

## Prevalence of diabetes mellitus among adults in rural north central Nigeria

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### Abstract

**Background:** Diabetes Mellitus is one of the non-communicable diseases and a public health problem facing the world. This chronic disease is expected to rise due to rapid population growth, urbanization, aging, obesity and physical inactivity. The objective of this study was to determine the prevalence of Diabetes Mellitus among rural adults in North Central Nigeria.

**Method:** We carried out a cross-sectional descriptive study of 750 subjects aged 15 years using systematic sampling technique. Blood samples were collected from subjects for the estimation of plasma glucose concentration using the glucose oxidase method. Diabetes mellitus was diagnosed according to standard guidelines.

**Results:** The study population consisted of 385 (51.3%) males and 365 (48.7%) females (male: female 1.05:1) with a

mean age of 39.42±16.17 years. The overall prevalence of diabetes mellitus in this study was 4.1%. The prevalence was 5.2% in males and 3.0% in females (male: female of 1.7:1). None of the subjects had plasma glucose levels in the impaired glucose tolerance (IGT) range.

**Conclusion:** The overall prevalence rate of diabetes mellitus in the study is higher than previously reported from northern parts of Nigeria; thus, it seems the prevalence of diabetes mellitus may be increasing among the adults of north central Nigeria. There is need for active screening for diabetes mellitus among the adults in rural Nigeria.

**Keywords:** Adults, Diabetes Mellitus, Nigeria, Prevalence

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### Introduction

Both non-communicable diseases and communicable diseases are epidemics facing the developing countries.<sup>1</sup> Due to research efforts, infectious diseases are projected to decline by 3% over the next 10 years while at the same time deaths due to chronic diseases are projected to increase by 17%.<sup>2</sup> It is also estimated that of the 64 million death worldwide projected in 2015, 41 million (64%) will result from chronic diseases-unless urgent step is taken.<sup>2</sup> Diabetes Mellitus is one of the non-communicable diseases and public health problems facing the world.<sup>3,4</sup>

Worldwide, it is estimated that cases of diabetes mellitus will rise from 171 million (2.8%) in 2000 to 366 million (4.4%) in 2030.<sup>4</sup> Sub-Saharan Africa accounts for a larger proportion of these diabetes mellitus with overall prevalence rate of 1-2% and this burden is expected to increase by 161% by 2030.<sup>4</sup> In series of surveys of diabetes mellitus performed in

Egypt, the average prevalence for the countries as a whole for the people above the age of 10 years was 4.3% with distinct geographical differences; 5.7% in urban areas, 4.1% in rural agricultural area and 1.5% in rural desert area.<sup>5</sup> An overall prevalence of 11% was found in the study of diabetes mellitus in large group of South African Indians.<sup>6</sup> In a community based prevalence study in Greater Accra, Ghana, the prevalence of diabetes was 6.3%.<sup>7</sup>

The prevalence of Diabetic Mellitus in Nigeria based on a national survey was estimated to be 2.2%.<sup>8</sup> Interestingly, earlier studies in various urban of Nigeria reported different prevalence rates; 19.3% in Lagos<sup>9</sup>, 0.43% in Ibadan<sup>10</sup> and 2.4% in Ilorin.<sup>11</sup> In addition, prevalence rates of 1.6%<sup>12</sup>, 2.0%<sup>13</sup> and 3.1%<sup>14</sup> were reported in the various semi-urban, suburban and urban communities of Northern Nigeria. Two rural studies in Nigeria on Diabetes Mellitus reported prevalence rates of 1.5%<sup>11</sup> and 1.4%.<sup>15</sup> There are paucity of studies on diabetes mellitus in the Nigerian rural settings and most of the Nigerian urban studies were done more than 10 years ago before the introduction of the current diagnostic criteria by WHO.<sup>16,17</sup> Diabetes mellitus remains a major health concern, and rural populace are more likely to be neglected compared with urban populace. Hence, the objective of this study was to determine the prevalence of Diabetic Mellitus among rural adults in North Central Nigeria.

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## Materials and Methods

### Study setting

This study was carried out in Zawan community, a rural settlement about 20 kilometers outside Jos city, North Central Nigeria. The population of Zawan community was 4,443 (National Population Commission Census 1991, Plateau State).<sup>18</sup> By the end of 2004, its population was estimated at 6520 based on an expected annual increase of 3%. The majority of the inhabitants of Zawan are Berom natives, and they share similar cultural beliefs and practices. The church, the market square and the community leaders were used to mobilize the members of this community to Our lady's of Apostles Hospital, Zawan. The hospital has a 90-bed capacity and provides primary and secondary health care.

