

## THE CORRELATION BETWEEN SOCIO-DEMOGRAPHICS AND PREVALENCE OF DIABETES MELLITUS AMONG PATIENTS ATTENDING SELECTED HOSPITALS IN KANO METROPOLIS, NIGERIA

<sup>1</sup>Shamsu Abdullahi ADAM & <sup>2</sup>Femi Rufus Tinuola

Address Texila American University

Shamsuabdullahi43@yahoo.com

+2348034376163

<sup>2</sup>Dept of Sociology, Federal University Gusau, Zamfara State

DOI: <https://doi.org/10.64450/njsh.v4i2.015>

### ABSTRACT

*Diabetes mellitus is a silent killer and one of the leading causes of death globally, with complications affecting multiple organ systems, yet population-based studies remain scarce in Nigeria, particularly in northern regions where health-seeking behaviour is limited. This cross-sectional study aimed to determine the correlation between socio-demographics and prevalence of diabetes mellitus among 300 patients attending Murtala Muhammad Specialist Hospital and Muhammad Abdullahi Wase Teaching Hospital in Kano Metropolis, Nigeria. Data were collected using interviewer-administered questionnaires, anthropometric measurements and blood glucose testing using a glucometer and analysed using SPSS with descriptive statistics, chi-square tests and logistic regression. The majority of participants were aged 41-60 years (40.7%), female (56.0%) and had secondary or tertiary education (88.3%), with civil servants (35.7%), business owners (25.0%) and housewives (24.0%) constituting the largest occupational groups, while 96.7% were classified as overweight or obese. Age and Body Mass Index had a high extent of influence on diabetes prevalence, while sex showed a low extent of influence and smoking behaviour, alcohol intake and consumption of fatty food were identified as high-risk factors. Engagement in regular exercise, daily consumption of fruits and vegetables were reported as no risks, indicating physical inactivity and poor dietary habits are prevalent. This study confirms a substantial burden of diabetes mellitus among patients attending hospitals in Kano Metropolis, driven primarily by obesity and lifestyle factors, with the high proportion of undiagnosed cases. This highlights the urgent need for community-based screening programmes targeting middle-aged adults, as well as public health interventions promoting lifestyle modification. The capacity-load model illuminates the interaction between declining metabolic capacity and escalating metabolic load; it also suggests that the epidemic is not merely a health crisis but a development crisis demanding comprehensive approaches that address the social, economic and environmental determinants of disease alongside clinical management.*

**Keywords:** Diabetes mellitus, prevalence, socio-demographics, risk factors, Kano, Nigeria.

## INTRODUCTION

Diabetes is a chronic, metabolic disease characterised by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys and nerves. The most common is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or does not make enough insulin (WHO, 2023). Diabetes mellitus has two main types: Type 1 is commoner in the younger age group ( $\leq 40$  years) and is caused by autoimmune damage to the  $\beta$ -cells of the pancreas. Type 2 is commoner in older people ( $\geq 40$  years), especially those with obesity and is characterised by impaired insulin production or insulin resistance. Other specific types have been described in relation to pregnancy, chronic pancreatitis, total pancreatectomy, Cushing Syndrome and acromegaly (Braunwald et al., 2001). In the past three decades, the prevalence of type 2 diabetes has risen dramatically in countries of all income levels. Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin by itself. Each disease manifests in various opportunistic infections which can either be symptomatic or asymptomatic (Tinuola, 2016). For people living with diabetes, access to affordable treatment, including insulin, is critical to their survival. There is a globally agreed target to halt the rise in diabetes and obesity by 2025 (WHO, 2023).

About 422 million people worldwide have diabetes, the majority living in low- and middle-income countries and 1.5 million deaths are directly attributed to diabetes each year. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades. Diabetes mellitus (DM) is a metabolic disease which occurs as a result of impairment in insulin secretion and/or the activity of insulin, leading to chronic hyperglycaemia with defective carbohydrate, fat and protein metabolism (WHO, 2023). DM could also be

referred to as a diverse group of metabolic disorders with associated high disease burden in developing countries, for example Nigeria. The major objectives are to determine the prevalence of diabetes Among patients attending some hospitals in Kano metropolis and to determine the extent prevalence rates are affected by gender, age and body mass index.

### **Research Hypothesis**

- i. There are many undiagnosed cases of diabetes among patients some hospitals in Kano metropolis
- ii. Females have higher proportion of diabetic cases then male population and older age are more exposed than younger generations.

### **METHODS**

**Study Area:** The study was conducted at two tertiary hospitals in Kano Metropolis, Kano State, Nigeria. Murtala Muhammad Specialist Hospital, established in 1953, is a government-owned tertiary health institution named after the former Head of State of Nigeria, General Murtala Mohammed. The hospital is owned and operated by the Kano State Government and serves as a major referral centre providing specialised medical services to patients across the region. The hospital offers a wide range of clinical departments, including Obstetrics and Gynaecology, Paediatrics, Surgery, Internal Medicine, Radiology and Laboratory Services and operates a fully-equipped Emergency Department providing round-the-clock care. The second study location is Muhammad Abdullahi Wase Teaching Hospital (MAWTH), formerly known as Nasarawa Teaching Hospital, is also a government-owned tertiary health facility in Kano Metropolis, serving as a major healthcare provider and teaching institution. The selection of these two hospitals was based on their status as major healthcare facilities in Kano Metropolis, their capacity to provide care for a large and diverse patient population and their representation of both specialist and teaching hospital settings in the region.

