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Spouses of patients with diabetes mellitus type 2 at increased risk of high blood glucose levels*

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ABSTRACT

Introduction: Diabetes mellitus type 2 is a growing threat in developing countries already burdened with high levels of infectious disease. Screening the general population has debatable advantages. This study aims to determine whether spouses of patients with diabetes mellitus have higher random blood glucose (RBG) levels as well as the benefit of RBG testing as a targetted screening tool. Methodology: The survey employed a cross-sectional comparative study of spouses' of diabetics and non-diabetics attending the general out-patient department of the Lagos State University Teaching Hospital (LASUTH), Ikeja. A modified WHO STEPS Surveillance Instrument and a one-touch Glucometer were used to collect data. Blood pressures and BMI were measured and correlated to blood glucose levels. Results: Prevalence of high RBG was found to be 7% among spouses of diabetics and 3.3% among spouses of non-diabetic patients. Mean RBG was 5.57 mmol/L and 7.7 mmol/L within the age group 40 - 49 years and 50 - 59 years respectively among spouses of diabetic patients compared to 5.4 mmol/L and 5.5 mmol/L within the same age group among the spouses non-diabetics. Spouses of patients with diabetes mellitus had higher systolic and diastolic blood pressures and BMI compared to spouses of non-diabetics. Conclusion: Being male, married to a diabetic patient, lower educational levels and higher body mass index are significantly associated with higher random blood glucose in the spouses of diabetic patients. Random blood glucose measurements are an effective screening tool and spouses of diabetic patients can benefit from targeted screening in controlled clinical settings.

Keywords: Diabetes Mellitus Type 2; Non-Communicable Disease; Random Blood Glucose Levels; Glucose Intolerance; Body Mass Index; Blood Pressure

1. INTRODUCTION

Diabetes mellitus type 2 is a growing threat in developing countries already burdened with high morbidity and mortality rates from infectious diseases, maternal and infant health concerns and weak ineffective health systems [1,2]. Analysis of the global and regional burden of non-communicable diseases shows that almost half the disease burden in developing countries is from non-communicable diseases, with 15 to 59 year olds facing a 30% greater risk of death from an NCD than their counterparts in the developed world [3]. In Nigeria there has been an increase in the prevalence of diabetes mellitus from 0.39% reported in a hospital population in 1963, to 6.8% in 2003 which is comparable to global estimated prevalence of 6.4%, with the largest proportion of increase occurring in developing countries [4-6]. Overall about 1.05 million people are diabetic in Nigeria and most of these are type II. Urban communities had a higher over all prevalence of diabetes mellitus (3.3%) when compared with rural communities (2.6%). The burden of diabetes in Nigeria is expected to increase even further [5].

The rising prevalence of diabetes mellitus cannot be linked only to the genetic factors of ageing populations. Environmental factors of obesity, diet and physical activity have a major influence. Various studies have examined the effect of environmental influences versus genetic factors in twins and cohabiting couples in morbidities such as coronary disease, cancer, hypertension and depression [7-13].

*Key findings: a statistically significant 7% of spouses of diabetic patients had random blood glucose levels over 11 mmol/L, compared to 3.3% of spouses in the comparative group. It was also observed that spouses of non-diabetic patients had statistically significantly lower systolic and diastolic blood pressures.

Screening for disease in the general population is appropriate when certain conditions are met with regards to representing a public health burden with known pathophysiology and a defined, asymptomatic preclinical stage when the disease can be diagnosed by reliable acceptable tests.

Diabetes meets many of the conditions for screening, which is cost-effective if done as a systematic process. Community screening is usually poorly targeted, tends to test those at low risk (the worried well) and those already diagnosed. However, in developing countries, there is benefit to be obtained from case detection using opportunistic events where there is clinical evidence of risk factors [14,15]. The cost-effectiveness of targeted screening of people attending clinics has been shown to have benefits of being able to institute preventive and therapeutic measures to reduce the impact of more serious complications [16,17]. The use of fasting blood glucose (FBG) and 2-hour blood glucose (2-hBG) have commonly been used as screening for type 2 diabetes mellitus especially for making the definitive diagnosis of diabetes in patients that have presented with the typical triad of polyuria, polyphagia and polydipsia. However, the use of random blood glucose levels has the advantage of not requiring a special time of day or trained personnel and can therefore be quickly used to screen [18]. This study set out to determine whether spouses of patients with type 2 diabetes mellitus are at risk of developing higher levels of random blood glucose and the value of random blood glucose testing as a screening tool for spouses of identified diabetic patients.

