GAVIN PUBLISHERS

OPEN ACCESS

Journal of Diabetes and Treatment

Al Majid H, et al. J Diabetes Treat 6: 1085.

DOI: 10.29011/2574-7568.001085

Research Article

Prevalence of Metabolic Syndrome among Bangladeshi Male Patients with Type 2 Diabetes Mellitus in a Newly Developing Country

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Citation: Al Majid H, Al Hamdani Z, Sultan A, Al Lenjawi B, Mohamed H, et al. (2021) Prevalence of Metabolic Syndrome among Bangladeshi Male Patients with Type 2 Diabetes Mellitus in a Newly Developing Country. J Diabetes Treat 6: 1085. DOI: 10.29011/2574-7568.001085

Received Date: 12 January, 2021; **Accepted Date:** 01 March, 2021; **Published Date:** 05 March, 2021

Abstract

Various reports have documented that Bangladeshi male populations have higher prevalence of risk factors for metabolic syndrome compared to other South Asian males both in the US and the UK. Currently no data is available on the distribution of metabolic syndrome among Bangladeshi men in the State of Qatar. We investigated the distribution of metabolic syndrome (MetS) and its risk factors in Bangladeshi men in Doha, Qatar. Qatar, a newly developing country, has a large male Bangladeshi work force and in order to assess the prevalence of MetS in this group of workers, a population-based study was undertaken. MetS was estimated by using the International Diabetes Federation (IDF) criteria. A random sample of subjects attending Al Wafideen Primary Health Care Center in Qatar were invited to the study. Anthropometric, biochemical, and clinical data were recorded and analyzed. Our result revealed that MetS was present in 42 % of patients with type 2 diabetes mellitus. Among other risk factors for metabolic syndrome were obesity, high triglyceride level, hypercholesterolemia, hyperglycemia, and hypertension. Since patients with type 2 diabetes mellitus are more prone to develop metabolic syndrome thereby representing a major risk factor for cardiovascular disease. Adequate and prompt measures must be taken to identify and prevent the grave consequences of the metabolic syndrome.

Introduction

Metabolic syndrome (MetS) is made up of a cluster of metabolic derangements closely linked to cardiovascular morbidity and mortality, thereby representing a major economic and human challenge for public health. Globally, type 2 diabetes mellitus is becoming a pandemic [1,2] due to increasing sedentary life styles and obesity [3]. Developing countries are bearing the highest burden of the disease including the Middle East [4] and specifically the Arabian Gulf Peninsula with a prevalence reaching almost 23% (IDF 2013) [5]. Metabolic syndrome is comprised of a cluster of biological factors characterized by abdominal obesity, type 2 diabetes mellitus, hypertension, and dyslipidemia [6]. Multiple chronic diseases have been linked to metabolic syndrome (e.g. cardiovascular disease, chronic kidney disease, arthritis, several types of cancer, schizophrenia, and early death [7]).

According to the IDF, metabolic syndrome is comprised of central obesity as defined by a waist circumference of >90 cm in Indian Asian men, along with two of the following four criteria:

- Fasting plasma glucose (FPG) ≥5.6 mmol/l, or previously diagnosed type 2 diabetes.
- Systolic blood pressure ≥130 or diastolic BP ≥85 mm Hg or treatment of previously diagnosed hypertension.
- Serum triglycerides ≥1.7 mmol/l or specific treatment for this lipid abnormality.
- HDL cholesterol <1.03 mmol/l in males and <1.29 mmol/l in females or specific treatment for this lipid abnormality [8].

The rapid socioeconomic transition in the Arabian Gulf region in the last few decades has led to unprecedented improvements in the infrastructure and an increase in per capita income [1,2], along with the plague of non-communicable diseases including type 2 diabetes, obesity, hypertension, and cardiovascular diseases. During this economic boom migrant workers started to flood the region, especially Qatar. The population of Qatar as of September 2018 was almost 2.7 million comprised mainly of people from the south Asian subcontinent, and constituting at least 86% of the

total population [2-5]. As of early 2017, Qatar had a Bangladeshi population of almost 260,000, second only to Nepalese at 350,000 [9].

