex interactions between genetic, behavioural, environmental, and socioeconomic factors (Okoh, 2014). Globalization and urbanization have played a major role in dietary practices and physical activity habits, which has led to a rise in the prevalence of overweight and obesity (Inechi, 2016). Additionally, dietary practices and physical activity have undergone substantial changes in Nigeria as a result of the country's rapid urbanization and westernization (Inechi, 2016). Processed meals heavy in saturated fats, refined sugars, and salts gradually replace traditional diets rich in fibre, fruits, vegetables and whole grains (Inechi, 2016). Furthermore, a rise in sedentary jobs, a decline in walking and bicycling in urban design, and an increase in the usage of motorized transportation have all contributed to the prevalence of inactive lifestyles leading to overweight and obesity (Umuerri et al., 2017).

Obesity significantly impacts family relationships, and family dynamics can influence an individual's weight (Halliday et al., 2014). This interplay involves genetic, emotional, psychological, environmental, and socio-economic factors (Halliday et al., 2014). For example, family members often share genetic traits that can predispose them to obesity. Moreover, families share eating habits, physical activity levels, and lifestyle choices, which can greatly influence body weight. The shared environment within a household plays a crucial role in shaping dietary patterns and physical activity behaviours that contribute to obesity (Sydney et al., 2022)

The emotional climate of a family can affect eating behaviors and weight. Stress or emotional distress within family relationships may lead to emotional eating and subsequent weight gain (Dakanalis et al., 2023) Conversely, a supportive family environment can encourage healthy eating and regular physical activity. The presence or absence of emotional and psychological support within the family can significantly impact weight management efforts.(Sydney et al., 2022) Parents serve as critical role models for their children, and their attitudes and behaviors toward food and exercise can substantially shape their children's habits. Studies have shown that parenting style also plays a role in the development of obesity. For example, Berge et al reported that authoritative parenting, which balances warmth and discipline, is associated with healthier weight outcomes in children compared to permissive or authoritarian styles (Berge et al., 2010) How parents model and manage their health behaviours can influence the entire family's diet and physical activity approach (Berge et al., 2010).

Cultural expectations and norms around body image and food heavily have been found to influence family attitudes toward weight and obesity in France and the US (Sydney et al., 2022) In African communities, Boyington et al reported in a hospital-based study that Family traditions and social gatherings, which often revolve around food, can impact eating patterns and contribute to obesity (Boyington et al., 2008) Cultural values regarding body image and food consumption can either support or hinder healthy weight management practices within the family and community (Boyingto et al., 2008) Similarly, the quality of family communication plays a crucial role in addressing weight-related issues. Open and supportive communication can facilitate discussions about health and encourage positive changes. However, high levels of family conflict and stress can contribute to unhealthy eating patterns and weight gain (Dakanalis et al., 2023) Effective communication within the family is essential for promoting healthy behaviours and managing obesity (Sydney et al., 2022) Socioeconomic status is also viewed as a significant factor in obesity risk. Families with limited financial resources may have less access to healthy foods and opportunities for physical activity, increasing their risk of obesity or vice versa. Economic constraints can limit the availability of nutritious food options and recreational activities, which are critical for maintaining a healthy weight. (Sydney et al., 2022)

Family-based interventions are effective in the management of obesity. A systemic review of thirty-four articles by Arnason et al reported that programs that involve the entire family in lifestyle changes tend to yield better outcomes than those targeting individuals alone. Families working together towards common health goals can create a supportive environment that fosters sustainable weight management. Shared goals and collective efforts within the family can significantly enhance the success of obesity interventions.(Arnason et al., 2021)

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Despite the growing public health concern, there is a paucity of data on the prevalence and determinants of overweight and obesity in Makurdi, Benue State. Existing studies in Nigeria have primarily focused on urban centers such as Lagos and Abuja, with limited research conducted in other regions. This study aims to fill this gap by examining the prevalence, patterns, and determinants of overweight and obesity among adult patients attending the general outpatient clinic at Federal Medical Centre (FMC) Makurdi, Benue State, Nigeria.

MATERIALS AND METHODS

The Federal Medical Centre, Makurdi is a 450-bed tertiary care facility operating five sites in Makurdi town, the capital of Benue State.

