

Original Article

Pattern of Cardiovascular Diseases in Diabetic population - a seven year study in a tertiary care hospital of Bangladesh.

SM Rezaul Irfan^{1*}, Samira Humaira Habib², Shabnam Jahan Hoque³, AKM Mohibullah⁴

Abstract:

Background: Cardiac involvement in diabetes covers a wide spectrum, ranging from asymptomatic silent ischemia to clinically evident heart failure. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. Up to 80% of diabetic patients die of macrovascular complications, including coronary artery disease (CAD), stroke, and peripheral vascular disease (PVD). CVD is the single-most important contributor, and is responsible for 17% of total mortality. Because of the growing numbers of diabetic patients and the increased mortality after their first cardiovascular event, it is critical to identify and treat risk factors early and aggressively in these patients.

Methodology: This is a retrospective observational study carried out in the Department of Cardiology BIRDEM General Hospital Dhaka Bangladesh from 2011 to 2017. Total 5598 patients who were admitted to the institute between 2011 to 2017 was studied and evaluated to see the pattern of cardiovascular diseases in diabetic population.

Results: Among total 5598 patients, 50.02% were male and 49.98% were female. Majority of them were Diabetic and Hypertensive. Most of the patient having cardiovascular disease belongs to age 50-70 years. IHD was found among 1810(32.33%) patients with slightly male predominance. Different types of Cardiomyopathy were found among 330(5.8%) study population. Heart failure of different forms were present among 632 (11.28%) of patients. Different types of Arrhythmia were found among 159 (2.8%) of admitted patient. Rheumatic Valvular Heart disease were found 64 (1.1%) of individual. Congenital Heart disease were found among 51 with ASD 36 (70.58%) followed by VSD 15 (29.42%) and PAD in 105 (1.8%).

Conclusion: This study reflects the higher incidence of Ischemic Heart Disease and higher association of Hypertensive Heart Disease in Diabetic population mostly affecting the 50-70 year age groups. This observational study also shows that the duration of hospital stay has gradually declined over the course of seven years. The incidence of Cardiomyopathy, Peripheral Vascular Disease and Heart Failure could be different in Diabetic population if wide range multicenter prospective approach would have been applied.

Key words: Coronary Artery Disease (CAD), Peripheral Artery Disease (PVD), Ischemic Heart Disease (IHD), Atrial Septal Defect (ASD), Ventricular Septal Defect (VSD), Peripheral Arterial Disease (PAD), Deep Vein Thrombosis (DVT).

Introduction:

Diabetes is one of the important modifiable risk factors for macrovascular disease. Diabetic patients are increasing in Bangladesh. It is estimated that the diabetic patients will

almost be doubled globally (2.8 % vs 4.4 %) by 2030.¹ Among the adults (age 20-79 years) with diabetes is in the top five diseases in South East Asian countries, Bangladesh is in the second position.² The number of people with diabetes in Bangladesh was 5.10 million in 2013, which is expected to increase to 8.20 million by 2035.^{2,3} In Bangladesh, the overall prevalence of type 2 DM in urban population is 11.2%.^{4,5} An increased prevalence of diabetes, in rural population, was also found with 6.8%.⁶ Great majority of the diabetic patients (80%) die of macrovascular complications, including coronary artery disease (CAD), stroke, and peripheral vascular disease (PVD).⁷ Cardiac involvement in diabetes covers a wide spectrum, ranging from asymptomatic silent ischemia to clinically evident heart failure.⁸ CVD is the number one killer worldwide including Bangladesh.^{9, 10} The prevalence of CAD in Bangladesh has been reported to be 0.33% to 19.6% in different studies.^{11, 12-15} According to the Bangladesh NCD Risk Factor Survey 2010, the prevalence of hypertension is 17.9% in general, 18.5% in men and 17.3% in women.¹⁶ The INTERHEART Study- a global case-control study of risk factors for acute myocardial infarction (MI)- reported that the mean age of MI among the Bangladeshis (51.9 years) was 6 years lower than the non-South Asians (58.8) and the lowest among all South Asians.¹⁷ In a hospital-based retrospective study at a tertiary cardiac hospital

1. Dr. S.M. Rezaul Irfan, FCPS (Med), Assistant Professor, Department of Cardiology, BIRDEM General Hospital, Shahbag, Dhaka, Bangladesh.
2. Dr. Samira Humaira Habib, Msc, MPhil, PhD., Principal Research Officer, Health Economics Unit, Diabetic Association of Bangladesh, BIRDEM General Hospital, Shahbag, Dhaka, Bangladesh.
3. Dr. Shabnam Jahan Hoque, FCPS (Med), DCard, Assistant Professor, Department of Cardiology, BIRDEM General Hospital, Shahbag, Dhaka, Bangladesh.
4. Dr. AKM Mohibullah, MD (Card), FCCP, FRCP, FACC, Professor, Department of Cardiology, BIRDEM General Hospital, Shahbag, Dhaka, Bangladesh.

