Screening of Pre-Diabetes and Type-II Diabetes Mellitus Among the Personnel of Bangladesh Air Force

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ABSTRACT

Background: Medical Squadron (Med Sqn) of Bangladesh Air Force (BAF) Base Bashar (BSR) has been providing medical support for BAF Base BSR, Air Headquarters, most of the retired officers and their families. It has been observed that the number of Diabetes Mellitus (DM) patient is increasing day by day, and now it becomes a major health problem among the members of BAF, even among the young age group. In view of above, a study was conducted among the BAF uniform members who reported for laboratory investigation to Med Sqn BAF Base BSR. Assessing prevalence of DM among BAF personnel will also help for overall assessment of health problem of BAF personnel to make a preventive guideline.

Methods: A descriptive type of cross-sectional study was conducted with available data in the pathological laboratory of Med Sqn BAF Base BSR during the period from 01 July 2021 to 30 Jun 2022. Within this period a total 9269 Air Force uniform members reported for routine as well as diagnostic purpose of checking blood sugar. Associated risk factor like overweight or obesity was also assessed by latest data from personal documents. Age and job pattern wise data were also analyzed. Statistical Package for Social Sciences (SPSS) version 29.0 was used to analyze data.

Results: Out of 9269 BAF members a total 683 persons (7.36%) had high (above normal) plasma glucose. Of these 413(60.46%) were diabetic and 270(39.53%) were pre-diabetic (IFG/IGT). Among the 413 diabetic patients 292(42.75%) had fasting plasma glucose (FPG) ≥ 7 mmol/L as well as post prandial plasma glucose (PPPG) level ≥ 11.1 mmol/L. Among the 270 pre-diabetic patients 205(30.01%) had FPG level between 6.1-6.9 mmol/L with PPPG level <7.8 mmol/L (Impaired Fasting Glucose/IFG) and 65(9.51%) had FPG level <7 mmol/L with PPPG level between 7.8-11 mmol/L (Impaired Glucose Tolerance/IGT).

Conclusion: DM has become a major health concern all over the world. This study attempted to identify the prevalence of age-related factors for DM among BAF uniform members between the ages 30 to 60 years. It has been observed that the prevalence of pre-diabetes is more among the 41 to 45 years age group and Type-II DM among the 46-50 years age group.

Keywords: Diabetes Mellitus, Metabolic disorder, Prevalence, Pre-diabetes

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INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder resulting from a defect in insulin secretion, insulin action or both. It remains as a significant contributor to the global burden of disease. People with diabetes have an increased risk of developing several serious life-threatening micro and macro vascular complications resulting in higher medical care cost, reduced quality of life and increased mortality.[1]

In 2019, the International Diabetes Federation estimated that 465 million (9.3%) people worldwide had diabetes, and by 2045, the number may rise to 700 million (10.9%).[2] Similarly, the prevalence of pre-diabetes in adults was estimated to be 374 million (7.5%) people in 2019 and is predicted to increase to 548 million (8.6%) by 2045. The average life expectancy of patients with type 2 diabetes mellitus (T2DM) decreases by approximately 10 years, and 80% of patients with T2DM die from cardiovascular complications.[3] Bangladesh, like many other countries, is transitioning from communicable to non-communicable diseases due to improved socioeconomic status and unplanned but rapid urbanisation.[4] Bangladesh is also going through a nutritional transition from traditional eating habits to a fast-food diet and sedentary lifestyle, which is contributing to the rise of non-communicable diseases like diabetes.[5]

As a military force, though all uniform members of Bangladesh Air Force (BAF) are more or less accustomed with daily physical exercise, PT, Parade, games and other physical activities, but due to change of dietary pattern or some unknown reasons recently it has been observed that number of overweight personnel are increasing day by day among the BAF uniform members and most of the cases of overweight individuals subsequently develop diabetes mellitus or other obesity related complications.

Medical Squadron (Med Sqn) BAF Bashar (BSR) has been providing medical supports for serving and entitled members of BAF Base BSR, members of BAF Headquarters, almost all retired officers and their families and for some specialist supports like cardiology, ENT, Eye, pediatrics and pathology for members of BAF base Bangabandhu. It has been observed that numbers of diabetic and pre-diabetic patients are increasing day by day during routine checkup for courses or UN mission as well as during diagnostic laboratory investigations. So, a study was carried out to assess the prevalence of diabetes and pre-diabetes among the BAF personnel especially among the uniform members. Based on these we aimed to study the age standardized prevalence of diabetes and pre-diabetes among BAF uniform personnel.