This cross-sectional analytical study involved 296 adult patients aged 18 years and above attending the General Outpatient Clinic of Federal Medical Centre (GOPC) Makurdi using a systematic random sampling technique. A systematic sampling method of patients who met the inclusion criteria was carried out in the GOPC. The average number of patients aged 18 years and above seen weekly (five working days) over a three-month period as obtained from the medical records was 555 patients. The sampling frame for this study was calculated thus:

The number of patients per week X 4 weeks X study duration (3 months) =555 X 4 X 3 = 6660

The sampling fraction = 6660/296=22.5. The sampling ratio was then approximated to 23.

From the daily GOPC register, eligible patients were selected in the order in which they were listed as follows: The first adult patient recruited into the study was chosen from the first 23 adult patients by simple random sampling using the balloting technique. A number was randomly selected between one (1) and twenty-three (23) from one of three papers that were labeled 1, 2, ….. and 23, folded and placed in a basket where an independent observer was requested to pick one. The number that was picked was the nth number of the patient presenting at the clinic that was recruited for the study. For instance, if 2 was picked the second adult patient at the clinic was recruited and then twenty-three (23) was added to the nth number to identify the next subject to be picked, in this example, that would have been 2 + 23 =25th, then plus 23 = 48th and so on. This process was repeated every day until the required 296 subjects were recruited

The minimum sample size required was calculated using the Leslie and Kish formula for a single proportion.

$N = Z^2pq/d^2$

Z = A constant at 95% confidence level = 1.96

p = Proportion in the target population estimated to have a particular characteristic of interest in another study in North Central, Nigeria 26%.(Sola et al., 2011)

q= 1-p (i.e1-0.26) =0.74

d= desired precision of 5%=0.05

$N= (1.96)^2 (0.26 \times 0.1924)/ (0.05)^2$

Therefore N = 296 patients

All patients who presented were given health education on lifestyle modification. Those who were very ill and pregnant women were excluded. Written informed consent was obtained from the responders and the Ethical Committee of Federal Medical Centre, Makurdi, Benue State. Only serial numbers the responders initials and serial numbers were written on the questionnaires for confidentiality. They were counseled to opt-out at any point where they thought they were no longer comfortable with the process and that it would not affect the care that would be given to them. Data was collected by interviewer-administered questionnaire.

The weight was measured with the aid of a ZT-160 health weighing scale. The patient was required to remove

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all objects deemed to increase his or her weight, including shoes, phones, keys, wallets, and headgear. He or she was then stood upright on the scale with both feet close together. The author ensured the pointer of the machine was on zero. After the study participant had been correctly positioned the pointer on the measuring device became stable. The weight was read from the scale to the nearest 0.5 kg, and an average of three readings was taken.

The height was measured with the aid of a stadiometer. The patient removed his or her shoes and head gears and then stood upright with the back to the scale and heels together and arms by the side. The heels, buttocks, upper back and occiput touched the measuring rule. The headpiece of the stadiometer descended to the head and the height was measured in meters to the nearest 0.1cm. An average of three readings were taken. The body mass index (BMI) was calculated as the ratio of the weight in kilograms to the square of the height in meters. The BMI was taken as normal (18.5-24.9), overweight (25-29.9), obesity class 1 (30-34.9), obesity class 2 (35.0-39.9) and morbidly obsessed >40kg/m ^{2} respectively. The data was analyzed with the Statistical Package for Social Sciences (SPSS) version 21 and were significant at $p<0.05$ and a 95% confidence interval.

RESULTS

Table 1

The respondents were aged between 18 to 74 years with mean age of 39.19 ± 13.74) years. Half of all respondents were aged between 25-34 years (28.7%) and 35-44 years (21.3%). There were more females, 58.4% (n = 173). Most of the respondents were married (58.1%, n = 172), had secondary (28.0 %, n = 83) and tertiary (35.5%, n = 105) education, were of the Tiv tribe (59.1%, n = 175), were Christians (89.9%, n = 266) and were urban dwellers (72.3%, n = 214). Almost half of the respondents were either self-employed (24.7%) or employed with the private sector (20.9%, n = 62) and a higher proportion were low-income earners whose monthly incomes were within the range of < N 18,000 (44.6%, n = 132) and N 18,000 to < N 54,000 (34.1%, n = 101).