* Corresponding Author:

Dr. S.M. Rezaul Irfan, FCPS (Medicine)
Assistant Professor, Department of Cardiology
Room-811, 7th Floor
BIRDEM General Hospital
122 Kazi Nazrul Islam Avenue, Dhaka-1000, Bangladesh.
Email: smrifandr@gmail.com

in Dhaka City¹⁸, about one-seventh (1970 out of 14009) of the patients admitted between January 2005 and August 2006 had heart failure Majority (35.79%) had CAD as the principal etiological factor, whereas hypertension was the primary risk factor for HF in 29.14% of cases. In another hospital-based study conducted in the National Institute of Cardiovascular Diseases (NICVD), Dhaka in 2009 involving 780 patients, 27.25% had heart failure.¹⁹ At present, there are probably no available data regarding arrhythmias, cardiomyopathies and peripheral arterial disease in Bangladesh. Little is known regarding the incidence and prevalence of congenital heart disease (CHD) in Bangladesh. It is essential to know the disease burden and pattern for developing prevention strategies and management guidelines.

Materials and Methods:

This is a retrospective observational study was carried out in the Department of Cardiology BIRDEM General Hospital Dhaka, Bangladesh from 2011 to 2017. Total 5598 patients who were admitted to the institute between 2011 to 2017 was studied and evaluated to see the pattern of cardiovascular diseases in diabetic population. Documents were evaluated for Gender, Age, Glycaemic Status, Blood Pressure, different forms of Ischemic Heart Disease, Cardiomyopathy, Heart Failure, and Renal Impairment. Diabetes Mellitus was diagnosed according to the American Diabetes Association (ADA) criteria; Fasting plasma glucose (FPG) at or above 126 mg/dL (7.0 mmol/L), A1C ≥6.5 %, a two-hour value in an oral glucose tolerance test (OGTT) (2-h post glucose) at or above 200 mg/dL (11.1 mmol/L), or a random (or "casual") plasma glucose concentration ≥200 mg/dL (11.1 mmol/L) in the presence of symptoms. Duration and type of DM will be detected from the registered diabetic book and past medical records of the patients.

Regarding diagnosing IHD which comprises stable angina and acute coronary syndrome we have maintained a standard protocol on the basis of clinical feature, cardiac biomarkers, ECG and Echocardiography. So, the patients with IHD should have the following features.

We have followed Framingham diagnostic criteria for Congestive Heart Failure CHF which includes; (a) Major criteria: Paroxysmal nocturnal dyspnea or orthopnea, neck-vein distension, rales, cardiomegaly, acute pulmonary

edema or S₃ gallop, increased venous pressure (>16 cm H₂O), hepatojugular reflux.(b) Minor criteria: Ankle edema or night cough, dyspnea on exertion, hepatomegaly, pleural effusion, vital capacity decreased one-third from maximal capacity. To diagnose CHF, simultaneous presence of at least two major criteria or one major criteria in conjunction with two minor criteria are needed. Minor criteria are acceptable only if they cannot be attributed to another medical condition (eg. pulmonary hypertension, chronic lung disease, cirrhosis, ascites, nephrotic syndrome)

Cardiomyopathy was diagnosed on the basis of history, clinical and echocardiographic findings in the absence of coronary artery disease, myocarditis and other causes of systolic dysfunction of the heart. (a) Dilated Cardiomyopathy was considered among those who have indolent course of relapse and remission of heart failure with Echocardiographic evidence of dilatation of all chambers, normal wall thickness and ejection fraction usually below 45%. (b) Hypertrophic cardiomyopathy was diagnosed by Echocardiographic evidence of asymmetric septal hypertrophy, systolic anterior motion of anterior Mitral valve leaflet and raised mid LV-Cavity pressure gradient.

Hypertensive heart disease was diagnosed according to Joint National Committee- 7 (JNC-7) guideline. Data were collected from institutional registry were all admitted patient’s diagnosis enlisted with outcome. Which are regularly checked weekly by the consultant and registrar and corrected accordingly.

Data was analyzed for mean, percentage, standard deviation only.

Results:

Total 5598 patient with 2800 (80.02%) male and 2798 (45.98%) female admitted between 2011 to 2017 in the Department of Cardiology BIRDEM General Hospital where analysis to see this pattern-

Table-I shows the total number, age and gender distribution of the study population along with their glycaemic status.

Table-I:

Gender	Total Number	< 50 yrs	≥ 50yrs	Diabetic	Non-Diabetic
Male	2800 (50.02%)	953(59.59%)	1847(46.18%)	2781 (99.32%)	19 (0.68%)
Female	2798 (49.98%)	646(40.40%)	2152(53.81%)	2699 (96.46%)	99 (3.54%)

Table-II shows pattern of different cardiac diseases in different Gender in studied population.