MATERIALS AND METHODS

This was a descriptive type of cross-sectional study carried out with available data in the pathological laboratory of Med Sqn, BAF Base BSR during the period from 01 Jul 2021 to 30 Jun 2022. Only serving uniform personnel were considered as study population. Age consideration for this study was between 30 to 60 years. Service patterns like sedentary types of work and hardworking jobs were also included in this study. Associated risk factors like overweight or obesity for this study population was also assessed by the latest office documents. Within this period a total of 9269 serving uniform BAF members reported for routine as well as diagnostic purpose of checking blood sugar. Both fasting plasma glucose (FPG) and 2 hours after breakfast or postprandial plasma glucose (PPPG) reports were analyzed. For diagnosis of pre-diabetes

and diabetes, the cut off points was utilized as recommended by WHO. If FPG range from 3.9 mmol/L to 6 mmol/L it was considered normal. The FPG value within the range between 6.1 to 6.9 mmol/L and PPPG value <7.8 mmol/L were considered as Impaired Fasting Glucose (IFG), FPG <7.0 mmol/L and PPPG value $\geq$7.8 and <11.1 mmol/L were considered as Impaired Glucose Tolerance (IGT) Both IFG and IGT were considered as Prediabetic. FPG $\geq$7 mmol/L or PPPG $\geq$11.1 mmol/L or HbA1c $\geq$ 48 mmol/mol were considered as diabetic.[6]

The exclusion criteria for this study were below 30 and above 60 years of age and serving civil BAF members. Data processing and analysis were done using Statistical Package for Social Sciences (SPSS) version 29.0 and presented through different tables. Frequencies, percentage, mean and standard deviation (SD) were used for descriptive statistics. Chi Square test was used to describe various associations among the domains.

RESULTS

In this study, a total of 9269 Bangladesh Air Force members reported for routine and diagnostic sugar test. Out of 9269 personnel 683(7.36%) persons were found to have raised blood sugar above normal range. Out of 683, 413 were diabetic and 270 were pre-diabetic (IFG/IGT). Among the 413 diabetic patients 292 had fasting plasma glucose (FPG) $\geq$7 mmol/L as well as post prandial plasma glucose (PPPG) level $\geq$11.1 mmol/L.

Table-I: Distribution of respondents with raised both FPG: $\geq$7 mmol/L and PPPG: $\geq$11 mmol/L according to age group (n=292)

Age Group (in Years)	Frequency		Percent
	Male	Female	
30-35	24	01	8.21+0.34= 8.56
36-40	30	02	10.27+0.68=10.95
41-45	32	02	10.96+0.68=11.64
46-50	114	-	39.04
51-55	73	-	25
56-60	14		4.7

Table-I depicts that among the diabetic patient most prevalent age group was within 46-50 years, where number of patients were 114(39.04%) and comparatively less prevalent age group was 50-60 years where number of patients were only 14(4.7%).

Table-II: Association between the age and development of diabetes (n=292)

Age group	Mean age	Non-diabetic	Diabetic	Significance
30-35	32.5	1620	36	
36-40	38	1736	45	X^2=149.08 df=4 p=0.000
41-45	43	1530	48	
46-50	48	1510	161	
51-55	55	2460	123	

Table-II shows correlation between age and the development of DM. In prevalent age group mean age was 48 years; calculated $x2$ =149.08 and p-value <0.01. So, it was considered to be statistically significant.

Table-III: Distribution of pre-diabetic patients (IFG/IGT) basis on the age group: (n=270)

Age group (in year)	Frequency	Percent	IFG n(%)	IGT n(%)
31-35	25	9.2		
36-40	38	14.07		
41-45	88	32.59	205(30.01)	65(9.51)
46-50	70	25.92		
51-55	27	10		
56-60	22	8.14		

Pre-diabetic patients were shown in Table-III. Out of total 270 pre-diabetic patients 205(30.01%) had IFG and 65(9.51%) had IGT. Mentionable that regarding pre-diabetic patients, most prevalent age group was 41-45 years and total number of patients was 88(32.59%).

