ORIGINAL ARTICLE

ISSN: 0331 - 670X

https://doi.org/10.51412/psnnjp.2025.06

The Nigerian Journal of PHARMACY
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A Cross-sectional Baseline Survey on Random Blood Glucose (RBG) Screening at World Diabetes Day Commemoration Health Outreach amongst Adult Residents' of Gwagwalada Federal Capital Territory Abuja, Nigeria

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ARTICLE INFO

Article history:

Received 31st January 2025
Revised 19th April 2025
Accepted 25th April 2025
Online Published

Keywords:

Abuja FCT,
Diabetes Mellitus,
Gwagwalada,
Health Screening,
Random Blood Glucose Testing

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ABSTRACT

Background: Diabetes poses a significant public health challenge globally, necessitating proactive screening measures for early detection and intervention. Random Blood Glucose (RBG) screening is an effective tool for identifying abnormal glucose levels and assessing diabetes risks.

Methods:A cross-sectional baseline study was conducted in University of Abuja Teaching Hospital Gwagwalada Abuja (N8° 57' 1.4976", E 7° 3' 45.4212"), Nigeria amongst 150 adult residents that voluntarily participated in the Health Awareness Talk, and granted verbal informed consent, with the goal of screening their random blood glucose. A random screening approach was adopted. The demographic data and views and response of volunteers were collected via structured questionnaires. The other clinical parameters of interest captured were subjects' RBG, Body Mass Index, Waist Circumference, blood pressure and pulse rate. Data analysis was then carried out using SPSS for frequencies and percentages of responses. Descriptive and inferential statistical analyses were determined using chi square test. A p value of 0.05 or less represented the threshold for statistical significance.

Results: The majority of participants were females (66%) aged 41–50 years (38.7%) with tertiary education (59.3%). Findings revealed that 5.7% of respondents had elevated RBG levels (>7.8 mmol/L), while a substantial proportion exhibited elevated BMI and waist circumference, indicating obesity-related risks. Alarmingly, 49.3% were unaware of their diabetes status, underscoring gaps in health awareness.

Conclusion: The study highlighted the need for targeted public health interventions promoting regular screening and education, especially for middle-aged adults at risk of obesity-related conditions.

1. Introduction

Diabetes mellitus is a chronic, non-communicable disease that continues to pose significant global health and economic challenges, with a rising prevalence in low- and middle-income countries[1]. In Nigeria, the increasing burden of diabetes is compounded by limited access to healthcare services and inadequate awareness about preventive measures. Random Blood Glucose (RBG) screening is a valuable tool for detecting abnormal glucose levels, allowing timely interventions to prevent the onset of diabetes-related complications.

While several studies have investigated the prevalence of diabetes in Nigeria, few have explored the interplay between RBG levels and demographic variables such as age, gender, and educational status in semi-urban areas like Gwagwalada, Abuja.

Despite increasing awareness of diabetes globally, many adults in semi-urban and peri-urban Nigerian communities remain undiagnosed until complications arise. Gwagwalada, a fast-growing sub-region of the Federal Capital Territory, presents a unique demographic mix of rural and urban dwellers with diverse socio-economic backgrounds and limited access to consistent primary healthcare services. This diversity places the population at an elevated risk of underdiagnosed non-communicable diseases such as diabetes mellitus. However, there is limited localized data assessing baseline glycemic status and associated risk factors in this setting[2,3,4].

The importance of early detection through community-based screening cannot be overemphasized, especially as a significant portion of at-risk individuals remain unaware of their condition. Furthermore, obesity-related indicators like waist circumference and BMI are often overlooked in primary screenings despite their strong association with diabetes and cardiovascular risk. This study was therefore designed to fill the critical data gap by providing baseline epidemiological evidence on random blood glucose levels, obesity indicators, and diabetes awareness among adults in Gwagwalada. The findings will support targeted public health strategies and resource allocation for diabetes prevention and early intervention in similar settings[5,6,7].

Random Blood Glucose (RBG) screening is a vital tool for identifying abnormal glucose levels, offering critical insights into the prevalence and risk of diabetes within populations[8]. This review explores existing literature on baseline studies of RBG screening, highlighting their findings, methodologies, and gaps.

Random Blood Glucose (RBG) screening measures glucose levels at any point in time, irrespective of fasting status. It is widely used in community and clinical settings due to its convenience and effectiveness in early detection of hyperglycemia, prediabetes, and diabetes[9]. RBG screening also serves as a practical tool for epidemiological studies, particularly in resource-limited settings where fasting glucose tests may not be feasible.

Research has consistently shown significant variability in RBG levels across different populations. For example, a study conducted in India found a high prevalence of abnormal RBG levels in rural areas due to limited access to healthcare and poor dietary habits[10]. However, in contrast, urban populations often have higher RBG levels due to sedentary lifestyles and increased stress[11].

