**A Community-Based Survey on Metabolic Health and Obesity at Mile One Market, Port Harcourt**

### Abstract

**Background:** Diabetes mellitus remains a major public health concern, with multiple demographic, metabolic, and lifestyle factors contributing to its risk. The associations between diabetes risk and various parameters, including age, sex, occupation, residence, alcohol consumption, and body mass index (BMI) were examined, while assessing correlations between metabolic and cardiovascular markers.

**Methods:** A cross-sectional survey was conducted among consenting adult Nigerians, with fasting blood glucose (FBG), random blood glucose (RBG), systolic blood pressure (SBP), diastolic blood pressure (DBP), BMI, and waist-to-hip ratio measured. Statistical analyses included correlation tests, regression modelling, and significance testing to evaluate associations between diabetes risk and predictor variables.

**Results:** Age was significantly associated with diabetes risk (p = 0.007), with individuals aged 41–60 years and >60 years more frequently classified as pre-diabetic or diabetic. However, sex, occupation, residence, alcohol consumption, and BMI were not significantly associated with diabetes risk (p > 0.05). Most participants in all glucose categories were traders (90.5%), suggesting limited occupational variability because of the study site. There were no significant differences in FBG (p = 0.51), RBG (p = 0.45), SBP (p = 0.42), DBP (p = 0.26), or BMI (p = 0.18). However, waist-to-hip ratio differed significantly between sexes (p = 0.04), with males exhibiting higher values (1.02 ± 0.005) than females (1.00 ± 0.005). Age was positively correlated with FBG (r = 0.27, p < 0.05), SBP (r = 0.40, p < 0.01), DBP (r = 0.45, p < 0.01), and BMI (r = 0.23, p < 0.05). Regression analysis showed no significant predictors of FBG, though SBP and DBP exhibited the strongest, albeit non-significant, associations.

**Conclusion:** Age emerged as a key factor in diabetes risk, while other demographic and metabolic variables showed weaker associations. Future research should explore additional covariates and diverse populations to enhance understanding of metabolic health determinants.

**Keywords:** *Diabetes Mellitus, Metabolic Risk Factors, Fasting Blood Glucose, Cardiovascular Health, Anthropometric Indices, Aging and Diabetes, Urbanization, Public Health.*

### Introduction

Diabetes mellitus is a complex metabolic disorder characterized by chronic hyperglycaemia resulting from defects in insulin secretion, insulin action, or both.1 It remains a major global health concern, with increasing prevalence in both developed and developing countries. According to the International Diabetes Federation,2 approximately 537 million adults worldwide were living with diabetes in 2021, with projections indicating a rise to 643 million by 2030 and 783 million by 2045. The rising incidence of diabetes is largely driven by demographic shifts, urbanization, and lifestyle changes.3 Aging populations, increased life expectancy, and changing socioeconomic conditions contribute to a growing at-risk population. Urbanization has led to greater consumption of processed, high-calorie foods and reduced physical activity due to sedentary work and transportation habits. Additionally, stress, inadequate sleep, and environmental factors further exacerbate metabolic dysfunction. Addressing these trends through public health interventions, lifestyle modifications, and early screening is crucial for diabetes prevention and management.

Aging is one of the strongest risk factors for diabetes, with prevalence increasing significantly among individuals aged 40 years and older.4 Physiological changes associated with aging, such as declining pancreatic beta-cell function and increasing insulin resistance, contribute to the higher risk of diabetes in older adults.5 However, other factors, including sex, occupation, place of residence, alcohol consumption, and body mass index (BMI), have also been linked to diabetes risk, although their associations remain inconsistent across different populations.6 Central obesity, as measured by waist-to-hip ratio, has been recognized as a stronger predictor of metabolic and cardiovascular risk compared to BMI alone.7 Despite these known associations, there is a need for population-specific studies to clarify the relative influence of these factors on diabetes risk.

This study aims to assess the relationship between diabetes risk and key demographic, metabolic, and cardiovascular parameters in a selected population. Specifically, it examines whether age, sex, occupation, residence, alcohol consumption, and BMI are significantly associated with diabetes risk. Additionally, it explores correlations between fasting blood glucose (FBG), random blood glucose (RBG), systolic and diastolic blood pressure, BMI, and waist-to-hip ratio to determine potential metabolic and cardiovascular interactions.

