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Prevalence of Diabetes mellitus among Patients Attending Selected General Hospitals in Niger State, Nigeria

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Abstract

This Study aims to determine the prevalence of diabetes mellitus among patients attending selected General Hospitals in Niger State, Nigeria. The research is a cross-sectional descriptive study involving General Hospital Minna, General Hospital Suleja and General Hospital Sabon Wuse in Niger state. Trained research assistants helped with obtaining data from the files of patients living with diabetes. The study revealed distinct patterns and significant variations in diabetes prevalence rates, with the highest recorded in General Hospital Minna (1.13%) and the lowest recorded in General Hospital Suleja (0.41%). Pre-validated questionnaires were also used to obtain the demographics of 330 patients living with diabetes. The data was analysed using frequency, percentages and chi-square (χ^2) tests. The results showed the prevalence of diabetes increased with age, socio-economic status and diet. No significant difference was observed in the prevalence of diabetes among smokers and non-smokers, with a p-value of .356. The study revealed that people living with T1DM and T2DM were predominantly between the ages of 41 to 60, they were mostly middle/lower class and non-smokers. High intake of carbohydrates and food devoid of vegetables and proteins should be avoided for a good quality of life and longevity. The study further revealed that consumption of beverages/food containing high sugar content posed a key risk factor for the development of T2DM. Therefore, the study recommends intensive effort by healthcare providers and stakeholders to facilitate efficient planning, a public enlightenment campaign, advocacy, and allocation of health resources for prevention and management of diabetes.

Keywords: *Diabetes Mellitus, Hyperglycemia, Insulin, Prevalence, Risk Factor.*

Introduction

Diabetes is known to be a chronic, life-threatening condition indicated by high blood sugar brought on by abnormal β-cell biology, which compromises the effectiveness of insulin [1, 2]. According to estimates from the International Diabetes Federation (IDF), 537 million people around the globe had diabetes in 2021, leading to medical expenses of US$966 billion globally, with estimates indicating that this number would rise to a little more than $1054 billion by 2045 [3, 4]. Diabetes represents a significant burden on healthcare systems [5]. According to the 2016 Non-Communicable Disease (NCD) Risk Factor Collaboration (NCD-Risc) findings, there is less than 1% chance that worldwide targets to stop increasing incidences of diabetes would be met by 2025 for women and even less for men [6]. Additionally, according to GBD 2019, diabetes is a major factor for stroke and ischemic heart disease, which are the top two causes of global disease burden [4] and the main cause of heart disease.

The two most prevalent types of diabetes, type 1 and type 2, are identified using recognised diagnostic standards [2]. Though preventive and control strategies differ based on the type of diabetes, there are effective approaches to reduce its impact [2]. Among

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these tactics are reducing the risk factors for type 2 diabetes, increasing insulin accessibility, and enhancing the healthcare system's infrastructure [7, 2]. However, there are currently notable variations in risk factor profiles, accessibility to screening and therapy, and the availability of health care among various populations due to societal factors that are suggestive of health [8]. As a result, there is considerable variation in the burden of diabetes-related fatalities, disabilities, and morbidity [9]. According to the 2020 Lancet Commission on Diabetes, Low- and middle-income countries (LMICs) account for eighty percent of diabetes diagnoses, highlighting the disease's unequal burden on these populations [2]. The Lancet Commission observed that low- and middle-income countries (LMICs) face a number of socioeconomic problems, including poor nutrition, physical inactivity and poverty. It also stressed the urgent need for precise, targeted data to inform the creation of successful programs that address these issues. Furthermore, it was stated that it is critical to precisely identify and characterize the groups most at risk, as characterized by their demographic characteristics and vulnerability to important risk factors, and to project future increases in the incidence of diabetes along these dimensions [2].

Objectives (General and Specific)

This Study aims to determine the Prevalence of Diabetes mellitus among Patients Attending selected General Hospitals in Niger State, Nigeria

Specific Objectives

1. determine the prevalence rate of Diabetes mellitus among patients attending General Hospital Minna, General Hospital Suleja and Sabon Wuse General Hospital in Niger State, Nigeria.
2. identify demographic trends of Diabetes mellitus among the selected population.
3. assess the risk factors associated with Diabetes mellitus among the selected population.

Materials and Methods

Study Site, Design, and Period

A cross-sectional descriptive study was conducted among Diabetes mellitus patients attending General Hospital Minna, General Hospital Suleja and General Hospital Sabon Wuse in Niger state, Nigeria. Trained research assistants helped with obtaining data from the files of patients living with diabetes, while baseline data on sociodemographic factors of respondents was collected using modified, pre-validated questionnaires. The study was completed within ten months (May 2023-February 2024).

