Prevalence of Diabetes among Adults in Agbani South East, Nigeria: A Population Based Study

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ABSTRACT

Despite the rising prevalence of diabetes mellitus in Nigeria, population based studies are scarce. This situation is worse in rural areas where the people are typically poor, not very educated and lack good hospitals. We aimed to determine the prevalence of diabetes mellitus among rural dwellers in Agbani, a semi-urban municipality in South East Nigeria. This was a preliminary, observational, cross-sectional investigation in which 400 adults were recruited using the 5 autonomous communities that make up Agbani as clusters. We randomly selected the initial 80 consenting adults from each village. Blood glucose levels were measured using a glucometer. Data obtained were analyzed using SPSS. There were 382 adults studied. There were 170 males and 212 females. The mean age was 59.37 ±15.90 years. Mean Blood Sugar was 135.69±85.94 mg/dl. The prevalence rate for hyperglycemia in this study was 20.14% or 201 persons per 1,000 rural population. There was no statistical difference between the mean blood sugar of males and females and no significant correlation between age and blood sugar.

Keywords: Agbani-Nigeria, diabetes mellitus, population-based, prevalence.

I. INTRODUCTION

Diabetes was a word coined by the Greek and Roman Physicians for conditions of excessive urine formation: the sugary urine variety was termed mellitus and the tasteless one, insipidus [1]. Diabetes mellitus has two main types: Type 1 is commoner in the younger age group (≤ 40 years) and is caused by autoimmune damage to the β-cells of the pancreas. Type 2 is commoner in older people (≥ 40 years), especially those with obesity, and is characterized 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 [2].

The exclusive criteria for diagnosis is chronic hyperglycemia, characterized by disturbances in carbohydrate, protein and fat metabolism resulting from absolute or relative insulin deficiency with dysfunction in organ systems [3], [4].

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In any population, there is a continuous distribution of blood glucose levels with no clear distinction between people with normal and abnormal values [5]. However, the diagnostic criteria for diabetes (a fasting plasma glucose 126 mg/dl (≥7.0 mMol/L) or glucose level 2 hours after an oral glucose challenge 200 mg/dl (≥ 11.1 mMol) have been selected to identify those who have a degree of hyperglycemia which, if untreated, carries a significant risk of microvascular disease and in particular diabetic retinopathy [5]. Less severe hyperglycemia is termed ‘impaired glucose tolerance’ or pre-diabetes which though does not have substantial risk of microvascular disease, has increased risk of large vessel disease (e.g. atheroma leading to myocardial infarction) and with a greater risk of developing diabetes in future [5].

The incidence of diabetes is rising globally. The recent prevalence figure published by the International Diabetes Federation (IDF) is 425 million persons living with diabetes mellitus worldwide with nearly 50% of these undiagnosed [6].

Diabetes mellitus and its complications appear to be on the increase in sub-Saharan African. It used to be considered a public health problem predominantly in the developed countries but is now increasing alarmingly in underdeveloped countries including Nigeria [7]. Diabetic eye complications of cataract, glaucoma and retinopathy are major causes of blindness. Diabetic foot ulcer is the commonest cause of lower limb amputations in Enugu, South East Nigeria [8].

In Nigeria, the reported prevalence rate of DM vary from 2% to 12% across the Country [9]-[12], though the IDR put the figure for Nigeria at 1.7% for people aged 20-69years [6].

The only nationwide population estimate of diabetes mellitus in Nigeria was in 1992 when it was said to occur in 2.2% of the population [13]. It is important to determine the actual burden of the disease in Nigeria to be able to facilitate health resource allocation, advocacy and planning.

The aim of this paper among others is to determine in a pilot survey the prevalence of diabetes mellitus among rural dwellers in Agbani, South East Nigeria.

II. PATIENTS AND METHODS

A. Study Area

Agbani is a semi-urban town of about 10,000 adults based on local church and voting records. It is located 20 km from Enugu off the Enugu-Port Harcourt high way.

It is the headquarters of Nkanu West Local Government Area of Enugu State. There are many people from other areas in Nigeria living with the indigenous population. The population is majorly engaged in farming, trade, and civil service work in several federal, state and local institutions and agencies.

B. Sampling

The researcher met with the community heads, opinion and church leaders in the area, explained the purpose of the research to them and sought and obtained permission from them to speak to the people in each autonomous communities. All consenting adults above 20year were included in the study. Only two adults however could be included from one house hold in each community.

After two weeks of sensitization of the population using church announcements, town hall meetings and town criers, the researcher visited each community for 2 consecutive days from 8am to 12noon on each day for data collection and testing. The first 80 consecutive consenting adults in each autonomous community were sampled and tested. Pregnant females were excluded.

C. Laboratory Testing

Three previously trained health workers were used for the testing. They include a laboratory technician and 2 nursing assistants.

Fasting blood glucose (FBG) or Blood glucose 2 hours after a normal meal (RBG) was measured using a glucometer (Fine test Premium, Infobia Co. Ltd, Dongangu, South Korea). The strips contain glucose oxidase and potassium ferricyanide and displays blood glucose results between 10.8 mg/dl-599.4 mg/dl (0.6-33.3 mmol/L) with a coefficient of variation of <10%. Fine test control solution was used to check the test strips to ensure accuracy.

Participants with FBG≤ 130 mg/dl or RBG ≤200 mg were considered normal while those with values above these figures were taken as abnormal, therefore within the diabetic range.

D. Statistical Analysis

Statistical analysis was performed by a statistician by the use of the SPSS version 20 (IBM Corporation, New York, USA). Results are presented in tables, graphs and charts.

