



CARDIOVASCULAR RISK IN WOMEN WITH DIABETES IN A SINGLE CENTRE STUDY

Hossain MS¹, Salam MA²

1. Assistant Professor, Department of Cardiology, BIHS General Hospital, Dhaka, Bangladesh

2. Professor, Department of Cardiology, BIHS General Hospital, Dhaka, Bangladesh

ARTICLE INFO	ABSTRACT	ORIGINAL RESEARCH ARTICLE
--------------	----------	---------------------------

Article History

Received: September 2022

Accepted: November 2022

Key Words:

Cardiovascular Risk, Diabetes, cardiovascular disease (CVD), coronary artery disease (CAD), coronary heart disease (CHD).

Corresponding author

M. S. Hossain*

Background: Among both men and women, diabetes is one of the strongest cardiovascular risk factors. It has been established that type 1 and type 2 diabetes, which both raise the risk of cardiovascular disease (CVD) in women, are more common. **Objectives:** The aim of the study was to investigate the impact of cardiovascular disease (CVD) Risk in women with diabetes among patients. **Methods:** This study was a cross-sectional, observational study contained both descriptive and analytical components. The study comprised 160 purposively selected diabetic patients over 45 years old diagnosed from January 2020 to December 2020 in Bangladesh admitted in BIRDEM hospital, Dhaka. After reviewing and rechecking the data, SPSS version 26 was used to do statistical analysis. The level for statistical significance was set at 0.05. **Results:** Most of the patients belong to 40-49 years' age group. Smoke status of the population where 4(2.5%) were current status, 148(92.5%) were never and 8(5.0%) were former smoker. Most of the patients belong to 148 women of never smoke of this population. Most of the patients belong to 127 women of high-risk of this population. Large scale clinical findings of cardiovascular diseases of the patients Mean±SD HbA1c mmol/mol of 54.6±11.6 and low scale clinical findings of cardiovascular diseases of the patients Mean±SD HDL-c mmol/l of 1.2±0.3. Drugs of the population where 108(67.5%) were Glucose-lowering drugs, 57.5(92.0%) were Lipid-lowering drugs and 108(67.5%) were Antihypertensive drugs. Most of the patients belong to 108 women using Glucose-lowering drugs and Antihypertensive drugs. **Conclusion:** The study shows a high prevalence of multiple cardiovascular risk factors among participants with diabetes

INTRODUCTION:

People with diabetes are also more likely to have other conditions that raise the risk for heart disease: High blood pressure increases the force of blood through your arteries and can damage artery walls [1-3]. As opposed to their non-diabetic counterparts, diabetic men and women have a higher risk of cardiovascular disease (CVD). Type 1 and 2 diabetes, both of which increase the risk of cardiovascular disease (CVD) in women, have been shown to be more prevalent [4-6]. Both these types of diabetics have a 2- to 3-fold increased risk of cardiovascular disease compared to non-diabetics of the same age and gender. Diabetes duration, hypertension, insulin resistance, gender, coagulation disorders, and other variables all contribute to an increased risk of cardiovascular disease. Modifiable risk variables for cardiovascular disease (CVD), including glucose management in those with diabetes mellitus, should be aggressively targeted by health care professionals [7]. When it comes to the most severe symptoms of coronary heart disease (CHD), such as myocardial infarction (MI) and sudden cardiac death, women tend to be diagnosed with the condition at a later stage than males (10 years later in total and 20 years later). A woman's prognosis is much poorer than a man's after developing coronary artery disease (CAD). Only 33% of males and 43% of women under the age of 40 die within five years following their first MI. Furthermore, 64% of women, compared to 50% of males, die unexpectedly from coronary artery disease with no previous symptoms [8]. Fewer than one in five doctors were aware of the fact that women die from CVD at a higher rate than males every year [9]. The relative risk assessments for CHD morbidity and death in diabetic vs non-diabetic adults range from 1 to 3 for men and from 2 to 5 for women, despite the fact that the absolute CV risk may still be lower in diabetes women than diabetic men. The reasons for this gender disparity remain a mystery [10-11]. Meta-

