An Assessment of Pre-diabetic and Diabetic Conditions among the Garo Population in Bangladesh

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Abstract

Diabetes mellitus is one of the most common non-communicable diseases and has a major impact on public health worldwide. It causes a vast contribution to morbidity and mortality worldwide. Several factors like age, sex, BMI, hypertension, dyslipidemia may be potentially controlled or minimized leading to huge benefits in the management and prevention of prediabetes and diabetes. Many diabetes studies have been conducted in Bangladesh among the general population, but only a few have been conducted among the indigenous population. Garos are one of the important ethnic groups in Bangladesh but major non communicable disease, diabetes has not been assessed among them. The present study was undertaken to assess the diabetic and prediabetic conditions of the Garo population in Bangladesh. It was an observational analytic study with a cross-sectional design conducted among 106 Garo people from Mymensingh and Tangail districts of Bangladesh. The result of the study shows that 7.5% of the study population had a family history of diabetes and mean± SD fasting blood glucose level (mmol/L) was 5.42 ± 2.83. The study found that 13.2% had impaired fasting glucose or prediabetic and 7.6% was diabetic based fasting blood glucose (FBG). Among the study population, 2.8% of the diabetic patient took insulin. The study also revealed gender-based distribution of diabetes mellitus among males and females, where 9.6% of the female participants were diabetic, based FBG. In association with nutritional status, it was found that 9.5% of the underweight 5.7% of the normal weight individuals, 10.8% of the overweight participants were diabetic based on FBG. Positive correlation was observed between waist hip ratio (WHR) and fasting blood glucose level ($r=0.23$, $p<0.05$). The SBP (Systolic Blood Pressure) had a positive correlation with fasting ($r=0.22$, $p<0.05$). Hypertension, WHR and diabetic conditions were found to be correlated in this community.

Keywords: Diabetes Mellitus, Garos, Fasting Blood Glucose, Impaired Fasting Glucose

Introduction

Diabetes mellitus, the most common non-communicable disease, is a group of metabolic disorders characterized by a high blood sugar level due to the mal production of insulin over a prolonged period of time. On the other hand, Prediabetes is a component of the metabolic syndrome and is characterized by elevated blood sugar levels beyond normal but fall below the threshold of diabetes mellitus. According to American Diabetes Association, it usually does not cause symptoms but people with prediabetes often have obesity, dyslipidemia with high triglycerides or low HDL cholesterol, and hypertension. It is also associated with an increased risk for cardiovascular disease (CVD)[1]. Prediabetes is more accurately considered as an early stage of diabetes and often occurs before the diagnosis of diabetes.

In South Asia, non-communicable diseases are increasing, which has developed a standardized rate of mortality where diabetes makes a large contribution[2]. According to International Diabetes Federation estimation, about 90 million adults are living with diabetes in the South-East Asia Region in 2021 and it is assumed to increase to 113 million by 2030 and 152 million by 2045 [3]. A recent study has estimated that ten million people have diabetes in Bangladesh[4] where the prevalence of diabetes and prediabetes is 7.8% and 10.1% respectively[5].

There are about 35 smaller groups of indigenous communities in Bangladesh. Among them, the Garo are one of the largest indigenous communities of Bangladesh. They live in the north-eastern parts of the country especially in Gazipur, Mymensingh, Netrokona, Tangail, Sheerpur, Jamalpur and some in Sylhet district[6]. Ethnic Garo tribe are susceptible to various

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types of health problems due to a lack of adequate health service and management of diseases. Their health status may be affected by their lifestyle, poor economic condition, improper hygiene practices[7]. Several recent studies have reported that some unhealthy practices, like tobacco, poor diet, and alcohol consumption are the main risk factors for prediabetes and diabetes mellitus among indigenous people in Bangladesh[8]. Usually, Indigenous peoples who suffers from diabetes at a younger age[9], face higher rates of complications, and experience poorer treatment outcomes[10,11]. In many studies it is observed that diabetes leads to other non-communicable diseases such as cardiovascular disease, kidney disease, and stroke[12]. Knowledge on diabetes and its management are necessary for the Garo population. So far, no national study has been conducted among Garo population regarding the prevalence of diabetes and pre-diabetes condition among indigenous people in Bangladesh. This study aimed to find out the diabetic and prediabetic condition among the Garo community living in greater Mymensingh in Bangladesh.