Table-IV: Distribution of respondents with high blood sugar according to job pattern (n=683)

Job pattern	Frequency	Percent
Hardworking job	310	45.38
Sedentary job	373	54.61

Table-IV reveals that frequency of high blood sugar was more among the persons involved in sedentary job.

Table-V: Distribution of respondents with high blood sugar based on body weight (n=683)

BMI	Frequency	Percent
Normal (18.5-24.9 kg/m$^{2)}$	268	39.24
Overweight ($\geq$ 25 kg/m^2)	415	60.76
Mean±SD	26.30±3.31	
Min-max	22.50-32.0	

Table-V shows that normal BMI was found in 39.24% cases, and 60.76% patients reported as overweight. Mean BMI was 26.30±3.31 kg/m2 with the range of 22.50 to 32.0.

DISCUSSION

DM is usually a hereditary disease, but in addition, there are many causal and contributory factors that precipitate to develop DM, such as obesity. Obesity may result in diabetes which is well documented in different studies.[7,8] Epidemics of obesity are associated with improper dietary habit and decrease physical activity. In our study, 60.76% patients were overweight and there may be a direct relation of overweight for the development of pre-diabetes as well as diabetes. So, priority should be given to maintain ideal bodyweight through proper dietary measures as well as increased physical activities.

In the present study, the prevalence of DM was observed more (39.04%) among 46-50 years age group (Table-II) and prevalence of pre-diabetes was 32.59% among 41-45 age group (Table-III). The prevalence of diabetes was higher with increased age also observed in different studies.[9,10] This may occur due to deficiency of insulin secretion following weaker pancreatic function in old people. In addition, the demand of insulin may increase due to improper utilization of insulin among aged people specially those who are obese.[11] In 2011 one study conducted by Bangladesh Demographic and health survey (BDHS) showed a feature, out of a total 7535 individuals, the prevalence of DM was 33.3% in 46-50 age groups[12] but in this study in the same age group prevalence of DM was 39.04%. Without effective preventive measures, diabetes may continue to increase among all BAF members.

In this study, only a small group of BAF members were included, especially those who all are regularly participating in PT, parade, games and other military activities. Aircrew are also involved in exhaustive flying duties in addition to routine ground activities. In spite of all activities, it was observed that a good number of uniform BAF members have been suffering either from pre-diabetes or diagnosed as diabetes. It was also observed that comparatively less active uniform members were diagnosed as either pre-diabetes or diabetes (54.61%). Apart from those uniform members there are a large number of entitled BAF members also need screening for pre-diabetes or diabetes through regular plasma glucose test and if need early intervention to prevent diabetes related acute or long-term complications. Another limitation of our study is unavailability of data from female uniform personnel above 45 years.

Pre-diabetes is important because during this stage, micro-vascular complications occur often without people knowing they are glucose intolerant. Even with good control measures up to 40.5% of individuals with pre-diabetes are subsequently diagnosed as diabetes mellitus during routine follow-up.[13] However early diagnosis of pre-diabetic patient and timely proper interventions can prevent diabetes related further complications.

Diabetes is a preventable disease through modification of dietary habits and increased physical activities. In this study a good number of pre-diabetic as well as diabetic patients were overweight, so weight control is an important part of diabetes prevention. It is helpful to prevent or delay diabetes by losing 5 to 10% of current weight.[14]

This study implies that efforts to control diabetes among all the members of BAF to be strengthen. A further implication of our analysis is that diabetes prevention should focus on reducing overweight and managing hypertension. Because those factors are usually associated with diabetes and their management will bring the greatest benefits.[15]

CONCLUSION

Diabetes Mellitus has become a major health concern all over the world. This study attempted to identify the prevalence of age-related factors for pre-diabetes and diabetes mellitus among BAF uniform members specially those who are within 30 to 60 years age group. It has been observed that pre-diabetes is more prevalent among the 41 to 45 age group and diabetes mellitus is more among the 46 to 50 years age group. This study demands for further study among all levels of BAF members and also need greater attention of BAF authority to come up with appropriate policy distribution for overweight personnel. It also demands for regular precautionary measures for pre-diabetic patients to lower the prevalence of diabetes and its complications.

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