Research Article

Incidence of Undiagnosed Diabetes Mellitus in Rural Community, Edo South, Benin City

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ABSTRACT

Background: The rate of diabetes is on the increase in Nigeria. Rural populace is most unlikely to receive routine medical screening or preventive services, tend to be severally ill when diagnosed and receive less optimum care. **Objectives:** To determine the incidence of undiagnosed diabetes mellitus among rural population. **Methods:** This was a cross-sectional study carried out at Iru community (off Abudu-Ogada Road) of Orhionmwon Local Government Area of Edo State. Data was collected using structured questionnaire. Part of World Health Organisation (WHO) stepwise approach for non-communicable diseases surveillance and Type 2 Finnish Diabetes Risk Assessment Form were used for clinical data collection. The respondents' data on anthropometric, blood glucose and blood pressure measurements, waist circumference and hip ratio were measured using standard criteria's. Data were analysed with Statistical Package for the Social Sciences (SPSS) version 20. **Results:** Less than half of the study participants had positive family history of diabetes (15.0%) and hypertension (25.2%). 23.7% of the rural respondents had incidence of unknown diabetes. Majority of the respondents (70.1%) had a lower risk of (1in 100) to developing diabetes mellitus within 10 years. Age, occupation, level of income per month, family history of diabetes and hypertension, distanced to health care facilities, ever seen doctor within last 12 months, ever had blood pressure measured, physical inactivity's, BMI and alcohol consumption among study participants were found to be associated with low, slightly elevated and moderate risk to developing diabetes mellitus within 10 years with *P*-value <0.05. **Conclusion:** There was poor knowledge of diabetes among rural community residents. Significant incidences of undiagnosed diabetes mellitus have been observed.

Key words: Diabetes mellitus, Incidence, Knowledge, Prevalence, Rural community, Undiagnosed diabetes.

INTRODUCTION

Diabetes mellitus is a chronic condition that occurs due to inability of pancreas to produce adequate insulin, or ineffectively utilization of the insulin produces leading to an increased glucose concentration in the blood. This often leads to organ damage paving way for various complications attributed to diabetes to set in. There is an increasing prevalence of DM worldwide.[1] It constitutes a significant health and socio-economic burden for patients and to the health care systems.

It was postulated that there would be an increase rate of 150 million diabetic patients worldwide by the year 2000 and a further increase of 221 to 300 million in 2010 and 2025 respectively.[1] It is estimated that of over 5 million suffering from DM in Africa, the number is expected to rise to 15 million by 2025.[1] A national survey in 1992 by the Non-communicable Disease Expert Committee of the FMOH recorded a prevalence of 2.2%.[2]

There is limited documented data on type 2 DM in Nigeria. Available reports showed crude prevalence rates of 2.2% and 6.8% in 1997 and 2003 respectively.[3,4] Urban communities had a higher overall prevalence of diabetes (3.3%) compared to rural communities (2.6%).[3] The prevalence of DM in Nigeria is estimated to be 4.04%.[5]

Good glycaemic control and prevention of risks of complications in diabetic patients lead to reduced morbidity and mortality.[6] At least 78% of people in Africa are undiagnosed and do not know they are

DOI: 10.5530/ijopp.13.3.38

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living with diabetes.[1] The human and economic burden of undiagnosed diabetes is enormous. Out of the 23.6 million people suffering from diabetes in the United States, 24% are undiagnosed.[7] A survey targeting the urban population aged 20 to 69 years in Mexico revealed that out of 26% of adult with diabetes, 42% years were unaware of their status.[8]

Complications of diabetes include blindness, kidney failure, cardiovascular disease and conditions that require lower-limb amputations.[9] Due to associated complications and comorbidities with diabetes there is high cost of managing the disease.[10] Complications of diabetes can only be prevented through quick medical and cost effective interventions, but this can only be carried out among people with diabetes who are aware of their conditions. Therefore timely detection of diabetes is crucial in preventing other risk associated with diabetes.