By identifying significant predictors of diabetes risk, this research seeks to contribute to the broader understanding of metabolic health determinants. The findings may provide insights for targeted public health interventions and risk reduction strategies, particularly in resource-limited settings where diabetes prevalence continues to rise.

### Literature Review

#### ****Diabetes Mellitus and Its Global Burden****

Diabetes mellitus is a chronic metabolic disorder that has emerged as a global public health challenge. The International Diabetes Federation2 estimates that the number of people with diabetes will rise from 537 million in 2021 to 783 million by 2045. This increase is driven by urbanization, aging populations, and lifestyle modifications such as sedentary behaviour and poor dietary habits.3 Developing countries, particularly in sub-Saharan Africa, are experiencing a rapid increase in diabetes prevalence, largely due to shifting epidemiological and nutritional transitions.6

#### ****Age and Diabetes Risk****

Age is a well-established risk factor for diabetes, with older adults displaying a significantly higher prevalence of both type 2 diabetes and pre-diabetes.4 This is primarily due to physiological changes that occur with aging, including increased insulin resistance and impaired pancreatic beta-cell function. Studies, including those by Chatterjee et al.4 have shown that the prevalence of diabetes rises with age, particularly in individuals over 45 years. Additionally, aging is often accompanied by other risk factors such as obesity, reduced physical activity, and chronic inflammation, all of which contribute to metabolic dysfunction.

Studies indicate that insulin resistance increases with age, largely due to declining pancreatic beta-cell function and alterations in glucose metabolism.5 Aging is associated with reduced insulin sensitivity in peripheral tissues, particularly muscle and adipose tissue, leading to impaired glucose uptake. Additionally, pancreatic beta-cells undergo functional decline, reducing their ability to compensate for rising insulin resistance. Chronic low-grade inflammation, mitochondrial dysfunction, and changes in body composition (such as increased visceral fat) further exacerbate metabolic disturbances, increasing the risk of type 2 diabetes and prediabetes in older adults.

Research indicates that individuals over 40 years of age have a significantly higher risk of developing diabetes compared to younger adults.1 This increased risk is largely attributed to age-related declines in insulin sensitivity, progressive beta-cell dysfunction, and metabolic changes such as increased visceral fat accumulation. Additionally, lifestyle factors, including reduced physical activity and dietary patterns, contribute to impaired glucose regulation. As a result, diabetes screening and preventive measures become increasingly important in this age group to mitigate the risk of progression to type 2 diabetes.

Furthermore, studies have linked aging to increases in systolic and diastolic blood pressure, body mass index (BMI), and fasting blood glucose (FBG), all of which contribute to heightened diabetes risk.8 Age-related changes in vascular function, reduced metabolic efficiency, and increased adiposity play a key role in these trends. Elevated blood pressure and BMI are closely associated with insulin resistance and chronic inflammation, further impairing glucose regulation. As these risk factors accumulate with age, they create a metabolic environment that significantly increases the likelihood of developing type 2 diabetes.

#### ****Sex, Occupation, and Residence as Influencing Factors****

The relationship between sex and diabetes risk remains inconclusive because research on gender differences in diabetes risk presents mixed findings. Some studies suggest that men have a higher predisposition to diabetes due to greater visceral fat accumulation, whereas others indicate that women, particularly postmenopausal women, may have an increased risk due to hormonal changes affecting insulin sensitivity.9 Greater visceral fat accumulation in men is strongly linked to insulin resistance and metabolic dysfunction. Conversely, other studies indicate that women, particularly postmenopausal women, may face an increased risk due to hormonal changes, such as declining oestrogen levels, which negatively impact insulin sensitivity and fat distribution. These sex-specific differences highlight the need for tailored prevention and management strategies for diabetes in men and women.

Occupational status has been investigated as a potential risk factor for diabetes, with studies indicating that sedentary occupations contribute to higher BMI and an increased risk of type 2 diabetes.10 Jobs that involve prolonged sitting and low physical activity levels are associated with reduced energy expenditure, weight gain, and metabolic dysfunction. Additionally, workplace stress and irregular work schedules may further contribute to insulin resistance and poor glucose control. Encouraging physical activity and ergonomic workplace adjustments can help mitigate these occupational health risks. However, limited occupational variability in some populations may obscure these associations.