Table 2

Smoking was reported by 13.9% (n = 41) of respondents, while alcohol intake was reported by 25.3% (n = 75) of respondents. Only 3% (n = 9) of respondents reported excessive alcohol intake. Daily consumption of fast foods was reported by 22.6% (n = 67) of respondents. Only 14.5% (n = 45) of respondents consumed fruits and vegetables daily, most of whom consumed only one serving per day. Regular participation in moderate-intensity exercise was reported by 11.8% (n = 35) of respondents and only 0.7% (n = 2) of respondents did this on daily basis. Sedentary lifestyle was reported in 47.0% (n = 139) of the respondents.

Figure 1

The prevalence of normal weight, overweight and obesity were 28.7% (n = 85), 40.9% (n = 121) and 30.4% (n = 90) respectively.

Table 3

The prevalence of overweight/obesity was significantly higher in respondents aged 41 years and above compared to those aged 40 years and below (79.2% versus 69.9%; p = 0.010). Females had a higher prevalence of overweight/obesity compared to males but this difference did not meet statistical significance (73.3% versus 69.9%; p = 0.662). It was also shown that significantly higher proportions of those who had ever been married at the time or previously (married, widowed or divorced) were obese or over weight compared to those who were single (p = 0.017). With regard to employment status, the prevalence of overweight and obesity was highest among the government employed (84.2%) followed by the unemployed (78.4%) was lowest among the students (52.4%). These differences were statistically significant (p = 0.014). Respondents who earned a monthly income of N54,000.00 and above, had significantly higher prevalence of overweight and obesity compared to those who earned less than that (p = 0.040). In addition, religion was significantly associated with BMI while the level of education, ethnicity, address (rural or urban), were not.

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Table 4

The prevalence of overweight/obesity was higher among non-smokers compared to smokers though this difference failed to meet statistical significance (72.5% versus 63.4%; p = 0.230). The prevalence of overweight/obesity was highest among those who consumed excessive alcohol (77.8%), followed by those who consumed alcohol moderately (71.2%), and was lowest among those who did not consume alcohol at all (71.0%). These differences were, however, not statistically significant (p = 0.908). Respondents who did not indulge in regular consumption of non-alcoholic beverages had a slightly higher prevalence of overweight/obesity compared to those who did which was not statistically significant (72.7% versus 70.4%; p = 0.673). Similarly, respondents who did not indulge in regular consumption of fast foods had a higher prevalence of overweight/obesity compared to those who consumed fast foods regularly though the difference did not meet statistical significance (73.4% versus 64.2%; p = 0.144). The prevalence of overweight/obesity was highest among respondents who did not consume fruits and vegetables daily (73.3%) and decreased in descending order with increasing number of daily servings. A significantly higher prevalence of overweight/obesity was seen in those who did not engage in moderate-intensity exercise at all compared to those who did (74.3% versus 48.6%; p = 0.002). The prevalence of overweight/obesity decreased to 75% in those who exercised 6 times weekly and then to 60% in those who exercised 4-5 times weekly and was lowest in those who exercised only 2-3 times weekly (31.6%). This difference was statistically significant (p = 0.001). Respondents who had a sedentary lifestyle, watching television or sitting in front of the computer for 2 or more hours daily, had a higher prevalence of overweight/obesity compared to those whose daily television or computer use was less than 2 hours (73.4% versus 69.4%; p = 0.453).

Table 5:

The independent variables which were eligible to be entered into the logistic regression model were those that were significant following the bivariate analysis. These included; age, marital status, religion, employment status, monthly income (in naira), exercise and frequency of exercise. Being in government employment and earning between N54,000.00 to N90,000.00 monthly were found to be the significant and independent determinants of overweight and obesity.

DISCUSSION

This was a cross-sectional study conducted to assess the pattern and determinants of overweight and obesity among adults in the context of the family. The study recruited two hundred ninety-six (296) adult patients attending the General Out-Patient Clinic of Federal Medical Centre, Makurdi. Respondents were aged between 18 to 74 years with mean age of 39. 19 (± 13.74) years. The respondents' mean age in this study was lower than 44 ± 2 years obtained among chief executives of public and private organizations in Jos, Plateau state, Nigeria (Banwat et al., 2012). The prevalence of overweight and obesity was significantly higher in respondents aged 41 years and above compared to those aged 40 years and below (p = 0.010). This may be because those aged 40 and above are more likely to have tertiary education and may be working at their various well-paid occupations that are sedentary and may be more financially buoyant to afford more frequent high-caloric diets.

