



ORIGINAL ARTICLE

Characteristics of Carotid Artery among Ischemic Heart Disease Patients with or without Diabetes Mellitus

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Abstract

Background: Involvement of coronary artery can vary among the ischemic heart disease patients with or without diabetes mellitus. **Objective:** The purpose of the present study was to assess the characteristics of carotid artery among ischemic heart disease patients with or without diabetes mellitus. **Methodology:** This case-control study was conducted in the Department of Cardiology at Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. The study was carried out from July 2013 to June 2015 for a period of two years. Patients who had coronary artery diseases or ischemic heart diseases and diabetes mellitus undergoing coronary angiography were selected as case of this study. In control group, age, sex match patients of IHD undergoing CAG not having DM were included. Every patient was clinically examined by detailed history and physical examination during entry into study. ECG, chest X-ray, echocardiogram, blood sugar (fasting), blood 2 hrs. after 75gm of glucose and or breakfast were analyzed. Coronary angiography was done in all patients through femoral approach by modified Seldinger technique. Carotid arteriography was performed selective and nonselective method by Hunter head or right Judkin's catheter in standard AP, lateral and oblique views. **Results:** A total number of 100 patients were included in this study. Of them 50 patients were coronary artery disease with diabetes mellitus and another 50 patients were coronary artery disease without diabetes mellitus. Morphological character of the lesion was also assessed. The mean age was found 57.48 years with 6.04 standard deviation (SD) in DM and 55.64 years with 6.34 standard deviation in NDM group and also 56.56 years with 6.49 standard deviation in the whole study population. The value of unpaired t-test was 0.158 and it was insignificant ($p>0.05$). The common site of lesion was bifurcation, internal carotid, common carotid and external carotid artery which were 13 cases, 9 cases, 4 cases and 1 case respectively. The individual vessel involvement was 9(18.0%) cases in right, 6(12.0%) cases in left, and 3(6.0%) cases in both in DM group whereas 5 (10.0%) cases in right, 3(6.0%) cases in left, and 1(2.0%) case in both in NDM group. It observed that out of 100 study subjects 10 had complex carotid lesion in DM and 4 in NDM. **Conclusion:** In conclusion the common site of lesion was bifurcation and internal carotid artery mostly in right side. [*Journal of Current and Advance Medical Research, January 2023;10(1):7-12*]

Keywords: Carotid artery; ischemic heart disease; diabetes mellitus

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Introduction

Atherosclerotic carotid artery disease is associated with atherosclerotic coronary artery disease¹. Coronary artery disease is high in DM. However, there is no direct study regarding carotid artery disease in diabetes mellitus in our country. The prevalence of carotid artery disease in patients with coronary artery disease and its clinical implications have not been adequately studied in the Bangladeshi population². Few studies had been conducted in our country regarding relation with Coronary artery disease and atherosclerotic carotid artery stenosis by non-invasive method but not by carotid arteriography³. Coronary heart disease remains leading cause of death and disability in the world. In United states, approximately 14 million people among 250 million have coronary heart disease, and 1.5 million individuals experience a myocardial infarction annually, leading to around 500,000 deaths per year⁴.

One study showed the prevalence of ischaemic heart disease (IHD) in western countries. One in six men aged 40 to 44 years had some evidence of ischaemic heart disease and at the age of 55 to 59 years, the prevalence was 1 in 3 cases⁵. Cardiovascular disease is prevalent throughout the world and showing declining mortality rates in developed countries but emerging a serious health problem in Bangladesh and other developing countries⁶. All types of cardiovascular disease are prevalent in Bangladesh as in other parts of the world⁷. If effective preventive and control measures are not taken in time, the disease will assume an epidemic form within next few years. With the increase of life expectancy from 46 to 61 years and control of common infectious diseases, atherosclerotic disease showed increasing trends⁸. Hence, the purpose of the present study was to assess the characteristics of carotid artery among ischemic heart disease patients with or without diabetes mellitus.

Methodology

Study Design and Population: This case-control study was conducted in the Department of Cardiology at Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. The study was carried out from July 2013 to June 2015 for a period of two years. Patients who had coronary artery diseases or ischemic heart diseases and diabetes mellitus undergoing coronary angiography were selected as case of this study. In control group, age, sex match patients of IHD undergoing CAG not having DM were included. There were several

inclusion criteria. Patients suffering from IHD with diabetes mellitus and undergoing CAG were taken as cases. Both sexes are included. Any age of patients suffering from IHD with DM and undergoing CAG. Exclusion Criteria were patients undergoing CAG without IHD with diabetes mellitus, Patients having previous CVA and TIA, Patients previously underwent carotid endarterectomy or angioplasty or stenting or patients previously underwent CABG or angioplasty.

Study Procedure: Informed consents was taken from all patients included in this study. History and clinical examination findings was recorded in pre-designed proforma. Clinical Evaluation were performed thoroughly. Every patient was clinically examined by detailed history and physical examination during entry into study. The signs and symptoms of the patients were carefully evaluated. Any chest pain, palpitation, shortness of breath was noted. During physical examination, emphasis was given on pulse, blood pressure, and jugular venous pressure, carotid pulse, carotid bruit. Detail drug treatment was recorded.