Residence in urban versus rural areas has been studied as a diabetes risk factor, with research showing a higher prevalence of diabetes among urban dwellers. This is largely attributed to greater access to processed and calorie-dense foods, lower physical activity levels due to sedentary lifestyles, and increased exposure to obesogenic environments.11 Urbanization is also linked to higher stress levels, air pollution, and reduced social cohesion, all of which may contribute to metabolic dysfunction. In contrast, rural populations often engage in more physically demanding activities and have greater access to fresh, unprocessed foods, potentially lowering their diabetes risk.

#### ****Alcohol Consumption and Metabolic Health****

The effect of alcohol consumption on diabetes risk is complex and appears to be dose-dependent. Moderate alcohol intake has been linked to improved insulin sensitivity and reduced risk of type 2 diabetes, whereas excessive alcohol consumption is associated with higher fasting glucose levels and increased diabetes risk.12 Moderate alcohol intake has been linked to improved insulin sensitivity and a reduced risk of type 2 diabetes, possibly due to its effects on glucose metabolism and lipid profiles. However, excessive alcohol consumption is associated with higher fasting glucose levels, increased insulin resistance, and pancreatic dysfunction, all of which elevate diabetes risk. Chronic heavy drinking can also lead to liver damage, obesity, and metabolic disturbances, further exacerbating glucose dysregulation. Therefore, while moderate alcohol consumption may have some protective effects, excessive intake significantly increases the likelihood of developing diabetes.

Some studies suggest that alcohol consumption is negatively correlated with BMI, as observed in this study, potentially due to its appetite-suppressing effects and alterations in fat metabolism.13 However, conflicting findings indicate the need for further research to clarify these relationships across different populations.

#### ****Anthropometric and Cardiovascular Predictors of Diabetes****

BMI and waist-to-hip ratio (WHR) are commonly used anthropometric indices for assessing obesity-related metabolic risks. While BMI is a widely accepted measure of general obesity, WHR has been suggested to be a better predictor of diabetes and cardiovascular risk due to its emphasis on central fat distribution.7 Studies have demonstrated a strong correlation between WHR and fasting blood glucose levels, blood pressure, and overall cardiometabolic risk.14

Blood pressure is another critical factor linked to diabetes risk. Hypertension and diabetes often coexist, sharing common pathophysiological mechanisms such as endothelial dysfunction, insulin resistance, and chronic inflammation.15 Research indicates that systolic and diastolic blood pressures are significantly correlated with BMI and fasting blood glucose, reinforcing the interconnection between metabolic and cardiovascular health.16

#### ****Gaps in the Literature and Study Justification****

Despite extensive research on diabetes risk factors, inconsistencies persist regarding the relative influence of sex, occupation, residence, and alcohol consumption on metabolic health. Additionally, while studies highlight the role of BMI and WHR in diabetes risk, their independent effects on fasting glucose levels remain unclear. Given the rising burden of diabetes, particularly in resource-limited settings, population-specific investigations are necessary to refine risk assessment strategies and develop targeted interventions. This study seeks to contribute to this growing body of literature by examining the associations between demographic, metabolic, and cardiovascular parameters and diabetes risk in a defined population.

**Methodology**

### Study Design

This study employed a cross-sectional design to assess the association between metabolic and cardiovascular parameters and diabetes risk. Cross-sectional studies are widely used in epidemiological research to identify risk factors and correlations at a specific point in time.17 The study focused on adult participants residing in an urban and peri-urban setting.

### Study Population and Sampling

The study population included adults aged 18 years and above who voluntarily participated in a community-based screening program. Participants were recruited through a combination of convenience and purposive sampling, targeting individuals attending a World Diabetes Day health awareness program organised by the Diabetes Association of Nigeria, Rivers state chapter in conjunction with the Mile one market association. Inclusion criteria were age ≥18 years, consent to participate, and willingness to undergo metabolic and cardiovascular assessments. Exclusion criteria included individuals with diagnosed chronic illnesses unrelated to diabetes and those on medications known to influence glucose metabolism.18

### Data Collection Procedures

Data collection involved structured questionnaires, anthropometric measurements, and biochemical assessments. Participants completed a standardized questionnaire that collected demographic details (age, sex, occupation, residence, and alcohol consumption habits). Anthropometric indices included body mass index (BMI), waist-to-hip ratio, and blood pressure; measured using standardized protocols.19 Biochemical assessments included fasting blood glucose (FBG) and random blood glucose (RBG), measured using a glucometer calibrated according to manufacturer guidelines.