Females had a higher proportion of overweight (58.4%) and obesity than males with 58.4% and (41.6%) respectively. This agrees with the findings by Umuerri and colleagues but is contrary to that by Coll *et al* in the Mediterranean Region (Coll et al., 2015; Umuerri et al., 2017). These gender differences may be due to genetics, biological differences, health-seeking behavior, and family lifestyle of the studied population. For instance, concerning physical activity between males and females, females may engage in less physically active jobs and recreational activities than males. Most respondents were married (58%) while those divorced had the least frequency (0.34%). It was shown that significantly higher proportions of those who had ever been married at the time were obese or overweight compared to those who were single which stimulates findings from a Southwest community in Nigeria (Murakami et al., 2017). This may be reflective of the fact that married individuals were more likely to have family support or tradition to eat and may therefore eat more regularly, leading to weight gain. This was not congruent with the report by Murakami and his colleagues where a higher proportation of unmarried women were overweight and obese (Murakami et al., 2017). A positive relationship between having

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some emotional support in the form of marriage or cohabiting has been associated with overweight and obesity in Ethiopia and USA (Caryn & Thorpe, 2019; Dagne et al., 2019).

Majority of the respondents had tertiary education (35.5%) while those with secondary education were 28.0%. There was no statistically significant relationship between level of education and being overweight/obese. However, Akarolo-Anthony and colleagues reported that people who were highly educated were more likely to be overweight or obese while on the contrary, a study among Iranian women found obesity to be more prevalent in women with little or no education (Akarolo-Anthony et al., 2014; Ghorbani et al., 2015).

The modal employment status was the self-employed 24.70%. There was statistically significant relationship between level of education and being overweight/obese. It was observed that a significantly higher proportion of those who were self-employed were overweight and obese corroborating with studies in Nigeria as against findings in Ghana where respondents engaged in professional/managerial and sales/trade occupations were significantly more likely to be overweight and obese (Umuerri et al., 2017; Tuoyire et al., 2016). The observed difference may probably be because government jobs may be more sedentary and pay higher wages than other forms of employers and can afford more fast foods.

Tiv was the most predominant ethnicity with a prevalence of 59.1 % while the least was Igede (5.4%). Ethnicity had no statistically significant relationship between level of education and being overweight/obese. This is probably due to similarities in diet and occupation within Benue State where the tribes are domiciled. Religion showed a statistically significant association with overweight and obesity in this study. Christians and Muslims had a significantly higher prevalence of overweight and obesity (ρ =0.048). some components of religious theology may also discourage obesity especially when members consider depriving the body of food is synonymous with purity. Bharmal et al reported a higher proportion of overweight and obesity among respondents who were affiliated with Hinduism, Sikhism, and Islam compared to those with no religious affiliation and Christians among South Asian immigrants in the United States (Bharmal et al., 2015). In contrast to that study, women whose religion was Christianity rather than those of other religious were two times more likely to be overweight and obese in a Nigerian study (Fagunwa, 2017).

Urban dwellers had a higher prevalence of overweight and obesity compared to rural dwellers but this difference was not statistically significant. This was in agreement with a study in Nigeria, and India (Poobalan & Aucott, 2016); Umuerri et al., 2017). On the other hand, individuals residing in rural areas of Botswana were more likely to be overweight or obese. This may be likely due to the low physical activity and low fruit/vegetable intake (Keetile et al., 2019).

Most respondents earned less than 18,000 naira per month (44.60%). Respondents who earned a monthly income of N54,000.00 and above had a significantly higher prevalence of overweight and obesity compared to those who earned less than that. Those with high incomes may be able to afford processed food and maybe more sedentary. In like manner, the odds of being overweight and obese also increased as the average monthly income of the respondent increased in studies in Nigeria, Ghana and USA (Banwat et al., 2012; Ogden et al., 2017; Lartey et al., 2019). Conversely, a higher prevalence of overweight and obesity was reported among health service providers in Nigeria by Iwuala et al who reported that persons with lower monthly income of ≤200, 000 naira (approximately 1200 dollars) were almost 3 times more likely to be obese compared with persons in the 200,000-400,000 Naira category (Iwuala et al., 2015). This finding may be because low-income earners may not be able to afford good nutrition leading to more obesity among them.