Many developing countries in Sub-Sahara Africa, Nigeria inclusive, particularly those in the rural areas are unable to meet the basic healthcare needs of their people. In Nigeria, the recognized rural health challenges are yet to be addressed.[11] There are limited qualified healthcare practitioners in the rural areas.

Accessing health care in rural areas is faced with so much limitations such as insufficient health infrastructure, increasing rate of chronic diseases and disabilities, physical and socio-economic barriers.[12] Studies have shown that rural populace is most unlikely to receive routine medical screening or preventive services,[13,14] tend to be severally ill when diagnosed and receive less optimum care.[15,16]

The study therefore aimed to determine incidences of undiagnosed diabetes mellitus in rural community in Edo State, as well as the associated risk of developing diabetes.

MATERIALS AND METHODS

Study design

The study is a descriptive cross-sectional community-based non-interventional, observational and epidemiological survey aimed to determine incidences of undiagnosed diabetes in rural community.

Study setting and population

The study was carried out at Iru community (off Abudu-Ogada Road) of Orhionmwon Local Government Area of Edo state, Nigeria. The centre was randomly chosen from the neighbouring communities around the Local Government Centre (Abudu). Iru community is 5 kilometre from the Local Government head quarter with a population of about 1250. Predominantly, their major occupation is farming. The study population comprises of consented adult 18 years and above who resides in the community for not less than one year. Pregnant women, terminally ill persons and those considered too old were excluded from the study.

Data collection

Data collection was carried in two phases. Phase I involved the use of structured questionnaire. The questionnaire consists of social demographics, knowledge of diabetes and risk of developing diabetes. Part of World Health Organisation (WHO) stepwise approach for non-communicable diseases surveillance and Type 2 Finnish Diabetes Risk Assessment Form were adapted and used for clinical data collection.[17]

Phase II was epidemiological survey which consists of collection of Anthropometric data and measurement of blood sugar. Anthropometric measurements such as weight, height, waist circumference (WC) and hip circumference (HC) were measured using standard criteria.[18] Weight and height was also measured using bathroom weight scale and metre ruler. The height was recorded in centimetres with least count of 0.1 cm. Weight was expressed in kilograms with accuracy of 100kg. Waist circumference was measured using measuring tape and was defined as the smallest horizontal girth between the costal margins and the iliac crests at minimal respiration. Hip circumference was measured to the nearest centimetre at the widest lateral extension of the hip. Waist to Hip ratio was calculated to the nearest 2 decimal point. On the basis of the body mass index (BMI), study populations were categorized as per the following criteria: underweight (<18.5 kg/m^2), normal (18.5–22.99 kg/m^2), overweight (23–24.99 kg/m^2) and obese (≥25 kg/m^2). Abdominal obesity was defined as waist circumference of ≥90 cm for men and ≥80 cm for women. Consented participants were told to fast overnight for at least 8 hrs. Venipuncture was performed after 8 hours of fasting to obtain plasma glucose[19] using a glucometer (Accu-Check ActiveR, Roche Diagnostic).

Those classified as having diagnosed diabetes were persons told by healthcare professional that they had diabetes. Persons without previous diagnosed diabetes were those who reported that they had never been told. Undiagnosed diabetes was defined as a fasting plasma glucose (FPG) ≥ 126 mg/dl among persons without diagnosed diabetes. Total diabetes is the sum of diagnosed and undiagnosed cases. Pre-diabetes was be defined as having no diabetes and FPG in the range 100-125 mg/dl.[19]

Outcome Measure

The primary outcome measure of this study was incidences of unknown diabetes. Others include knowledge of diabetes and risk of developing diabetes.

Statistical analysis

The data collected was coded, validated and analysed using *SPSS*, version20. Analysis was descriptive and inferential. Pearson chi-squared test was used to test for significance between proportions. *P*-value < 0.05 was considered statistically significant.