Worldwide migrant workers are usually discriminated against when it comes to social welfare, housing, education, and health delivery. They are marginalized when it comes to health education, access to facilities and availability of health care services in countries including China [10], the European Union [11,12] and the US [13]. In the United States, migrants must acquire specific criteria (qualified and nonqualified), in order to qualify for limited federal assistance, including health benefits such as Medicaid, but only for a period of time [14]. Qatar as a newly developing country has a free health care system catering for national and expatriates alike. Expatriates only pay a nominal fee for medications up to 10% of the actual price whereas all the other health care deliveries are free of charge including investigations, vaccinations, interventions, surgeries, and hospitalization. Nonetheless, migrant workers may not utilize the health care services or the educational or preventative services due to many reasons including working (shift) hours, living in remote areas, having an external locus of control, language barriers, and cultural factors. Metabolic syndrome prevalence data for Bangladeshi male workers living in Qatar is lacking. In this population-based survey, we are aiming to assess the prevalence of metabolic syndrome among a national representative sample of adult participants of various age groups visiting primary health care clinics in Qatar.

Materials and methods

This community-based, cross-sectional study was carried out in Al Wafideen Health Center, which is located in the center of Doha, the capital city of the State of Qatar. The health center primarily caters for expatriates from south East Asia, mainly Bangladeshi people. A previously modified questionnaire utilized for Bangladeshi subjects was used in our study [20]. Socio-demographic data, diet, family history of coronary heart disease, smoking history, and physical activity were recorded. Continuous variables included age, height, and weight. Based on the nature of the majority of Bangladeshi male population being manual labor workers, we opted to keep the mean distribution of education divided into 'above' and 'at or below' secondary level of education. Income on a yearly basis was divided into 'above' and 'at or below' $12,000.00. Family history of heart disease was considered positive if a parent or a sibling suffered from myocardial infarction. Alcohol consumption was not included in the survey as it was considered a sensitive issue in this largely Muslim population.

The study included adult male patients (≥18 years) attending Al Wafideen Health Center after they had signed an informed consent letter followed by an overnight fast.

The sample size for the study was determined using the following parameters: According to a previous study conducted in Bangladesh [18] the prevalence of metabolic syndrome conducted in Bangladesh was 47%, with a standardized normal distribution at 95% confidence interval, and using a margin of error of 5% the ideal number of participants needed was 384. Considering an attrition rate of 30% therefore, the required sample would be 499. High attrition rate is forecast since many of these migrant workers are on short-term contracts which means that attrition represents a high threat to the validity of the sample. Detailed subject information including demographic, socioeconomic, health, and behavioral status was collected. Various independent study variables were considered for this study including: age, educational level, alcohol consumption, smoking status, waist circumference, diagnosed hypertension or those taking medications, diagnosed with diabetes mellitus or those taking medications, taking a lipid-reducing drug, impaired/diabetic range using FBG, serum HDL, and serum TG. Recruited subjects were interviewed by a trained data collector who used the modified WHO STEP wise approach to Surveillance of non-communicable diseases-structured questionnaire. The questionnaire was first written in English, translated into the Bangladeshi language. The questionnaire had been piloted prior to inclusion in our study.

BP was measured electronically with subjects sitting, after resting for at least 5 minutes without prior smoking or coffee consumption on the day of measurement taking. Three consecutive BP readings were taken with at least 5-minute intervals in between. The mean systolic and diastolic BP readings were analyzed using the second and third readings. Blood samples along with anthropometric measurements were undertaken by a trained nurse. Waist circumference was measured halfway between the lower boundary of the last palpable rib and the iliac crest. BMI was measured by dividing the subject's weight in kilograms by their height in meters (kg/m^2). Participants had a blood specimen extracted after at least 8-hour overnight fast for FBS and lipid profiles in the Al Wafideen Health Center clinical chemistry lab. Participants' data were entered into SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) for statistical analysis. In the multivariate logistic regression test, $P<0.05$ was considered a cutoff value for significant association between dependent and independent variables.

Data analysis

Frequencies and prevalence are expressed in terms of percentage. Descriptive analyses involved the mean along with standard deviations (SD) for continuous variables.

Results

Study participants' characteristics are shown in Table 1. A total cohort of 499 participants visited the Al Wafideen Primary Health Care Clinic with a mean age of 45.12 years (SD 12.9 years, range 21–71). Almost half of the participants (44.5%) attained

a secondary education; 95.3% lived in an urban area; were of a young age group and those working in manual labor comprised 66.23% of the study population.