### Ethical Considerations

Ethical approval was obtained from an institutional review board (IRB), and all participants provided written informed consent before participation. Confidentiality and anonymity of participants were maintained throughout the study in accordance with ethical guidelines for human research.20

### Statistical Analysis

Data were analyzed using SPSS version 25.0. Descriptive statistics (means, standard deviations, and percentages) were computed for continuous and categorical variables. Pearson correlation analysis assessed relationships between metabolic and cardiovascular parameters. Logistic regression models were used to determine predictors of diabetes risk, with significance set at p < 0.05.21

**Results**

This table presents the distribution of individuals based on their fasting blood glucose (FBG) and/or Random Blood glucose (RBG) levels. The table categorizes participants into **Normal**, **Pre-Diabetes**, and **Diabetes** groups, and examines their distribution with sex, age, occupation, residence, alcohol consumption, and body mass index (BMI). The chi-square (*χ*²) values and corresponding p-values assess the statistical significance of these associations.

**Key Findings:**

1. **Age is significantly associated with diabetes risk** (p = 0.007). A higher percentage of individuals aged 41-60 years and >60 years were in the pre-diabetes and diabetes groups.
2. **Sex, occupation, residence, alcohol consumption, and BMI** were **not significantly associated** with diabetes risk (p > 0.05).
3. **Most participants in all glucose categories were traders** (90.5% in normal and diabetes groups), suggesting limited variability in occupational distribution.

This table provides insight into the demographic and lifestyle characteristics associated with glucose regulation, highlighting the role of age in diabetes risk.

Table 1: Distribution of Blood Glucose Categories by Demographic and Lifestyle Factors

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **NORMAL**  **[FBG 4.0-6.0 mmol/L**  **RBG <7.8 mmol/L]** | **PRE-DIABETES**  **[FBG 6.1-6.9 mmol/L**  **RBG 7.8-11.1 mmol/L]** | **DIABETES**  **[FBG >7.0 mmol/L**  **RBG >11.0 mmol/L]** | **total** | ***χ***² | **p-value** |
| **Sex**  Male  Female | 41(48.8%)  43(51.2%) | 4(57.1%)  3(42.9%) | 1(25.0%)  3(75.0%) | 46(48.4%)  49(51.6%) | 1.10 | 0.58 |
| **Age**  <20 years  21-40 years  41-60 years  >60 years | 0(0.0%)  55(65.5%)  23(27.4%)  6(7.1%) | 1(14.3%)  2(28.6%)  3(42.9%)  1(14.3%) | 0(0.0%)  1(25.0%)  2(50.0%)  1(25.0%) | 1(1.1%)  58(61.1%)  28(29.5%)  8(8.4%) | 17.78 | **0.007** |
| **Occupation**  None  Farming  white collar  technician  trading  business  driver | 1(1.2%)  1(1.2%)  1(1.2%)  1(1.2%)  76(90.5%)  3(3.6%)  1(1.2%) | 0(0.0%)  0(0.0%)  0(0.0%)  0(0.0%)  6(85.7%)  0(0.0%)  1(14.3%) | 0(0.0%)  0(0.0%)  0(0.0%)  0(0.0%)  4(100.0%)  0(0.0%)  0(0.0%) | 1(1.1%)  1(1.1%)  1(1.1%)  1(1.1%)  86(90.5%)  3(3.2%)  2(2.1%) | 6.33 | 0.90 |
| **Residence**  Rural  Urban  City | 1(1.2%)  46(55.4%)  36(43.4%) | 1(14.3%)  2(28.6%)  4(57.1%) | 0(0.0%)  3(75.0%)  1(25.0%) | 2(2.1%)  51(54.3%)  41(43.6%) | 7.08 | 0.13 |
| **Alcohol**  Yes  No | 36(42.9%)  48(57.1%) | 2(28.6%)  5(71.4%) | 2(50.0%)  2(50.0%) | 40(42.1%)  55(57.9%) | 0.65 | 0.72 |
| **Body Mass Index**  <18.5 kg/m2  18.5 - 25.0 kg/m2  25.5-29.5 kg/m2  >30.0 kg/m2 | 2(2.4%)  21(25.0%)  33(39.3%)  28(33.3%) | 0(0.0%)  1(14.3%)  4(57.1%)  2(28.6%) | 0(0.0%)  1(25.0%)  2(50.0%)  1(25.0%) | 2(2.1%)  23(24.2%)  39(41.1%)  31(32.6%) | 1.27 | 0.97 |