Figure 1 below shows the map of Niger State by Local Governments. Niger State constitutes one of the 36 states within Nigeria. Established in 1976, this area is located in the North Central geo-political zone and boasts the largest landmass, encompassing approximately 70,955 km². The state comprises approximately 25 local government areas, with Minna serving as the capital. The prominent urban centres consist of Bida, Kontagora, and Suleja. Niger state is home to a population of 6,783,300 individuals, according to the Population Projection for 2022. Suleja local government area is one of the local government areas in Niger State, Nigeria. The administrative headquarters is situated in Suleja town. The location is both a city and an Emirate situated within Niger state. The local government area was previously referred to as Abuja. The location is situated in the eastern region of Niger state, adjacent to the Tafa local government area and the Federal Capital Territory, Abuja. Suleja's population stands at 368,900 based on the 2022 population projection. Tafa local government area is situated in Niger state, Nigeria, with its administrative headquarters positioned in Wuse town. The Tafa local government area is in close proximity to the Federal Capital Territory,

Abuja. The location is situated in the eastern part of Niger state, adjacent to the local government areas of Suleja and Gurara. The population of Tafa is projected to be 143,900 in 2022 [10].

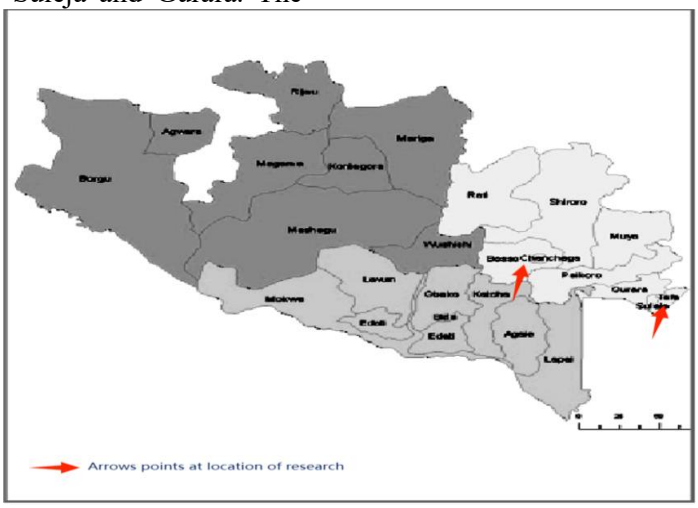

Figure 1. Map of Niger State by Local Government

Population

The study subjects were patients from 3 different hospitals with either type 1 or type 2 diabetes mellitus. The subjects were classified between the ages of 1-20, 21-40, 41- 60 and 61 years and above.

Sampling Frame

This was the clinic Diabetic patients' registers containing the list of all diabetic patients at each recruitment site (obtained from the medical records department of each hospital). The recruitment sites being the 3 General Hospitals in Niger state.

Sampling Method

A simple random sampling method was used to select the eligible clients for the study from the study population.

Sample Size

Simple random sampling techniques was employed by the researcher, who has chosen a sample size for the study that encompasses the reviewed period. To guarantee that the sample size accurately reflects the population, safeguards were in place. The Taro Yamane method was used to calculate the sample size, which came out to be 337 out of the 2,156 diabetic patients at General Hospital Minna, General Hospital Suleja, and General Hospital Sabon Wuse.

$$\underline{N \; Where \; n = the \; sample \; size}$$

$$\underline{N = 1 + N(e)^2}$$

$$\underline{\text{Where n} = \text{the sample size}}$$

$$\underline{N = \text{population size}}$$

$$\underline{e = (0.05)^2 \text{ coefficient of confidence on the margin of error}}$$

$$\underline{1 = \text{Constant}}$$

$$\underline{\text{Therefore;}}$$

$$\underline{= 1 + \frac{2156}{2156 * (0.05)^2}}$$

$$\underline{= 1 + \frac{2156}{2156 * 0.0025}}$$

$$= \frac{2156}{6.39} = 337.4 \text{respondents}$$

$$\underline{\text{Approx} = 337 \text{ respondents}}$$

This translate to 337 sample sizes against a population of 2,156 respondents at 95% confidence level at 5% error of precision level confirmed by the Krejcie and Morgan (11) table of determined sample size, is appropriate for the study.

Inclusion Criteria

In order to be included in this study, a record of cases of children and adults diagnosed with DM within ten months must be seen in selected hospitals in Niger state Nigeria.

Exclusion Criteria

A case record was excluded especially if patient was seen before and after the specified ten months for the study. Unrelated diagnosed Diabetes mellitus cases would be excluded.

Ethical Consideration

Ethical approval letter was obtained from the state Ministry of Health (MoH) Niger State. The introduction letter was written to the medical directors of the three hospitals to be involved in the study through the ethics and research committee of Niger State MOH, after which permission was granted to get access to the hospitals through their various coordinators/ Monitoring and evaluation officers. A written and signed informed consent was obtained from each participant before they were enrolled in.