Materials and Methods

Study settings

The study was conducted in Mymensingh and Tangail districts in Bangladesh.

Study design, study period, and sample size

An observational analytic study with a cross-sectional design was conducted

Study Period: March to June 2021

Sampling technique

A Multistage cluster sampling technique was used to select the study sites and, 2 out of 3 districts (where Garos are available) were selected by following a lottery method. From the two selected districts, two Upazilas (1 Upazila from each district) were selected by following a random sampling technique. From the two selected Upazilas, two Unions (1 Union was selected from 1 Upazila) were selected randomly. From each Union, 1 village was selected randomly.

Sample Size: 106 rural Garo adults

Inclusion Criteria: Garo adults aged between 18-70 years

Exclusion criteria

i) Garo adults above 70 years old, ii) Severe ill subjects due to other concurrent diseases. iii) Subjects with mental disorders, iv) Pregnant women, v) Adults unwilling to participate in the study.

Data collection methods and techniques

First, we took permission from local community leader by making him understand about objective of the study and then he guided us to search Garo peoples. Socioeconomic information was collected by face-to-face interview with a pre-structured validated questionnaire. Anthropometric measurements (height, weight, waist circumference, hip circumference) blood pressure measurement and blood sample were collected. Measuring tapes were used to measure waist and hip height. Sphygmomanometer were used to measure blood pressure. Disposable syringes, cotton swabs, stripes, reagents were used for blood withdrawal. In biochemical analysis fasting blood glucose (FBG) level, was measured for individual respondents. Data were processed with appropriate procedures and precautions.

Blood collection procedure

Blood samples were collected through organization of health camps at a suitable location. Samples distributed in suitable vials Vacutainers and centrifuged. Blood glucose was analyzed by enzymatic techniques using a semi-auto analyzer. One touch handling process were applied for blood collection.

Data analysis

Data were entered, checked, cleaned, and analyzed using SPSS software (Version 23.0). An analytical descriptive statistical approach and correlation were conducted. association.

Results

Table 1 depicts demographic information among study population. Among the Garo subject, 21.7% were males and 78.3% were females. About 97.2% of them were married. Main religion of the subjects was Christian (91.5%). In case of educational status, 32.1% of study population were illiterate.

Table 1. Sociodemographic characteristics of the study subjects (n=106)

Variable	Frequency (n)	Percentage (%)
Sex		
Male	23	21.7
Female	83	78.3
Religion		
Hindu	5	4.7
Buddhist	4	3.8
Christian	97	91.5
Marital Status		
Married	103	97.2
Unmarried	2	1.9
Widowed	1	0.9
Education		
Illiterate	34	32.1
Primary	30	28.3
SSC	29	27.4
HSC	6	5.7
Graduate	6	5.7
Postgraduate	1	0.9

Table 2 shows that the mean age of the subjects were 47.5 years. The subjects' mean BMI was 23.11, and their mean waist-hip ratio (SD) was 74.19 (12.77). The mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) of the study subjects were 114 (mm/Hg) and 76 respectively. The mean fasting blood glucose level (FBG) was 5.42 mmol/L of the study subjects.

Table 2: Anthropometric and clinical characteristics of the study population (n=106)

Variable	Mean ± SD
Age (years)	47.46 ± 11.61
BMI (kg/m^2)	23.11 ± 7.04
Waist hip ratio (WHR)	74.19 ± 12.77
SBP (mm/Hg)	113.68 ± 15.88
DBP (mm/Hg)	76 ± 10. 1
FBG (mmol/L)	5.42 ± 2.83

Note: BMI = Body Mass Index; WHR = Waist Hip Ratio; SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; FBG = Fasting Blood Glucose.

