Pattern and correlates of obesity among public service workers in Ondo State, Nigeria: a cross-sectional study

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Introduction
Obesity is a public health challenge and has reached epidemic proportion globally. Currently, over half a million adults have been reported to be obese worldwide. Although the highest prevalence of obesity is documented in the developed countries, evidence shows an increasing prevalence of obesity in the developing countries also, including Nigeria.

Besides the social and psychological burden independently associated with obesity, obesity further poses significant risk to chronic health conditions, thus increasing the overall disease burden. Also, there is an accompanying increase in direct healthcare costs as well as indirect losses in productivity associated with obesity, which have enormous health and economic implications.

Although genes predispose an individual to obesity, several other factors have been reported to be responsible for the rising epidemic of obesity. Among these are socio-demographic factors and changes in society, as well as the behavioural patterns of communities, brought about by economic growth, modernisation, urbanisation, as well as globalisation of food markets. As such, there is a resultant increase in the consumption of energy-dense foods and reduced physical activity patterns, leading to energy imbalance and, consequently, obesity.

Public service workers constitute the greater percentage of a nation’s workforce and are particularly prone to obesity as a result of sedentary behaviour as well as poor dietary practices. Given the significant role played by the public service workers in the economy of a nation, an increase in obesity among them could affect their cardiometabolic health negatively, reduce productivity and ultimately affect the health and the economy of the nation adversely. Epidemiological data on obesity and its determinants could play a crucial role in crafting effective public health and workplace policies. Several studies have been carried out on obesity among various population groups in Nigeria, however, there is a paucity of data on the correlates of obesity among public service workers. This study therefore sought to determine the prevalence and correlates of obesity among civil servants in Akure, Ondo State, Nigeria.

Methods
This was a cross-sectional study involving 4 828 public civil service workers across 47 ministries, departments and agencies in Ondo State, Nigeria. Relevant demographic and lifestyle measures were obtained using the World Health Organization (WHO) STEPwise Questionnaire. Height and weight were measured using standardised procedures. Obesity and overweight were defined according to the WHO Criteria as a body mass index (BMI) of ≥ 30 kg/m² and 25–29.9 kg/m², respectively. Bivariate and multivariate (logistic regression models) analyses were used to determine the significant predictors of obesity.

Results: Of the total participants (n = 4828), there was a male to female ratio of 1:1 (male = 2 299 and female = 2 529). One in every five participants was found to be obese with 55% of the participants having a BMI ≥ 25 kg/m². In the bivariate analysis, female sex (p < 0.000), age above 41 years (p < 0.000), post-primary education level (p < 0.001), marriage (p < 0.000), no alcohol consumption (p < 0.001), diabetes (p < 0.000) as well as hypertension (p < 0.000) were significantly associated with obesity. In the multivariate analysis, after adjusting for confounders, only female sex (AOR = 5.7, CI = 4.7–6.9), age (AOR = 1.4, CI = 1.1–1.8), level of education (AOR = 0.8, CI = 0.7–0.9), marital status (AOR = 2.1, CI = 1.7–2.1), alcohol consumption (AOR = 0.7, CI = 0.5–0.9), diabetes mellitus (AOR = 0.7, CI = 0.5–0.9) and hypertension (AOR = 0.5, CI = 0.4–0.6) were the significant and independent predictors of obesity.

Conclusion: This study found a high prevalence of obesity among public service workers in Akure, Nigeria, possibly attributed to ageing, being of female gender, being married, and having other non-communicable diseases. A well-implemented workplace policy focusing on integrated screening for obesity and non-communicable diseases should be prioritised in Nigeria.

Keywords: diabetes mellitus, hypertension, obesity, overweight, public service workers
Methods

Study area and design
This cross-sectional study was carried out among public service workers from 47 ministries, departments and agencies (MDAs) in Akure, Ondo State. Akure is a big city and the administrative state capital of Ondo State. There are over 30,000 workers working in the various MDAs with official working hours of 08h00 to 16h00 (Nigerian time).