Data Collection Techniques and Instruments Used

To determine the prevalence of Diabetes mellitus in selected hospitals in Niger State of Nigeria, a thorough sorting of all diabetes medical records in the hospitals was conducted. The research assistance went through a day training on diabetes knowledge and management by the Diabetes experts. Sociodemographic data and risk assessment were collected using an adapted and modified; Finnish Diabetes Risk Score (FINDRISC) questionnaire. Eligible cases were subjected to a pre coded; semi structured questionnaires conducted by trained research assistants.

Reliability and Validity of the Instruments

Pre-testing (test retest) of the questionnaires among 25 individuals with diabetes in a medical facility similar to the research group guaranteed the instrument's reliability. The use of simple English and well-defined questionnaire items guaranteed the face validity of the study tools. By making sure the questionnaires' contents were complete and equivalent to a standard diabetes knowledge and risk score questionnaire, such as the Finnish Diabetes Risk Score (FINDRISC) questionnaire, content validity was achieved [12]. After that, trained research assistants assisted in gathering data from diabetic patients' files, and customised, pre-validated questionnaires were used to gather baseline data on respondents' sociodemographic characteristics. Following a comprehensive description of the purpose of the study and its methodology, participants were asked to complete consent forms and questionnaires that collected personal information such as age, sex, socioeconomic status, age at diagnosis, type of diabetes, diet, and smoking status.

Procedures for Data Processing and Analysis

A Microsoft Excel spreadsheet was used to record the raw data for initial analysis. Chi-square (χ^2) tests was used for further analysis. Frequency tables, bar charts and graphs were used to display the data.

Data Storage

Data from the diabetic patients registers and questionnaires that were collated by the trained research assistance were stored in highly confidential format.

Results

Prevalence rate of Diabetes Mellitus among Patients Attending General Hospital Minna, General Hospital Suleja and Sabon Wuse General Hospital

Table 1 presents the prevalence of Diabetes mellitus among patients attending General Hospital Minna from May 2023 to February 2024. Over this period, a total of 143,482 patients visited the hospital, with 1,561 diagnosed with diabetes. The number of diabetic patients varied each month, with the highest recorded in July 2023 at 200 cases, and the lowest in September 2023 at 134 cases. The overall prevalence rate for diabetes during this

time was 1.13%, though monthly rates ranged from 0.63% in February 2024 to 1.35% in May and July 2023. The result suggests that while the hospital had a steady flow of patients, the prevalence of diabetes fluctuated across the months.

Table 1. Prevalence Rate of Diabetes Mellitus among Patients Attending General Hospital (GH) Minna

Months	Facility Attendance	Diabetic Patients	Prevalence (%)
May 2023	14470	195	1.35
June 2023	13426	172	1.28
July 2023	14706	200	1.35
August 2023	16413	170	1.04
September 2023	12985	134	1.03
November 2023	14976	193	1.29
December 2023	14688	151	1.03
January 2024	15186	178	1.17
February 2024	26632	168	0.63
TOTAL	143,482	1561	1.13

(**Source:** Field survey 2024)

Table 2 presents the prevalence of Diabetes mellitus among patients attending General Hospital Suleja from May 2023 to February 2024. During this period, 114,689 patients visited the facility. A total of 456 diabetic cases were recorded, resulting in an overall prevalence rate of 0.41%. Monthly rates show that the highest prevalence was 0.87% in February 2024, while the lowest was 0.12% in May 2023. The fluctuations suggest that, despite a consistent number of hospital visits, the number of diabetic cases remained relatively low, reflecting a generally low diabetes prevalence at this facility.

Table 2. Prevalence Rate of Diabetes Mellitus among Patients Attending General Hospital (GH) Suleja

Months	Facility Attendance	Diabetic Patient	Prevalence (%)
May 2023	13033	16	0.12
June 2023	11414	76	0.67
July 2023	13014	39	0.30
August 2023	11870	47	0.40
September 2023	10823	43	0.40
October 2023	11829	23	0.19
November 2023	12422	29	0.23
December 2023	9604	40	0.42
January 2024	10654	56	0.52
February 2024	10026	87	0.87
TOTAL	114689	456	0.41

(**Source:** Field survey 2024)

Table 3 shows the prevalence of Diabetes mellitus among patients attending General Hospital Sabon Wuse from May 2023 to February 2024. Over this period, 19,471 patients visited the hospital, with 139 of them diagnosed with diabetes, resulting in an overall

prevalence rate of 0.76 %. The monthly prevalence varied, with the highest rate recorded in October 2023 at 1.66%, and the lowest in September 2023 at 0.28%. The data indicates that while the number of diabetic patients fluctuated, there was a relatively steady attendance at the hospital. However, months like October 2023 and May 2023 saw notable spikes in diabetes cases.