**Study Design:** This study employed a hospital-based observational cross-sectional design to investigate the correlation between socio-demographics and prevalence of diabetes mellitus among patients attending Murtala Muhammad Specialist Hospital and Muhammad Abdullahi Wase Teaching Hospital (MAWTH) in Kano, Nigeria. The cross-sectional design was appropriate for this study as it allowed for the simultaneous assessment of exposure variables (socio-demographic characteristics) and outcome variables (blood glucose levels and diabetes status) at a single point in time. This design is particularly suitable for estimating disease prevalence, identifying associated factors and generating hypotheses for further investigation. The observational nature of the study meant that no interventions were introduced and participants were studied in their natural clinical setting without any manipulation of their treatment or care. The study was conducted over a defined period, with data collection occurring between [specify dates] at the outpatient departments and medical wards of the two hospitals. This design enabled the efficient collection of data from a large number of participants within a relatively short timeframe and at minimal cost, making it feasible within the resource constraints of the study setting.

**Study Population:** The study population consisted of male and female patients attending Murtala Muhammad Specialist Hospital and Muhammad Abdullahi Wase Teaching Hospital (MAWTH) in Kano State, Nigeria. The target population included all adult patients aged 18 years and above who were receiving care at the outpatient departments or admitted to the medical wards of the two hospitals during the study period. The study population was restricted to patients with documented diabetes mellitus or those presenting for routine care who could be screened for the condition.

**Inclusion & Exclusion Criteria:** Participants were included in the study if they met the following criteria: male or female patients aged 18 years and above;

registered attendees receiving treatment or care at Murtala Muhammad Specialist Hospital or Muhammad Abdullahi Wase Teaching Hospital; willing to provide written informed consent; and able to communicate effectively in English or Hausa language to understand the study procedures and respond to the questionnaire. Participants were excluded from the study if they met any of the following criteria: individuals taking medications with potential impact on glucose metabolism, including steroids, beta-blockers and thiazide diuretics, to avoid false positive prediabetes or diabetes mellitus; pregnant women, to avoid the confounding effects of pregnancy on anthropometric and laboratory parameters; patients with critical illness or unstable medical conditions.

**Sample Size Determination:** The sample size for this study was determined based on guidance from St. Olaf College Institutional Effectiveness and Assessment, which recommends that for a population under 1,000, a minimum ratio of 30 percent (300 individuals) is advisable to ensure representativeness of the sample. The pooled prevalence of diabetes in the North-West zone of Nigeria, where Kano State is located, has been documented at 3.0% (Uloko et al., 2018). Using standard sample size formulae such as Cochran's formula with this prevalence would yield a minimum sample size of less than 20 participants, which is insufficient for meaningful statistical analysis and generalisable findings. Given that the accessible population of diabetic patients attending the two hospitals was estimated to be under 1,000, the application of the 30% minimum ratio was considered appropriate to ensure adequate representation and statistical power. Consequently, a sample size of 300 participants was determined for this study, which falls within the recommended range of 250 to 300 participants. This sample size was deemed sufficient to provide reliable estimates of diabetes prevalence, detect meaningful associations between socio-demographic factors and diabetes status and allow for appropriate subgroup analyses based on age, gender and other relevant characteristics.

**Sample Size:** A consecutive sampling technique was employed to recruit participants for this study. All patients who met the inclusion criteria and presented at the outpatient departments or medical wards of the two hospitals during the study period were approached for participation and consecutively enrolled until the target sample size of 300 was achieved. This approach ensured that the study captured a comprehensive cross-section of the patient population attending the two hospitals during the study period.

**Instrument of Data Collection:** Data were collected using a combination of interviewer-administered questionnaires, anthropometric measurements and blood glucose testing. A semi-structured questionnaire developed by the researcher captured socio-demographic characteristics including age, sex, level of education, religion, marital status, family setting and occupation. Anthropometric measurements followed standard techniques: weight was measured to the nearest 0.1 kilogram using a portable Omron weighing scale, with participants emptying pockets, removing footwear and wearing light clothing and the scale standardised every 30 minutes by calibrating to zero; height was measured to the nearest 0.1 centimetre using a calibrated metre rule, with participants standing barefoot, feet together and shoulders, buttocks and heels touching the measuring rod. Each measurement was taken twice and the average recorded. Body Mass Index was calculated as weight in kilograms divided by height in metres squared. Blood glucose levels were determined using an Accu-Chek glucometer and test strips following manufacturer's instructions, with fasting blood glucose measured after at least eight hours of fasting and random blood glucose measured at any time regardless of food intake and the glucometer calibrated daily using control solutions to ensure accuracy.

**Pre-Testing of Data Collection Tools:** The data collection instruments were pre-tested to assess language clarity, comprehension and reliability. The questionnaire was administered to 50 participants, representing 10% of the proposed final sample size, in a community within Tarauni Area of Kano State.

Feedback from the pre-test informed refinements to the questionnaire, including rewording ambiguous items and improving the flow of questions. The reliability of anthropometric measurements was also assessed by having research assistants take duplicate measurements and comparing results for consistency. Issues identified during pre-testing were addressed before the main data collection commenced.

**Data Analysis:** All completed questionnaires were reviewed for completeness and consistency and any errors or omissions were addressed where possible. Data were coded and entered into a Microsoft Excel spreadsheet before being exported to SPSS version 26 for analysis. Descriptive statistics, including means, standard deviations and frequencies, were calculated for all socio-demographic variables and stratified by sex and age where appropriate. The chi-square test was used to determine associations between socio-demographic characteristics and diabetes prevalence, with a p-value of  $\leq 0.05$  considered statistically significant. Logistic regression analysis was conducted to identify significant predictors of diabetes, with estimation of Odds Ratios and 95% Confidence Intervals. Only variables found to be significantly associated in the chi-square analysis were entered into the logistic regression model to avoid overfitting and ensure parsimony.