Community-based baseline studies demonstrate the value of RBG screening in underserved areas. For instance, a study in Sub-Saharan Africa highlighted that 20% of participants had elevated RBG levels, yet 80% were previously undiagnosed[12]. Such findings emphasize the need for scalable screening programs.

Baseline studies on RBG screening play a crucial role in understanding the prevalence and risk factors for abnormal blood sugar levels. While existing research provides valuable insights, there is a need for more comprehensive, demographically inclusive studies. The findings of such studies will help shape effective diabetes prevention and management strategies.

Methodology

Sample Size Determination

The minimum sample size was estimated using Cochran's formula for cross-sectional studies:

n=Z2pqd2n=\frac{Z^2pq}{d^2}n=d2Z2pq

Where:

Z = 1.96 (standard normal deviate at 95% confidence)

p = 0.07 (estimated national prevalence of diabetes in Nigeria[13])

$q = 1 - p = 0.93$

$d = 0.05$ (margin of error)

$n = (1.96)2 \times 0.07 \times 0.93 (0.05)2 \approx 100n = \frac{(1.96)^2 *0.07 * 0.93}{(0.05)^2} \approx 100n=(0.05)2(1.96)2×0.07×0.93≈100$

Considering a likely 20% non-response rate, and need for robustness of the number of participants, an addition of 50 was done to the sample size to arrive at 150 participants being recruited for the study[14].

A cross-sectional baseline study was conducted at the University of Abuja Teaching Hospital Gwagwalada Abuja (N8° 57' 1.4976", E 7° 3' 45.4212"), Nigeria, amongst adult

residents that voluntarily participated in the Health Awareness Talk, and granted verbal informed consent, with the goal of screening their random blood glucose. A random sampling approach was adopted until the 150 participants was reached. The demographic data, views and responses of volunteers were collected via structured questionnaires.

The other clinical parameters of interest captured were particpants' RBG, Body Mass Index, Waist Circumference, blood pressure and pulse rate. The measurements were administered as follows: for Random Blood Glucose (RBG) Testing; capillary blood samples were collected via thumb or index finger prick using sterile single-use lancets. Random blood glucose levels were measured using pre-calibrated digital Accu-Chek Active® glucometers (Model GB 28663075). Measurements were taken regardless of fasting status, and the process followed manufacturer's protocol. Glucometers were quality-checked before and during the outreach using control solutions. Blood pressure was measured using the Omron® M3 Intellisense Automatic Upper Arm Blood Pressure Monitor. Participants were seated and rested for at least 3-5 minutes in a quiet environment. The left arm was used, supported at heart level resting on the table, and two measurements were taken one minute apart; the average was recorded. Also, the displayed pulse rate was recorded simultaneously.

The anthropometric Measurements were also determined as follows: Weight was measured using a Hana® Mechanical Personal Scale (Model BR9011) to the nearest 0.5 kg, with participants wearing light clothing and bear footed with no shoes stood still on it and reading recorded. Height was measured to the nearest 0.01 m using a portable stadiometer, with participants standing upright bear footed without shoes, with a ruler placed on top of the respondents' head the reading in cm was taken and recorded. Waist Circumference was measured using a non-stretchable tape measure at the midpoint between the lower rib and iliac crest of respondent after exhalation, reading taken and recorded. Body Mass Index (BMI) was calculated as weight (kg) divided by the square of height (m^2).

Data analysis was then carried out using SPSS for frequencies and percentages of responses. Descriptive and inferential statistical analyses were determined using the chi-square test. A *p*-value of 0.05 or less represented the threshold for statistical significance.

Ethical approval with assigned number UATH/HREC/PR/2025/01/216 FWA00011836 was obtained from the Institutional Review Board of the University of Abuja Teaching Hospital (UATH) Gwagwalada Abuja. The confidentiality and anonymity of the data were maintained and strictly guarded in compliance with the Ethical Approval.

Results

Demography

A total of 150 respondents were recruited for this study, with the majority of the respondents being females (60.0%), and the dominant age group was 41 to 50 (50.0%), whilst a total of (52.0%) of the respondents had tertiary level of education. Also, half (50.0%) of the participants were not from any of the three dominant Nigerian ethnic groupings of Hausa, Yoruba or Igbo, whilst 44.7% of the respondents were civil servants. Further details on the socio-demographic characteristics are shown in Table 1 below.