Table 3. Prevalence Rate of Diabetes Mellitus among Patients Attending Sabon Wuse General Hospital (GH)

Months	Facility Attendance	Diabetic Patients	Prevalence (%)
May 2023	2684	30	1.12
June 2023	2040	12	0.59
Jul y 2023	1841	16	0.87
August 2023	2131	17	0.80
September 2023	2112	6	0.28
October 2023	1208	20	1.66
November 2023	1008	10	0.99
December 2023	2132	9	0.42
January 2024	2164	8	0.37
February 2024	2151	11	0.51
TOTAL	19,471	139	0.76

(**Source:** Field survey 2024)

Table 4 shows the Demographic data trends of diabetes mellitus among selected populations. Result on the Age at Diagnosis shows that only 39 individuals, representing 11.82% of the study population, were diagnosed with diabetes between the ages of 1 and 20. A significant portion of the population, 143 individuals or 43.33%, were diagnosed with diabetes between the ages of 41 and 60, making this the largest age group represented. The age group between 21 to 40 years follows closely, with 112 individuals or 33.94% being diagnosed during this period. Lastly, 36 individuals, accounting for 10.91%, were diagnosed with diabetes after the age of 60. In terms of gender distribution, the result reveals that 134 males, constituting 40.61% of the population, have been diagnosed with diabetes. In contrast, a higher number of 196 females, or 59.39%, have been diagnosed with the condition. This indicates a higher prevalence of diabetes among females in the selected population. Regarding the level of education, 43 individuals, making up 13.03% of the population, obtained HND/Degree, 14 individuals, making up 4.24% had Masters/PhD, 52 individuals, making up 15.76% obtained OND, 80 individuals, making up 24.24% finished secondary school education and lastly 141 individuals who were illiterate making up 42.73%. The socio-economic status shows that 24 individuals have high economic status (07.28%), majority of the individuals (194) are middle class (58.78%) while 112 individuals are lower class (33.94%).

Table 4. Demographic Data Trends of Diabetes Mellitus among Selected Populations

Demographic data		Frequency	Percentage (%)
How old were you when diagnosed with diabetes	1-20	39	11.82%
	21-40	112	33.94%
	41-60	143	43.33%
	>60	36	10.91%
	Total	330	100.0%

Gender	Male	134	40.61%
	Female	196	59.39%
	Total	330	100.0%
What is your highest level of education?	HND/Degree	43	13.03%
	Masters/PhD	14	4.24%
	OND	52	15.76%
	Sec. sch	80	24.24%
	Illiterate	141	42.73%
	Total	330	100%
How would you describe your socio-economic status?	Higher class	24	7.28%
	Middle class	194	58.78%
	Lower class	112	33.94%
	Total	330	100%

The result from table 5 on the demographic data trends of Diabetes mellitus among a selected population of 330 individuals reveals significant patterns regarding age at diagnosis, gender distribution, and socio-economic status. Examining the age at diagnosis, 23 of the individuals with Type 1 diabetes (31.94%) were diagnosed between the ages of 1 and 20, whereas 16 individuals with Type 2 diabetes (06.20%) were diagnosed in this age range, accounting for 11.82% of the total population. The chi-square test shows a significant difference in the distribution of age at diagnosis between Type 1 and Type 2 diabetes ($\chi 2$ = 137.50, df = 3, p <.00001). For those diagnosed between the ages of 21 and 40, there were 45 individuals with Type 1 diabetes (62.50%) and 67 individuals with Type 2 diabetes (25.97%), representing 33.94 % of the total population. In the 41 to 60 age group, 3 individuals were diagnosed with Type 1 diabetes (04.17%) and 140 with Type 2 diabetes (54.26%) were diagnosed, comprising 43.33% of the population. Among those diagnosed at over 60 years of age, 1 individual was diagnosed with Type 1 diabetes (01.39%) and 35 with Type 2 diabetes (13.57%), making up 10.91 % of the total population.

Regarding gender distribution, the results indicate a significant difference between the two types of diabetes ($\chi 2$ = 23.24, df = 1, p <.0000). In the male population, 47 individuals have Type 1 diabetes (65.28%) and 87 have Type 2 diabetes (33.72%), constituting 40.61% of the total population. Among females, 25 individuals have Type 1 diabetes (34.72%) and 171 have Type 2 diabetes (66.28%), making up 59.39% of the total population. The educational qualification has a significant variation between the types of Diabetes (x^2=9.933 df = 4, p=.0016). Among those who obtained HND/Degree, only 3 individuals had type 1 diabetes (4.17%) and 40 individuals with type 2 diabetes (15.50%) constituting 43% 0f the total population. 3 individuals with Master's degree/PhD had type 1 diabetes (4.17%) and 11 individuals with type 2 diabetes (4.26%) constituting 14% of the total population. Those individuals who were illiterate represents the highest group constituting 42.73% of the total population.