Participants and sample size
All public civil service workers in Ondo state ministries, departments and agencies who fulfilled the inclusion criteria and were on duty during the period of the study were recruited. Participants were included if they were 18 years and above, willing to participate and had fasted for eight hours prior to the time of study. However, pregnant and lactating women, and those with physical deformities affecting anthropometric measurements were excluded. A convenient sample of workers \( (n = 4,828) \), corresponding to about one-sixth of the workers in Akure, across the various MDAs was considered adequate to test the hypothesis of the study. A communique detailing the purpose, process and specified dates for each ministry was sent to the relevant authorities and all workers. Each MDA was allocated one to three days in which to gather adequate samples of workers for the study.

Data collection
Trained research nurses took measurements of weight and height of the participants. The majority of the participants completed the previously validated World Health Organization (WHO) STEPwise Methodology for the surveillance of non-communicable diseases’ (NCDs) risk factors at the country level. A convenient sample of participants across the various MDAs was selected.

The questionnaire included items on gender, age, managerial grade level, marital status, cigarette smoking status, alcohol intake, dietary patterns, hours of sleep and physical activity. Level of education was defined as the highest grade level attained in school and participants were categorised as having no formal education, primary (grade 1–6), secondary (7–12), tertiary (first degree in university or colleges of higher learning) or postgraduate (minimum of second degree). Participants were categorised based on their grade level into: senior management staff (Level 13–17), middle-level staff (Level 8–12) and junior management staff (Levels below 8).

Data were collected on daily consumption of red meat (Western-type diet), cigarette smoking status (considered as ‘smoked’ if they had ever smoked cigarettes or not), excessive consumption of alcohol (if they had ever had three or more units of alcohol daily for men and two or more units for women or not). Physical activity was based on self-reporting and participants were categorised as inactive (having a sedentary lifestyle) if they spent eight or more hours in a sitting position per day.

Measurements
Weight: Body weight was measured in light clothing to the nearest 0.5 kg in the standing position using a Soehnle® Scale (Soenle-Waagen GmbH, Muhrhardt, Germany). The height was measured by stadiometer in a standing position with feet together (without shoes to the nearest 0.5 cm), holding their breath in full inspiration and Frankfurt line of vision.20 Body mass index (BMI) was calculated as weight divided by height in square metres. BMI was categorised in accordance with WHO criteria\(^7\) as <18.5 kg/m\(^2\), 18.5–24.9 kg/m\(^2\), 25.5–29.9 kg/m\(^2\) and >30.0 kg/m\(^2\) as underweight, normal, overweight and obese, respectively.

Blood glucose: Glycaemia was measured using Accutrend\(^8\) test strips, (2010 LifeScan, Inc. 021–606, Switzerland), for capillary blood glucose (fasting state). Diabetes was defined as fasting blood greater than or equal to 7.0 mmol/l.\(^24\)

Blood pressure: Systolic and diastolic blood pressure were measured in accordance with standard protocol\(^23\) with a validated Microlife\(^8\) BP A100 Plus model (Omron HEM – 705 CP Device, Tokyo, Japan), which provided an average of two readings for each participant. Hypertension was defined as average of two systolic blood pressure measurements of ≥140 mmHg and diastolic of ≥90 mmHg or a history of hypertension. Both the blood glucose and the blood pressure were measured by a qualified nurse involved in the data collection.

Data analysis
Data were expressed as mean values ± standard deviations (SD) for continuous variables. Counts (frequency = n) and proportions (%) were reported for categorical variables. Percentages were compared using a chi-square test. Student’s t-test was used to compare means between groups. We calculated the univariate odds ratio (ORs) using a Maentel–Haenszel test and multivariate ORs and their 95% confidence intervals (95% CIs) using logistic regression to identify the determinants of obesity. Our logistic regression model analysis adjusted for confounding factors, which was performed to estimate the independent determinants of obesity. A p-value of <0.05 was considered statistically significant. Data were analysed using the Statistical Package for Social Science (SPSS\(^9\)) version 21 for Windows (IBM Corp, Armonk, NY, USA).