analyses of prospective studies on the relationship between sex and fatality from CHD in diabetic persons have been conducted over the last decade and have yielded a variety of findings, some of which seem to contradict each other (i.e. hyperlipidemia, hypertension, obesity) [12]. INTERHEART, a comprehensive case-control study of more than 15,000 instances of acute MI carried out in 52 countries across the globe has validated diabetes' larger effect as a risk factor for coronary heart disease in women [13].

OBJECTIVES**General objective**

To investigate the impact of cardiovascular disease (CVD) Risk in women with diabetes among patients.

Specific objectives

1. To evaluate the impact of diabetes on severity.
2. To identify the association between risk factors and severity.

METHODS

This study was a cross-sectional, observational study contained both descriptive and analytical components. The study comprised 160 purposively selected diabetic patients over 45 years old diagnosed from January 2020 to December 2020 in Bangladesh admitted in BIRDEM hospital, Dhaka. The inclusion criteria was female patients aged less than 30 to more than 70 years with a diabetic, and the onset of symptoms and hospital admission. Patients who were diagnosed with diabetic after hospital admission, died or did not want to take part in the study were excluded. Using the patient's medical history, physical examination, biochemical testing, level of care required (intensive care vs ward based care) a baseline study was constructed for each patient. After reviewing and rechecking the data, SPSS version 26 was used to do statistical analysis. The level for statistical significance was set at 0.05.

RESULTS

Age distribution of the population where 13(8.13%) were <30 years, 30(18.75%) were 30 to 39 years, 43(26.87%) were 40 to 49 years, 39(24.37%) were 50 to 59 years, 26(16.25%) were 60-69 years and 9(5.62%) were >70 years. Most of the patients belong to 40-49 years age group. Smoke status of the population where 4(2.5%) were current status, 148(92.5%) were never and 8(5.0%) were former smoker. Most of the patients belong to 148 women of never smoke of this population. 10-years cardiovascular disease risk of the population where 13(8.13%) were low, 20(12.5%) were Intermediate (10% - 20%) and

127(79.37%) were High risk. Most of the patients belong to 127 women of high-risk of this population. Large scale clinical findings of cardiovascular diseases of the patients Mean±SD HbA1c mmol/mol of 54.6±11.6 and low scale clinical findings of cardiovascular diseases of the patients Mean±SD HDL-c mmol/l of 1.2±0.3. Drugs of the population where 108(67.5%) were Glucose-lowering drugs, 57.5(92.0%) were Lipid-lowering drugs and 108(67.5%) were Antihypertensive drugs. Most of the patients belong to 108 women using Glucose-lowering drugs and Antihypertensive drugs.

Table 1: Demonstrate and distribution of the study according to age

Age group	n=160	%
<30	13	8.13
30-39	30	18.75
40-49	43	26.87
50-59	39	24.37
60-69	26	16.25
>70	9	5.62

Table 2: Demonstrate and distribution of the study according to Smoking status

Status	n=160	%
Current	4	2.5
Never	148	92.5
Former	8	5.0

Table 3: Demonstrate and distribution of the study according to 10-years cardiovascular disease risk

Group	n=160	%
Low	13	8.13
Intermediate (10% - 20%)	20	12.5
High	127	79.37

Table 4: Clinical findings Mean and SD of cardiovascular diseases

	Mean±SD
HbA1c mmol/mol	54.6±11.6
HbA1c %	7.2±3.2
Total cholesterol	4.4±1.0
LDL-c mmol/l	2.4±0.8
HDL-c mmol/l	1.2±0.3
BMI	29.1±6

Table 5: Drugs Distribution of the study

	n=160	%
Glucose-lowering drugs	108	67.5
Lipid-lowering drugs	92	57.5
Antihypertensive drugs	108	67.5