Table 1: Socio-Demographic Data

Variables	Frequency (%)
Age	
18 to 30	16 (10.7)
31 to 40	12 (8.0)
41 to 50	75 (50.0)
51 to 59	26 (17.3)
60 and above	21 (14.0)

Sex	
Male	60 (40.0)
Female	90 (60.0)
Ethnicity	
Hausa	22 (14.7)
Yoruba	26 (17.3)
Igbo	27 (18.0)
Others	75 (50.0)
Educational Level	
No formal education	5 (3.3)
Primary school	13 (8.7)
Secondary school	39 (26.0)
ND/NCE	15 (10.0)
B.Sc/HND	47 (31.3)
Postgraduate	31 (20.7)
Employment Status	
Government	67 (44.7)
Private	50 (33.3)
Unemployed	33 (22.0)

Source: 2024 WAPCP Abuja Health Outreach

Clinical Parameters

Random Blood Glucose (RBG), Blood Pressure (BP) and Pulse Rate

Results from this study showed that the majority (94.3%) of the respondents have normal RBG and 5.7% prediabetes level, whilst (40.0%) of the respondents are prehypertensive and 25.0% are hypertensive at different stages. Also, more than half (61.3%) of the participants have a pulse rate between 70 to 90 beats per minute. Further details are presented in the figure below.