The socio-economic status also shows a significant variation between the types of diabetes ($\chi 2$ = 8.30, df = 2, p = .015). Among the higher class, 10 individuals have Type 1 diabetes (13.89%) and 14 have Type 2 diabetes (05.43.%), representing 7.27% of the total population. Among the middle class, 34 individuals have Type 1 diabetes (47.22%) and 160 have Type 2 diabetes (62.01%), making up 58.79% of the total population. While among the lower class, 28 individuals have Type 1 diabetes (38.89%) and 84 have type 2 diabetes (32.56%), making up 33.94% of the total

population. The result highlights significant demographic trends in Diabetes mellitus diagnoses among the selected population. Age at diagnosis, gender distribution, and socio-economic status are critical factors, with significant differences observed between Type 1 and Type 2 diabetes across these demographics. The findings emphasize the importance of considering these variables in understanding and addressing the demographics of diabetes mellitus.

Table 5. Demographic Data Trends of Diabetes Mellitus among Selected Populations

Variable	**Frequency (%)**			χ^2	**df**	**p-value**
	Type 1	**Type 2**	**Total**			
	n = 72	n = 258	n = 330			
How old were you when diagnosed with diabetes						
1-20	23(31.94)	16(6.20)	39(11.82)	137.50	3	<.00001
21-40	45(62.50)	67(25.97)	112(33.94)			
41-60	3(4.17)	140(54.26)	143(43.33)			
>60	1(1.39)	35(13.57)	36(10.91)			
Gender						
Male	47(65.28)	87(33.72)	134(40.61)	23.24	1	<.00001
Female	25(34.72)	171(66.28)	196(59.39)			
What is your highest level of education?						
HND/Degree	3(4.17)	40(15.50)	43(13.03)	9.933	4	.0016
Masters/PhD	3(4.17)	11(4.26)	14(4.24)			
OND	10(13.89)	42(16.28)	52(15.76)			
Secondary School	25(34.72)	55(21.32)	80(24.24)			
Illiterate	31(43.05)	110(42.64)	141(42.73)			
How would you describe your socio-economic status?						
Higher class	10(13.89)	14(5.43)	24(07.28)	8.30	2	.015
Middle class	34(47.22)	160(62.01)	194(58.78)			
Lower class	28(38.89)	84(32.56)	112(33.94)			

Table 6 revealed the study conducted at the 3 selected facilities aimed to explore the relationship between various risk factors and the prevalence of Diabetes mellitus among a sample of 330 individuals. The findings revealed significant associations across different variables, shedding light on the complex dynamics of diabetes onset and its contributing factors. Age at diagnosis played a crucial role in diabetes type distribution. Individuals diagnosed between the ages of 1-20 predominantly exhibited Type 1 diabetes (31.94%), whereas those diagnosed between 41-60 years showed a higher prevalence of Type 2 diabetes (54.26%). Among those diagnosed over the age of 60, Type 2 diabetes was even more prevalent (13.57%), indicating an age-dependent pattern in diabetes type manifestation.

Table 6 revealed that most patients were 76.39% and 69.77% nonsmokers for type 1 and 2 diabetes respectively while 23.61% and 30.23% were smokers with T1DM and T2DM respectively. Similarly, regular physical activity of at least 30 minutes daily was associated with a lower incidence of Type 2 diabetes among individuals (23.26%) compared to Type 1 (51.39%) for those who never engage in

physical exercise, suggesting a potential protective effect of physical activity against Type 2 diabetes development. Family history also played a significant role, with a higher incidence of Type 2 diabetes (77.91%) observed among individuals with a family history of diabetes. In contrast, individuals without a family history of diabetes were more likely to have Type 1 diabetes (58.33%), highlighting genetic predispositions in diabetes etiology.

Hypertension was strongly associated with Type 2 diabetes (72.48%), compared with individuals with Type 1 diabetes (23.61%). Obesity shows a significant difference in diabetes type distribution in this study. With a higher incidence in type 2 diabetes (67.05%) and 27.78 in type 1 diabetes. Overall, the findings underscore the multifaceted nature of Diabetes mellitus, influenced by age, lifestyle factors such as smoking and physical activity, genetic predispositions through family history, and comorbid conditions like hypertension. The study emphasizes the importance of tailored prevention and management strategies that consider these diverse factors to effectively combat the rising prevalence of diabetes in the populations.