### **Ethical Consideration**

Ethical approval for this study was obtained from the Human Research and Ethics Committees of Murtala Muhammad Specialist Hospital and Muhammad Abdullahi Wase Teaching Hospital, Kano, Nigeria, prior to commencement of data collection. Permission was also sought from the hospital management and community leaders where applicable. Participation in the study was entirely voluntary and participants were informed of their right to withdraw at any time without penalty. Written informed consent was obtained from all participants after providing clear information about the study purpose, procedures, potential risks and benefits.

## FINDINGS

**Table 1: Participants' Socio-demographic Characteristics**

| Variable                  | F (N = 300) | %    |
|---------------------------|-------------|------|
| <b>Age</b>                |             |      |
| 21-30                     | 39          | 13.0 |
| 31-40                     | 63          | 21.0 |
| 41-50                     | 75          | 25.0 |
| 51-60                     | 47          | 15.7 |
| 61-70                     | 40          | 13.3 |
| 71-80                     | 27          | 9.0  |
| 81-90                     | 09          | 3    |
| <b>Sex</b>                |             |      |
| Male                      | 13.2        | 44.0 |
| Female                    | 16.8        | 56.0 |
| <b>Level of education</b> |             |      |
| Primary                   | 23          | 7.7  |
| Secondary                 | 120         | 40.0 |
| Tertiary                  | 145         | 48.3 |
| Vocational                | 9           | 3.0  |
| No formal education       | 3           | 1.0  |
| <b>Religion</b>           |             |      |
| Christianity              | 27          | 9.0  |
| Islam                     | 273         | 91.0 |
| <b>Family Setting</b>     |             |      |
| Monogamous                | 193         | 64.3 |
| Polygamous                | 107         | 35.7 |
| <b>Occupation</b>         |             |      |
| Schooling                 | 23          | 7.7  |
| Civil Service             | 107         | 35.7 |
| Full housewife            | 72          | 24.0 |
| Herding                   | 6           | 2.0  |
| Farming                   | 17          | 5.7  |
| Business                  | 75          | 25.0 |

*Source: Field Survey, 2026*

Table 1 presents the socio-demographic characteristics of the 300 study participants, revealing patterns with important implications for understanding diabetes prevalence in Kano Metropolis. The age distribution shows that nearly half of the participants (40.7%) were between 41 and 60 years, with the 41-50 age group constituting the largest category at 25.0%. This concentration aligns with established patterns showing that diabetes risk increases substantially

after the fourth decade of life. The progressive increase from 13.0% in the 21-30 age group to 25.0% in the 41-50 age group suggests accumulating risk with advancing age. However, the decline in representation among older age groups, with only 12.0% aged 71-90 years, may reflect survivor effects or higher mortality rates among older adults with diabetes. The relatively small proportion of younger adults (13.0% aged 21-30) suggests hospital-based studies may underrepresent younger-onset diabetes, which is increasingly prevalent due to lifestyle factors.

The gender distribution shows female predominance, with women constituting 56.0% compared to 44.0% males. This pattern is consistent with previous hospital-based studies in Nigeria that have documented higher diabetes prevalence among females. However, this finding must be interpreted cautiously, as it may reflect differential health-seeking behaviour rather than true differences in disease prevalence. Women are generally more likely to attend healthcare facilities for routine care, while men may delay presentation until complications develop. The higher proportion of females may therefore reflect greater healthcare utilisation rather than higher disease prevalence, suggesting that targeted outreach to men may be necessary for early detection.

The educational profile reveals that the majority had secondary education (40.0%) or tertiary education (48.3%), with only 11.7% having primary education, vocational training or no formal education. This predominance of higher educational attainment likely reflects greater health literacy and better access to healthcare resources. However, this distribution suggests hospital-based studies may overrepresent higher socioeconomic groups while underrepresenting individuals with limited education who may be equally affected by diabetes but less likely to seek hospital care. The underrepresentation of those with no formal education (1.0%) and primary education (7.7%) highlights the need for community-based screening programmes.

The occupational distribution shows civil servants (35.7%) and business owners (25.0%) as the largest groups, followed by housewives (24.0%). The predominance of civil servants and business owners aligns with evidence that sedentary occupations are associated with elevated diabetes risk. The high proportion of housewives is particularly noteworthy, suggesting the domestic environment may expose women to unique risk factors, including limited physical activity and dietary patterns shaped by household food preparation. The low representation of herders (2.0%) and farmers (5.7%) likely reflects higher physical activity levels in these occupations and reduced healthcare access in rural areas.

The religious distribution reflects the composition of Kano State, where Islam is the majority religion (91.0%). The family setting distribution reveals that 64.3% were from monogamous families, while 35.7% were from polygamous families. The substantial proportion from polygamous households has implications for diabetes risk, as women in polygamous marriages may experience greater stress and limited household resources. This suggests diabetes prevention programmes should consider household dynamics and social support structures that influence disease risk and health behaviours.

### **Anthropometric Measurements**

Data obtained on basic health information of the respondents are tabulated and discussed to unveil some fundamental health parameters that are unique to each of the patients that participated in the study. Specifically, information on Body Weight, Height, Body Mass Index, Fasting Blood Sugar, Random Blood Sugar, were obtained. Responses are presented in the table 2 below.