Results
Of the total participants \((n = 4,828)\); 52.4% \((n = 2,529)\) were females while 47.6% \((n = 2,299)\) were males. The majority had at least a secondary education (86.5%), were married (76.6%), and fell in the middle-level category (53.2%). Sedentary behaviour (spending up to eight hours daily in sitting position) was reported by 24.5% of study participants with no significant difference between sexes (Table 1).

The prevalence of overweight and obesity was 35% and 20%, respectively (Figure 1). Obesity was strongly associated with female gender, ageing (≥41 years), post-primary education, being married, no excessive alcohol consumption, being inactive, and diabetes mellitus as well as hypertension (Table 2). There was no significant association between grade level of workers and obesity.

In the multivariate regression analysis, after adjusting for engagement in physical activity, consumption of red meat and managerial grade level, only gender, age, level of education, marital status, excessive alcohol consumption, diabetes mellitus and hypertension were the significant and the independent determinants of obesity (Table 3).

Discussion
We sought to determine the pattern and correlates of obesity among civil servants in Akure, Ondo state, Nigeria. The prevalence of obesity found among the study participants was comparable to the prevalence reported among worksite workers at Abuja, Nigeria\(^4\) and urban-dwelling adults from various regions of
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A higher prevalence than the current study was recorded among public civil servants in Lagos, and in the northern part of Nigeria. A thorough comparison of the prevalence of obesity might be difficult as a result of variation in sampling, participants, location and age range across studies. The high prevalence of obesity recorded among the civil servants requires attention and might be attributed to sedentary behaviour and poor dietary practices among this group. There is a need for the implementation of public health and workplace policies promoting active living and healthy lifestyle in order to curb the growing prevalence of obesity and its consequential lifestyle.

Female gender was found to be significantly associated with obesity among the study participants. This finding is consistent with several other studies in Nigeria and other African countries. This, however, is contrary to the report from most high-income countries where male gender was reported to be associated with obesity. Several reasons have been proffered as being responsible for the higher prevalence of obesity found among females. Adeniran et al. argued that the higher prevalence of obesity found among females is basically a result of behavioural factors because both male and females are exposed to genetic, physical and environmental conditions that predispose them to obesity. Cultural beliefs have also been identified as a plausible factor.

Studies have shown that social norms of acceptability or preference for big body size among African women contributes to the high prevalence of obesity among them. Some African women still wrongly perceive being obese or overweight as a sign of affluence. Also, women have also been shown to be less active than men. Given the significant role played by physical activity in maintaining energy balance, obesity is therefore unavoidable in the presence of physical inactivity. In addition, weight gain, which is usually associated with successive pregnancies, contributes to obesity among the young reproductive-aged women while the older women have reduced basal metabolism, which also leads to weight gain. This is also a possible explanation for the higher prevalence of obesity found among the married workers. Another contributing factor to obesity found among the study population was ageing. Ageing has been reported by several other studies to be associated with obesity as a result of reduced physical activity level and reduced metabolism as one grows older. These contribute to lesser utilisation of energy, leading to energy imbalance, a precursor to obesity.

Post-primary education was also observed to be associated with obesity among the public service workers. Educational attainment constitutes a major part of socio-economic status. We presume that those with a higher level of education might be associated with a better work position and consequently a higher income and socio-economic status. Evidence in high-income countries shows that low socio-economic status is often related to a higher level of obesity, but the reverse has been said to be the case in developing countries where individuals with higher socio-economic status have higher levels of obesity. This was linked to the improved purchasing power usually associated with high socio-economic status, which usually gives such individuals the ability to purchase and consume energy-dense foods that are often detrimental to metabolic health.