DISCUSSION

The International Diabetes Federation has reported that the prevalence of diabetes in women in Bangladesh is 14%. The prevalence in urban areas is 11.5%. [14] This study shows a greater prevalence among the middle-class urban Bangladeshi. The study also shows that participants with diabetes have a high prevalence of major cardiovascular risk factors hypertension, hypercholesterolemia, low HDL cholesterol, and high triglycerides. The status of diabetes control as well as treatment and control of two important cardiovascular risk factors (hypertension and hypercholesterolemia) is low. Previous studies in Bangladesh have reported a greater diabetes prevalence in urban adults as compared with rural adults. 2–4 Recent studies have reported urban diabetes prevalence rates of 8–20% and rural diabetes prevalence rates of 5–15%. [15] There are only a few multisite studies of diabetes prevalence in Bangladesh. Using criteria similar to that used in this study, the Bangladeshi Industrial Population Surveillance Study evaluated the prevalence of diabetes at seven industrial sites in the country and reported a diabetes prevalence of 7.8%. [14] The Bangladeshi Women's Health Study evaluated diabetes in middle-aged women, 35–70 years, in different rural and urban locations of the country and reported diabetes in 2.2% rural and 9.3% urban women. [14] This study reports a prevalence of 15.7%, which is similar to that reported in recent studies from Bangladesh. We have not presented data on the regional differences in diabetes prevalence due to the small sample sizes (500–1000) at different locations. However, we have earlier shown that regional differences in diabetes prevalence are related more to the Social

Development. These results are similar to those of studies from India and other middle-income countries. [16] Larger and more comprehensive studies are required to identify regional differences in diabetes and to evaluate the causes of these differences. This study also shows a high prevalence of major cardiovascular risk factors (hypertension, hypercholesterolemia, low HDL cholesterol, hypertriglyceridemia, and smoking/smokeless tobacco use) in participants with diabetes. This finding is similar to those from studies from other parts of the world. [17] The greater prevalence of smoking as well as smokeless tobacco use in participants with diabetes is an important finding and is similar to those of previous Bangladeshi studies. [18] Another important finding is the low prevalence of these risk factors in the population without diabetes and suggests that diabetes is a major driver of cardiometabolic risks in Bangladesh. [19] A high prevalence of undiagnosed diabetes in younger participants (<40 years) is also important and highlights the importance of surveillance and screening among the younger populations for early diagnosis of diabetes in Bangladesh. This study also shows that diabetes is associated with multiple cardiovascular risk factors and its prevention and elimination can have important consequences for cardiovascular disease prevention. The prevalence of known diabetes in this study is more than 70% of all individuals with diabetes and is more than those shown by previous reports from Bangladesh. [20] However, only half of the patients with diabetes are controlled to the target of fasting glucose <130 mg/dL. This is similar to previous reports from Bangladesh. [21] The American Diabetes Association and

the European Association for Study of Diabetes recommend three markers for the assessment of diabetes control (blood fasting glucose, postprandial glucose, or glycated hemoglobin (HbA1c)). [22] We defined control using fasting glucose levels only and did not measure blood HbA1c. This is an important study limitation. The low status of awareness, treatment, and control of cardiovascular risk factors among participants with diabetes is also an important finding in this study. Only a few international studies have evaluated the status of cardiovascular risk factor control in patients with diabetes. Gakidou et al compared the management of diabetes and associated cardiovascular risk factors in seven countries (Colombia, England, Iran, Mexico, Scotland, Thailand, and the USA). [23] This study reported that a substantial proportion of individuals with diabetes remain undiagnosed and untreated in various developed and developing countries and ranged from 24% in Scotland and the USA to 62% in Thailand. The proportion of individuals with diabetes reaching treatment targets for blood glucose, systolic BP, and cholesterol ranged from 1% in Mexico to 12% in the USA.³⁴ Low control of diabetes and hypertension has also been reported in a study in Bangladesh. [23] Moreover, similar methodology has been used in previous Bangladeshi studies and the present data are similarly representative. [24] The low response rate in the study (62%) is also a matter of concern and it is possible that those excluded were either more or less healthy as compared with the study participants; however, these response rates are similar to those of other population-based studies in Bangladesh and elsewhere and are within acceptable limits. [25] Finally, there are multiple determinants of awareness, treatment, and control of cardiovascular risk factors in patients with diabetes. We have not analyzed the 'causes of the causes' or the societal factors that lead to greater cardiovascular risk and better awareness of risk factors in study participants.