RESULTS

A total of 147 rural respondents were interviewed in the study. 51 of the respondents were of age >60 years. More than half of study participants were female (60.5%) and majority of them (68.7%) had formal education (predominantly at the primary level 41.5%). Less than half of the respondents had family history of diabetes (15.0%), hypertension (25.2%) and majority of them (80.3%) are farmers. Majority (87.8%) were married and farmers (80.3%). Almost all of the respondents were not on any health insurance scheme. . As shown in the Table 1 below, more than half of the study participants (57.1%) neither heard of diabetes nor how it can be prevented. Majority of them have no knowledge of the symptoms (77.6%) and risk of diabetes mellitus (77.6%) respectively. Less than half (23.7%) of the rural respondents had unknown diabetes.

Majority of the respondents (70.1%) however, had a lower risk of (1in 100) of developing diabetes mellitus within 10 years as shown in Table 2. Occupation and level of income per month of the respondents were

Table 1: Knowledge of Diabetes Mellitus among study participants.

Variables	Yes N (%)	No N (%)
Ever heard of diabetes	84 (57.1)	60 (40.8)
If more people are getting affected	70(47.6)	42 (28.6)
Is diabetes mellitus a communicable disease?	10 (6.8)	99 (67.3)
Symptoms of diabetes mellitus		
Thirsty/urinate often	31 (21.1)	-
Eat very well	2 (1.4)	-
Defecate		-
I don't know	107 (72.8)	-
Risk factors diabetes mellitus		
Overweight	10 (6.8)	-
High blood pressure	1 (0.7)	-
Family history	4 (2.7)	-
Physical inactivity	2 (1.4)	-
Consume more sweet	10 (6.8)	-
Mental stress	-	-
I don't know	114 (77.6)	-
Diabetes mellitus affects other organs	64 (43.5)	83 (56.5)
Organs affected in the body		
Eye	2 (1.4)	-
Heart	1 (0.7)	-
Kidney	12 (8.2)	-
Leg	23 (15.6)	-
Brain	2 (1.4)	-
Lungs	-	-
I don't know	91 (61.9)	-
Can diabetes be prevented		
Yes	62 (42.2)	
No	11 (7.5)	
I don't know	46 (31.1)	
How can diabetes mellitus be prevented	56 (38.1)	
Diet	7 (4.8)	
Exercise	84 (57.1)	
I don't know		

Table 2: Clinical Characteristics of the Respondents.

Characteristics	Frequency (n)	Percentage (%)
Body mass index		
<18.5kg/m^2 (underweight)	11	7.5
18.5-24.9kg/m^2 (normal)	58	39.5
25-29.9kg/m^2 (overweight)	24	16.3
≥30 (obesity)	54	36.7
Abdominal obesity		
Normal <90cm (male),<80cm (female)	51 96	34.7 65.3
Abdominally obese ≥90(male),≥80(female)		
Waist hip ratio		
Low≤0.95(male),<0.8(female)	37	25.2
Moderate 0.96-1.0(male),0.8-0.88(female)	12 98	8.2 66.7
High ≥1.0(male),≥0.86(female)		
Diabetes		
No diabetes	112	76.2
Unknown diabetes	35	23.7
Risk of developing diabetes within 10 years	103	70.1
Lower than 7 (1in 100) low	35	23.8
7-11 (1 in 25) slightly elevated	9	6.1
12-14 (1 in 6) moderate	-	-
15-20 (1in 3) high	-	-
>20 (1 in 2) very high		
Hypertension		
Systolic		
Normal <120	39	26.5
Prehypertension 120-139	28	19.0
Hypertension ≥140	80	54.0
Diastolic		
Normal <80	65	44.2
Prehypertension 80-89	27	18.4
Hypertension ≥90	55	37.4

Table 3: Characteristics of the Study Participants by Diabetes Group.