Surprisingly, a higher prevalence of obesity was found among public civil servants who do not consume alcohol. There seems to be a complex relationship between alcohol consumption and obesity. While some authors argued that alcohol use predisposes to weight gain as a result of the stimulation of appetite, another indicated no clear-cut relationship between alcohol consumption and weight gain. The association between alcohol consumption and weight gain has been reported to be dependent on other variables such as physical inactivity, genetics

### Table 1: Baseline characteristics of the respondents

| Variables                      | Overall N (%) | Male n (%) | Female n (%) | p-value |
|--------------------------------|---------------|------------|--------------|---------|
| **Age groups**                 |               |            |              |         |
| Less than 24 years             | 215 (4.5)     | 91 (4.0)   | 124 (4.9)    | 0.000   |
| 25–34                          | 1185 (24.5)   | 541 (23.5) | 644 (25.5)   |         |
| 35–44                          | 1673 (34.7)   | 773 (33.6) | 900 (35.6)   |         |
| 45–54                          | 1408 (29.2)   | 681 (29.6) | 727 (28.7)   |         |
| 55–64                          | 333 (6.9)     | 200 (8.7)  | 133 (5.3)    |         |
| 65 and above                   | 14 (0.3)      | 13 (0.6)   | 1 (0.0)      |         |
| **Level of education**         |               |            |              |         |
| No formal education            | 59 (1.3)      | 49 (2.2)   | 10 (0.4)     |         |
| Primary education              | 568 (12.4)    | 356 (16.1) | 212 (8.9)    | -       |
| Secondary education            | 1258 (27.7)   | 556 (25.2) | 702 (29.6)   |         |
| Tertiary education             | 1783 (38.9)   | 779 (35.3) | 1004 (42.3)  |         |
| Postgraduate education         | 911 (19.9)    | 467 (21.2) | 444 (18.7)   |         |
| **Marital status**             |               |            |              |         |
| Single                         | 934 (19.8)    | 442 (19.9) | 492 (19.8)   | 0.000   |
| Married                        | 3606 (76.6)   | 962 (49.8) | 1163 (56.4)  |         |
| Widowed                        | 131 (2.8)     | 10 (0.4)   | 121 (4.9)    |         |
| Separated                      | 38 (0.8)      | 8 (0.4)    | 30 (1.2)     |         |
| **Grade level**                |               |            |              |         |
| Junior staff                   | 1162 (29.1)   | 555 (28.8) | 607 (29.5)   | 0.000   |
| Middle level                   | 2125 (53.2)   | 962 (49.8) | 1163 (56.4)  |         |
| Senior level                   | 704 (17.6)    | 413 (21.4) | 291 (14.1)   |         |
| Sleep less than six hours daily| 1634 (38.8)   | 806 (35.0) | 828 (32.6)   | 0.043   |
| Smoke more than three cigarettes per day | 138 (2.9) | 99 (4.3) | 39 (1.5) | 0.000 |
| Consume red meat               | 1555 (32.1)   | 816 (35.4) | 739 (29.1)   | 0.000   |
| Excessive consumption of alcohol| 411 (8.5)    | 353 (15.3) | 58 (2.3)     | 0.000   |
| Engage in physical exercise    | 2172 (44.9)   | 983 (45.3) | 1189 (54.7)  | 0.002   |
| Spend up to eight hours daily in sitting position | 1187 (24.5) | 560 (24.3) | 627 (24.7) | 0.390 |

Notes: N = total frequency, n = frequency.
and gender. Such underlying factors might have contributed to the higher level of obesity found among the study participants who did not consume alcohol.

Finally, cardiovascular risk factors, specifically diabetes and hypertension, were found to be associated with obesity. Obesity was found to be higher among participants with hypertension and diabetes. This is not surprising as other studies have documented a similar relationship between obesity, hypertension and diabetes. The clinico-pathological relationship between obesity and other cardiovascular risk factors has been extensively documented in the literature. This points to the need to prioritise actions targeted at the reduction of obesity in order to reduce the associated burden of non-communicable diseases among civil service workers and the population at large.