Variables		Values
Cohort	Total participants	n=499
Mean age	Total participants	45.12 ± 12.8 yrs
Age group (years)	<24	1.26%
	24–35	2.46%
	36–45	17.93%
	46–55	31.58%
	56–66	36.57%
	>66	12.18%
Education	Illiterate	6.25%
	Primary school	25.29%
	Secondary school	44.55%
	College degree	9.18%
	No response	16.91%
Occupation	Manual labor	66.23%
	Office	18.36%
	Retired	11.54%
	Others	4.83%
Residing area	Urban	95.30%
	Rural	4.70%

Table 1: Population study characteristics.

Risk factor	(Mean ± SD)
Body mass index (kg/m^2)	30.82 ± 5.23
Systolic blood pressure (mm Hg)	133.52 ± 12.13
Diastolic blood pressure (mm Hg)	83.85 ± 3.56
Fasting blood glucose (mmol/l)	9.38 ± 4.39
HDL cholesterol (mg/dl)	52.15± 6.32
Triglyceride (mg/dl)	180.54 ± 75.93
Total cholesterol (mg/dl)	166.61 ± 55.44

Table 2: Anthropometric, biochemical, and clinical characteristics of the study population.

Among 499 participants, 84% (n=419) showed high fasting glucose values of (>7.0 mmol/l) level and 47.0% of participants were suffering from metabolic syndrome. The prevalence of metabolic syndrome increased with age and was highest among those in the 55–64 years age range (Figure 1).

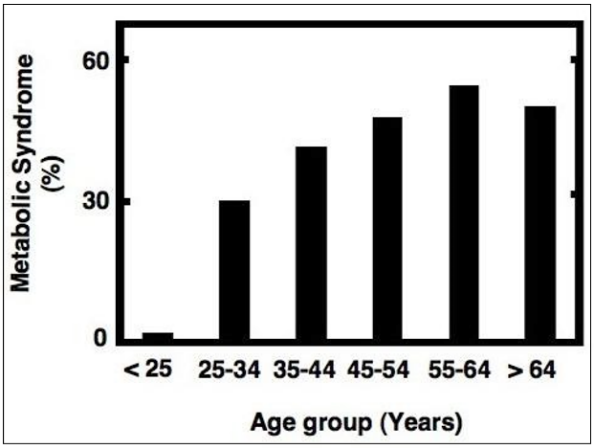

Figure 1: Age-related prevalence of metabolic syndrome.

Table 3 depicts the prevalence of the various components of metabolic syndrome assessed in the study population. The prevalence of hyperglycemia was 82.04%, obesity (high BMI) was (42.22%) and hypertriglyceridemia (81.04%), high blood pressure (23.23%), and high total cholesterol levels (35.36%). None the less, hypertriglyceridemia was the major risk factor in the study population (Table 3). Factors leading to the development of metabolic syndrome are depicted in Figure 2. About 39% of the subjects suffered from the combined effect of high fasting plasma glucose, hypertriglyceridemia, and obesity, whereas 24% of the study population was affected the presence of the four components.

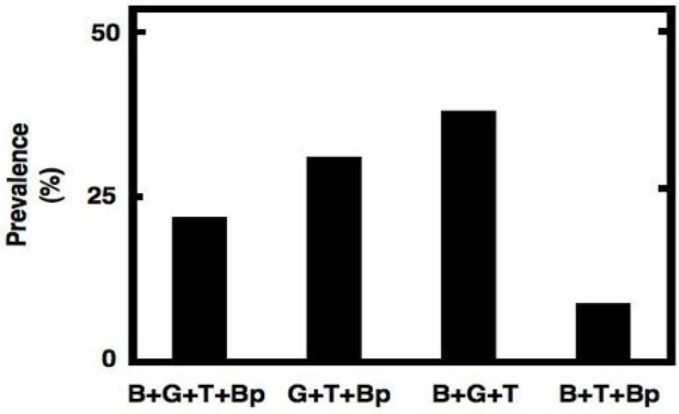

Figure 2: Prevalence of risk factors for metabolic syndrome.

The percentages of prevalence of various elements leading to the development of metabolic syndrome were estimated. Where G = high fasting plasma glucose, B = high BMI value, T = high levels of triglycerides, Bp = high blood pressure.