Characteristics	Number	No diabetesn (%)	Diabetesn (%)	P-value
Age (years)				
<45	22	19(12.9)	3(2.0)	0.635
45-54	35	26(17.7)	9(6.1)	
55-64	39	30(20.4)	9(6.1)	
>64	51	37(25.2)	14(9.5)	
Sex				
Male	58	43(29.3)	15(10.2)	0.390
Female	89	69(46.9)	20(13.6)	
Marital Status				
Single	7	5(3.4)	2(1.4)	0.557
Married	129	100(68.0)	29(19.7)	
Divorced	11	7(4.8)	4(2.7)	
Educational Level				
No formal	46	33(22.5)	13(8.8)	0.327
Primary	61	48(32.7)	13(8.8)	
Secondary	27	23(15.6)	4(2.7)	
Tertiary	13	8(5.4)	5(3.4)	
Occupation				
Farmer	118	90(61.2)	28(19.0)	0.03*
Artisan	11	11(7.5)	-	
Business	7	6(4.1)	1(0.7)	
Civil Servants	4	1(0.7)	3(2.0)	
Others	7	4(2.7)	3(2.0)	
Level of Income per month(₦)				
10,000-20,000	91	66(44.9)	25(17.0)	0.009*
21,000-40,000	23	21(14.3)	2(1.4)	
41,000-60,000	17	16(10.9)	1(0.7)	
61,000-80,000	8	3(2.0)	5(3.4)	
>80,000	6	5(3.4)	1(0.7)	
Insurance Status				
No	146	111(75.5)	35(23.8)	0.762
Yes	1	1(0.7)	0(0)	
Family History of Diabetes Mellitus				
No	123	94(63.9)	29(19.7)	0.786
Yes	22	16(10.9)	6(4.1)	
Family History of Hypertension				
No	110	87(59.2)	23(15.7)	0.182
Yes	37	25(17.0)	12(8.2)	
Body mass index				
<18.5kg/m^2 (underweight)	11	9(6.1)	2(1.4)	0.046*
18.5-24.9kg/m^2 (normal)	58	48(32.7)	10(6.8)	
25-29.9kg/m^2 (overweight)	24	16(10.9)	8(5.4)	
≥30 (obesity)	54	39(26.5)	15(10.2)	
Abdominal obesity				
Normal <90cm (male),<80cm (female)	51	40(27.2)	11(7.5)	0.689
Abdominally obese ≥90(male), ≥80 (female)	96	72(49.0)	24(16.3)	
Waist hip ratio				
Low ≤0.95(male), <0.8(female)	37	28(19.0)	9(6.1)	0.298
Moderate 0.96-1.0(male),0.8-0.88(female)	12	7(4.8)	5(3.4)	
High ≥1.0(male), ≥0.86(female)	98	7(4.8)	21(14.3)	
Hypertension				
Systolic				
Normal <120	39	30(20.4)	9(6.1)	0.663
Prehypertension 120-139	28	23(15.7)	5(3.4)	
Hypertension ≥140	80	59(40.1)	21(14.3)	
Diastolic				
Normal <80	65	50(34.0)	15(10.2)	
Prehypertension 80-89	27	19(12.9)	8(5.4)	
Hypertension ≥90	55	43(29.3)	12(8.2)	
Physical inactivity				
No	25	20(13.6)	5(3.4)	0.616
Yes	111	82(55.8)	29(19.7)	
Health facilities utilization				
No place	44	37(25.2)	7(4.8)	0.192
Hospital/clinic	42	32(21.8)	10(6.7)	
Pharmacy	1	1(0.7)	0(0)	
Patent medicine store	36	28(19.1)	8(5.4)	
Traditional healer	24	14(9.5)	10(6.8)	
Alcohol consumption				
No	62	47(32.0)	15(10.2)	0.926
Yes	85	65(44.2)	20(13.6)	

found to be significantly associated with diabetes group with *P*-value<0.05. The shows that the lower the level of income and poor standard of living the more likely are the respondents affected with diabetes mellitus and poor access to healthcare facilities. This is represented in the Table 3.