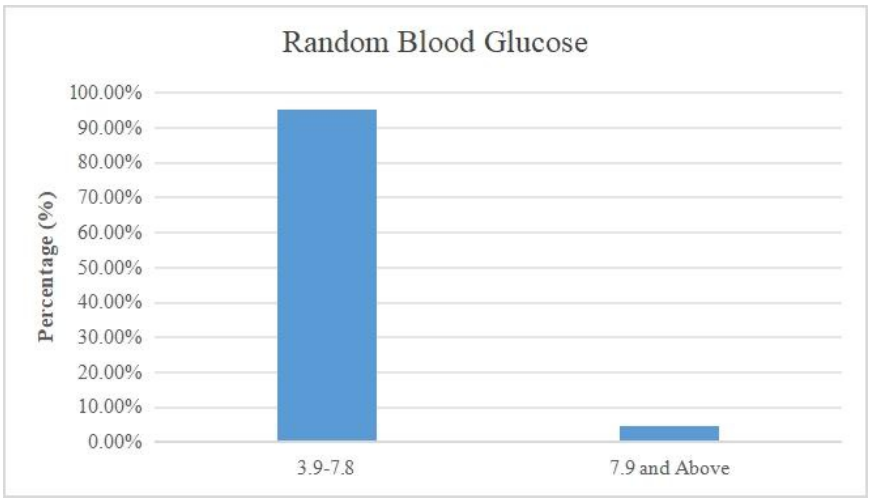

Figure 1: Distribution of Respondents' RBG Level

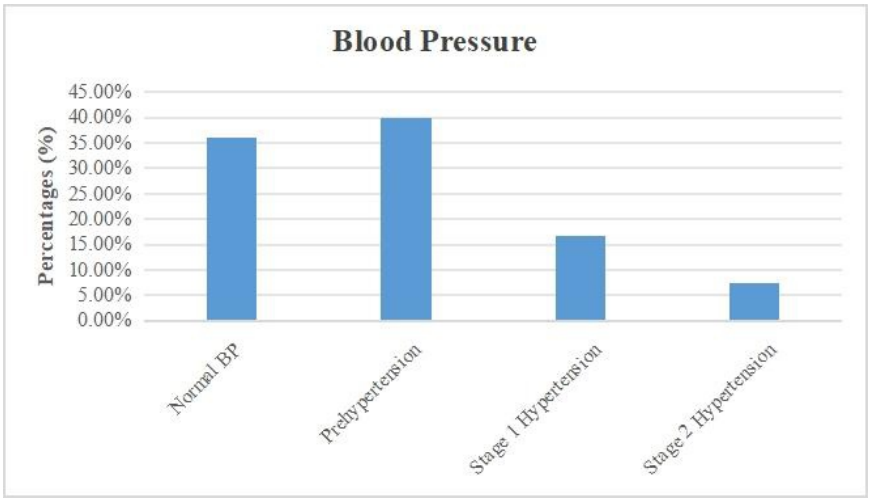

Figure 2: Distribution of Respondents' Blood Pressure

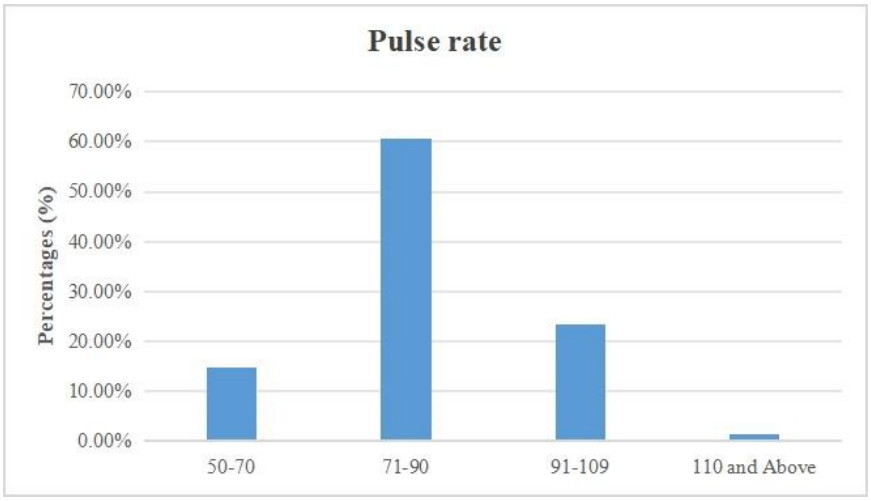

Figure 3: Distribution of Respondents' Pulse Rate

5.2.2 Body Mass Index (BMI), Weight, Height and Waist Circumference

It was observed that 30.0% of the respondents in this study weighs between 70 to 80 kg, whilst 45.3% of the respondents have a height between 1.60 to 1.70 m. Slightly above half of the participants (58.0%) have a BMI above 24.9 Kg/H (M^2) and the majority of the respondents have waist circumference above 81 cm. Further details are presented in the figures 4, 5, 6 and 7.