### Research subjects

We carried out a cross-sectional descriptive study between February and May 2005. The sample size of the study was obtained using the national prevalence rate of 2.2%<sup>8</sup> and 1% sampling error. Seven hundred and fifty subjects who were 15 years were sampled using systematic sampling technique. Each recruited subject was given information regarding the research objectives in English or the local language (Hausa or Berom) as appropriate. Pregnant women and ill subjects were excluded. Written informed consent was obtained from the subjects before enrolment into the study. The subjects were assured of confidentiality of the data. Permission and co-operation for the study was obtained from the community leader of Zawan and management of Our lady's of Apostles Hospital, Zawan. The study was approved by the Ethical Committee of the Jos University Teaching Hospital, Jos, Nigeria. Data on sociodemographic information were collected with questionnaire. Blood samples (without regard to time of last meal) were collected from subjects for the estimation of plasma glucose concentration using the glucose oxidase method of Trinder.<sup>19</sup> The blood sample (two milliliters) of each subject was stored in a labeled fluoride oxalate tube and transported to the chemical pathology laboratory of Jos University Teaching Hospital for plasma glucose estimation. Subjects with random plasma glucose level  $\geq 11.1$  mmol/L (200 mg/dl) were diagnosed as having Diabetes Mellitus.<sup>16,17</sup> Subjects who had random plasma glucose levels between 7.8 mmol/L (140 mg/dl) and 11.1 mmol/L (200 mg/dl) were retested for fasting plasma glucose and 2 hours post glucose load (75g) plasma glucose estimation. Fasting plasma glucose level  $\geq 7.0$  mmol/L (126 mg/dl) and/or 2 hours post glucose plasma glucose level  $\geq 11.1$  mmol/L (200 mg/dl) was diagnosed as Diabetes Mellitus.<sup>16,17</sup> Subjects with two hours post glucose load levels between 7.8 mmol/L (140 mg/dl) and 11.1 mmol/L

(200 mg/dl) were then classified as having impaired glucose tolerance (IGT).<sup>16,17</sup>

### Statistical analysis

Data entry and analysis were done with Epi Info 3.2.2 (CDC, Atlanta Georgia, USA). The frequencies of categorical variables and means of continuous variables were determined. All P-values less than 0.05 were considered as significant.

### Results

Seven Hundred and fifty subjects were recruited for the study by the investigators. The age and sex distribution of the study subjects is shown in Table 1. The study population consisted of 385 (51.3%) males and 365 (48.7%) females (male: female 1.05:1). The mean age of the study population was  $39.42 \pm 16.17$  years. The mean ages of the males and female were  $35.23 \pm 14.09$  years and  $43.83 \pm 17.04$  years respectively ( $t=7.55$ ,  $p<0.001$ ).

Table 1. Age and sex distribution of adults in Zawan, Nigeria

Age group (yr)	Males (%)	Females (%)	Total (%)
15 - 24	96 (63.6)	55 (36.4)	151 (20.1)
25 - 34	110 (62.5)	66 (37.5)	176 (23.5)
35 - 44	70 (50.7)	68 (49.3)	138 (18.4)
45 - 54	74 (49.3)	76 (50.7)	150 (20.0)
55 - 64	21 (29.2)	51 (70.8)	72 (9.6)
65 - 74	7 (22.6)	24 (77.4)	31 (4.1)
75 - 84	7 (21.9)	25 (78.1)	32 (4.3)
Total	385 (51.3)	365 (48.7)	750 (100)

The overall prevalence of diabetes mellitus in this study was 4.1%. The prevalence was 5.2% in males and 3.0% in females (male: female 1.7:1). Sixteen subjects (nine males and seven females) had random plasma glucose in equivocal range ( $7.8 < 11.1$  mmol/L); and when tested for fasting and 2 hours post glucose load (75g oral glucose tolerance test), none had diabetic values. None of the 16 subjects retested had plasma glucose levels in the impaired glucose tolerance (IGT) range.

### Discussion

The prevalence of diabetes mellitus in this study was 4.1%, a figure higher than the rates reported in other studies in Nigeria<sup>8,10-15</sup> and equally lower than rates observed in other part of Nigeria.<sup>9</sup> When the figure was compared to other countries, it was higher than overall prevalence rate of Africa,<sup>4</sup> and the rate in rural desert area of Egypt<sup>5</sup> but lower than rates in South African

Indians,<sup>6</sup> Ghana<sup>7</sup> and urban areas of Egypt.<sup>5</sup> Interestingly, the prevalence of diabetes mellitus in this study was same as the figure in rural agricultural area of Egypt.<sup>5</sup> Strict comparison of the prevalence rates of DM from this study with those of other studies may be difficult because of the differences in the criteria for diagnosis employed and the age of the subjects in various studies. The high prevalence of DM in adults in this study may be attributed to rapid population growth, urbanization, aging, obesity and physical inactivity, an observation already confirmed in other countries.<sup>4,7</sup> We had previously reported 31.3% overall prevalence of both overweight and obesity in this population.<sup>20</sup> The paucity of recent population surveys on diabetes mellitus in Nigeria may also strengthens the high prevalence of DM in this study since most previously reported surveys were done more than ten years ago. In addition, this high prevalence of DM may be accounted for by the emerging new lifestyles in both Urban and rural Nigeria.

The higher rate of prevalence of DM in males in this study was similar to a previous study in Jos<sup>14</sup>, while others reported the contrary<sup>8,9</sup>. Interestingly, all the detected subjects were previously undiagnosed before the survey and they were asymptomatic. Simple random sampling of a defined population would have been ideal for this study but this was not possible because of the large size of the population used. However, a systematic sampling technique was employed for this study. The non-use of Oral Glucose Tolerance Test (OGTT) to test the whole study population limits its comparative strength.

In conclusion, the overall prevalence rate of diabetes mellitus in this study is higher than previously reported from northern parts of Nigeria. It seems the prevalence of diabetes mellitus may actually be increasing in this part of Nigeria. There is the need for active screening of people for diabetes mellitus in rural Nigeria

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