More than half of the total population studied were either overweight (40.9%) or obese (30.4%). Compared to this study where the participants had a prevalence of 71.3% Maruf et al in a Nigerian study, reported a prevalence of 58.1% (Maruf & Udoji, 2015). Such a difference may be due to the characteristics of the studied population. One such difference in patient characteristics in the present study versus their study included tertiary education (35.5% vs 27.6%). Lower prevalence of overweight and obesity compared to this study has been observed in another study from Jos, Nigeria (31.4% vs 23.2%) (Inechi, 2016). This might be due to the different sampling techniques used.

The pattern of obesity in this study showed 40.9 % of the respondents were overweight and Grade 1 obesity was

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18.6%. Both overweight and Grade 1 obesity made up 87.6% of the study population. This is similar to the pattern of obesity reported previously in Jos Nigeria (Inechi, 2016). This pattern is supported by the observation that body build at the level of class 1 obesity is culturally and socially desirable and acceptable in Nigeria, and not usually regarded as a pathological condition (Inechi, 2016). It was also observed that female adults living in urban areas with tertiary education had a higher prevalence of overweight and obesity. This finding is also in tandem with the work of Darebo and colleagues in Ethiopia where significant proportions of middle-aged female adults were overweight and obese (Darebo et al., 2019). In India, Rani et al. in India reported a lower prevalence of overweight and obesity among the respondents, 6.2% were overweight and 5.2% were obese (Rani & Sathiyasekaran, 2013). The suggested reason was their mode of transportation to school the majority of the students were either walking or cycling which provides an opportunity for increased physical activity as against this present study where most of the respondents lived in urban areas where their mode of transportation was mostly by bus or motorcycle.

When comparing respondents aged 40 and under to those aged 41 and above, the prevalence of overweight and obesity was considerably greater ($p = 0.010$). This could be the case because those over 40 are more likely to have completed their higher education, to be employed in sedentary, well-paying jobs, and to be in better financial standing, allowing them to indulge in regular high-calorie diets. The results could also be explained by the way low- and middle-income nations have gradually evolved toward westernization.

In comparison to smokers, non-smokers had a higher prevalence of overweight/obesity; however, this difference did not reach statistical significance when measured by BMI (72.5% versus 63.4%; $p = 0.230$). This was consistent with prior research (Dare et al., 2015; Lartey et al., 2019). On the other hand, a cross-sectional investigation found the opposite association (Keetile et al., 2019). Even though both studies were cross-sectional, the study population's age and sample size varied.

It was shown that there is a negative correlation between alcohol use and being overweight or obese. Studies conducted in other nations, however, indicate that alcohol use can be a significant risk factor for weight gain. Studies in the UK and the US among adults who drank alcohol consumed 10% and 16% of their overall energy consumption, respectively (Murakami et al., 2017). This is because energy from alcohol is more addicting than energy from other foods. Alcohol use combined with increased energy intake can lead to a positive energy balance and, eventually, weight gain (Traversy & Chaput, 2015). Additional research conducted in Northeast China and Sri Lanka revealed no correlations between alcohol use and either central or overall obesity (Shiven et al., 2019; Jayawardana et al., 2017).

Ironically respondents who did not indulge in regular consumption of non-alcoholic beverages had a slightly higher prevalence of overweight and obesity compared to those who did which was not statistically significant ($p = 0.673$).

This was similar to findings in India where the BMI status of adolescents was not significantly associated with carbonated drink intake (Rani & Sathiyasekaran, 2013) and was dissimilar to findings from other studies (Basu et al., 2014); Inechi, 2016). Findings from this study showed that 22.6% of the respondents consumed fast foods or snacks every day, and 77.4% did not. This findings of 22.6% frequency of 45.6% however the study population were young undergraduates with busy schedules that might have altered their dietary habits (Inechi, 2016). In the UK, snacking frequency was inversely associated with measures of adiposity in normal-weight men and women (Connor et al., 2015). The observed difference may be because theirs was population-based research while the present study was hospital-based.

The results of this study, which showed extremely low fruit and vegetable consumption, are in line with those of previous investigations (Basu et al., 2014; Inechi, 2016; Yu et al., 2018). In Jiangsu Province, China, a cross-sectional household survey revealed that the prevalence of central and general obesity rose throughout the quartiles of diets high in vegetables (Shi et al., 2008). The results of this study can also be explained by the low level of awareness regarding the health advantages of fruits and vegetables. About 85.5 percent of people did not eat, 20% consumed one serving per day, and 4% consumed more than five servings per day.