Laboratory Procedure: ECG, chest X-ray, echocardiogram, blood sugar (fasting), blood 2 hrs. after 75gm of glucose and or breakfast, lipid profile, blood urea and creatinine complete blood count, B.T, C.T platelet count, HBSAg, VDRL were analyzed and also documented. Coronary angiography was done in all patients through femoral approach by modified Seldinger technique. Left and right Judkins' catheter were used to perform coronary angiography. Ionic/nonionic dye was used.

Multiple angled views with cranial and caudal angulation were taken to separate branches of left anterior descending (LAD). Left circumflex (LCx) and right coronary arteries. Left ventricular angiography was done in right anterior oblique (RAO) view in all patients and left ventricular ejection fraction and left ventricular end-diastolic pressure (LVEDP) was measured in both the groups. Carotid arteriography was performed selective and nonselective method by Hunter head or right Judkin's catheter in standard AP, lateral and oblique views.

Statistical Analysis: The collected data were checked and coded manually and then entered into computer. The numerical data obtained from the study were analyzed and significance of difference was estimated by using the statistical methods. Data were expressed in frequency, percentage, mean and

standard deviation as applicable. Comparison between groups was done by unpaired student's t test, chi-square test, and test as applicable. Analysis of data was done by using computer based SPSS program (version 11.5). Probability less than 0.05 was considered as significant.

Ethical Consideration: All procedures of the present study were carried out in accordance with the principles for human investigations (i.e., Helsinki Declaration) and also with the ethical guidelines of the Institutional research ethics. Formal ethics approval was granted by the local ethics committee. Participants in the study were informed about the procedure and purpose of the study and confidentiality of information provided. All participants consented willingly to be a part of the study during the data collection periods. All data were collected anonymously and were analyzed using the coding system.

Results

A total number of 100 patients were included in this study. Of them 50 patients were coronary artery disease with diabetes mellitus and another 50 patients were coronary artery disease without diabetes mellitus. Both group were undergoing coronary and carotid angiography. Coronary artery stenosis was assessed by different scoring system and carotid artery stenosis are categorized as mild (<50% stenosis) moderate (50-69% stenosis) and critical (\geq 70% stenosis). Moderate and critical stenosis were considered as significant carotid artery disease. Morphological character of the lesion was also assessed. The mean age was found 57.48 years with 6.04 standard deviation (SD) in DM and 55.64 years with 6.34 standard deviation in NDM group and also 56.56 years with 6.49 standard deviation in the whole study population. The value of unpaired t-test was 0.158 and it was insignificant ($p>0.05$). Therefore, there was no age difference in both groups (Table 1).

Table 1: Age distribution of the Study Subjects

Age Group	Case Group	Control Group	Total	P Value
Less Than 50 Years	2(4.0%)	4(8.0%)	6(6.0%)	
50 to 59 Years	27(54.0%)	26(52.0%)	53(53.0%)	
More Than 59 Years	21(42.0%)	20(40.0%)	41(41.0%)	
Total	50(100.0%)	50(100.0%)	100(100.0%)	
Mean\pmSD	57.48\pm6.04	55.64\pm6.34	56.56\pm6.49	0.158

It was observed that out of 100 study subjects ultimately found 67 (60.9%) had complex coronary lesion in DM and 43(39.1%) were in NDM. Similarly, 86(52.4%) found the simple coronary lesion in DM and 78(47.5%) were in NDM group ($p<0.001$) which was highly significant ($p>0.05$) which was insignificant and Z test was done between two proportions in total coronary lesion ($p<0.001$) (Table 2).

Table 2: Comparison of Morphological Character of Coronary Lesion (n=100)

Coronary Lesion	Case Group	Control Group	Total	P Value
Simple	86	78	164	<0.05
Complex	67	43	110	
Total	173	121	274	

It was found that the critical lesion in carotid was 5, moderate 13 and mild 11 in DM group whereas in NDM group the critical lesion in carotid was 2,

moderate 7 and mild 6. The difference was statistically significant ($p<0.05$) in DM compared to NDM ($p=0.004$) (Table 3).

Table 3: Comparison of Carotid Lesion in Case and Control (n=44)

Category	Case Group	Control Group	Total	P Value
Mild	11	6	17	<0.05
Moderate	13	7	20	
Critical	5	2	7	
Total	29	15	44	

The common site of lesion was bifurcation, internal carotid, common carotid and external carotid artery which were 13 cases, 9 cases, 4 cases and 1 case respectively. Among 18 cases of case group site of lesions were found in bifurcation of carotid artery, internal carotid artery, common carotid artery and external carotid artery which were 8 cases, 6 cases, 3 cases and 1 case respectively.