III. RESULTS

In all 400 people were tested but only 382 were eventually analyzed because of clerical errors in the remaining 18 test cases. The studied population was divided into 3 age groups-less than 40 years, 40-60 years and above 60 years. There was no significant difference between the mean blood glucose levels of the 3 age groups (p=0.908). The parameters of the 3 age groups are as shown in the Table I. Table II and Table III show age group versus normal/abnormal blood glucose; and descriptive statistics respectively.

A total of 382 patients were recruited for the study. Out of the total number of participants, 170 were males and 212 were females. The mean age of the participants was 59.37 ±15.90 years with range of 20-102 years. The mean blood sugar of all participants was 135.69±85.94 mg/dl. There was no statistical difference between the mean age of males (60.95 ±15.88 years) and mean age of females (58.11 ±15.83 years) p = 0.083. There was no statistically between the mean blood sugar of males (140.44±82.78 mg/dl) and mean blood sugar of females (131.88±88.40 mg/dl) p = 0.334. There was no significant correlation between age and blood sugar (Pearson correlation = -0.03; p = 0.556) as shown in the scatter plot (Fig 1). Fig. 2 shows a bar chart of normal versus abnormal blood glucose and 78 persons out of 382 were found to have blood sugar levels in the diabetic range (RBS > 200 mg/dl or FBS > 130 mg/dl) giving a total prevalence rate of 20.14 % or 201 persons per 1,000 population. This is shown in the table below. Forty one of 170 males have blood sugar level in the diabetic range giving a male prevalence of 24.12 percent or prevalence of 241 males per 1000 male population. 37 of 212
females have blood sugar levels in the diabetic range giving a female prevalence of 17.45% or 174 females per 1000 of studied female population.

### TABLE I: MEAN BLOOD SUGAR BY AGE GROUP

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>Frequency</th>
<th>Mean blood glucose (mg/dl)</th>
<th>Prevalence of Diabetes (per 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 40</td>
<td>49</td>
<td>139.5±97.88</td>
<td>224</td>
</tr>
<tr>
<td>40-60</td>
<td>146</td>
<td>134.2±88.49</td>
<td>199</td>
</tr>
<tr>
<td>Greater than 60</td>
<td>187</td>
<td>135.8±80.93</td>
<td>203</td>
</tr>
</tbody>
</table>

### TABLE II: AGE GROUP VERSUS NORMAL/ABNORMAL BLOOD GLUCOSE CROSS TABULATION

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Normal</th>
<th>DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 40 years</td>
<td>38</td>
<td>11</td>
</tr>
<tr>
<td>40-60 years</td>
<td>117</td>
<td>29</td>
</tr>
<tr>
<td>Above 60 years</td>
<td>149</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>304</td>
<td>78</td>
</tr>
</tbody>
</table>

### TABLE III: DESCRIPTIVE STATISTICS

<table>
<thead>
<tr>
<th>Age</th>
<th>Blood sugar</th>
<th>Valid N (listwise)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td></td>
<td>20.00</td>
<td>102.00</td>
</tr>
<tr>
<td>382</td>
<td>51.00</td>
<td>600.00</td>
</tr>
<tr>
<td>15.89510</td>
<td>135.6911</td>
<td>85.94083</td>
</tr>
</tbody>
</table>

Fig. 1. Scatter plot of blood glucose and age.

Fig. 2. Bar chart showing normal versus abnormal blood glucose.

### IV. DISCUSSION

The prevalence rate reported from other studies in Nigeria includes 0.8% in Ibadan, South West Nigeria in, 1995 [12] and 26.2% in Port Harcourt [13] and 10.5% in Uyo [13] South South Nigeria in 2010.

A study from an urban slum in Enugu in 2018 had an overall incidence rate of 11.7% [14]. Our figure of 20.1% is higher than that reported by other workers above except the report from Port Harcourt. This is surprising as we expect figures from the rural communities to be lower than that from urban areas since previous studies reported that 2-5 fold increase in the risk of diabetes mellitus is associated with urban dwelling [13]. With increasing level of poverty in Nigeria, it would appear that rural dwellers are eating and drinking whatever is available and affordably rather than what they usually consume or feel is healthy. We found no significant difference between blood sugar levels in males and females and the same was noted in the study from urban slums in Enugu [14] and other reports across Nigeria [15], [16], [18]-[21].

In the absence of typical signs and symptoms of diabetes mellitus like polyuria, polydypsia, polyphagia and glycosemia and the absence of significant diabetes mellitus complications like diabetic retinopathy, or renal disease in the tested population, we can safely assume that majority of those classified as within the diabetic range in this study may be pre-diabetic.

Our study did not find any significant difference in the blood sugar levels with increasing age. The same was noted in the study in Enugu [14] but in other studies higher prevalence was noted in the older age intervals of ≥ 60 years [15], [17]. This may probably be due to decreased physical activity energy expenditure (PAEE) [16].

The strengths of this study include that it is population derived; the first of such study in our rural dwellers and it covers the five autonomous communities of Agbani.

Limitations of this study are the small sample size making the prevalence figures apparently on the high side. Again, we did not select samples to cover all potential risk factors like obesity, socio-economic status and alcohol intake and finally we did not sub-classify the prediabetic from the truly diabetic.

### V. CONCLUSION

Diabetes mellitus has high prevalence in the population we studied. This is in accord with the acknowledged increase in the prevalence of diabetes mellitus globally including in Nigeria. We need a national diabetes mellitus survey to accurately define the risk factors, burden, complications, geographic spread and preventive strategies for this chronic debilitating disease.

### ACKNOWLEDGMENT

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CONFLICT OF INTEREST
Authors declare that they do not have any conflict of interest.

REFERENCES