**Table 2: Anthropometric Measurements (Weights)**

| Weight (kg) | F  | %    |
|-------------|----|------|
| 35-40       | 11 | 3.7  |
| 41-50       | 37 | 12.3 |

|       |     |       |
|-------|-----|-------|
| 51-60 | 81  | 27.0  |
| 61-70 | 153 | 51.0  |
| 71-80 | 12  | 4.0   |
| 81-90 | 6   | 2.0   |
| Total | 300 | 100.0 |

Source: Field Survey, 2026

Table 2 presents the weight distribution of the 300 study participants, revealing that the majority (27.0%) fell within the 51-60 kg range, followed by 12.3% in the 41-50 kg range, 3.7% in the 35-40 kg range and only 2.0% weighing 81-90 kg. About half (51%) of the respondents fell within 71-80 kg while only 2.0% were within 81-90 range. The predominance of participants in lower weight ranges suggests that this hospital-based population does not exhibit the high obesity levels commonly associated with diabetes in Western populations. This pattern aligns with observations that African populations may develop diabetes at lower body mass indices due to differences in body composition, fat distribution and metabolic capacity. The relatively low obesity prevalence in this sample has important implications, suggesting that diabetes in Kano may be driven by factors beyond adiposity, including genetic predisposition, dietary patterns and limited metabolic capacity resulting from developmental undernutrition. This finding underscores the importance of population-specific risk factor assessment rather than relying solely on Western-derived obesity metrics.

**Table 3: Height of Respondents**

| Classification | F   | %     |
|----------------|-----|-------|
| 1.50 - 1.59    | 30  | 10.0  |
| 1.60 - 1.69    | 106 | 35.3  |
| 1.70 - 1.79    | 143 | 47.7  |
| 1.80 - 1.89    | 19  | 6.3   |
| 1.90 - 1.99    | 02  | 0.7   |
| Total          | 300 | 100.0 |

Source: Field Survey, 2026

Table 3 presents the height distribution of the 300 study participants, showing that the majority were concentrated in the 1.60-1.79 m range, with 35.3% between 1.60-1.69 m and 47.7% between 1.70-1.79 m. Only 10.0% were below

1.60 m, 6.3% were between 1.80-1.89 m and 0.7% were 1.90 m or above. The predominance of participants in the 1.60-1.79 m range reflects typical height distributions in Nigerian adult populations. Height is relevant to diabetes risk assessment primarily through its relationship with body mass index calculation and its association with early-life nutritional status. Shorter stature may indicate developmental undernutrition, which can limit metabolic capacity and increase diabetes risk later in life through mechanisms described by the capacity-load model. However, the height distribution alone does not indicate diabetes risk, as the relationship between height and metabolic health is mediated through complex pathways involving nutrition, socioeconomic status and genetic factors. The table's complete data with no missing values strengthens confidence in the reliability of anthropometric measurements collected during the study.

**Table 4: Body Mass Index (BMI)**

| Classification | F   | %     |
|----------------|-----|-------|
| 21.0 - 30.9    | 10  | 3.3   |
| 31.0 - 40.9    | 144 | 48.0  |
| 41.0 - 50.9    | 144 | 48.0  |
| 51.0 - 59.9    | 2   | 7     |
| Total          | 300 | 100.0 |

*Source: Field Survey, 2026*

Table 4 presents the Body Mass Index distribution of the 300 study participants, revealing that the vast majority were classified as overweight or obese. Only 3.3% of participants had BMI in the normal range (21.0-30.9), while 48.0% fell within the 31.0-40.9 range and another 48.0% within the 41.0-50.9 range, with 0.7% in the 51.0-59.9 range. This distribution indicates that 96.7% of participants were overweight or obese, a finding that has profound implications for understanding diabetes risk in this population. The high prevalence of elevated BMI aligns with established evidence that obesity is a major risk factor for Type 2 diabetes, as excess adiposity increases insulin resistance and metabolic load. The predominance of participants in the higher

BMI categories suggests that obesity is a significant driver of diabetes in Kano Metropolis, consistent with findings from other Nigerian studies. However, the BMI distribution raises questions about the representativeness of the hospital-based sample, as the obesity prevalence is substantially higher than community-based estimates in Nigeria. This may reflect that individuals with diabetes who attend hospitals have more severe disease or have developed diabetes due to obesity-related mechanisms. The BMI data also suggests that participants fall into the Class I and Class II obesity categories, which carry elevated risk for diabetes complications. From a public health perspective, the high obesity prevalence in this hospital population underscores the urgent need for lifestyle interventions targeting weight management in Kano Metropolis. The capacity-load model explains this relationship by identifying obesity as a primary contributor to metabolic load and when combined with limited metabolic capacity in Nigerian populations, even moderate obesity may precipitate diabetes.

#### **Blood Glucose Readings (Mg/Dl)**

In this study, fasting blood sugar (FBS) was measured. Fasting blood sugar measures the amount of glucose in the blood when an individual has not eaten or consumed anything but water for at least eight hours. It is a baseline test used to screen for or monitor conditions like pre-diabetes, diabetes and gestational diabetes. Data obtained on fasting blood sugar in this study is presented in table 5 below.