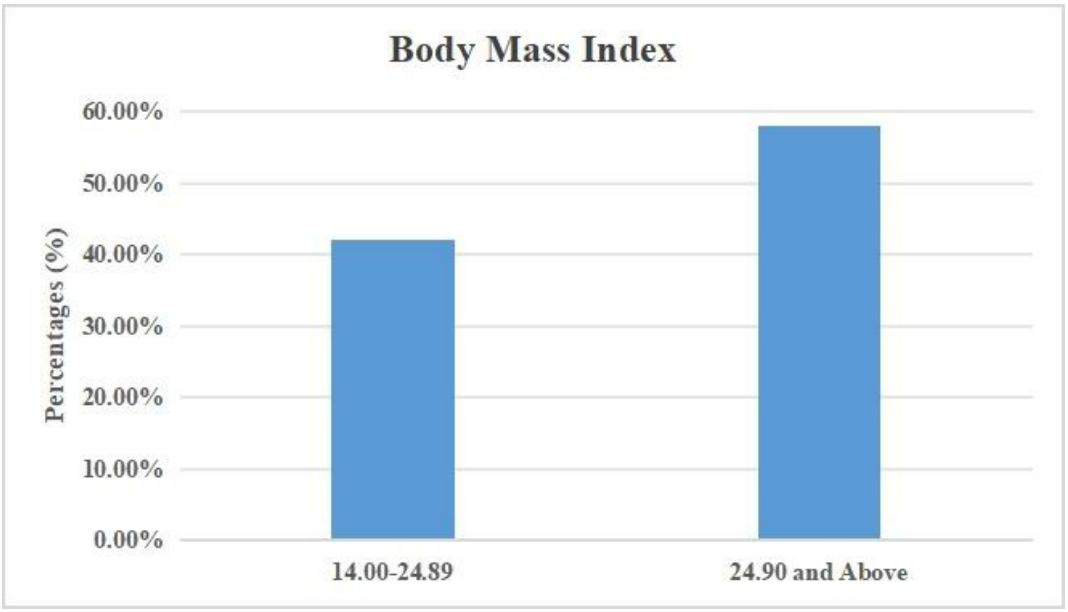

Figure 4: Distribution of Respondents' BMI

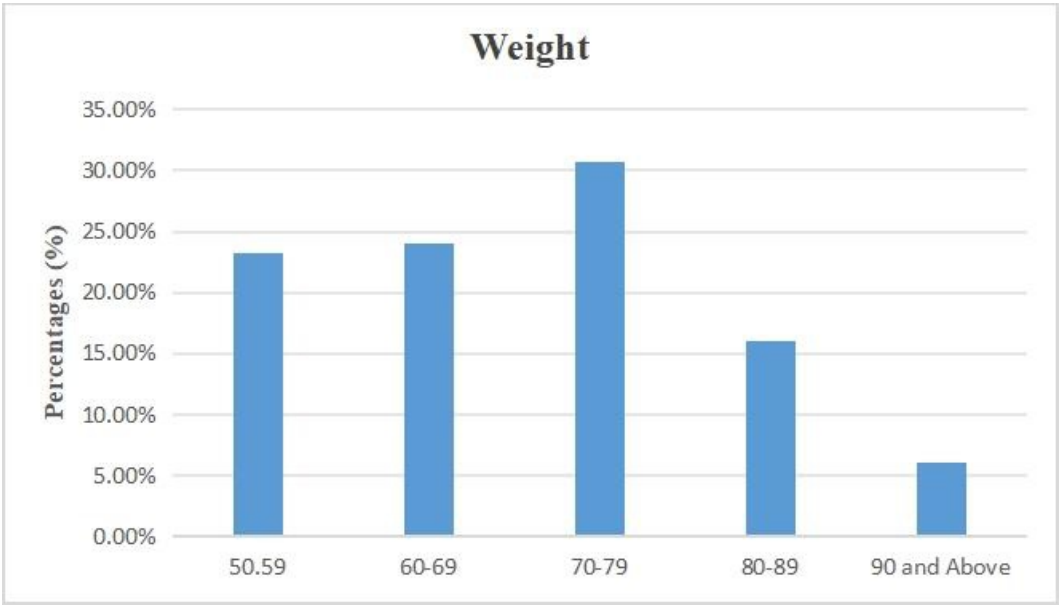

Figure 5: Distribution of Respondents' Weight

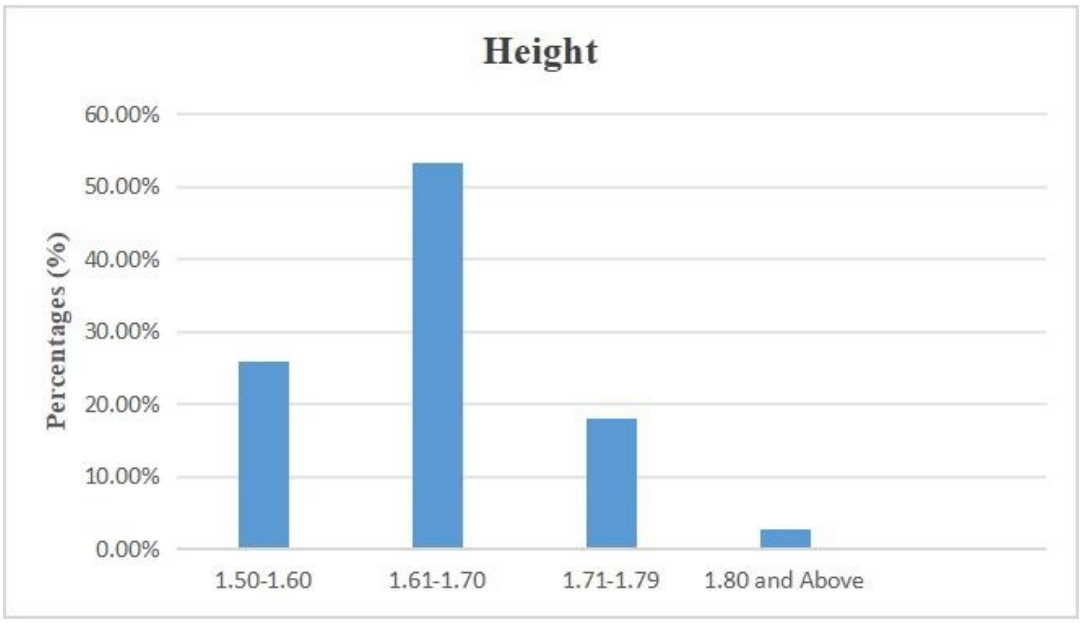

Figure 6: Distribution of Respondents' Height

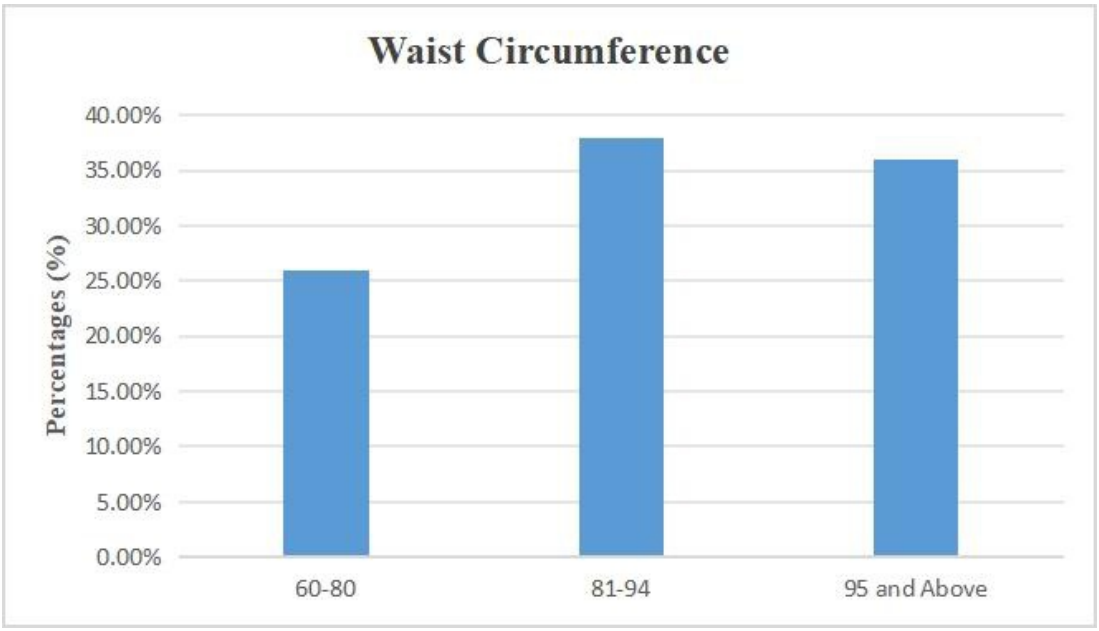

Figure 7: Distribution of Respondents' Waist Circumference

Diabetes, Smoking, Alcohol Status and Family History of Diabetes

The majority of the respondents (49.3%) are not aware of their diabetes status, whilst 86.0% of the study participants have never smoked. Above three quarters (72.0%) of the respondents do not consume alcohol and the majority of the respondents do not have close relatives with diabetes. Further details are presented in the figures 8, 9, 10 and 11.