Table 4: Distribution of Site of Carotid Lesion, Individual Vessel Involvement and in Case and Control (n=100)

Variables	Case Group	Control Group	Total	P Value
Site of Carotid Lesion				
• Bifurcation Of Carotid Artery	8	5	13	<0.05
• Internal Carotid Artery	6	3	9	
• Common Carotid Artery	3	0	4	
• External Carotid Artery	1	0	1	
Vessel Involvement				
• Right	9	5	14	<0.05
• Left	6	3	9	
• Both	3	1	4	
Total	18	9	27	
Morphological Character				
• Simple	8	5	13	<0.05
• Complex	10	4	14	
Total	18	9	27	

The individual vessel involvement was 9(18.0%) cases in right, 6(12.0%) cases in left, and 3(6.0%) cases in both in DM group whereas 5 (10.0%) cases in right, 3(6.0%) cases in left, and 1(2.0%) case in both in NDM group. It observed that out of 100 study subjects 10 had complex carotid lesion in DM and 4 in NDM. Similarly, 8 found the simple coronary lesion in DM and 5 were in NDM group.

Discussion

We studied our cases on the basis of vessel involvement. Single vessel involvement was 25 percent, double vessels involvement was 37 percent and triple vessel involvement was 31 percent. This study is more or less similar with the study done Jacob et al⁹ where they found single vessel, involvement 15 percent, double vessel involvement 38 percent and triple vessel involvement 40 percent. The mean coronary stenosis score⁷ was 14.2 with standard deviation 11.25 and the minimum and maximum score was 3 and 44 respectively in case group. Similarly, in NDM the mean coronary SS score was 9.0 with standard deviation 6.23 and the minimum and maximum score was 4 and 36 respectively.

The mean coronary assessment score¹⁰ was 10.4 with standard deviation 2.86 and the minimum and maximum score was 4 and 17 respectively in DM. Similarly, in NDM the mean coronary assessment score was 8.0 with standard deviation 2.44 and the minimum and maximum score was 4 and 14 respectively. The result was similar with Akanda et al¹¹ it was 7.66±1.63. The mean Vessel score, Stenosis: score and the Assessment score difference The morphological character out of 100 study

Z test was done between two proportions in complex coronary lesion where $z= 6.864$ ($p<0.001$) which was highly significant, Z test was done between two proportions in simple carotid lesion where $z= 3.66$ ($p<0.001$) which was highly significant and Z test was done between two proportions in total carotid lesion where $z= 5.36$ ($p<0.001$) which was highly significant (Table 4).

subjects ultimately found that 67(60.9%) cases had complex coronary lesion in DM and 43(39.1%) cases were in NDM. Similarly, 86(52.4%) cases were found the simple coronary lesion in DM and 78(47.5%) cases were in NDM group. Z test was done between two proportions in complex coronary lesion where $z= 3.345$ ($p<0.001$) which was highly significant, Z test was done between two proportions in simple coronary lesion where $z= 0.593$ ($p>0.05$) which was insignificant and Z test was done between two proportions in total coronary lesion where $z= 3.993$ ($p<0.001$) which was highly significant.

In carotid angiography it was found that the critical lesion in carotid was 5, moderate 13 and mild 11 in DM group whereas in NDM group the critical lesion in carotid was 2, moderate 7 and mild 6. The difference was statistically significant ($p<0.05$) in DM compared to NDM in chi-square test ($p=0.004$). A similar result was reported by Rath et al¹² from India where they found carotid involvement 18%. The morphological character of lesion it was observed that out of 100 study subjects 10 had complex carotid lesion in DM and 4 in NDM. Similarly, 8 found the simple coronary lesion in DM and 5 were in NDM group. Z test was done between two proportions in complex coronary

lesion where $z = 6.864$ ($p < 0.001$) which was highly significant, Z test was done between two proportions in simple carotid lesion where $z = 3.66$ ($p < 0.001$) which was highly significant and Z test was done between two proportions in total carotid lesion where $z = 5.36$ ($p < 0.001$) which was highly significant.

The commonest site of involvement of carotid artery was Bifurcation, Internal carotid, Common carotid and External carotid artery 13, 9, 4 and 1 respectively. Atherosclerosis is characterized by intimal lesions called atheromas or fibro fatty plaques that protrude into the lumen, weaken the underlying media and undergo a series of changes¹³. Atherosclerosis is not a single disease entity. The lesions or atherosclerosis to the different forms, depending on their anatomic site; the age, genetic and physiological status of the affected individual; and presumably, the so-called risk factors to which each individual may have been exposed. Atherosclerosis is a multifactorial process which, if it leads to clinical sequelae, requires extensive accumulation of smooth muscle cells within the intima of the affected artery.

Conclusion

In conclusion the most common site of lesion is in the bifurcation of carotid artery followed by internal carotid artery, common carotid artery and external carotid artery. The individual vessel involvement is found more in right side than left in DM group. It has been observed that out of all study subjects' majority have complex carotid lesion in case group. Further large scale study should be carried out to get the real scenario.

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Conflict of Interest

The authors have no conflicts of interest to disclose

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Contributions to authors: Rahman AKMM, Sharmin F prepared the manuscript from protocol preparation upto report writing. Islam MM, Shoman MM, Khan K have revised the manuscript. Rahman AKMM Has prepared the manuscript. All the authors have involved from protocol preparation up to manuscript writing & revision.

Data Availability

Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

Ethical approval for the study was obtained from the Institutional Review Board. As this was a prospective study the written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.

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