Table 6. The Risk Factors Associated with Diabetes Mellitus among Selected Population

Variable	**Frequency (%)**			χ^2	**df**	**p-value**
	Type 1	**Type 2**	**Total**			
	n = 72	n = 258	n = 330			
How old were you when diagnosed with diabetes						
1-20	23(31.94)	16(06.20)	39(11.82)	137.50	3	<.00001
21-40	45(62.50)	67(25.97)	112(33.94)			
41-60	3(04.17)	140(54.26)	143(43.33)			
>60	1(01.39)	35(13.57)	36(10.91)			
Do you smoke						
Yes	17(23.61)	78(30.23)	95(28.79)	2.06	2	.356
No	55(76.39)	180(69.77)	235(71.21)			
How often do you engage in physical activity for at least 30 minutes every day?						
Often	2(02.78)	60(23.26)	62(18.79)	34.99	2	<.00001
Never	37(51.39)	156(60.47)	193(58.48)			
Rarely	33(45.83)	42(16.27)	75(22.73)			
How often do you consume sugary food or beverages (diet)						
Rarely	5(06.94)	42(16.28)	47(14.24)	34.23	2	<.00001
Often	38(52.78)	178(68.99)	216(65.46)			
Occasionally	29(40.28)	38(14.73)	67(20.30)			
Have you ever been diagnosed with High Blood Pressure?						
Yes	17(23.61)	187(72.48)	204(61.82)	56.95	1	<.00001
No	55(76.39)	71(27.52)	126(38.18)			
Do you have any member of your family (parents, sibling) diagnosed with diabetes						
Yes	30(41.67)	201(77.91)	231(70.00)	5.51	1	.00001
No	42(58.33)	57(22.09)	99(30.00)			
Body Mass Index kg/m2						
25-30	52(72.22)	85(32.95)	137(41.52)	38.25	1	<.00001
>30	20(27.78)	173(67.05)	193(58.48)			

Discussions

The study on the prevalence of Diabetes mellitus among patients attending General Hospitals in Minna, Suleja, and Sabon Wuse revealed distinct patterns and significant variations in diabetes prevalence rates. The study also showed the demographic trends and risk factors associated with Diabetes mellitus. These findings provide critical insights into the epidemiology of diabetes in Niger state, Nigeria, offering implications for patient care, public enlightenment and hospital management strategies. These findings revealed a notable variation in diabetes prevalence across the hospitals, with General Hospital Minna recording the highest prevalence, followed by GH Sabo Wuse and Suleja General Hospital. The overall prevalence rates indicate that diabetes remains a public health concern in these areas, although the rates vary across months and locations. General Hospital Minna recorded an average diabetes prevalence rate of 1.13%, with the highest prevalence observed in May and July 2023 (1.35%). The lowest prevalence was observed in February 2024 at 0.63%. The high prevalence observed in the General Hospital Minna may be attributed to the sedentary lifestyle associated with urban dwellers.

In General Hospital Suleja, the prevalence rate of diabetes was 0.41%, significantly lower compared to GH Minna. The highest prevalence of 0.87% was recorded in February 2024, while the lowest, 0.12%, was seen in May 2023. This low rate could be related to less awareness of diabetes in this region. According to Ugwu et al. [13], two-thirds of diabetes cases in Nigeria are believed to be undetected. The steady but low prevalence rate suggests that interventions to raise awareness within the community and improve diagnostic services could help in identifying more cases. General Hospital Sabon Wuse reported an average prevalence rate of 0.76%, which is higher than GH Suleja but lower than GH Minna. The highest prevalence of 1.66% occurred in October 2023. While the lowest prevalence rate of 0.28 occurred in September, 2023. Evidence from other studies conducted in Nigeria corroborates these findings, the prevalence of diabetes ranged from 0.8 percent to 11 percent, according to Dahiru et al. [14]. It is therefore imperative to determine the actual prevalence of diabetes mellitus in Nigeria, especially in Niger state, in order to facilitate efficient planning, public enlightenment campaign, advocacy, and allocation of health resources.

The demographic data trends presented provide insights into the relationship between age, gender, socio-economic status, and the types of Diabetes mellitus (Type 1 and Type 2) among the selected population. A total of 330 patients diagnosed with Diabetes mellitus were interviewed, with significant trends observed across different demographic variables, as analysed through Chi-square (χ^2) tests. Gender was another significant factor in diabetes distribution, with a p-value of .0001 indicating a strong association between gender and the type of diabetes. Female participants (59.39%) were more prevalent than males (40.61%). A higher proportion of women (66.28%) had Type 2 diabetes compared to men (33.72%). This may be attributed to the cultural belief that fat women are seen to be wealthy. These findings are supported by studies suggesting that T2DM was found to affect Nigerian women more frequently than men [15]. This greater frequency in women has been connected to the diet, lifestyle, and cultural aspects of various Nigerian communities [16]. Ogbera and Ekpebegh [16] also stated that fat women are typically associated with affluence. Furthermore, hormonal differences, such as the role of estrogen and its decline after menopause, have been implicated in the higher risk of diabetes among older women [17].

