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PREVALENCE OF CARDIOVASCULAR DISEASE AND RISK FACTOR OF TYPE 2 DIABETES

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ABSTRACT

This cross-sectional study was carried out to estimate the prevalence of type 2 diabetes mellitus and its' risk factors in Bangladesh. Total 975 subjects (>20 years), were included following simple random procedure. Capillary blood glucose levels, fasting blood glucose (FBG) levels and 2-hour after 75g oral glucose load (OGTT) were measured. Height, weight, waist and hip circumferences and blood pressure were measured. The study population was lean with mean body mass index (BMI) of 20.48. The total prevalence of type 2 diabetes was 8.5%, men showed higher prevalence (9.4%) compare to women (8.0%). Increasing age and higher BMI were found to be significant risk factors following both FBG and OGTT. The study has shown that prevalence of diabetes has increased in the populations who are in transitional stage of urbanization, and may indicate an epidemiological transition due to fast expanding urbanization.

INTRODUCTION

Cardiovascular disease (CVD) morbidity and mortality rates are higher in the diabetic population than in nondiabetic persons and the related sociosanitary problems are alarming when taking into account the well described increase in the prevalence of type 2 diabetes mellitus (T2DM) and obesity (diabesity) worldwide.[1,2,3,4] Recent epidemiological studies have shown an increased prevalence of diabetes in India (11.6%), Pakistan (11.1%), Hawaii (20.4%), and Turkey (7.2%).[5,6,7,8] It has been suggested that the increase in prevalence of diabetes among Asian Americans is due to ageing of the population, urbanization and increasing prevalence of obesity and physical inactivity.[9] It was reported that prevalence of type 2 diabetes is on the rise more in urban areas compared to rural population in Bangladesh.[10,11] Bangladesh is one of the developing countries in the world, which is facing rapid urbanization in recent time.[12] The country is also in the stage of demographic transition with an increasing proportion of older population. Urbanization was found to be associated with a sedentary lifestyle, higher calorie food intake and stressful condition, which might have contributed to the increasing prevalence of diabetes.[13] Previously, 4-fold increase in prevalence of type 2 diabetes was noted among urban migrants compare to their source population (rural) without increased obesity or hypertension. To the best of our knowledge there is no well- designed study conducted to observe the prevalence of type 2 diabetes and its associated risk factors in the urbanizing rural population in Bangladesh.

The purpose of the study was to observe the prevalence of type 2 diabetes and identify its' risk factors in an urbanizing rural population in Bangladesh. Moreover, the diagnostic procedures were largely based on fasting blood glucose (FBG) and/or 2-hour after 75 g oral glucose load (OGTT), therefore, risk estimates were performed and compared following both procedures.

OBJECTIVE

The purpose of the study was to evaluate prevalence of cardiovascular disease and risk factor of Type 2 diabetes mellitus

METHODOLOGY

Study type

- This study was a cross-sectional study.

Place and period of study

- This study was conducted at tertiary medical college and hospital from May 2017 to May 2018.

Sample size and sampling technique

- 1,000 subjects were selected following a simple random sampling technique for investigating the prevalence of diabetes mellitus and other abnormal glucose conditions. Of them 25 subjects did not participate in the study, leaving 975 individuals for investigation and analysis.

Statistical analysis

Data were registered using Microsoft Access data entry. Control of data entry was secured through both program appliance and manually. The prevalence rate of diabetes was determined by simple percentage. Statistical comparisons between different groups were made using χ^2 test. The odds ratio (OR) with 95% confidence interval (CI) for risk factors was calculated taking the least prevalence of complications or clinically relevant criteria as a reference value. All P-values presented are two-tailed. Multiple logistic regressions were executed to adjust for potential confounding factors; using SPSS 11.0 software performed all statistical analysis.

RESULTS

Among the 975 participants, 31% were males and 63% were females. Table I shows the selected characteristics of the study subjects. The majority of the subjects were young; however, the proportion of young among the males was lower than the females and the proportion that were older (50+) were more among the males than females. Regarding educational status most of the subjects were literate and only a few were illiterate. Most of the male subjects were business-man and employed in different local industries and some other business farm. Among the males more than 50% had monthly household income more than Tk. 5,000 and this figure was almost reverse among the females.

Table I: Selected socio-demographic characteristics of the sample populations.