2. METHODOLOGY

This was a cross-sectional comparative study carried out in the general out-patients department (GOPD) of the Lagos State University Teaching Hospital. One thousand four hundred and sixty two patients attending the outpatients' clinic were divided into 2 groups based on the sampling formula using a prevalence rate of 2.2% [4]. Respondents of the first group was made up of spouses of known diabetics aged 30 years and over who had been diagnosed previously and were attending the GOPD for regular follow-up. The second group was made up of the spouses of other patients attending GOPD who neither had diabetes mellitus nor had been diagnosed with same at the time of recruitment. For this study, spouses referred to a married couple aged 30 years and above, of opposite genders living at the same address, with the same surname [11].

The WHO STEPS questionnaire was administered to each respondent after verbal and written consent had been obtained. The questionnaire examined socio-demographic and socio-economic data, knowledge of diabetes mellitus; its risk factors and management, lifestyle risk perception and behaviour of the respondents of both groups.

Diabetic patients were those who had previously been diagnosed by having had two fasting blood glucose levels of >7.0 mmol/L, but who did not require insulin for management and had not had ketonuria in the previous six months. All respondents were measured for weight, height and truncal circumferences. The body mass index (BMI) and waist-hip (W-H) ratios were calculated and random blood glucose levels were clinically determined. Blood pressure was measured as three supine readings taken at 5 minute intervals. Diastolic pressure was measured as Korotkoff phase 5.

Data was collated and analyzed using SPSS version 14 and presented as means (±SD) and/or medians (range) where relevant. Differences in variables between the two groups was examined using Student's t test, and χ^2 (Chi-Square) was used to examine the discrete variables. Statistical significance was determined at $P < 0.05$.

3. RESULTS

Of the 1462 patients recruited into the study, 62 either did not consent to continue in the study, were lost to follow-up, or could not be reached at the addresses provided. Their data were used to establish the contiguity of the groups but were not included in the final statistical analysis. There was some statistical difference in the socio demographic characteristics between the two groups. More spouses were females and more spouses of diabetics were aged 60 and over. Significantly more spouses of non-diabetics earned over N30,000 ($200) a month. Over a third of the respondents of both groups lived within walking distance (**Table 1**).

Seventy two respondents had random blood glucose levels over 11 mmol/L, of which significantly more than half (49/72) were spouses of diabetic patients ($P > 0.001$). It was also observed that spouses of non-diabetic patients had statistically significantly lower systolic and diastolic blood pressures ($P > 0.001$). Waist-hip ratios measured were high in both groups, but significantly lower in the group of spouses of non-diabetics ($P = 0.027$) (**Table 2**).

Random blood glucose levels in spouses of diabetic patients showed statistically significant association with increasing age, being male and higher income brackets ($P > 0.001$). Two-thirds of respondents in both groups had body mass indices (BMI) over 30, and this was significantly more prevalent among spouses of diabetic patients (**Table 3**).

4. DISCUSSION

This study shows that spouses of diabetic patients are twice as likely to have higher than normal random blood glucose levels compared to spouses of patients that did

Table 1. Socio-demographic characteristics of respondents.

Variables	*Spouses of the diabetics* N (%)	*Spouses of Non-diabetics* N (%)	X^2	P
Age (years)				
30 - 39	169 (24.1)	110 (15.7)		
40 - 49	24 (3.4)	134 (19.1)		
50-59	151 (21.6)	160 (22.9)		
60 and above	356 (50.9)	296 (42.2)	94.84	0.00**
Sex				
Males	332 (47.4)	335 (47.6)		
Females	368 (52.6)	365 (52.4)	0.872	0.03**
Religion				
Christianity	489 (69.9)	484 (69.1)		
Islam	172 (24.6)	167 (23.9)		
Traditional Religion	39 (5.6)	49 (7.0)	1.24	0.54
Education				
No formal education	190 (27.1)	194 (27.7)		
Primary School	260 (37.1)	250 (35.7)	4.9	0.17
Secondary	212 (30.3)	233 (33.3)		
University	38 (5.4)	23 (3.3)		
Family income per month				
Less than N10,000[1]	267 (38.1)	140 (20.0)		
N10,001 to N20,000	191 (27.3)	135 (19.3)		
N20,001 to N30,000	124 (17.7)	210 (30.0)		
Above N30,000	118 (16.9)	215 (30.7)	102.5	0.00**
Nearness to health care facility				
Walking distance	256 (36.6)	275 (39.3)		
5 km	140 (20.0)	140 (20.0)		
10 km	159 (22.7)	145 (20.7)		
15 km	145 (20.7)	140 (20.0)	1.41	0.70

*Computed on the basis of daily incomes of $2 at rate of $1 to N150.

Table 2. Random blood glucose levels in spouses of diabetic and non-diabetic patients.