Only 0.7% of respondents reported engaging in moderate-intensity exercise daily, compared to 11.8% of

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respondents who reported doing so regularly. The study's low level of physical activity is in line with previous research findings (Basu et al., 2014; Fagunwa, 2017). Ogunbode and his associates in South-West, Nigeria, support the notion that obesity and physical inactivity are positively correlated (Ogunbode et al., 2011). The respondents' low levels of physical exercise may have been influenced by their sedentary lifestyles—they were mostly employed and had post-secondary education.

Compared to those who used a computer or television less often than two hours a day (69.4% versus 73.4%; p = 0.453), those who led sedentary lives and watched television or used a computer for two or more hours a day were more likely to be overweight and obese. However, there was no statistically significant change. This was not in line with Munyowa's study, but it was in line with other studies (Kalyani & Corriere, 2014; Hess, 2016; Munyogwa & Mtumwa, 2018). In another study, boys were far more likely than girls to use computers for more than two hours a day (32.6%) compared to 23.0% ($p<0.001$) (Rani & Sathiyasekaran, 2013). The observed discrepancy might be the result of the subsequent study's use of a younger sample population.

CONCLUSION

This study has shown some significant inappropriate patterns and determinants of overweight and obesity in the study population. We recommend that risk factors for overweight and obesity should be routinely assessed during clinic visits to detect inappropriate management. Lifestyle modification measures should be offered routinely to families through health counselling on health promotion and disease prevention strategies. This study was descriptive and cross-sectional in design. It did not capture changes within the subjects over time. There may have been recall bias by some of the respondents. However, it stimulates the need for longitudinal studies.

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DECLARATION

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TABLES

Table 1: Sociodemographic characteristics of respondents

Variables	**Frequency (n = 296)**	**Percentage**
Age group (in years)		
≤ 24	42	14.2
25 – 34	85	28.7
34 – 44	63	21.3
45 – 54	53	17.9
55 – 64	37	12.5
≥ 65	16	5.4
Age group (< or > 40 years)		
≤ 40	171	57.8
≥ 41	125	42.2

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Mean age 39.19 (± 13.74)		
Sex		
Male	123	41.6
Female	173	58.4
Marital status		
Single	91	30.74
Married	172	58.11
Widowed	32	10.81
Divorced	1	0.34
Level of education		
None	49	16.6
Informal	25	8.4
Primary	34	11.5
Secondary	83	28.0
Tertiary	105	35.5
Employment status		
Government employed	57	19.3
Private sector employee	62	20.9
Self-employed	73	24.7
Unemployed	51	17.2
Student	42	14.2
Retired	11	3.7
Ethnic group		
Tiv	175	59.1
Idoma	44	14.9
Igede	16	5.4
Others*	61	20.6
Religion		
Christianity	266	89.9
Islam	27	9.1
Traditional worshippers	1	0.3
Others	2	0.7
Address		
Rural	82	27.7

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Urban	214	72.3
Monthly income		
< N18,000	132	44.60
N 18,000 - < N 54,000	101	34.12
N 54,000 - < N 90,000	33	11.15
N 90,000 - < N 126,000	13	4.40
≥ N 126,000	17	5.74

Key: n = total number; * others include Hausa, Yoruba, Igbo, Jukun etc.

Table 2: Lifestyle characteristics of respondents

Variables	**Frequency (n = 296)**	**Percentage**
Smoking		
Yes	41	13.9
No	255	86.1
Alcohol intake		
None	221	74.7
Moderate intake	66	22.3
Excessive intake	9	3.0
Consumption of non-alcoholic beverage		
Yes	186	62.8
No	110	37.2
Daily consumption of fast foods		
Yes	67	22.6
No	229	77.4
Daily consumption of fruits and vegetables		
No	251	84.7
1 serving daily	20	6.8
2 servings daily	14	4.7
3 servings daily	5	1.7
4 servings daily	2	0.7
≥ 5 servings daily	4	1.4
Moderate intensity exercise		

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None at all	261	88.2
2-3 times weekly	19	6.4
4-5 times weekly	10	3.4
6 times weekly	4	1.4
Daily	2	0.7
Hours of TV*/computer use		
> 2 hours / day	139	47.0
≤ 2 hours / day	157	53.0