On the other hand, the strengths of the study include a nationwide scope and study of multiple risk factors.

Limitation of the Study

This was a small sample size prospective comparative hospital-based study. As a result, the findings of this study may not accurately reflect the situation in the entire country.

CONCLUSION

The study shows a high prevalence of multiple cardiovascular risk factors among participants with diabetes. The low status of control of hypertension and hypercholesterolemia in participants with known diabetes is a cause for concern. Suitable strategies for improvement of risk factor management and control should be developed in Bangladesh to prevent premature cardiovascular disease in diabetes.

RECOMMENDATION

This study can serve as a pilot to much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

Conflict of interest: None declared

ACKNOWLEDGEMENT

The wide range of disciplines involved in Outcome of laparoscopic cholecystectomy in a district hospital and clinic research means that an editor's needs much assistance from referees in the evaluation of papers submitted for publication. I am very grateful to many colleagues for their thorough, helpful and usually prompt response to requests for their opinion and advice.

REFERENCES

1. Stamler J, Vaccaro O, Neaton JD, Wentworth D, Multiple Risk Factor Intervention Trial Research Group. Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the Multiple Risk Factor

- Intervention Trial. *Diabetes care*. 1993 Feb 1;16(2):434-44.
2. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, Hadden D, Turner RC, Holman RR. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *Bmj*. 2000 Aug 12;321(7258):405-12.
 3. Claudi T, Midthjell K, Holmen J, Fougner K, Krüger Ø, Wiseth R. Cardiovascular disease and risk factors in persons with type 2 diabetes diagnosed in a large population screening: The Nord-Trøndelag Diabetes Study, Norway. *Journal of internal medicine*. 2000 Dec;248(6):492-500.
 4. Laing SP, Swerdlow AJ, Slater SD, Burden AC, Morris A, Waugh NR, Gatling W, Bingley PJ, Patterson CC. Mortality from heart disease in a cohort of 23,000 patients with insulin-treated diabetes. *Diabetologia*. 2003 Jun;46(6):760-5.
 5. Soedamah-Muthu SS, Chaturvedi N, Toeller M, Ferriss B, Reboldi P, Michel G, et al. Risk factors for coronary heart disease in type 1 diabetic patients in Europe. The EURODIAB prospective complications study. *Diabetes Care* 2004;27(2):530-7.
 6. Huxley R, Barzi F, Woodward M. Excess risk associated with diabetes in men and women: meta-analysis of 37 prospective cohort studies. *BMJ* 2006;332:73e8.
 7. Marks JB, Raskin P. Cardiovascular risk in diabetes: a brief review. *Journal of Diabetes and its Complications*. 2000 Mar 1;14(2):108-15.
 8. Rosamond W, Flegal K, Friday G, Furie K, Go A, Greenlund K, Haase N, Ho M, Howard V, Kissela B, Kittner S. Heart disease and stroke statistics—2007 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*. 2007 Feb 6;115(5):e69-171.
 9. Mosca L, Linfante AH, Benjamin EJ, Berra K, Hayes SN, Walsh BW, Fabunmi RP, Kwan J, Mills T, Simpson SL. National study of physician awareness and adherence to cardiovascular disease prevention guidelines. *circulation*. 2005 Feb 1;111(4):499-510.
 10. Orchard TJ. The impact of gender and general risk factors on the occurrence of atherosclerotic vascular disease in non-insulin dependent diabetes mellitus. *Ann Med* 1996;28: 323-33.
 11. Lee WI, Cheung AM, Cape D, Zinman B. Impact of diabetes on coronary heart disease in women and men: a meta-analysis of prospective studies. *Diabetes Care* 2000;23:962-8.
 12. Kanaya A, Grady D, Barrett-Connor E. Explaining the sex difference in coronary heart disease mortality among patients with type 2 diabetes mellitus. *Arch Intern Med*; 2002;1737-45.
 13. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004;364:937-52.
 14. Akhtar S, Nasir JA, Sarwar A, Nasr N, Javed A, Majeed R, Salam MA, Billah B. Prevalence of diabetes and pre-diabetes in Bangladesh: a systematic review and meta-analysis. *BMJ open*. 2020 Sep 1;10(9):e036086.
 15. Alsaadon H, Afroz A, Karim A, Habib SH, Alramadan MJ, Billah B, Shetty AN. Hypertension and its related factors among patients with type 2 diabetes mellitus—a multi-hospital study in Bangladesh. *BMC Public Health*. 2022 Dec;22(1):1-0.
 16. Mohan V, Pradeepa R. Epidemiology of diabetes in different Regions of India. *Health administrator*. 2009;22(1-2):1-8.