### ****Table 2:** Comparison of Metabolic and Cardiovascular Parameters Between Males and Females**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Male**  **Mean(sem)** | **Female**  **Mean(sem)** | **t** | **p-value** |
| FBG | 4.95(0.17) | 5.18(0.31) | 0.67 | 0.51 |
| RBG | 5.59(0.48) | 5.13(0.36) | 0.78 | 0.45 |
| systolic | 123.80(2.79) | 120.71(2.60) | 0.81 | 0.42 |
| diastolic | 77.93(1.99) | 74.69(2.08) | 1.13 | 0.26 |
| BMI | 27.84(0.61) | 29.37(0.94) | 1.37 | 0.18 |
| Waist/hip | 1.02(0.005) | 1.00(0.005) | 2.05 | 0.04 |

The study examined differences in metabolic and cardiovascular parameters between males and females. The results showed no statistically significant differences in fasting blood glucose (FBG) (p = 0.51), random blood glucose (RBG) (p = 0.45), systolic blood pressure (p = 0.42), diastolic blood pressure (p = 0.26), or body mass index (BMI) (p = 0.18). However, the waist-to-hip ratio showed a statistically significant difference (p = 0.04), with males having a higher mean value (1.02 ± 0.005) compared to females (1.00 ± 0.005). This finding suggests potential sex-related differences in fat distribution, which may have implications for cardiovascular and metabolic health.

### ****Table 3:** Correlation Between Metabolic and Cardiovascular Parameters with Demographic and Lifestyle Factors**

**Spearman's rho Correlations**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **FBG** | **RBG** | **systolic** | **diastolic** | **BMI** | **Waist/hip** |
| **Sex** | 0.007 | -0.122 | -0.081 | -0.144 | 0.065 | -0.187 |
| **Age** | 0.271\* | 0.079 | 0.403\*\* | 0.448\*\* | 0.229\* | 0.090 |
| **Occupation** | 0.006 | -0.499\* | -0.074 | -0.031 | -0.234\* | 0.011 |
| **Residence** | 0.032 | 0.014 | -0.088 | -0.065 | 0.074 | -0.023 |
| **Alcohol** | -0.110 | -0.126 | -0.163 | -0.078 | -0.222\* | -0.156 |
| **FBG** | 1.000 | . | 0.170 | 0.221\* | 0.227\* | 0.148 |
| **RBG** | . | 1.000 | -0.303 | -0.450 | -0.127 | 0.004 |
| **Systolic Bp** | 0.170 | -0.303 | 1.000 | 0.817\*\* | 0.401\*\* | 0.085 |
| **Diastolic Bp** | 0.221\* | -0.450 | 0.817\*\* | 1.000 | 0.366\*\* | 0.112 |
| **BMI** | 0.227\* | -0.127 | 0.401\*\* | 0.366\*\* | 1.000 | 0.193 |
| **Waist/hip** | 0.148 | 0.004 | 0.085 | 0.112 | 0.193 | 1.000 |

The table presents correlation coefficients between fasting blood glucose (FBG), random blood glucose (RBG), blood pressure (systolic and diastolic), body mass index (BMI), and waist-to-hip ratio with various demographic and lifestyle factors.

* **Sex** showed weak, non-significant correlations with all parameters, with the strongest being a negative correlation with waist-to-hip ratio (r = -0.19).
* **Age** was positively correlated with FBG (r = 0.27, p < 0.05), systolic BP (r = 0.40, p < 0.01), diastolic BP (r = 0.45, p < 0.01), and BMI (r = 0.23, p < 0.05), indicating an association between increasing age and these health markers.
* **Occupation** was significantly negatively correlated with RBG (r = -0.49, p < 0.05) and BMI (r = -0.23, p < 0.05), suggesting an inverse relationship between occupational status and these parameters.
* **Residence** in rural, urban and city showed weak, non-significant correlations with all metabolic and cardiovascular parameters.
* **Alcohol consumption** was negatively correlated with BMI (r = -0.22, p < 0.05), indicating that alcohol consumption was associated with lower BMI.
* **FBG** was significantly correlated with diastolic BP (r = 0.22, p < 0.05) and BMI (r = 0.23, p < 0.05), suggesting that higher fasting blood glucose may be linked to increased blood pressure and body mass.
* **Systolic and diastolic BP** were strongly correlated with each other (r = 0.82, p < 0.01) and with BMI (r = 0.40, p < 0.01 and r = 0.37, p < 0.01, respectively), reinforcing the link between obesity and hypertension.