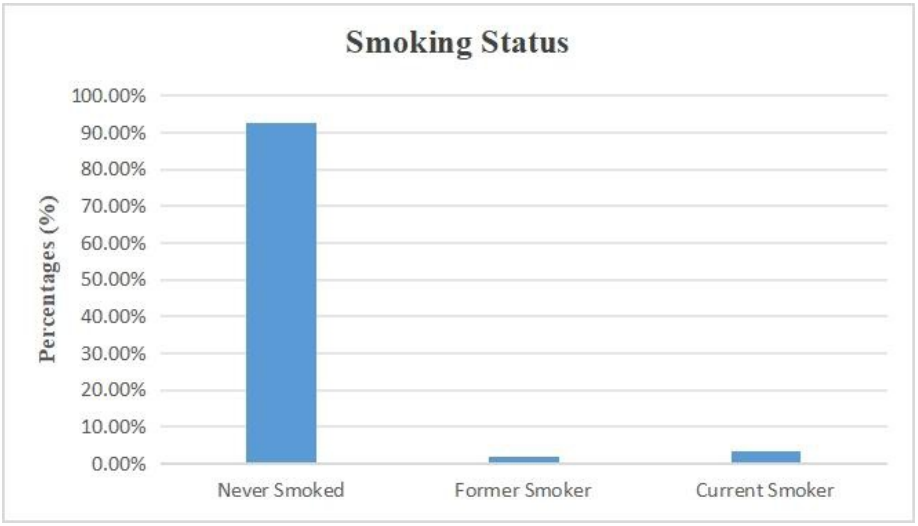

Figure 8: Distribution of Respondents' Smoking Status

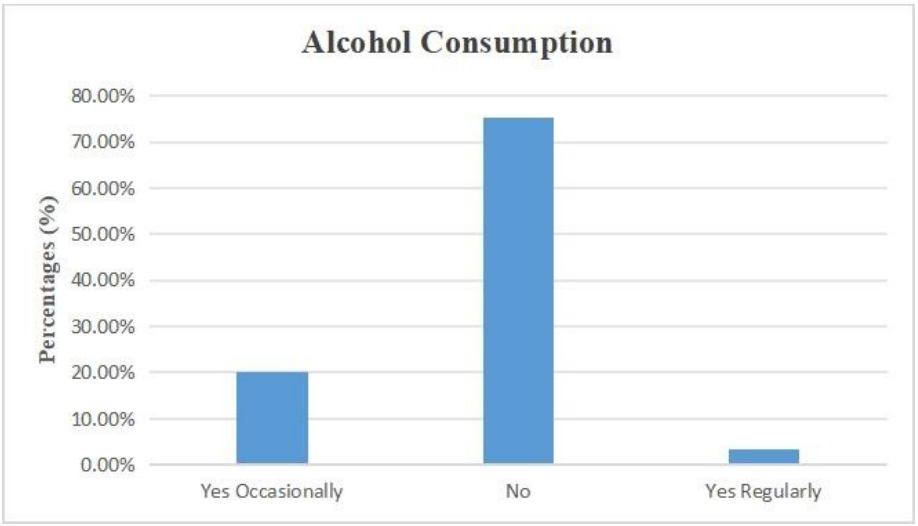

Figure 9: Distribution of Respondents' Alcohol Consumption

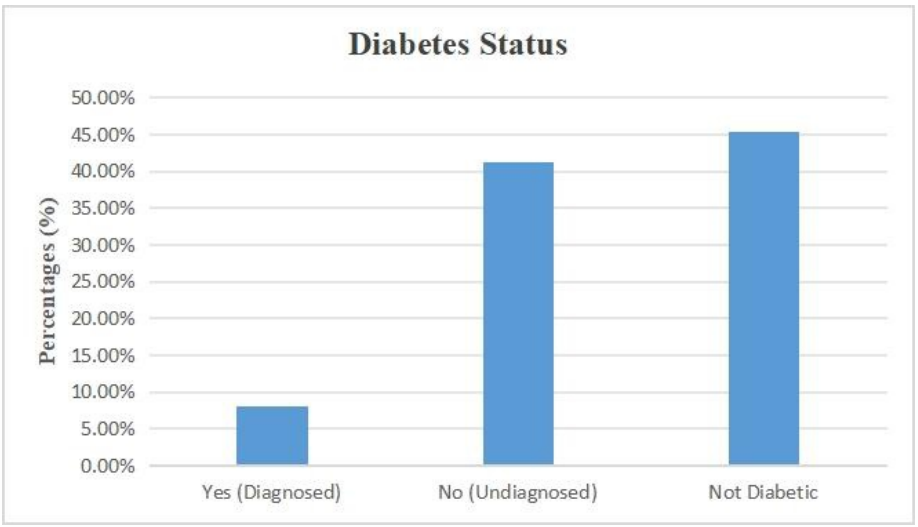

Figure 10: Distribution of Respondents' Diabetes Status

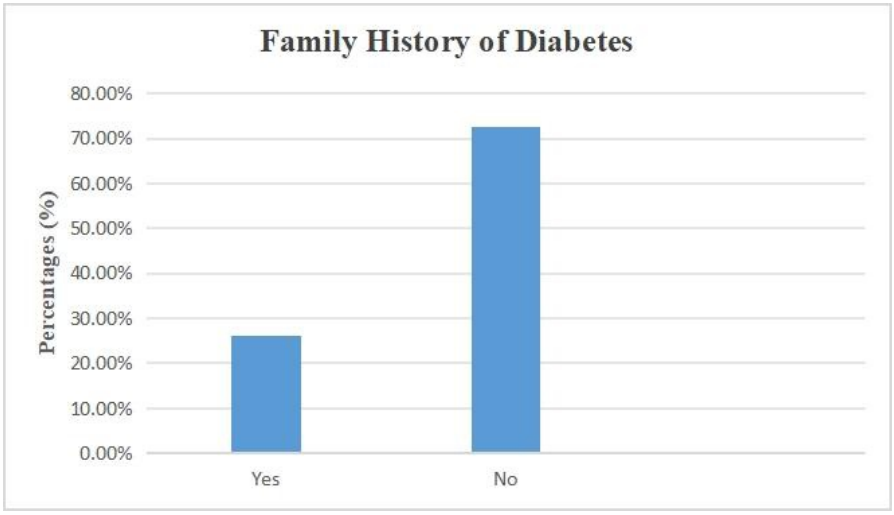

Figure 11: Distribution of Respondents' Family History of Diabetes

The descriptive crosstab statistical analysis was carried out using chi-square test to determine the association between waist circumference and gender data. The result showed that only (38.6%) of the male participants have a waist circumference above 95cm whilst above three quarters (82.3%) of the female respondents have a waist circumference above 81cm. These results were statistically significant (p=0.034). Further details are presented in Table 2.

Table 2: Cross Tabulation of Gender and Waist Circumference

Statement	Gender	60-80 (%)	81-95 (%)	95 and Above (%)	X^2	*P-value*
Waist Circumference	Male	22 (38.6)	14 (24.6)	21 (36.8)	10.408	0.034
	Female	16 (17.8)	42 (46.7)	32 (35.6)		

The descriptive crosstab statistical analysis was carried out using the chi-square test to determine the association between RBG and demographic variables. The result showed that respondents in all age groups have RBG values below 7.9. These results were statistically insignificant (p=0.863). Also, the majority of the study showed that both genders have RBG values below 7.9. These results were statistically insignificant (p=0.787). Similarly, most of the study respondent at all education levels have their RBG value below 7.9. These results were statistically insignificant (p=0.323). The majority of the participants both employed (Government & Private) and unemployed have their have RBG value below 7.9. These results were statistically insignificant (p=0.226). Further details are presented in table 3.

Table 3: Cross Tabulation of Age, Gender, Education level and Employment Status to Random Blood Glucose (RBG)

Demographic Data		RBG Level			
		3.9-7.8 (%)	7.9 and Above (%)	X^2	*P-value*
Gender	Male	55 (96.5)	2 (3.5)	0.478	0.787
	Female	85 (94.4)	5 (5.6)		

Age	18-30	15 (93.8)	1 (6.3)	1.288	0.863
	31-40	12 (100.0)	0 (0.0)		
	41-50	72 (96.0)	3 (4.0)		
	51-59	24 (92.3)	2 (7.7)		
	69 and Above	20 (95.2)	1 (4.8)		
Education Level	No Formal Education	5 (100.0)	0 (0.0)	5.832	0.323
	Primary School	12 (92.3)	1 (7.7)		
	Secondary School	35 (89.7)	4 (10.3)		
	OND/NCE	14 (93.3)	1 (6.7)		
	B.Sc./HND	47 (100.0)	0 (0.0)		
	Postgraduate	30 (96.8)	1 (3.2)		
Employment status	Government	68 (98.6)	1 (1.4)	2.973	0.226
	Private	50 (92.6)	4 (7.4)		
	Unemployed	25 (92.6)	2 (7.4)		

Discussion

The study findings highlight the trends and patterns connecting to broader health and societal concerns. The dominance of females and civil servants may reflect the sampling methodology and accessibility of the study population which had only voluntary respondents that presented themselves for screening. The high level of education suggests that participants might be more informed about health practices, which could influence their clinical outcomes.