Socio-economic status also played a statistically significant role in diabetes trends, with a p-value of .015. A higher percentage of middle- and lower-class individuals (58.78% and 33.94%) were diagnosed with diabetes

compared to those in the upper class (07.27%). Type 2 diabetes was predominant among all groups, but more pronounced in the middle- and lower-class population (62.01% and 32.56%). People with low socioeconomic status have limited access to information on diabetes care, prevention and management. This is consistent with the broader literature, which highlights the connection between socioeconomic status and the risk of developing diabetes. People with higher SES compared with those with lower SES are likely to have improved quality healthcare, higher life expectancy, not suffer from serious health conditions, able to receive better medications and no constrained access to health care because they can afford the high cost [18]. Lower class individuals may have limited access to healthcare, proper nutrition, and physical activity, all of which are key preventive measures against diabetes [19]. Moreover, chronic stress, which is often higher among lower class, has been linked to increase insulin resistance and the development of Type 2 diabetes [20].

Educational qualification was another significant factor in diabetes prevalence, with a p-value of .0016 indicating a strong association between educational attainment and the type of diabetes. Among those participants with Type 2 diabetes, 21.32% had secondary school education while 42.64% were illiterate. The reason for the higher diabetes prevalence among the individual with the lowest educational level may be due to ignorance or limited access to educational information regarding diabetes prevention and control. Such individuals engage in various risky behaviour such as consumption of unhealthy diet, lack of exercise etc. Prior research by Dasgupta et al. [21] found that those who were obese, had the lowest levels of education and led an inactive lifestyle, had a higher chance of contracting the disease compared to those who had higher levels of education and had active lifestyles. Dasgupta et al. [21] further state that a person's educational attainment is a major factor in lowering their chance of developing diabetes because such a person is more knowledgeable about living a healthier lifestyle. The demographic trends observed in this study align with existing scientific literature, highlighting the significant impact of age, gender, and socio-economic status on the prevalence and type of Diabetes mellitus. Type 2 diabetes was predominantly associated with older age groups, women, and individuals with low socio-economic status, while Type 1 diabetes was more common in younger males. The findings highlight the need for targeted interventions that address these demographic disparities, particularly in increasing awareness, early diagnosis, and improved access to healthcare, especially for those at higher risk of developing Type 2 diabetes due to socioeconomic factors.

The result on risk factors associated with diabetes mellitus across the three hospitals; General Hospital Minna, General Suleja, and Sabo Wuse General Hospital provides a comprehensive view of the demographic and lifestyle elements linked to Type 1 and Type 2 diabetes. The findings align with global literature on diabetes risk factors, which consistently highlight the roles of age, lifestyle behaviors, and family history as critical determinants in the prevalence and onset of the disease. The age at which participants were diagnosed with diabetes showed significant difference between Type 1 and Type 2 diabetes, because the p-value <.00001 is less than <0.05 alpha, indicating a statistically significant relationship between age and the type of diabetes. The age distribution showed that individuals in the age class 1 to 20 consisted 31.94% and 6.20% of persons living with T1DM and T2DM respectively. Age class 21 to 40 consisted 62.50% and 25.97% of type 1 and 2 diabetes respectively. Among the age group 41 to 60 consisted the highest number of individuals with T2DM. 4.17% with T1DM and 54.26% had T2DM. The age class >60 was

1.39% and 13.57% with type 1 and 2 diabetes respectively. This agrees with the report by Lyssenko et al. [22] that Type I diabetes frequently strikes younger people between the ages of 8 and 12 unexpectedly, frequently with the start of puberty. However, all ages can be affected by this type of Diabetes mellitus. Incidence of diabetes diagnoses among individuals aged 21-40 is consistent with the growing trend of earlier onset of Type 2 diabetes in developing countries like Nigeria. This earlier onset may be attributed to the rapid urbanization, sedentary lifestyles, unhealthy diets, and obesity among younger adults as reported by Redondo *et al.* [23]. Among the age group 41-60 consisted the highest number of individuals living with diabetes. This shows diabetes tends to rise with increasing age. The predominance of Type 2 diabetes in those above 60 is well-documented, as aging is a known risk factor for insulin resistance and metabolic changes that contribute to diabetes [24].