Components	Subjects (%)
High BMI	42.22
High fasting plasma glucose	82.04
High blood pressure	23.23
Hypertriglyceridemia	81.04
Hypercholesterolemia (Total)	35.36

Table 3: Prevalence of different components of metabolic syndrome.

Discussion

To the best of our knowledge, our study is the first of its kind in the Middle East in assessing the prevalence of metabolic syndrome among Bangladeshi male patients. This data revealed a high percentage of metabolic syndrome among male Bangladeshi subjects with T2DM living in Qatar. According to our findings the prevalence of metabolic syndrome among Bangladeshi male patients with type 2 diabetes living in Qatar was about 42%, which is two-fold greater than the prevalence for those living Bangladesh being estimated at around 19% [13]. Similar to our findings, the prevalence of metabolic syndrome among male immigrant Bangladeshi subjects in the USA was 38% [17]. This high prevalence of metabolic syndrome in our study can be attributed to many factors including a high calorific diet consisting of heavily dense staple which is fried rice with Ghee (butter) and or fried vegetables in Ghee and consumption of three main meals consisting of rice and oil as the main ingredient. Secondly, Qatar being an affluent country in the Middle East provides buses and cars as means of transport for laborers and office workers thereby a sedentary life style is encouraged indirectly and exercise is almost non-existent! Thirdly, the genetic predisposition to develop obesity among certain populations including South Asians is suggested through the 'thrifty genotype.' Neel postulated the hypothesis of the 'thrifty' genotype [15] which would have been advantageous for people who had very little food to survive on since these genes would make cells store energy to survive at times of food scarcity. However, nowadays where there is a constant abundance of food, this genotype led to obesity and consequently more prevalence of type 2 diabetes. Fourthly, body fat distribution differs in southern Asians compared to their European (Anglo-Saxons) and African counterparts due to reduced lower limb fat compartments and more developed metabolically active compartments (upper body) [16]. Finally, the composition of the diet in Qatar and the US among Bangladeshi immigrant is rich in saturated fat, refined rice and consumed almost three times daily be it mixed with fried starchy vegetables such as potato or mixed with meat and chicken [17], thereby when coupled with a sedentary life style predisposes them to develop metabolic syndrome.

Our data revealed that the prevalence of metabolic syndrome increased with age but declined slightly after the age of 65, consistent with findings reported in Bangladesh [18] and India [16]. This could be due to the fact that some of the aging population may suffer from depression and or co-morbid conditions there by affecting their appetite and hence their food intake or it might be due to poor response by subjects over 65 years age leading to a lower prevalence of metabolic syndrome in this age group. The prevalence of obesity in this study was estimated as 42.22%, high triglyceride levels at 81%, cholesterol level at 35.36% and hypertension at 23.23%. Individual elements of metabolic syndrome are well established risk factors leading to cardiovascular morbidity and mortality. Furthermore, a fivefold increase in cardiovascular risk is established among adult subjects with type 2 diabetes and metabolic syndrome independent of glycated hemoglobin (HbA1c), of age, sex, and smoking status [20]. Therefore, it is imperative that all efforts should be geared toward preventing or reducing the incidence of metabolic syndrome which includes aggressive medical therapy, assessing compliance with medications, provision of medications at cost price, the inclusion of culturally sensitive educational programs [21] in the routine follow-up of patients with type 2 diabetes, work-related activities as well as environmental changes including health promoting schools and colleges, traffic congestion charges, pedestrian alleys, and increasing taxes on simple carbohydrates.

Limitations

Our data has a few limitations. Firstly, a comparative group of another ethnicity is needed to see if the same factors are prevalent in both groups. Secondly, medications were not accounted for including oral hypoglycemic agents and/or insulin or other injectable medications, statins, and antihypertensives. Thirdly, co-morbid conditions were not recorded in our study.

Conclusion

The study revealed that metabolic syndrome is common among the adult male Bangladeshi population living in the State of Qatar. Adequate measures to reduce, identify and control the metabolic syndrome among this population is of great importance since patients with type 2 diabetes are prone to cardiovascular morbidity and mortality.

Ethical considerations

Ethical approval was obtained from the Primary Health Care Corporation Research Review Board. Participants' confidentiality was maintained throughout the study and a written oral informed consent was distributed among participants and obtained before inclusion in the study.

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