Figure 1 demonstrates that the family history of diabetes was 7.5% of the study population had family history of diabetes. On the other hand, 17% of study population were unaware of their family history of diabetes mellitus .

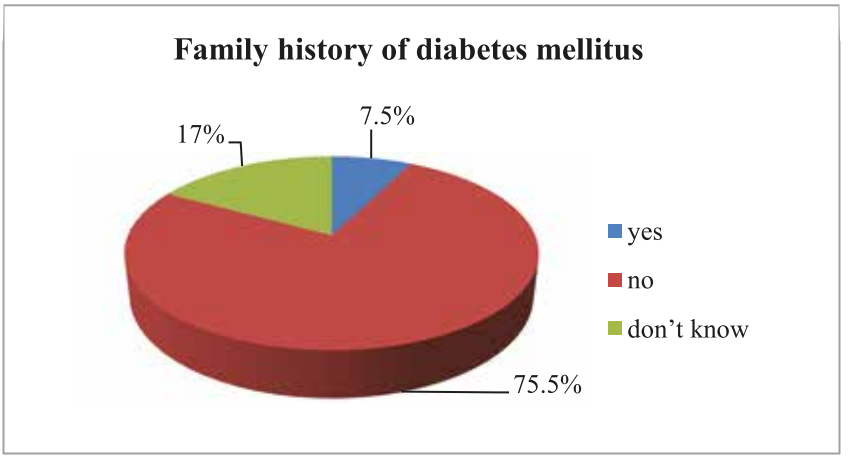

Figure 1. Family history of diabetes mellitus among the study subjects

Based on fasting blood glucose level, 13.2% had impaired fasting glucose, and 7.6% was diabetic person (Table 3).

Table 3. Proportion of Diabetic and Pre-diabetic Subjects based on Fasting Blood Glucose Level

Variable (mmol /L)	Number (n)	Percentage (%)
Normoglycemic (NG)	84	79.2
Impaired Fasting Glucose (IFG)	14	13.2
Diabetes Mellitus (DM)	8	7.6
Total	106	100

Figure 2 shows the history of insulin dependency among study population. 2.8% of the diabetic subjects took insulin.