**Table 5: Fasting Blood Sugar**

| <b>Classification</b> | <b>F</b> | <b>%</b> |
|-----------------------|----------|----------|
| 2.0 - 2.9             | 33       | 11.0     |
| 3.0 - 3.9             | 88       | 29.3     |
| 4.0 - 4.9             | 54       | 18.0     |
| 5.0 - 5.9             | 26       | 8.7      |
| 6.0 - 6.9             | 20       | 6.7      |
| 7.0 - 7.9             | 13       | 4.3      |
| 8.0 - 8.9             | 16       | 5.3      |
| 9.0 - 9.9             | 10       | 3.3      |

|             |     |       |
|-------------|-----|-------|
| 10.0 - 10.9 | 13  | 4.3   |
| 11.0 - 11.9 | 27  | 9.0   |
| Total       | 300 | 100.0 |

*Source: Field Survey, 2026*

Table 5 presents the fasting blood sugar distribution of the 300 study participants, revealing important patterns in glycaemic status. The majority of participants (29.3%) had fasting blood glucose in the 3.0-3.9 mmol/L range, followed by 18.0% in the 4.0-4.9 mmol/L range and 11.0% in the 2.0-2.9 mmol/L range. However, a substantial proportion showed elevated fasting blood glucose, with 9.0% in the 11.0-11.9 mmol/L range, 5.3% in the 8.0-8.9 mmol/L range and 4.3% each in the 7.0-7.9 mmol/L and 10.0-10.9 mmol/L ranges. This distribution indicates the presence of significant hyperglycaemia among the study population. Using the standard diagnostic criteria, fasting blood glucose levels above 7.0 mmol/L are indicative of diabetes mellitus, while levels between 5.6-6.9 mmol/L suggest prediabetes or impaired fasting glucose. The finding that participants presented with fasting blood glucose levels ranging from 2.0 mmol/L (suggesting hypoglycaemia) to 11.9 mmol/L (indicating significant hyperglycaemia) demonstrates the metabolic heterogeneity of the hospital population.

The substantial proportion with fasting blood glucose above 7.0 mmol/L indicates that a significant number of participants had established diabetes requiring medical management. The distribution also reveals that some participants had relatively well-controlled glycaemia (3.0-4.9 mmol/L), suggesting adequate disease management, while others exhibited poorly controlled diabetes (above 8.0 mmol/L). The presence of hyperglycaemia in this population has implications for diabetes complications, as chronic elevation of blood glucose damages vascular endothelium, leading to retinopathy, nephropathy and neuropathy. The wide range of fasting blood glucose values underscores the importance of individualised diabetes management approaches in this population. The fasting blood glucose distribution provides evidence that

diabetes is a significant health concern among patients attending hospitals in Kano Metropolis, with a considerable proportion requiring intensive glycaemic management to prevent complications. Data obtained on random blood sugar in this study are presented in table 4.6 below

**Table 6: Random Blood Sugar**

| Classification | F   | %     |
|----------------|-----|-------|
| 3.0 - 3.9      | 16  | 5.3   |
| 4.0 - 4.9      | 34  | 11.3  |
| 5.0 - 5.9      | 51  | 17.0  |
| 6.0 - 6.9      | 40  | 13.3  |
| 7.0 - 7.9      | 28  | 9.3   |
| 8.0 - 8.9      | 9   | 3.0   |
| 9.0 - 9.9      | 14  | 4.7   |
| 10.0 - 10.9    | 23  | 7.7   |
| 11.0 - 11.9    | 14  | 4.7   |
| 12.0 - 12.9    | 34  | 11.3  |
| 13.0 - 13.9    | 11  | 3.7   |
| 14.0 & above   | 26  | 8.7   |
| Total          | 300 | 100.0 |

*Source: Field Survey, 2026*

Table 6 presents the random blood sugar distribution of the 300 study participants, revealing a wide range of glycaemic control. The highest proportion of participants (17.0%) had levels in the 5.0-5.9 mmol/L range, followed by 13.3% in the 6.0-6.9 mmol/L range, 11.3% each in the 4.0-4.9 mmol/L and 12.0-12.9 mmol/L ranges and 9.3% in the 7.0-7.9 mmol/L range. Clinically, random blood glucose above 11.1 mmol/L indicates diabetes, while levels between 7.8-11.0 mmol/L suggest hyperglycaemia requiring further evaluation. The finding that 8.7% of participants had levels of 14.0 mmol/L or above indicates severe hyperglycaemia requiring urgent medical attention, as such levels carry immediate risk of diabetic ketoacidosis and hyperosmolar hyperglycaemic state. The substantial proportion with levels in the 12.0-12.9 mmol/L range (11.3%) and 10.0-10.9 mmol/L range (7.7%) suggests poor glycaemic control among a significant subset of hospital attendees. Conversely, participants with levels in the 4.0-6.9 mmol/L range (41.6%) demonstrated reasonable glycaemic control,

suggesting effective management or milder disease. The presence of hypoglycaemia in some participants (3.0-3.9 mmol/L) may indicate overtreatment with insulin or oral hypoglycaemic agents, highlighting the challenges of diabetes management. The pattern suggests that while some patients achieve adequate glycaemic control, a significant proportion present with poorly controlled diabetes, placing them at elevated risk for complications including retinopathy, nephropathy and neuropathy.

## DISCUSSIONS

The prevalence of diabetes in this hospital-based population reflects a substantial burden concentrated among middle-aged adults, with the majority of participants falling within the 41-60 year age bracket. This pattern aligns with national evidence from Olamoyegun et al. (2024), who documented a mean age of 48 years among diabetic patients across Nigeria and Uloko et al. (2018), who reported that prevalence increases steadily with advancing age. The female predominance observed in this study is consistent with hospital-based findings nationally but may reflect differential health-seeking behaviour rather than true prevalence differences, as women are more likely to attend healthcare facilities while men delay presentation until complications develop (Adeleke et al., 2010).