RBG (mmol/L)	Spouses of diabetics N (%)	Spouses of non-diabetics N (%)	P
<11.1	651 (93.0)	677 (96.7)	
≥11.1	49 (7.0)	23 (3.3)	0.0016**
Blood pressure measurements & W-H ratio			
Systolic BP (mmHg)	129.8 ± 13.1	112 ± 10.1	0.000***
Diastolic BP (mmHg)	81.2 ± 8.3	76.1 ± 6.1	0.000***
Waist-Hip Ratio	0.99 ± 0.13	0.97 ± 0.11	0.027***

*Computed on the basis of daily incomes of $2 at rate of $1 to N150.

Table 3. Correlates of random blood glucose levels of spouses of diabetic and non-diabetic patients.

	Spouses of diabetics RBG (mmol/L)			Spouses of non-diabetics RBG (mmol/L)			
	N (%)	N (%)	P	N (%)	N (%)	X 2	P
	<11.1	>11.1		<11.1	>11.1		
Age							
30 - 39	159 (22.7)	10 (1.4)		105 (15)	5 (0.7)	0.25	0.62
40 - 49	15 (2.1)	9 (1.3)		129 (18.4)	5 (0.7)	28.74	0.0000**
50 - 59	138 (19.7)	13 (1.9)		155 (22.1)	5 (0.7)	4.29	0.04*
>60	339 (48.4)	17 (2.4)		288 (41.1)	8 (1.1)	1.88	
Sex							
Males	324 (46.3)	23 (3.3)		542 (77.4)	15(2.14)	8.22	0.004**
Females	327 (46.7)	26 (3.7)		135 (19.3)	8 (1.14)	0.55	0.48
Education							
No Formal Education	165 (23.5)	25 (3.5)		187 (26.7)	7 (1.0)	11.46	0.0007**
Primary	244 (34.6)	16 (2.3)		241 (33.4)	9 (1.3)	4.12	0.004**
Secondary	207 (29.6)	5 (0.7)		229 (32.7)	4 (0.6)	9.20	0.002**
University	35 (5.0)	3 (0.4)	0.000**	20 (2.9)	3 (0.4)	0.43	
Family Income Per month							
Less than 10,000	237 (33.6)	30 (4.3)		134 (19.1)	1(1.9)	0.58	
10,001 - 20,000	183 (26.1)	8 (1.1)		121 (17.3)	5 (0.7)	0.32	
20,001 - 30,000	119 (17.0)	5 (0.7)	0.007**	207 (29.3)	3 (0.4)	2.26	
Above 30,000	112 (16.0)	6 (0.9)		215 (30.7)	2 (0.3)	5.68	0.02**
Body Mass Index							
18 - 24.9	167 (23.9)	5 (0.7)		163 (23.3)	4 (0.6)	0.00	0.96
25 - 29.9	30 (4.3)	11 (1.6)		44 (6.3)	5 (0.7)	3.66	0.06
>30	454 (64.6)	35 (5.0)	0.0000**	470 (67.1)	14 (2.0)	9.25	0.0023**

*Computed on the basis of daily incomes of $2 at rate of $1 to N150.

not have diabetes. The findings were very similar to others who also noted that age, sex, BMI and waist circumference did not have any significant influence on the findings [19]. The phenomenon of spousal concordance has been demonstrated in spouses of patients of hypertension who were found to have higher tendencies to themselves develop hypertension [7] and diabetes [10] for reasons attributed to both spouses living in environmentally similar situations. The finding of higher blood pressure and BMI mirrored other studies [11] and this was significant. In view of the finding that a significant proportion of spouses of diabetic patients lived on less than $2 a day (less than N10,000 per month), setting the random blood glucose cut-off point at 11 mmol/L, presented the financial advantage to patients of immediately instituting preventive and therapeutic measures in those patients are definite risk of microvascular complications. [20] Lower departures from normal have the opportunity to be evaluated using FBG and OGTT. Research evidence has consistently shown that early targetted treatment of diabetes mellitus and conditions known to be risk factors can significantly decrease the development and/or progression of chronic complications [21-25].

In consonance with studies done to screen for gestational diabetes mellitus, the use of random blood glucose testing was shown to have the same sensitivity and specificity as traditional risk factors and offer a measure of cost-effectiveness in reducing the tendency to develop cardiovascular complications [26-28]. Spouses of diabetic patients have a greater tendency to higher random

blood glucose levels and can benefit from targeted random blood glucose testing as part of a 2-stage screening process that affords them the opportunity to discuss the results and management options with a primary care provider in a clinical setting. Research is needed to determine whether the extra years of treatment that individuals will receive if screening determines their pre-diabetic state will result in significantly improved diabetes related cardiovascular outcomes in a cost-effective manner.

5. KEY MESSAGES

- Spouses of diabetic patients with a greater tendency to higher random blood glucose levels can benefit from targetted screening in a clinical setting.
- Random blood glucose measurements are an effective screening tool in controlled clinical settings.

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