Overall, age, occupation, and BMI emerged as important factors influencing metabolic and cardiovascular health parameters in this study.

### ****Table 4:** Multiple Regression Analysis of Metabolic and Cardiovascular Predictors of FBG**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Unstandardized Coefficients** | | **Standardized Coefficients** |  |  |
|  | **B** | **Std. Error** | **Beta** | **t** | **Sig.** |
| (Constant) | 3.49 | 6.54 |  | 0.54 | 0.59 |
| sex | 0.41 | 0.43 | 0.13 | 0.95 | 0.34 |
| age | 0.02 | 0.02 | 0.12 | 0.88 | 0.38 |
| occupation | 0.22 | 0.34 | 0.08 | 0.67 | 0.51 |
| residence | -0.14 | 0.38 | -0.05 | 0.37 | 0.71 |
| alcohol | -0.14 | 0.45 | -0.04 | 0.31 | 0.76 |
| systolic | -0.03 | 0.02 | -0.31 | 1.43 | 0.16 |
| diastolic | 0.04 | 0.03 | 0.33 | 1.47 | 0.15 |
| BMI | -0.01 | 0.04 | -0.05 | 0.33 | 0.74 |
| Waist/hip | 0.69 | 5.86 | 0.01 | 0.12 | 0.91 |

The table presents the results of a multiple regression analysis examining the relationship between various independent variables (sex, age, occupation, residence, alcohol consumption, systolic and diastolic blood pressure, BMI, and waist-to-hip ratio) and fasting blood glucose as the dependent variable.

* The model's **constant (intercept)** is **3.49** (p = 0.59), indicating the baseline value when all predictors are zero.
* **Sex, age, occupation, residence, and alcohol consumption** had weak and non-significant effects on fasting blood glucose, with p-values ranging from **0.34 to 0.76**, suggesting that these variables do not significantly contribute to the model.
* **Systolic blood pressure** (B = -0.03, p = 0.16) and **diastolic blood pressure** (B = 0.04, p = 0.15) had moderate, but statistically non-significant, associations with fasting blood glucose. The beta values indicate that an increase in systolic BP slightly decreases the fasting blood glucose, whereas an increase in diastolic BP has the opposite effect.
* **BMI** (B = -0.01, p = 0.74) and **waist-to-hip ratio** (B = 0.69, p = 0.91) showed very weak, non-significant effects on the fasting blood glucose levels.
* The **standardized beta coefficients** indicate that diastolic blood pressure (**β = 0.33**) and systolic blood pressure (**β = -0.31**) had the largest influences, though not statistically significant.

None of the independent variables were significant predictors in this model, with **systolic and diastolic blood pressure showing the strongest, albeit non-significant, associations**. Further studies with a larger sample size or additional covariates may be needed to clarify these relationships.

**DISCUSSION**

The present study examined the association between demographic, metabolic, and cardiovascular parameters with diabetes risk. The results revealed that age was significantly associated with diabetes risk (p = 0.007), with individuals aged 41-60 years and >60 years more likely to be classified as pre-diabetic or diabetic. This finding aligns with previous research highlighting age as a major risk factor for type 2 diabetes due to the cumulative effects of metabolic changes, insulin resistance, and decreased pancreatic function over time.22

Conversely, sex, occupation, residence, alcohol consumption, and BMI were not significantly associated with diabetes risk (p > 0.05). This suggests that while demographic and lifestyle factors play a role in diabetes risk, their independent effects may be weak or moderated by other unmeasured variables. Interestingly, the occupational distribution was skewed, with 90.5% of individuals in both normal and diabetes groups being traders. This lack of occupational variability could have limited the ability to detect potential associations.