Strength and limitations
The limitations of our study should be noted. A cross-sectional study utilising a convenience sampling technique could not ascertain causal association. Self-reporting of some of the lifestyle measures may have introduced bias. However, given the large sample size and participation of workers from all the MDAs, the findings highlight the need for workplace policies and cardiometabolic screening programmes for public civil service workers to curb the menace of obesity among them.

Conclusion
There is a high prevalence of overweight and obesity associated with clustering of diabetes mellitus and hypertension among civil service workers in Akure, Nigeria. We found evidence of epidemiological transitions (physical inactivity and an ageing population) among the study population. A well-implemented workplace policy on non-communicable diseases should aim at reducing physical inactivity and overweight/obesity among the civil service workers in that country, particularly among women and the older age groups.

Declarations

Ethics and consent to participate – Ethical approval was granted by the Ondo State Health Research Ethics Committee (SHREC-
Acknowledgements — The authors are grateful to the heads of the various ministries, departments and agencies for the unflinching support towards the successful implementation of the project.

Funding — The project was partly funded by the Ondo State Ministry of Health which has no influence on the conceptualisation, design, implementation or outcome of the study.

Competing interests — The authors declare no conflict of interest.

Authors’ contributions – IA, OF, MA: conceptualised, designed the protocol and collected data. OVA, DTG, EEO: provided intellectual input to the design of the protocol and drafted the manuscript. AIA: conducted the statistical analysis. All authors read the manuscript and approved the final version.

Consent for publication – All authors approved the submission of this final draft towards publication in a peer-reviewed journal.

Availability of data and materials – Data from this study will be made available on request.

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Table 3: Multivariate (LR Model) analysis on determinants of obesity

| Variables                  | B     | SE     | Wald  | OR (95% CI) | p-value |
|----------------------------|-------|--------|-------|-------------|---------|
| Sex                        |       |        |       |             |         |
| Female                     | 1.74  | 0.10   | 317.90| 5.7 (4.7–6.9)| 0.000   |
| Male                       |       |        |       |             |         |
| Age groups                 |       |        |       |             |         |
| 41 and above               | 0.33  | 1.13   | 6.31  | 1.4 (1.1–1.8) | 0.012   |
| Less than or equals 40     |       |        |       |             |         |
| Level of education         |       |        |       |             |         |
| Primary or no formal education | 0.21 | 0.09   | 5.71  | 0.8 (0.7–0.9) | 0.017   |
| Post-primary education     |       |        |       |             |         |
| Marital status             |       |        |       |             |         |
| Ever married               | 0.78  | 0.13   | 36.64 | 2.1 (1.7–2.8) | 0.016   |
| Never married              |       |        |       |             |         |
| Excessive consumption of alcohol | 0.39 | 0.17   | 5.12  | 0.7 (0.5–0.9) | 0.024   |
| Diabetes mellitus          |       |        |       |             |         |
| Yes                        | 0.39  | 0.16   | 5.78  | 0.7 (0.5–0.9) | 0.000   |
| No                         |       |        |       |             |         |
| High blood pressure        |       |        |       |             |         |
| Yes                        | 0.71  | 0.09   | 69.22 | 0.5 (0.4–0.6) | 0.000   |
| No                         |       |        |       |             |         |

Notes: OR = odds ratio; SE = standard error.

AD4693/307). Prior to each day’s interview, a public lecture was delivered to the participants describing all information regarding the study. Information sheets and consent forms were provided to the participants. All participants provided written informed consent before they were enrolled for the study. Participants were interviewed in a secured room to ensure privacy and confidentiality of each worker.

Consent for publication – All authors approved the submission of this final draft towards publication in a peer-reviewed journal.

Availability of data and materials – Data from this study will be made available on request.
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