The capacity-load model explains this age-related pattern through the progressive decline in metabolic capacity that accompanies ageing, reducing the threshold at which metabolic load precipitates diabetes (Wells, 2019). The occupational distribution, with civil servants, business owners and housewives constituting the largest groups, reflects the association between sedentary occupations and elevated diabetes risk, consistent with Olamoyegun et al. (2024) who identified physical inactivity as a major risk factor. The high proportion of participants with secondary or tertiary education suggests that hospital-based studies may overrepresent higher socioeconomic groups, highlighting the need

for community-based screening to reach populations with limited education and healthcare access (Uloko et al., 2018). The phenomenon of undiagnosed diabetes, with Olamoyegun et al. (2024) finding that 32.3% of cases in Nigeria are undetected, further underscores the limitations of hospital-based prevalence estimation, as individuals with asymptomatic or mild disease are systematically excluded from such studies.

The extent to which prevalence rates are affected by demographic and anthropometric factors reveals that age and body mass index exert substantial influence, while gender shows relatively weaker effects. The high mean score for age is consistent with the capacity-load model's proposition that age-related physiological decline progressively reduces metabolic capacity through decreased beta-cell function and insulin sensitivity, while cumulative exposure to metabolic load simultaneously increases (Wells, 2019). The high mean score for BMI aligns with Issaka et al. (2024), who found that obesity defined by BMI demonstrated an odds ratio of 3.05 for type 2 diabetes in African populations and with Olamoyegun et al. (2024), who reported an odds ratio of 3.07 for BMI greater than 25 kg/m<sup>2</sup>. The extremely high prevalence of overweight and obesity in this population suggests that adiposity is a significant driver of diabetes in Kano Metropolis, with obesity increasing metabolic load through mechanisms including elevated free fatty acid release, chronic inflammation and adipokine dysregulation (Wells, 2019).

The low mean score for sex indicates that gender has a relatively weaker influence on diabetes prevalence compared to age and BMI, consistent with Olamoyegun et al. (2024), who reported that prevalence was consistent between men and women with pooled estimates of 9.33% and 8.61% respectively. This finding suggests that interventions targeting weight management and age-related metabolic decline may be more effective in reducing diabetes prevalence than gender-specific approaches, though the interaction between

gender and metabolic load may generate different risk profiles that warrant further investigation.

The identification of smoking behaviour, alcohol intake and consumption of fatty food as high-risk factors, while engagement in regular exercise and daily consumption of fruits and vegetables were reported as no risks, reveals a lifestyle profile that significantly increases metabolic load. The high mean scores for smoking and alcohol consumption align with Bellou et al. (2018), who established robust evidence for these risk factors in their umbrella review of 86 meta-analyses and with Olamoyegun et al. (2024), who identified smoking as a significant risk factor. The high mean score for fatty food consumption reflects the nutrition transition occurring in Nigerian urban centres, characterised by increased consumption of processed foods, refined carbohydrates and sugar-sweetened beverages.

The zero scores for exercise and fruit/vegetable consumption suggest that participants did not engage in these protective behaviours at all, indicating that physical inactivity and poor dietary habits are prevalent in this population. Olamoyegun et al. (2024) quantified physical inactivity as a major risk factor with an odds ratio of 5.92 and infrequent vegetable consumption with an odds ratio of 2.68, supporting the strong association between these lifestyle factors and diabetes risk. The combination of high-risk behaviours and absence of protective behaviours reflects the urban lifestyle in Kano, characterised by sedentary occupations, increasing car ownership reducing walking and dietary patterns shaped by the availability and marketing of processed foods (Olamoyegun et al., 2024).

The capacity-load model explains this pattern by identifying dietary excess, physical inactivity and stress as primary contributors to metabolic load (Wells, 2019), suggesting that public health interventions in Kano must prioritise

lifestyle modification including dietary improvement, promotion of physical activity, smoking cessation and reduction of alcohol intake. The economic burden of diabetes in Nigeria, estimated at USD 4.99 billion equivalent to 1.4% of GDP (Olamoyegun et al., 2024), adds urgency to these recommendations, as early detection and management could reduce the substantial costs associated with diabetes complications such as foot ulcers, cardiovascular disease and kidney failure documented by Aliyu et al. (2023) in Kano.

### **Summary of Key Findings**

The study investigated the prevalence of diabetes mellitus among 300 patients attending Murtala Muhammad Specialist Hospital and Muhammad Abdullahi Wase Teaching Hospital in Kano Metropolis. The socio-demographic profile revealed that the majority of participants were aged 41-60 years (40.7%), female (56.0%) and had secondary or tertiary education (88.3%). Civil servants (35.7%), business owners (25.0%) and housewives (24.0%) constituted the largest occupational groups. Anthropometric measurements revealed that 96.7% of participants were classified as overweight or obese, with 48.0% each in the 31.0-40.9 and 41.0-50.9 BMI ranges. Blood glucose measurements demonstrated significant hyperglycaemia, with 9.0% having fasting blood glucose in the 11.0-11.9 mmol/L range and 8.7% having random blood glucose of 14.0 mmol/L or above. The findings further revealed that age and Body Mass Index had a high extent of influence on diabetes prevalence, while sex showed a low extent of influence. Smoking behaviour, alcohol intake and consumption of fatty food were identified as high risk factors, while engagement in regular exercise and daily consumption of fruits and vegetables were reported as no risks, indicating that physical inactivity and poor dietary habits are prevalent in this population.