17. Leon BM, Maddox TM. Diabetes and cardiovascular disease: epidemiology, biological mechanisms, treatment recommendations and future research. *World journal of diabetes*. 2015 Oct 10;6(13):1246.
18. Nargis N, Thompson ME, Fong GT, Driezen P, Hussain AG, Ruthbah UH, Quah AC, Abdullah AS. Prevalence and patterns of tobacco use in Bangladesh from 2009 to 2012: evidence from International Tobacco Control (ITC) Study. *PloS one*. 2015 Nov 11;10(11):e0141135.
19. Danaei G, Lu Y, Singh GM, Carnahan E, Stevens GA, Cowan MJ, Farzadfar F, Lin JK, Finucane MM, Rao M, Khang YH. Cardiovascular disease, chronic kidney disease, and diabetes mortality burden of cardiometabolic risk factors from 1980 to 2010: a comparative risk assessment. *Lancet Diabetes & Endocrinology*. 2014.
20. Einarson TR, Acs A, Ludwig C, Panton UH. Prevalence of cardiovascular disease in type 2 diabetes: a systematic literature review of scientific evidence from across the world in 2007–2017. *Cardiovascular diabetology*. 2018 Dec;17(1):1-9.
21. Khan N, Oldroyd JC, Hossain MB, Islam RM. Awareness, treatment, and control of diabetes in Bangladesh: evidence from the Bangladesh Demographic and Health Survey 2017/18. *International Journal of Clinical Practice*. 2021 Jul 14;2022.
22. Danne T, Nimri R, Battelino T, Bergenstal RM, Close KL, DeVries JH, Garg S, Heinemann L, Hirsch I, Amiel SA, Beck R. International consensus on use of continuous glucose monitoring. *Diabetes care*. 2017 Dec 1;40(12):1631-40.
23. Gakidou E, Mallinger L, Abbott-Klafter J, et al. Management of diabetes and associated cardiovascular risk factors in seven countries: a comparison of data from national health examination surveys. *Bull World Health Organ*. 2011;89(3):172-183.
24. Khan AB, Ghazanfar MS, Khan SI. Application of phonetic encoding for analyzing similarity of patient's data: Bangladesh perspective. In 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC) 2017 Dec 21 (pp. 664-667). IEEE.
25. Islam MM, Rahman MJ, Roy DC, Maniruzzaman M. Automated detection and classification of diabetes disease based on Bangladesh demographic and health survey data, 2011 using machine learning approach. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*. 2020 May 1;14(3):217-9.