The study found that 5.7% of respondents had RBG test reading of over 7.8mmol/L, which is a serious health concern as according to a study, a single RBG test with a reading of over 5.6mmol/L is more strongly associated with undiagnosed diabetes than any traditional single risk factors like obesity[15].

The RBG and BP results indicate that many participants are at risk of acquiring prediabetes or hypertension. This study found a BP prevalence of 8 % for Stage 2 Hypertension and 17% for Stage 1 Hypertension, which is similar to findings in another study at Life Camp Abuja that found a prevalence of 2.5 percent for stage 2 hypertension and 18.3 percent for stage 1 hypertension[16].

Another study stated that high rates of blood pressure, also known as hypertension are generally considered to be affected by genetic make-up, blood type, more specifically, of an individual[17]. To control these borderline values and avoid their progression to chronic illnesses, public health interventions could focus on education and lifestyle changes. Four of the study participants had very high BP as a Hypertensive emergency and were immediately referred to the nearest General Outpatient Department for more immediate medical attention, which the study team followed up.

The significant incidence of higher BMI and waist circumference highlights the need for focused measures to combat obesity and its related hazards, such as diabetes and cardiovascular disease. Conforming to a study BMI and

waist circumference are the main diagnostic indicators of overweight/obesity used in clinical practice, but this measure cannot provide an accurate indication of fat mass or distribution[18]. The study also suggested that markers of central fat, even in people with illness, are better indicators of future risk compared with BMI, waist circumference and intentional weight reduction is usually beneficial for controlling Cardiovascular disease risk in those with central obesity. Waist circumference, as a measure of central obesity, may be associated with metabolic syndrome in this population.

Low levels of smoking and alcohol intake are good indicators of a healthy lifestyle. A study found that people's healthy living activities are inversely associated with their risk of all-cause mortality[19]. Compared to people who live an unhealthy lifestyle (smoking, no or excessive alcohol intake, no physical activity, poor food, obesity). However, the significant percentage of participants who were uninformed of their diabetes status demonstrates a gap in routine health screening and awareness initiatives. This may be an area for improvement in community health programs.

The study results indicate a population with several risk factors for chronic diseases, such as obesity and elevated BP. The data suggest the need for public health strategies focusing on routine screening and health education to improve awareness of diabetes and BP risks, lifestyle interventions targeting obesity and central adiposity, policy measures to support healthy eating and physical activity, especially for middle-aged adults.

Conclusion

This study revealed a significant burden of prediabetes, obesity, and related chronic disease risk factors among adult residents of Gwagwalada. The findings emphasize the urgent need for accessible diabetes screening programs and targeted public health interventions addressing obesity management and lifestyle modifications. Future research should explore longitudinal data to better understand the progression of these risk factors.

Acknowledgement

The support of the members of the West African College of Pharmacists (WAPCP) Abuja Zone Executive Committee in approving the funds for the execution of the study, the twenty (28) volunteer pharmacists as well as the members of the Local Organizing Committee are greatly acknowledged. Also, the support of the HOD Pharmacy Department of the University of Abuja Teaching Hospital Gwagwalada is greatly appreciated.

Conflict of Interest

We declare that there is no conflict of interest to disclose.

Funding

This study was funded by the West African College of Pharmacists (WAPCP) Abuja Zone with the support of Mega Life Sciences Limited Abuja in the provision of Test strips and glucometers for the RBG Screening. The West African Postgraduate College of Pharmacists (WAPCP) Abuja Zone is an association of all pharmacists that are fellows of the WAPCP practising in the Federal Capital Territory Abuja. The zone has its periodic health outreaches, this time to commemorate the 2024 World Diabetes Day on November, 14th 2024 with the Theme: "Breaking Barriers, Bridging Gaps", a survey was conducted. The WAPCP Abuja Zone, as a way of rendering corporate social responsibility to the community, organized and delivered a targeted health talk to raise awareness on the dangers of unmanaged diabetes and conducted a free comprehensive Random Blood Glucose, Body Mass Index and Waist Circumference screening for volunteers in attendance, at the premises of the University of Abuja Teaching Hospital Gwagwalada located at Gwagwalada Abuja, Nigeria.

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