Numerous studies have demonstrated that smoking is a major risk factor that could potentially accelerate the onset of Type II diabetes [25]. In this study, only 23.61% and 30.23% of the participants often smoke, for T1DM and T2DM respectively. However, smoking did not show a significant difference between Type 1 and Type 2 diabetes (p-value of .356), suggesting that while smoking is a contributing factor, it may not be prominent in these populations. Physical activity plays an important preventive role, with regular exercise reducing the risk of developing Type 2 diabetes by improving insulin sensitivity. In this study, only 2.78% and 23.26% often engage in physical activities for at least 30 minutes for T1DM and T2DM respectively. The lack of physical activity showed a higher prevalence of Type 2 diabetes (60.47%). Almdal et al. [26] discovered that extended television watching raised the probability of getting diabetes in both men and women, suggesting that physical inactivity may be a risk factor for the formation of the condition under discussion. A family history of diabetes is another strong predictor of the disease, particularly Type 2 diabetes, due to genetic predispositions. 77.91% and 41.67% of individuals with T1DM and T2DM respectively had a family history of the disease, which aligns with the findings of Haghighatdoost et al. [27] that a person's genetic makeup genuinely plays a role in the pathophysiology of Type II diabetes. Researchers came to the conclusion that a person is more likely to get Type II diabetes if they have a positive family history among their first-degree relatives [28]. According to Naseer et al. [28], this risk increases considerably more if both parents have Type II diabetes.

The study revealed a strong association between hypertension and the types of diabetes. 23.61% and 72.48% for T1DM and T2DM respectively. A substantial amount of research points to a connection between body mass index, blood pressure, and the chance of getting Type II diabetes [29]. Obesity is one of the most significant risk factors for diabetes, particularly Type 2, due to its contribution to insulin resistance.

In this study, most of the participants were either over weight (41.52%) or obese (58.48%). According to WHO, obesity accounts for 44% of diabetes and the incidence of obesity-related diabetes is expected to double to 300 million by 2025 [30]. This study shows strong association between consumption of sugary food or beverages and the types of diabetes. Most of the participants often consume sugary foods or beverages; 52.78% and 68.99% for T1DM and T2DM respectively. An individual's eating habits play a significant role in determining their risk of developing diabetes. A positive correlation has been reported by Sun [3] between different eating habits and the likelihood of developing diabetes. For example, Villegas et al. [31] found that, as multiple cohort studies have demonstrated, there is a significant correlation between greater dietary glycemic patterns and an increased risk of developing diabetes. Nigerians are more likely

to develop diabetes as a result of their increased use of beverages with added sugar, according to a previous Dataphyte [32] study. It also revealed that Nigerians who regularly drink one or two cans of sugar-sweetened beverages each day are at a 26% chance of developing type 2 diabetes [32]. The findings across the three hospitals reinforce the role of well-established risk factors such as age, smoking, physical inactivity, family history, hypertension, and obesity in the development of diabetes. These trends are consistent with global patterns and highlight the need for targeted public health interventions focusing on lifestyle modifications, early screening, and education to prevent and manage diabetes in these populations.

Conclusions

The study revealed distinct patterns and significant variations in diabetes prevalence rates, with the highest recorded in General Hospital Minna (1.13%) and the lowest recorded in General Hospital Suleja (0.41%). It further revealed that people living with T1DM and T2DM where predominantly between the ages of 41 to 60. The prevalence of diabetes was found to increase with age, socio-economic status, family history and diet. Therefore, high intake of carbohydrate and food devoid of vegetables and proteins should be avoided for good quality of life and longevity. The research further revealed that consumption of beverages/food containing high sugar content posed a key risk factor for the development of T2DM. Finally, the study recommends intensive effort by healthcare providers and stakeholders to facilitate efficient planning, public enlightenment campaign, advocacy, and allocation of health resources for prevention and management of diabetes.

Recommendations

Based on these findings, the following recommendations were made:

1. The study should be repeated in several Healthcare facilities in Niger state to determine the overall diabetes prevalence in the state.
2. Primary prevention strategies such as continuous public enlightenment campaign should be targeted at both local community and state levels to ensure individuals have access to early diabetes detection and management.
3. There is need to ensure the mass media is utilized as a medium of advocacy for diabetes education.
4. Establishment of diabetes testing unit at all Primary healthcare centres should be encouraged.
5. There is need to facilitate efficient planning, advocacy, and allocation of health resources by the Government and other donors.
6. There is need to have a well-defined and structured National diabetes care and prevention policy to lessen the burden of the disease on Nigerians.

Limitations

Sample and Population Limitations

1. Small sample size: Limits statistical power and may not represent the broader population.
2. Selection bias: Participants may not reflect the general population
3. Three hospitals will be used to find the prevalence of Diabetes mellitus in Niger state in this research project. There is a need for a similar study among all the hospitals in Niger state to ensure better generalizability.

Conflicts of Interest

There was no conflict of interest. The study was funded by the authors.

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