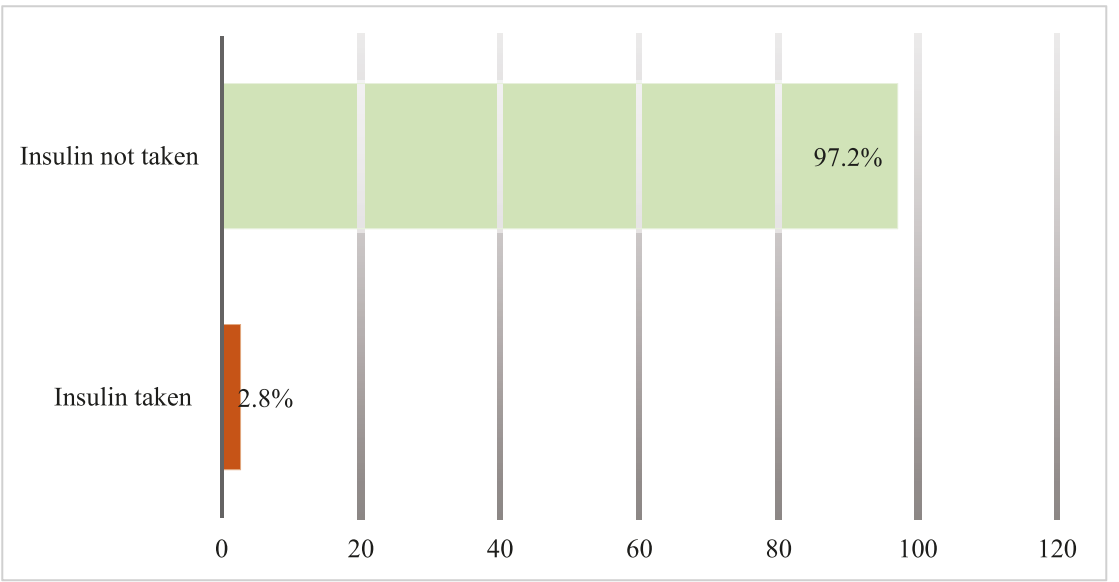

Figure 2. History of insulin dependency among study population

Table 4 shows gender-based distribution of diabetes mellitus. 9.6% of the females had diabetes mellitus based on FBG.

Table 4. Distribution of diabetic and prediabetic groups among male and female based on fasting blood glucose (FBG)

Variable	Gender		
	Male n (%)	Female n (%)	Total n (%)
Normoglycemic (NG)	20 (86.9)	64 (77.1)	84 (79.2)
Impaired fasting Glucose (IFG)	3 (13.0)	11 (13.2)	14 (13.2)
Diabetes Mellites (DM)	0 (0)	8 (9.6)	8 (7.7)
Total	23 (100)	83 (100)	106 (100)

Table 5 illustrates distribution of diabetic and pre-diabetic subjects among different BMI subgroups where 9.5% of underweight population, 5.7% of normal weight individuals, 10.8% of overweight were diabetic.

Table 5: Distribution of diabetic and pre-diabetic subjects among different BMI Subgroups based on fasting blood glucose (FBG)

Variable	Body Mass Index (BMI)				
	Underweight n (%)	**Normal weight n (%)**	**Overweight n (%)**	**Obese n (%)**	**Total n (%)**
Normoglycemia (NG)	18 (85.7)	28 (80 .0)	27 (73 .0)	11 (84.6)	84 (79.2)
Impaired Fasting Glycemia (IFG)	1(4.8)	5 (14.3)	6 (16.2)	2 (15.4)	14 (13.2)
Diabetes Mellites (DM)	2 (9.5)	2 (5.7)	4 (10.8)	0 (0)	8 (7.5)
Total	21 (100)	35 (100)	37 (100)	13 (100)	106 (100)

Table 6 represents the positive correlation of waist hip ratio with fasting blood glucose level and diastolic blood pressure. On the other hand, systolic BP has positive correlation with fasting blood glucose

Table 6. Correlation among BMI, WHR, SBP, Fasting and DBP of the subjects

Variables	**BMI**	**Waist -hip ratio**	**Systolic BP**	**Diastolic BP**	**Fasting Glucose**
BMI	1	0.113	0.098	0.070	0.077
		0.249	0.318	0.476	0.435
		106	106	106	106
Waist - hip ratio		1	0.114	0.311**	0.228*
			0.246	0.001	0.019
			106	106	106
Systolic Blood pressure			1	0.687**	0.218*
				0.000	0.024
				106	106
Diastolic Blood pressure				1	0.126
					0.200
					106
Fasting Glucose					1

***Correlation is significant at the 0.01 level (2-tailed)*

** Correlation is significant at the 0.05 level (2-tailed)*

Discussion

The objective was to assess prevailing prediabetic and diabetic condition among the Garo Tribe. Prediabetes and diabetes affected a substantial proportion of the Garo population in Bangladesh. In this study we found that around one fifth of the population had either impaired fasting glucose or diabetic condition according to fasting blood glucose level. Prediabetic conditions found to be more prevalent than diabetic condition. Prevalence of diabetes was more frequent among females compared to males. Waist Hip Ratio and blood pressure were found to be correlated with diabetes.

According to a recent study, the prevalence of prediabetes among native Bangladeshi population was found to be 14% which was similar to the recent findings of the Garo population[13]. The similar study also found a higher prevalence in women (16.5%) than men (12.1%)[13]. Similar trends of diabetes have been observed in other Southeast Asian countries[14].