In Table 4 below, age, occupation, level of income per month, family history of diabetes and hypertension, distanced to health care facilities, ever seen doctor within last 12 months, ever had blood pressure measured, physical inactivity's, BMI and alcohol consumption among study participants were found to be associated with low, slightly elevated and moderate risk of developing diabetes mellitus within 10 years with *P*-value <0.05.

DISCUSSION

In this study, majority of the rural respondents lack the knowledge of diabetes and how it can be prevented. Similar levels of knowledge of diabetes, 30.2%, have been observed in previous study in Jos State, Nigeria.[20] In similar studies done in western Nepal and amongst ethnic

Table 4: Characteristics of the Respondents by risk of developing Diabetes Mellitus within 10 year.

Characteristics	Low n (%)	Slightly elevated n (%)	Moderate risk n (%)	High risk n (%)	Very high risk n (%)	*P*-value
Age(years)						
<45	20(13.6)	2(1.4)	0(0)	-	-	0.001*
45-54	28(19.1)	4(2.7)	3(2.0)	-	-	
55-64	17(11.6)	18(12.3)	4(2.7)	-	-	
>64	38(25.9)	11(7.5)	2(1.4)	-	-	
Sex						
Male	39(26.5)	15(10.2)	4(2.7)	-	-	0.830
Female	64(43.5)	20(13.6)	5(3.4)	-	-	
Marital Status						
Single	6(4.1)	1(0.7)	0(0)	-	-	0.393
Married	91(61.9)	31(21.1)	7(4.8)	-	-	
Divorced	6(4.1)	3(2.0)	2(1.4)	-	-	
Educational Level						
No formal	32(21.80)	12(8.2)	2(1.4)	-	-	0.086
Primary	37(25.2)	19(12.9)	5(3.4)	-	-	
Secondary	24(16.3)	3(2.0)	0(0)	-	-	
Tertiary	10(6.80	1(0.7)	2(1.4)	-	-	
Occupation						
Farmer	78(53.1)	33(22.5)	7(4.8)	-	-	0.006*
Artisan	11(7.5)	0(0)	0(0)	-	-	
Business	6(4.1)	1(0.7)	0(0)	-	-	
Civil Servants	2(1.4)	0(0)	2(1.4)	-	-	
Others	5(3.4)	1(0.7)	0(0)	-	-	
Level of Income per month(₦)						
10,000-20,000	65(44.2)	21(14.3)	5(3.4)	-	-	0.0001*
21,000-40,000	13(8.8)	10(6.8)	0(0)	-	-	
41,000-60,000	15(10.2)	2(1.4)	0(0)	-	-	
61,000-80,000	4(2.7)	0(0)	4(2.7)	-	-	
>80,000	6(4.1)	0(0)	0(0)	-	-	
Insurance Status						
No	103(70.1)	34(23.1)	9(6.1)	-	-	0.2
Yes	0(0)	1(0.7)	0(0)	-	-	
Family History of Diabetes Mellitus						
No	91(61.9)	30(20.4)	2(1.4)	-	-	0.0001*
Yes	10(6.8)	5(3.4)	7(4.8)	-	-	
Family History of Hypertension						
No	81(55.1)	28(19.1)	1(0.7)	-	-	
Yes	22(15.0)	7(4.8)	8(5.4)	-	-	0.0001*
Distance to facilities						
≤4 km	50(34.0)	24(16.3)	2(1.4)	-	-	0.009*
5-9 km	38(25.9)	7(4.8)	3(2.0)	-	-	
10-14 km	10(6.8)	4(2.7)	4(2.7)	-	-	
How much money to get to health facilities((₦)						
100-200	44(29.9)	15(10.2)	0(0)	-	-	0.009*
300-500	37(25.2)	13(8.8)	3(2.0)	-	-	
600-900	5(3.4)	0(0)	2(1.4)	-	-	
≥1000	12(8.2)	7(4.8)	4(2.7)	-	-	
Ever seen a doctor in last 12 months						
None	50(34.0)	19(12.9)	2(1.4)	-	-	0.0009*
1-3 times per year	32(21.8)	12(8.2)	4(2.70	-	-	
≥4 times per year	15(10.2)	4(2.7)	3(2.0)	-	-	
Ever had blood pressure measured						
No	71(48.3)	18(12.2)	2(1.4)	-	-	0.006*
Yes	31(21.1)	17(11.6)	7(4.8)	-	-	