Table-II

Cardiac Disease	Pattern	Male	Female
HTN		2791	2696
IHD	Stable Angina	89	40
	Unstable Angina	74	80
	NSTEMI	168	148
	STEMI	128	81
	OMI	283	305
	S/P CABG	143	116
	S/P PTCA	100	55
Cardiomyopathy	DCM	11	12
	HCM	08	03
	ICM	154	142
Heart Failure	ALVF	125	308
	CCF	128	71
Arrhythmia	Atrial Fibrillation (AF)	45	33
	Supraventricular tachycardia (SVT)	19	11
	Ventricular arrhythmia	06	07
	On Permanent pacemaker	15	18
	S/P Cardiac arrest	02	03
Vulvular Disease	Rheumatic heart disease (RHD)	29	35
Congenital heart diseases	Atrial septal defect (ASD)	15	21
	Ventricular septal defect (VSD)	06	09
Miscellaneous	Peripheral arterial disease (PAD)	49	56
	Deep vein thrombosis (DVT)	09	11

Table-III Shows Distribution of Ischemic Heart Disease, Heart Failure, HTN and Cardiomyopathy according to the age of the study subjects

Table-III

Age Distribution yrs	IHD(%)	HTN(%)	Heart Failure(%)	Cardiomyopathy(%)
<20	1(0.05)	3(0.05)	0(0.0)	0(0.0)
20-30	213(10.53)	425(7.75)	7(1.38)	3(0.91)
30-40	233(11.52)	351(6.40)	19(3.75)	23(6.97)
40-50	269(13.30)	318(5.80)	45(8.88)	25(7.58)
50-60	897(44.36)	2201(40.11)	289(57.00)	142(43.03)
60-70	292(14.44)	1925(35.08)	111(21.89)	102(30.91)
70-80	85(4.20)	141(2.57)	19(3.75)	21(6.36)
90	32(1.58)	123(2.24)	17(3.35)	14(4.24)
Total	2022(100)	5487(100)	507(100)	330(100)

The distributions of Ischemic Heart Disease, Heart Failure, HTN and Cardiomyopathy according to the age were shown in Table-III. According to the age distribution 50-60 was the most vulnerable group. Because at this age Ischemic Heart Disease (44.36%), Heart Failure (40.11%), HTN (57.00%) and Cardiomyopathy (43.03%) were more than any other age groups.

Figure-1 Shows average length of hospital stay in days during 7 consecutive years.

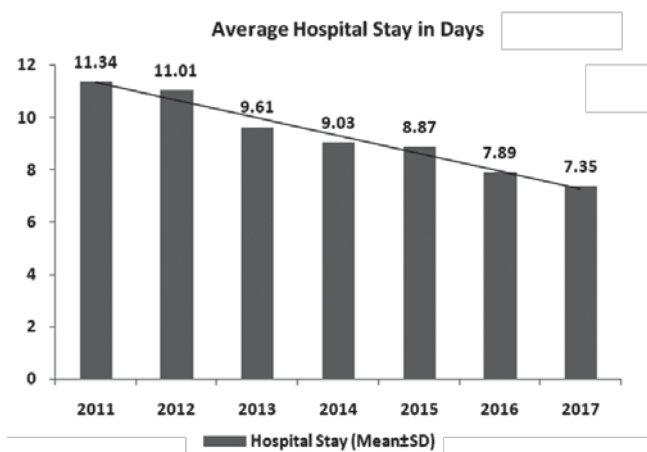


Figure-1

Figure-1 shows the duration of hospital stay from 2011 to 2017 gradually declined.

Discussion:

The prevalence of CAD in the diabetic population ranges from 14.4% to 21.4%,^{20,21} whereas in the general population, it was reported to be 1.85–3.4%^{22,23} This study found that the prevalence of CAD was 32.33% and this result is higher than the Sayeed et al who found that the prevalence of CAD was 18.6%.²⁴ This result was also higher than the Agrawal RP et al who found CAD in 780 out of 4067 (19.2%).²⁵ Jurado J et al also reported that the prevalence of CAD was 18.9% in a study from North Catalonia.²⁶ Many authors reported that older patients had higher prevalence rates than younger patients, but provided few details on age categories.²⁷⁻³¹ Our study showed that in case of female its true but in aspect of male category it's not like that (in case of female <50 years the percentage is 59.59 and > 50 years its 46.18%, but in aspect of male the corresponding values are 40.40%and 53.81% respectfully).