Key: n = total number; * TV = television

Table 3. Association of BMI with sociodemographic characteristics of respondents

Variables	**BMI**		**Test statistics**	**DF**	***p* - Value**	**RR (95% CI)**
	Normal weightn (%)	**Overweight/ Obesityn (%)**				
Age group						
≤ 40	59 (34.5)	112 (65.5)				2.01
≥ 41	26 (20.8)	99 (79.2)	X^2= 6.62	1	**0.010***	**(1.18-3.42)** #
Sex						
Male	37 (30.1)	86 (69.9)	X^2= 0.19	1		1.12
Female	48 (27.7)	125 (73.3)			0.662	(0.67-1.86)
Marital status						
Single	37 (40.7)	54 (59.3)				
Married	40 (23.3)	132 (76.7)	Fisher's Exact test = 9.16			
Widowed	8 (25.0)	24 (75.0)				_____
Divorced	0 (0.0)	1 (100.0)			**0.017***	
Level of education						
None	12 (24.5)	37 (75.5)				
Informal	5 (28.0)	18 (72.0)				
Primary	11 (32.4)	23 (67.6)	X^2= 1.46	4	0.834	_____
Secondary	27 (32.5)	56 (67.5)				
Tertiary	28 (26.7)	77 (73.3)				
Employment status						
Government	9 (15.8)	48 (84.2)				
Private sector	17 (27.4)	45 (72.6)				

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Self employed	24 (32.9)	49 (67.1)				
Unemployed	11 (21.6)	40 (78.4)				
Student	20 (47.6)	22 (52.4)				
Retired	4 (36.4)	7 (63.6)	X^2= 14.24	5	**0.014***	_____
Ethnic group						
Tiv	48 (27.4)	127 (72.6)				
Idoma	11 (25.0)	33 (75.0)				
Igede	7 (43.8)	9 (56.2)				
Others	19 (31.1)	42 (68.9)	X^2= 2.38	3	0.497	_____
Religion						
Christianity	76 (28.6)	190 (71.4)				
Islam	6 (22.2)	21 (77.8)	Fisher's Exact test = 6.74			
Traditional	1 (100.0)	0 (0.0)				
Others [a]	2 (100.0)	0 (0.0)			**0.048***	_____
Address						
Rural	30 (36.6)	52 (63.4)				1.67
Urban	55 (25.7)	159 (74.3)	X^2= 3.43	1	0.064	(0.968-2.873)
Monthly income						
< N18,000	44 (33.3)	88 (66.7)				
N 18,000 - < N 54,000	31 (30.7)	70 (69.3)				
N 54,000 - < N 90,000	2 (6.1)	31 (93.9)			**0.040***	_____
N 90,000 - < N 126,000	3 (23.1)	10 (76.9)				
≥ N 126,000	5 (29.4)	12 (70.6)	X^2= 10.05	4		

Key: n = frequency; % = percentage; DF = degree of freedom; RR = relative risk, CI = confidence interval; ***** statistically significant

Table 4: Association of BMI with lifestyle characteristics of respondents

Variables	**BMI**		**Test statistics**	**DF**	***p* - Value**	**RR (95% CI)**
	Normal weight n (%)	**Overweight/ Obese n (%)**				
Smoking						
Yes	15 (36.6)	26 (63.4)				1.525
No	70 (27.5)	185 (72.5)	X^2= 1.44	1	0.230	(0.763-3.047)

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Alcohol intake						
None	64 (29.0)	157 (71.0)				
Moderate intake	19 (28.8)	47 (71.2)				
Excessive intake	2 (22.2)	7 (77.8)	X^2= 0.19	2	0.908	_____
Consumption of non-alcoholic beverage						
Yes	55 (29.6)	131 (70.4)				1.12
No	30 (27.3)	80 (72.7)	X^2= 0.178	1	0.673	(0.663-1.892)
Daily consumption of fast foods						
Yes	24(35.8)	43(64.2)				1.537
No	61(26.6)	168(73.4)	X^2= 2.136	1	0.144	(0.862-2.743)
Daily consumption of fruits and vegetables						
No	67 (26.7)	184 (73.3)				
1 serving daily	7 (35.0)	13 (65.0)				
2 servings daily	5 (35.7)	9 (64.3)				
3 servings daily	2 (40.0)	3 (60.0)	Fisher's Exact test = 6.16			
4 servings daily	1 (50.0)	1 (50.0)				
≥ 5 servings daily	3 (75.0)	1 (25.0)			0.202	_____
Moderate intensity exercise						
Yes	18 (51.4)	17 (48.6)				3.066
No	67 (25.7)	194 (74.3)	X^2= 10.00	1	**0.002***	**(1.494-6.290)**[#]
Frequency of exercise						
None at all	67 (25.7)	194 (74.3)				
2-3 times weekly	13 (68.4)	6 (31.6)				
4-5 times weekly	4 (40.0)	6 (60.0)	Fisher's Exact test = 15.35			
6 times weekly	1 (25.0)	3 (75.0)				
Daily	0 (0.0)	2 (100.0)			**0.001***	_____
Hours of TV/computer use						
> 2 hours / day	37 (26.6)	102 (73.4)				0.824
≤ 2 hours / day	48 (30.6)	109 (69.4)	X^2= 0.56	1	0.453	(0.496-1.367)