Body mass index						
<18.5kg/m² (underweight)	9(6.1)	2(1.4)	0(0)	-	-	
18.5-24.9kg/m² (normal)	41(27.9)	13(8.8)	4(2.7)	-	-	0.045*
25-29.9kg/m² (overweight)	17(11.6)	7(4.8)	0(0)	-	-	
≥30 (obesity)	36(24.5)	13(8.8)	5(3.4)	-	-	
Abdominal obesity						
Normal <90cm (male), <80cm (female)	36(24.5)	13(8.8)	2(1.4)	-	-	0.7
Abdominally obese ≥90(male), ≥80(female)	67(45.6)	22(15.9)	7(4.8)	-	-	
Waist hip ratio						
Low≤0.95(male), <0.8(female)	25(17.0)	10(6.8)	2(1.4)	-	-	0.474
Moderate0.96-1.0(male),0.8-0.88(female)	7(4.8)	5(3.4)	0(0)	-	-	
High≥1.0(male),≥0.86(female)	71(48.3)	20(13.6)	7(4.8)	-	-	
Hypertension (mmHg)						
Systolic						
Normal <120	29(19.7)	9(6.1)	1(0.7)	-	-	0.842
Prehypertension 120-139	20(13.6)	6(4.1)	2(1.4)	-	-	
Hypertension ≥140	54(36.7)	20(13.6)	6(4.1)	-	-	
Diastolic (mmHg)						
Normal <80	48(32.7)	15(10.2)	2(1.4)	-	-	0.286
Prehypertension 80-89	16(10.9)	7(4.8)	4(2.7)	-	-	
Hypertension ≥90	39(26.5)	13(8.8)	3(2.0)	-	-	
Physical inactivity						
No	8(5.4)	14(9.5)	3(2.0)	-	-	0.0001*
Yes	87(59.2)	18(12.3)	6(4.1)	-	-	
Health facilities utilization						
No place	27(18.4)	10(6.8)	7(4.8)	-	-	0.137
Hospital/clinic	32(21.8)	9(6.1)	1(0.7)	-	-	
Pharmacy	1(0.7)	0(0)	0(0)	-	-	
Patent medicine store	27(18.4)	8(5.4)	1(0.7)	-	-	
Traditional healer	16(10.9)	8(5.4)	0(0)	-	-	
Alcohol consumption						
No	38(25.9)	15(10.2)	9(6.1)	-	-	0.001*
Yes	65(44.2)	20(13.6)	0(0)	-	-	

Where*=significant at *p*-value <0.05

groups in Glasgow, lacks of awareness of diabetes were reported.[21,22] The low incidence of undiagnosed diabetes mellitus among the study participants (23.7%) may be due to a good life style and diet rich in vegetables, fruits and low in saturated fat as well as physical activities as majority of the participants were farmers. This is unlike in urban areas where processed food is on the increase.

When foods are processed it can affect the glycaemic index of the foods and the more processed a food is, the higher the glycaemic response it will produce.[23] This could be the result of much dietary fibers present in the vegetable diet playing a protective role and absence of the same in the non-vegetable diet.