Heart failure (HF) is the most common cardiovascular complication of diabetes mellitus (DM).³²⁻³³ Heart dysfunction in the diabetic population may develop regardless of typical risk factors such as hypertension and coronary artery disease.³⁴ The cause of HF in diabetes is certainly multifactorial in nature, but hyperglycemia and insulin resistance seem to be the core factors. Furthermore, the results of some studies suggest that an increased risk of HF may be associated with specific therapies, such as insulin,³⁵ sulfonylurea (SU), gliptins or glitazones.³⁶ In our study the incidence of Heart Failure was 11.28%, which is consistent with Nichols GA et al, where analysis of data from 9,591 type 2 DM (T2DM) patients registered in the Kaiser Permanente Northwest Division revealed HF in 11.8% of diabetic subjects at base-line, with an additional 7.7% of patients developing HF during a 30-month period of observation.³⁵

In a study by Arifur Rahman et al. in prevalence of cardiovascular diseases and prescription patterns in a randomly selected population in Bangladesh, they found that the hypertension (30%), heart failure (28.5%), myocardial

infarction (20.9%), ischemic heart disease (19.9%), stroke (17.1%) and angina (11%).³⁷ In our study we found that heart failure was less 11.28% among the study population, old myocardial infarction was also less 10.50%, but ischemic heart disease was more 32.33%.

There are identifiable risk factors for developing diabetic cardiomyopathy, such as increased HbA1c,³⁸ high body mass index, advanced age, use of insulin, proteinuria, the coexistence of coronary artery disease and/or peripheral target organ diseases such as retinopathy and nephropathy.^{39, 40} Several studies have shown that diabetes causes defects in cellular calcium transport,⁴¹ defects in myocardial contractile proteins,⁴² and an increase in collagen formation,⁴³ which result in anatomic and physiological changes in the myocardium. In a large case-control study, Bertoni et al tested the hypothesis that diabetes mellitus was independently associated with idiopathic cardiomyopathy.⁴⁴ After adjusting for age, sex, race, and hypertension, diabetes mellitus was significantly associated with idiopathic cardiomyopathy (relative risk 1.58, 95% CI 1.55–1.62). In diabetic patients the prevalence of diabetic cardiomyopathy is 12% and reaches 22% in people over 64 years old.⁴⁵ In this study group 5.8% of the population had cardiomyopathy.

In a study by Fatimah F A et al revealed that females were more likely to be suffering from hypertension and arrhythmia (61%, 69.2% respectively) compared to males (39%, 30.8% respectively), in our study we found that in corresponding values are 50.86%, 54.71% respectively in female compare to male 49.13% and 45.28% respectively which was supported by the above mentioned study. In the same study males were found to be suffering more from ischemic heart diseases than females which didn't found in our study.⁴⁶ Our study found that the age group 50-60 a bit vulnerable than other age groups for IHD (44.36%), HTN (40.11%); Heart Failure (57.00%) and Cardiomyopathy (43.03%). But in the above mentioned study 32.5% of HTN, 42.9% of myocardial infarction, 37.5% of IHD and 46.2% of arrhythmic cases respectively bellow the age group of 60.

There were various studies on length of hospital stay in acute myocardial infarction and well explored in developed countries but almost no such study have carried out in our country. The length of duration of hospital stay in accordance to specific disease could play an important role at national level of health care policy making. In a study by Alan K. Berger the length of hospital stay progressively declined from 1985 to 2001. The median, 25th and 75th percentiles lengths of stay were 9 (7, 12) days, 8 (6, 11) days, 6 (4, 9) days, and 4 (3, 7) days, respectively, similar consequences observed in our study, that the average length of hospital stay in days decline from 11.31 to 11.01, 9.61, 9.03, 8.87, 7.89 and 7.35 days for the consecutive year of 2011 to 2017.⁴⁷

The incidence of Congenital Heart diseases (0.9%), Rheumatic Valvular heart diseases (1.1%) and Peripheral Vascular diseases (1.8%) are assumed to be low among this study group. Which could be due to specific efforts, specific unit and specific age groups are required but lacking to make diagnosis for Congenital and Rheumatic Valvular heart

diseases. Our Hospital has services for Diabetic Foot Care facilities under the supervision of surgery department and most of the patients of peripheral vascular diseases are managed by them. Our hospital doesn't have any cardio-thoracic/vascular surgery unit or any pediatric cardiology unit. This may explain the smaller number of patients regarding these issues we have noticed in this study group.

Limitation:

The study was small; single centered and carried out in a specific population group who are mostly diabetic. Therefore a large population based with different group multicenter prospective study is needed to reflect the actual scenario and magnitude of the cardiovascular problem in Bangladesh.

Conclusion: This study reflects the higher incidence of Ischemic Heart Disease and higher association of Hypertensive Heart Disease in Diabetic population. Incidence of Cardiomyopathy, Peripheral Vascular Disease and Heart Failure could be higher in this population if wide range multi-center approach would have been applied.

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