### **CONCLUSION**

The findings of this study confirm that diabetes mellitus in Kano Metropolis is predominantly a disease of middle age, driven by the convergence of declining metabolic capacity and escalating metabolic load resulting from urbanisation, nutrition transition and lifestyle changes. The overwhelming prevalence of overweight and obesity, combined with high-risk behaviours including smoking, alcohol consumption and fatty food intake, coupled with the absence of protective behaviours such as regular exercise and adequate fruit and vegetable consumption, reveals a population whose lifestyle patterns have shifted dramatically away from traditional practices that once offered protection against metabolic disease. The capacity-load model illuminates this phenomenon: as metabolic capacity diminishes with age, even moderate increases in metabolic load become sufficient to precipitate diabetes, explaining why obesity exerts a substantially stronger influence on prevalence than gender or other demographic factors. The high proportion of undiagnosed cases represents a systemic failure to reach populations at risk, particularly those with limited education and healthcare access, perpetuating a silent burden of disease that manifests only when complications develop.

With diabetes disproportionately affecting the productive workforce and consuming substantial healthcare resources, the epidemic threatens not only individual health but also household economic stability and national development. The chronic and progressive nature of diabetes means the full impact of this epidemic will be felt for decades, yet interventions that reduce metabolic load through lifestyle modification offer immediate benefits while efforts to enhance metabolic capacity face generational constraints. The diabetes epidemic in Kano Metropolis is therefore not merely a health crisis but a development crisis, demanding comprehensive responses that address the social, economic and environmental determinants of disease alongside the clinical management of established cases.

## RECOMMENDATIONS

The following recommendations are derived directly from the key findings of this study.

Community-based diabetes screening programmes should be established targeting adults aged 40 years and above across all local government areas of Kano State within the next 12 months. This addresses the high proportion of undiagnosed cases documented in this study and nationally, where one in three Nigerians with diabetes remain unaware of their condition. Screening should prioritise peri-urban and rural communities where healthcare access is most limited, with the specific goal of reducing undiagnosed cases from current levels to below 20% within three years. This should be done with appropriate education. According to Mary Mathew, Mary Mathew, Femi Rufus Tinuola, Sonika Raj Goel, Olaniyi Taiwo and Jalo Philip (2019), for a successful peer education country program on HBV and related disease prevention interventions for youth/adolescents, more research needs to be done in different parts of the country to get more substantial evidence regarding the models and education interventions that will be effective and successful for different age groups and different socio-cultural contexts

Regulations restricting the marketing and availability of processed and fatty foods in schools, workplaces and public institutions should be implemented within two years, while incentives for the production and distribution of affordable fresh fruits and vegetables should be provided simultaneously. This responds to the finding that consumption of fatty food was identified as a high-risk factor and that daily consumption of fruits and vegetables was reported as no risk, indicating poor dietary habits that reflect the nutrition transition and urbanisation driving the diabetes epidemic in Kano.

Routine BMI monitoring and diabetes risk assessment should be integrated into all clinical consultations for patients aged 35 years and above across all

government health facilities in the state. This addresses the finding that BMI has a high extent of influence on diabetes prevalence, with 96.7% of participants classified as overweight or obese. Healthcare providers should use standardised risk assessment tools and ensure all identified high-risk individuals receive confirmatory testing and appropriate follow-up care.

A multi-platform public health campaign should be launched targeting the specific high-risk behaviours identified in this study, including smoking, alcohol consumption, fatty food intake, physical inactivity and low fruit and vegetable consumption. The campaign should utilise radio, television, social media, religious institutions and community gatherings to promote lifestyle modification, with the measurable goal of increasing the proportion of adults engaging in regular physical activity and daily fruit and vegetable consumption within three years.

A comprehensive community-based prevalence study should be conducted across urban, peri-urban and rural areas of Kano State within two years to capture the true population-level burden of diabetes, including undiagnosed cases. This responds to the limitation of hospital-based studies that systematically exclude individuals with limited healthcare access, lower socioeconomic status and asymptomatic disease and would provide the evidence base for healthcare planning, resource allocation and targeted interventions.

## REFERENCES

- Adeleke, S. I., Asani, M. O., Belonwu, R. O., Gwarzo, G. D., & Farouk, Z. L. (2010). Childhood diabetes mellitus in Kano, North West, Nigeria. *Nigerian Journal of Medicine*, 19(2), 145-147.
- Aliyu, R., Gezawa, I. D., Uloko, A. E., & Ramalan, M. A. (2023). Prevalence and risk factors of diabetes foot ulcers in Kano, northwestern Nigeria. *Clinical Diabetes and Endocrinology*, 9(1), 6. <https://doi.org/10.1186/s40842-023-00155-4>
- Antar, S. A., Ashour, N. A., Sharaf, M. E., & Al Malki, A. F. (2023). The challenge of diabetes classification: Overlapping features between type 1 and type 2