Metabolic and cardiovascular parameters, including fasting blood glucose (FBG) (p = 0.51), random blood glucose (RBG) (p = 0.45), systolic blood pressure (p = 0.42), diastolic blood pressure (p = 0.26), and BMI (p = 0.18), showed no statistically significant differences across groups. However, the waist-to-hip ratio showed a significant difference (p = 0.04), with males having a higher mean value (1.02 ± 0.005) compared to females (1.00 ± 0.005). This suggests potential sex-related differences in fat distribution, which may have implications for cardiovascular and metabolic health, consistent with findings that central obesity is a stronger predictor of metabolic syndrome than BMI alone.23

Correlation analysis further revealed that sex had weak, non-significant correlations with all parameters, with the strongest being a negative correlation with waist-to-hip ratio (r = -0.19). Age showed significant positive correlations with FBG (r = 0.27, p < 0.05), systolic BP (r = 0.40, p < 0.01), diastolic BP (r = 0.45, p < 0.01), and BMI (r = 0.23, p < 0.05), reinforcing the link between aging and metabolic/cardiovascular deterioration. Occupation was negatively correlated with RBG (r = -0.49, p < 0.05) and BMI (r = -0.23, p < 0.05), suggesting that certain occupational activities may be protective against obesity and glycemic dysregulation. Similarly, alcohol consumption was negatively correlated with BMI (r = -0.22, p < 0.05), indicating that alcohol consumption was associated with lower BMI, a relationship observed in some epidemiological studies.24

FBG was significantly correlated with diastolic BP (r = 0.22, p < 0.05) and BMI (r = 0.23, p < 0.05), suggesting that higher fasting blood glucose levels may be linked to increased blood pressure and body mass. The strong correlations between systolic and diastolic BP (r = 0.82, p < 0.01) and their associations with BMI (r = 0.40, p < 0.01 and r = 0.37, p < 0.01, respectively) reinforce the well-documented link between obesity and hypertension.25

Multivariate analysis showed that none of the independent variables were significant predictors of fasting blood glucose, with systolic and diastolic blood pressure showing the strongest, albeit non-significant, associations. The model's constant (intercept) was 3.49 (p = 0.59), indicating the baseline fasting glucose when all predictors are zero. The effects of sex, age, occupation, residence, and alcohol consumption on fasting blood glucose were weak and non-significant (p-values ranging from 0.34 to 0.76). The beta coefficients for systolic BP (B = -0.03, p = 0.16) and diastolic BP (B = 0.04, p = 0.15) suggested a moderate influence, though not statistically significant. BMI (B = -0.01, p = 0.74) and waist-to-hip ratio (B = 0.69, p = 0.91) had minimal effects on fasting blood glucose levels.

Overall, this study highlights the significant role of age in diabetes risk, with additional correlations suggesting interactions between metabolic and cardiovascular parameters. The findings also indicate that while occupation, BMI, and waist-to-hip ratio play roles in metabolic health, their direct influence on fasting glucose may be limited. Future research with larger sample sizes and additional covariates, including dietary patterns and genetic factors, may be needed to clarify these associations.

### Conclusion

This study highlights the significant association between age and diabetes risk, with older individuals (41–60 years and >60 years) more likely to be in the pre-diabetes and diabetes groups (p = 0.007). However, other demographic and lifestyle factors, including sex, occupation, residence, alcohol consumption, and BMI, were not significantly associated with diabetes risk (p > 0.05). The predominance of traders (90.5%) across all glucose categories suggests limited occupational variability, which may influence the generalizability of the findings.

Despite the lack of significant differences in FBG, RBG, blood pressure, and BMI, waist-to-hip ratio showed a notable sex-related disparity (p = 0.04), indicating potential differences in fat distribution that could impact metabolic health. Correlation analysis further revealed that age was positively associated with FBG, systolic and diastolic blood pressure, and BMI, reinforcing the role of aging in metabolic and cardiovascular risks. The negative correlation between occupation and both RBG and BMI suggests that employment type may influence metabolic health, possibly through variations in physical activity levels or economic factors. Additionally, the inverse relationship between alcohol consumption and BMI (r = -0.22, p < 0.05) warrants further investigation to understand underlying behavioural or metabolic mechanisms.

Regression analysis indicated that none of the independent variables were significant predictors of fasting blood glucose, though systolic and diastolic blood pressure had the strongest, albeit non-significant, associations. This suggests that while age and other variables play roles in metabolic health, additional covariates or a larger sample size may be necessary to clarify these relationships. Future research should consider longitudinal studies to establish causality and incorporate more diverse occupational and socioeconomic groups to enhance the applicability of findings.

Limitations

The cross-sectional design limits causal inference. Additionally, reliance on self-reported data may introduce recall bias. Future research should incorporate longitudinal designs to establish temporal relationships.

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