Characteristics	Male n= 360	Female n= 615	Total n= 975
Age group in years			
20-30	108	252	360
31-40	94	177	271
41-50	62	80	142
50+	96	106	202
Mean age	41.7	37.3	
Education			
Literate	290	525	815
Illiterate	70	90	160
Occupation Student	80	40	120
Service	110	100	210
Business	120	35	155
House wife		375	375
Others	50	65	115
Monthly income in Taka			
< 5,000	175	480	655
> 5,000	185	135	320

Table II shows the differences of mean values with + SD and their P values between males and females for anthropometric and clinical characteristics. The mean age, height, weights, waist circumference, WHR were significantly higher ($p<0.001$) for males than the females and the mean values of 2-hour post glucose test were considerably higher among the females compare to males. The prevalence of diabetes in males and females were 9.4% and 8.0% and the prevalence of impaired fasting glycaemia was 3.9% and 5.2% respectively following fasting blood glucose values. The higher prevalence of diabetes was found among the higher age group for both males and females. The male had higher prevalence of diabetes among the older subjects compare to females (Table III). The prevalence of impaired glucose tolerance increased consistently with increasing age among the females. The total prevalence of diabetes in males is slightly higher than females although the increased prevalence of impaired glucose tolerance was noted among the females compared to male subjects following OGTT (Table III). The prevalence of diabetes was higher following FBG criterion (8.5%) than the OGTT (4.9%). The prevalence of diabetes among the males and females was also higher following FBG values compared to OGTT values. Group comparisons were done by using χ^2 test. Age and higher BMI>25.00 were statistically significant for the development of diabetes following FBG and OGTT in multivariate analysis after

adjusting for a number of other potential confounders. The risk for diabetes is higher in age strata 31-40 years by FBG and OGTT compare to younger and older age group (Table IV). We did not find any significant association between systolic and diastolic hypertension and central obesity for the occurrence of diabetes in multivariate analysis, whereas the association was apparent in bivariate model.

Table II: Mean values (SD) for anthropometric and clinical variables of the study subjects.

Variables	Male (n=360) Mean (SD)	Female (n=615) Mean (SD)	P value
Anthropometric variables			
Height in cm	161.74 (6.89)	150.74 (6.24)	0.00
Weight in kg	53.74 (9.90)	46.58 (8.57)	0.00
Waist circumference in cm	74.81 (9.35)	71.88 (9.52)	0.00
Body mass index (BMI), wt in kg/ht m^2	20.48 (3.20)	20.48 (3.44)	0.97
Waist to hip ratio (WHR)	0.88 (0.06	0.84 (0.06)	0.00
Clinical Variable			
Systolic blood pressure (mm Hg)	120.14 (19.77)	119.99 (18.75)	0.90
Diastolic blood pressure (mm Hg)	77.39 (11.81)	77.40 (11.56)	0.99
Fasting blood glucose (FBG) mmol/l	5.02 (3.29)	4.91 (1.38)	0.52
2-hour post glucose test (OGTT) mmol/l	5.71 (3.12)	6.10 (2.88)	0.05

Table III: Prevalence of diabetes and other abnormal glucose conditions following fasting blood glucose and 2-hour post glucose test by age and sex.

Age group	Fasting blood glucose		2-hour post glucose test	
	Prevalence in diabetes (95%CI)	Prevalence in impaired fasting glucose (95% CI)	Prevalence in diabetes (95% CI)	Prevalence in impaired fasting glucose (95% CI)
Male				
20-30	2.8 (0.5-7.9)	2.8 (0.6-7.9)	1.9 (0.2-6.5)	3.7 (1.0-9.2)
31-40	8.5 (3.7-16.1)	2.1 (0.3-7.5)	6.4 (2.4-13.4)	7.4 (3.0-14.7)
41-50	8.1 (2.7-17.8)	3.2 (0.4-11.2)	6.5 (1.8-15.7)	3.2 (0.4-11.2)
51->	18.8 (11.5-28.0)	7.3 (3.0-14.4)	9.4 (4.4-17.1)	11.5 (5.9-19.6)
Total	9.4 (6.6-12.9)	3.9 (2.1-6.4)	5.8 (3.6-8.8)	6.7 (4.3-9.8)
Female				
20-30	3.6 (1.6-6.7)	3.6 (1.6-6.7)	0.8 (0.1-2.8)	7.5 (4.6-11.5)
31-40	13.0 (8.4-18.9)	3.4 (1.3-7.2)	8.5 (4.8-13.6)	6.8 (3.6-11.5)
41-50	7.5 (2.8-15.6)	5.0 (1.4-12.3)	3.8 (0.8-10.6)	12.5 (6.2-21.8)
51->	10.4 (5.3-17.8)	12.3 (6.7-20.1)	6.6 (2.7-13.1)	17.9 (11.2-26.6)
Total	8.0 (6.0-10.4)	5.2 (3.6-7.3)	4.4 (2.9-6.3)	9.8 (7.5-12.4)

Table IV: Odds ratio (OR) with 95% CI of diabetes following fasting blood glucose values and 2-hour post glucose values by the following risk factors in urbanizing rural population of Bangladesh.