Prediabetes is important as micro-vascular complications occur, often without people knowing they are glucose intolerant. Among the Garo population, prediabetic condition was more prevalent, which predisposes them to increased risk diabetes in the following years. The literature shows that up to 40.5% of individuals with prediabetes convert to diabetes during follow-up. There is evidence from a 5-Year Perspective Study (2009–2014) in Iran where the incidence of prediabetes incidence is 40.8 per 1000 person-years and after a 5-year period, 33.1% remained pre diabetic, and 16.8% changed to diabetics[15]. A high conversion rate of prediabetes to diabetes is indicative of the potential for an uncontrolled increase in the prevalence of diabetes[14]. This evidence indicate the dire need of identifying prediabetes and controlling it before it turns into diabetes.

In cases of family history of leading non- communicable diseases, this study found around one tenth of study population had a family history of diabetes. This may be due little knowledge about the disease. Similar result has been found from a study of the Garo population in Tangail district, bangladesh[16]. In our study, we see that 16.2% overweight subjects and 15.4% were obese subjects were prediabetic and 10.8% of the overweight subjects were the diabetic. Whereas a study has been conducted among general adult population in Bangladesh where the result showed that 15.9% of the prediabetic subjects were overweight and 21.1% were obese, on the other hand 14.7% of the diabetic subject were overweight and 19.6% were obese[13]. Compare with these studies, we find that the prevalence of prediabetes among overweighted subjects are slightly lower in mainstream people than the Garos, and diabetes are comparatively higher in general Bangladeshi population than Garo indigenous. But, in case of obese respondents prediabetic and diabetic both condition is higher in general population than Garos. These findings confirm a continuing high burden of diabetes and prediabetes in Bangladesh.

In association with diabetes and nutritional status, this study found that there is a positive relation between waist hip ratio and diabetes occurrence. Also, there is a positive correlation between diastolic blood pressure and diabetes. Earlier studies found direct relationship between diabetes risk and WHR[17,18]. The risk of diabetes found to be increased by 28%, for every 10% increase in WHR[18]. One explanation for this could be that WHR represent abdominal fat deposition or ectopic fat better in diabetes. Compared to general obesity markers, abdominal obesity is a more substantial risk factor for metabolic disorders[19].

In the population hypertension and diabetes were found to be correlated. Earlier studies also reported similar findings[20]. The proliferation of vascular smooth muscle cells and an increase in vascular stiffness brought on by the hyperinsulinemia that characterizes situations of insulin resistance predispose to the development of hypertension[20].

These diabetic and prediabetic conditions among the tribal population suggest that despite greater global awareness of diabetes and interventions for improved noncommunicable disease management in primary

health care, diabetes in Bangladesh is increasing. Furthermore, it suggests that health promotion may be failing in the face of dietary and lifestyle patterns. Thus, more resources are needed to be invested in primary health care to address the prevention of diabetes in Bangladesh.

Limitations of the study

The study had some limitations. Due to the remoteness of the area and slightly distinct language, the data collection process was challenging. Thus, some of the answers may be underreported and overreported. Further, data collection was restricted and done with caution due to the Covid 19 epidemic, and it was time consuming.

Conclusion

Findings of the study show that prediabetic and diabetic condition are high among the Garo indigenous in Bangladesh. Female subjects were more likely to have diabetes. The risk of both prediabetes and diabetes was increased in, higher body weighted and hypertensive persons of the Garos. Paying more attention to prediabetes, which can be ameliorated by lifestyle changes; and managing body weight (waist-hip ratio) and hypertension which was associated with diabetes and prediabetes in our study, by means of lifestyle measures since this will prevent or delay the complications of diabetes. Again, there are very few research activities on indigenous people. More research activities and epidemiological studies on the Garo as well as other indigenous populations can provide more information and clues to identify several disease pathogenesis and risk factors, and this may help them lead a better quality of life.

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