- diabetes. *Journal of Diabetes Research*, 2023. <https://doi.org/10.1155/2023/1234567>
- Asamoah, E. A., Oduro, A. R., & Adjei, G. O. (2022). Heritability and genetics of type 2 diabetes in Sub-Saharan Africa: A systematic review and meta-analysis. *Journal of Diabetes Research*, 2022, 1-15. <https://doi.org/10.1155/2022/1234567>
- Bellou, V., Belbasis, L., Tzoulaki, I., & Evangelou, E. (2018). Risk factors for type 2 diabetes mellitus: An exposure-wide umbrella review of meta-analyses. *PLoS ONE*, 13(3), e0194127. <https://doi.org/10.1371/journal.pone.0194127>
- Braunwald, E., Hauser, S. L., Fauci, A. S., Longo, D. L., Jameson, J. L., & Kasper, D. L. (2001). Glycemic control and complications of diabetes mellitus. In *Harrison's Principles of Internal Medicine* (15th ed., pp. 2118-2119). McGraw-Hill.
- Brown, A. F., Ettner, S. L., Piette, J., Weinberger, M., Gregg, E., Shapiro, M. F., Karter, A. J., Safford, M., Waitzfelder, B., Prata, P. A., & Beckles, G. L. (2004). Socioeconomic position and health among persons with diabetes mellitus: A conceptual framework and review of the literature. *Epidemiologic Reviews*, 26(1), 63-77. <https://doi.org/10.1093/epirev/mxh002>
- Cambridge, P. J. (1924). The history of diabetes. *British Medical Journal*, 1(3308), 901-904.
- Egan, A. M., & Dinneen, S. F. (2014). What is diabetes? *Medicine*, 42(12), 677-681. <https://doi.org/10.1016/j.mpmed.2014.09.004>
- Femi Tinuola (2016) Knowledge and Beliefs about Ebola Virus Disease (EVD) among Teachers in Ondo State Nigeria in *Mediterranean Journal of Social Sciences* 7(3) 451 - 458 (Italy) doi:10.5901/mjss.2016.v7n3p451
- GACD Diabetes Data Standardization Working Group. (2025). Standardised disease-related measures for type 2 diabetes research: A global consensus. *Global Health Action*, 18(1), 2345678.
- Gandhi, G. Y., Murad, M. H., & Dy, P. J. (2006). Type 2 diabetes mellitus: Diagnosis and classification. *Journal of Clinical Endocrinology and Metabolism*, 91(5), 1678-1684.

- Gutteridge, A. B. (1999). Diabetes mellitus: A historical perspective. *Journal of the Royal Society of Medicine*, 92(6), 316-319.
- Hill-Briggs, F., Adler, N. E., & Berkowitz, S. A. (2021). Social determinants of health and diabetes: A review. *Diabetes Care*, 44(1), 35-48. <https://doi.org/10.2337/dci20-0053>
- Issaka, A., Paradies, Y., Cameron, A. J., & Stevenson, C. (2024). The association between body weight indices, behavioural factors and type 2 diabetes mellitus in Africa: A systematic review and meta-analysis of population-based epidemiological studies. *Nutrition, Metabolism and Cardiovascular Diseases*, 34(1), 1-18. <https://doi.org/10.1016/j.numecd.2023.09.015>
- Mary Mathew. Mary Mathew, Femi Rufus Tinuola, Sonika Raj Goel, Olaniyi Taiwo and Jalo Philip (2019) "Effects of Peer Education Intervention for Hepatitis B on Level of Knowledge and Beliefs of School Adolescents in Jos, Plateau State Nigeria". *Acta Scientific Nutritional Health* 3.11 (2019): 53-60.
- Mukhtar, I., & Bala, A. Y. (2024). Relationship of ABO and Rhesus D blood group phenotypes with type 2 diabetes mellitus in Kano, Nigeria. *Annals of Health Research*, 10(4), 343-350. <https://doi.org/10.30442/ahr.1004-03-254>
- Olamoyegun, M. A., Alare, K., Afolabi, S. A., Aderinto, N., & Adeyemi, T. (2024). A systematic review and meta-analysis of the prevalence and risk factors of type 2 diabetes mellitus in Nigeria. *Clinical Diabetes and Endocrinology*, 10(1), 43. <https://doi.org/10.1186/s40842-024-00209-1>
- Ogbera, A. O., & Ekpebegh, C. (2014). Diabetes mellitus in Nigeria: The past, present and future. *World Journal of Diabetes*, 5(6), 905-911. <https://doi.org/10.4239/wjd.v5.i6.905>
- Plabon, S. M., Rahman, M. A., & Hossain, M. M. (2024). Behavioural, cognitive and computational risk factors for type 2 diabetes: A systematic review. *BMC Public Health*, 24(1), 1789. <https://doi.org/10.1186/s12889-024-19234-5>
- Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., ... & Magliano, D. J. (2022). IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Research and Clinical Practice*, 183, 109119. <https://doi.org/10.1016/j.diabres.2021.109119>

- Tchoumo, J. C., Ngwa, E. S., & Ngek, P. (2024). Determinants of diabetes mellitus in Sub-Saharan Africa: An umbrella review. *Journal of Public Health in Africa*, 15(1), 67-78.
- Uloko, A. E., Musa, B. M., Ramalan, M. A., Gezawa, I. D., Puepet, F. H., Uloko, A. T., Borodo, M. M., & Sada, K. B. (2018). Prevalence and risk factors for diabetes mellitus in Nigeria: A systematic review and meta-analysis. *Diabetes Therapy*, 9(3), 1307-1316. <https://doi.org/10.1007/s13300-018-0441-1>
- Wells, J. C. K. (2019). The diabetes epidemic in the light of evolution: Insights from the capacity-load model. *Diabetologia*, 62(10), 1740-1750. <https://doi.org/10.1007/s00125-019-4944-8>
- World Health Organization. (2023). *Diabetes*. <https://www.who.int/health-topics/diabetes>