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Key: n = frequency; % = percentage; DF = degree of freedom; RR = relative risk, CI = confidence interval; ***** = statistically significant ($p \leq 0.05$); **#** = 95% CI for the difference between the 2 proportions does not include number 1, therefore difference is statistically significant; TV = television

Table 5: Logistic regression analysis of independent sociodemographic and lifestyle characteristics predicting overweight/obesity based on BMI

Variables	**Adjusted odds ratio (aOR)**	**95% confidence interval (CI)**	***p* - value**
Age group			
≤ 40	0.740	0.343 – 1.599	0.444
≥ 41*	1.000		
Marital status			
Single	0.000		1.000
Married	0.000		1.000
Widowed	0.000		1.000
Divorced*	1.000		
Religion			
Christianity	0.000		0.999
Islam	0.000		0.999
Traditional worshippers	4.133		1.000
Others*	1.000		
Employment status			
Government employed	6.945	1.141 – 42.277	**0.035**$^{+}$
Private sector employee	2.494	0.517 – 12.020	0.255
Self employed	2.341	0.485 – 11.295	0.289
Unemployed	4.951	0.963 – 25.443	0.055
Student	2.374	0.424 – 13.283	0.325
Retired*	1.000		
Monthly income			
< N18,000	1.518	0.357 – 6.450	0.572
N 18,000 - < N 54,000	2.282	0.553 – 9.418	0.254
N 54,000 - < N 90,000	11.097	1.541 – 79.927	**0.017**$^{+}$
N 90,000 - < N 126,000	1.333	0.217 – 8.213	0.756
≥ N 126,000*	1.000		
Regular exercise			
Yes	0.874	0.077 – 10.415	0.915

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No*	1.000		
Frequency of exercise			
2-3 times weekly	0.000		0.999
4-5 times weekly	1.193	0.014 – 2.747	0.224
6 times weekly	1.582	0.090 – 27.643	0.753
Daily*	1.000		

Key: * reference group; + statistically significant

FIGURES AND LEGENDS

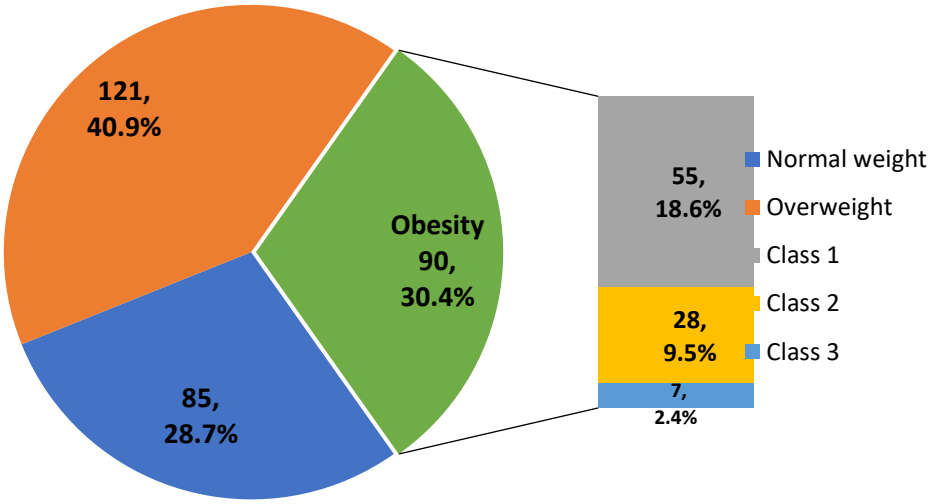

Figure 1: Bar on pie chart showing the BMI Distribution of respondents