It is understandable that, given the contributions of lifestyle modifications in the aetiology of chronic diseases, the incidence of diabetes is low in rural areas. Among the diabetes group, occupation (predominantly farmers) and low level of income were found to be significantly associated with the risk of developing diabetes mellitus. Age is highly associated with the risk to developing DM within 10 years (P-value < 0.05). This is because the older the respondents are, the more likely they develop diabetes and this was strongly substantiated at age greater 64. Our findings are in consistent with previous studies in Ethiopia, India and Iran which indicated higher incidence of undiagnosed DM as age increases.[24-27]

The incidence of unknown diabetes was significantly associated with BMI above 25. Similar observations of high BMI and older age have been reported in Nigeria[28] and Uganda.[29,30] Physical inactivity's was statistically significant with undiagnosed diabetes. Similar reports in Nigeria[4] and Uganda[30] revealed a link between physical activity and DM. Raghupathy *et al*. in a Vallore study reported an association between the physical activity and diabetes.[31] Physical inactivity is seen among top modifiable risk factors for type 2 DM (IDF 2011-2021). Our study showed a correlation between positive family history of

diabetes and hypertension to risk factors to developing the disease within the next ten years. Similar observations have also been reported in previous studies.[30,32] There is a strong link between family history and lineage to Type 2 DM and studies of have shown the role of genetic links to its development.[33] Alcohol use was a common practice among the study group and also posed a significant risk to developing diabetes.

Previous study in Kenya however reported no association between alcohol use and risk of DM.[34] Although quantification of the dose and duration of alcohol was not made in this study, previous researches has indicated a correlation between low to moderate alcohol consumption to a reduced incidence of DM.[35-37]

Distance to health facilities, transportation cost, ever visited doctor and ever had BP measured were observed to be very statistically significant (P-value < 0.05) to risk of developing DM. This suggests that the longer the distance to health facilities and high cost of transportation, the poorer the access or a total lack of access to medicine. The study also revealed that majority have not visited the hospital in the last 12 months and their BP not checked.

The study is not without limitations, this was a community based cross-sectional study and findings cannot be generalized. There could be recall bias as some of the information provided was based on self-reporting. The small sample size used in this study is insufficient to do detailed analysis on the various risk factors. This study can serve as a guide for further studies with large sample size on chronic diseases in rural community residence.

CONCLUSION

The study has demonstrated poor knowledge of diabetes mellitus among rural community dwellers. There was a low but significant increase in incidence of undiagnosed diabetes mellitus in rural populace. This study strongly recommends that screening of based study of the high risk individuals should be done at regular intervals especially in those above 35 years with sedentary life style and with or without obesity, hypertension to identify the undiagnosed diabetes. Also, individuals with family history of diabetes should be screened more frequently for type 2 diabetes, irrespective of the presence or absence of other major risk factors.

Appropriate actions need to be taken to avail diagnostic and treatment services in all health units to detect DM early and initiate appropriate preventive and supportive care before complications arise.

ACKNOWLEDGEMENT

Special appreciation goes to Dr. Ja'Belo-Osagie, Surveyor Anthony Ekhator, Engr. Lance Osawe and Mr. O.C Nwanduwa and many others, for their financial support and contributions towards this study.

CONFLICT OF INTEREST

There is no conflict of interest declared by the authors.

Ethical Issues

Ethical approval was sorted and obtained from the Ethics Committee of the Faculty of Pharmacy, University of Benin with reference number EC/FP/019/12. Consent letter was written and given to the study participants to obtain their informed consent.

ABBREVIATIONS

DM: Diabetes mellitus; **WHO:** World Health Organisation; **FMOH:** Federal Ministry of Health; **WC:** Waist Circumference; **HC:** Hip Circumference; **BMI:** Body Mass Index; **FPG:** Fasting Blood Glucose.

SUMMARY

- Poor knowledge of diabetes amongst rural populace was observed
- There was low and significant incidence of undiagnosed diabetes in the study
- Distance to health facilities, transportation cost, ever visited doctor and ever had BP measured were associated to risk of developing diabetes

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