Variables	Fasting blood glucose			2-hour post glucose test		
	n	OR*	95% CI	n	OR*	95% CI
Age						
20-30	360	1.0		360	1.0	
31-40	271	3.3	1.6-6.7	271	6.4	2.1-19.2
41-50	142	2.0	0.8-4.9	142	3.8	1.0-13.4
51->	202	4.0	1.8-8.5	202	6.4	2.0-20.7
Sex						
Male	360	1.0		360	1.0	
Female	615	0.8	0.5-1.4	615	0.7	0.3-1.3
BMI						
> 18.5	285	1.0		285	1.0	
18.5-24.9	590	1.4	0.7-2.6	590	1.9	0.9-4.1
25.0->	100	2.5	1.3-4.9	100	3.3	1.4-7.3
Systolic BP						

=140 mmHg	884	1.0		884	1.0	
>140 mmHg	91	1.5	0.5-4.2	91	2.5	0.7-9.0
Diastolic BP						
=140 mmHg	884	1.0		884	1.0	
>140 mmHg	91	1.5	0.5-4.2	91	2.5	0.7-9.0
Central obesity						
=90 mmHg	890	1.0		890	1.0	
> 90 mmHg	85	1.2	0.4-3.4	85	0.5	0.1-2.1

*OR, adjusted odds ratio for age, sex, systolic BP, diastolic BP, and BMI and for central obesity for the rural population; BMI, body mass index was calculated as weight in kg/ height in m2; Central obesity was defined as (WHR >0.9 for male and or WHR >0.8 for female)

DISCUSSION

In this study we observed that female participation was almost two times higher than male. In rural Bangladesh male population mostly engaged in agriculture work, outside business and other out of home works and during the study period males' involvement was lower than women at the investigation site. In other studies in Bangladesh especially on rural areas showed the female preponderance of participation for diabetes investigation.[10] Our populations are comparatively younger both male and female, and female were younger than males. The mean age in the study stent with the national population e in Bangladesh.

We have observed a higher prevalence (8.5%) of type 2 diabetes among the rural subjects. We have found the higher prevalence of diabetes among the males (9.4%) compare to females (8.0%) but the differences were not statistically significant. This prevalence rate in the rural population is noticeably higher than in the previous studies in Bangladesh.[14] It is also higher than the rural prevalence of China (2.5%), Mongolia (2.9%) and India (2.4%)18-0. The recent report of urban Indians showed that there was 40% increase in type 2 diabetes from 8.2% in 1988 to 11.6% in 19952. Urban studies in Bangladesh have also shown increasing prevalence of diabetes in 1996 (7.9%) and in 2000 (8.1%). This may suggest that the observed results are in feared with other studies in India and Bangladesh.[15]

The present study showed the higher prevalence of diabetes among the younger women in age strata 20-40 years compared to male subjects. The findings of the female predominance at younger age are in it the previous study conducted in Bangladesh.

The prevalence of impaired fasting glucose is lower than diabetes for both men and women following FBG, but the prevalence of impaired glucose tolerance is significantly higher than diabetes following OGTT. Impaired glucose tolerance is the peripatetic condition and it appears 5-10 years before the diagnosis of diabetes is established. The increased impaired glucose tolerance is an emerging thread for the rural population for developing diabetes in coming decades. In our population impaired glucose tolerance is the index of pre-diabetic condition than impaired fasting glucose but in American and Europeans population impaired fasting glucose is more applicable for assessing the pre diabetic state. So in lean population like Indians and Bangladeshis, OGTT may diabetic population than FBG.

We found systolic and diastolic hypertension was associated with the prevalence of diabetes in the bivariate analysis (data not shown), but in multivariate analysis the association was not apparent. Systolic and diastolic hypertension was found to be significantly associated with higher FBG levels in a previous rural study. Significant association was found with hypertension and type 2 diabetes in Turkey, Japanese Americans and among the Polynesians in Tonga.[16,17] Systolic hypertension was found to be associated with the prevalence of diabetes in southern Taiwan, in Nigeria and in China.[18,19,20] Obesity is an established risk factor for type 2 diabetes, we found a significant association between higher BMI >25.00 and occurrence of diabetes in our survey. Data from previous studies showed a marginal risk for type 2 diabetes with higher BMI for both sexes in Bangladesh.[15] An Indian study has also shown that higher BMI is independently associated as risk for occurrence of type 2 diabetes among men and women.

Central obesity (waist-to-hip ratio) was significantly associated with the occurrence of diabetes in men and women. The association between WHR and diabetes was also evident in previous studies in Bangladesh. Studies on South Asians migrants also showed that the WHR was higher among the migrants than the European populations of the same BMI.[27] South Asians, especially Indians and Bangladeshi population represents a particular form of physical structure, usually a deposition of fat in the central abdominal region other than extremities. It is postulated that we are representing a distinctive form of type 2 diabetes among a lean on, related to diabetes described in Indian population.[21]

In multivariate analysis, higher age and higher BMI was significantly associated for the development of diabetes in our population but in bivariate model the central obesity ion showed significant association. The higher prevalence in the present report is not likely to be the true prevalence of diabetes in rural population of Bangladesh. The study area was selected purposively as

a rural, 50 km far from Dhaka to and the sample size was not so large as to represent country burden of diabetes.

CONCLUSION

In conclusion, the higher prevalence in the present study indicates the environmental factors may encompass a strong role for the rising prevalence of diabetes in urbanizing population in a developing country like Bangladesh. FBG showed higher prevalence compare to OGTT in our population. In this context we can say FBG is suitable diagnostic tools for diagnosis of epidemiological study rather than OGTT.

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