Correlation between Peripheral Arterial Disease and Coronary Artery Disease in Bangladeshi Population—A Five Years Retrospective Study

SYED DAWOOD MD. TAIMUR¹, MASHHUD ZIA CHOWDHURY¹, MD. ENAMUL HAKIM²

¹Department of Cardiology, Ibrahim Cardiac Hospital & Research Institute, Dhaka, ²Department of Cardiac surgery, National Institute of Cardiovascular Diseases (NICVD), Dhaka

Address of Correspondence: Dr. Syed Dawood Md. Taimur, Assistant Professor & Associate Consultant, Department of Cardiology, Ibrahim Cardiac Hospital & Research Institute, Dhaka, Bangladesh, Email: sdmtaimur@gmail.com

Abstract:

Background: Peripheral arterial disease (PAD) is under diagnosed in primary care practices, yet the extent of unrecognized PAD in patients with coronary artery disease (CAD) is unknown.

Objective: To assess the prevalence of previously unrecognized PAD in patients undergoing coronary angiogram and to determine the relationship between presence of PAD and severity of CAD.

Material & Methods: This five years retrospective study was conducted at invasive lab of the department of Cardiology, Ibrahim Cardiac Hospital & Research Institute, Dhaka, Bangladesh from January 2010 to December 2014. Total 77 patients were included in this study. Study variables were age, sex, risk factors like hypertension, diabetes mellitus, dyslipidaemia, smoking habit and positive family history for ischemic heart disease, severity of coronary artery and peripheral artery disease.

Results: Mean age was 56.83±13.64 years, Male mean age was 53.98±15.08 years and female mean age was 54.5±1.73 years. Hypertension were detected in 55.8%, diabetes in 87%, dyslipidaemia in 81.8%, smoking habits in 88.3% and 58.4% had positive family history. After catheterization 88.3% had peripheral arterial disease and 71.4% had coronary artery disease. Out of 77 patients 52 had both coronary and peripheral arterial disease which was statistically significant (p<.014). Coronary angiogram revealed 28.6% (22) patients had triple vessel disease, 23.3% (18) had single vessel disease, 19.5% (15) had double vessel disease and 28.6% (22) were normal coronary arteries. Peripheral angiogram revealed 51.9% had superficial femoral artery disease, 24.7% had anterior tibial artery disease, 26% had posterior tibial artery disease, 15.6% had common iliac artery and common femoral artery disease and 2.6% had renal artery disease.

Conclusion: There is a strong and definite correlation between coronary and peripheral arterial disease. We found that cardiovascular risk factors were in fact risk factors for both PAD and CAD.

Keywords: Peripheral artery disease; Coronary artery disease; Risk factors.

Introduction:

Peripheral Artery Disease (PAD) is a distinct atherosclerotic syndrome marked by stenosis or occlusion of the arteries, particularly of the lower extremities. PAD affects 8 to 10 million individuals in the United States¹,² and is associated with reduced functional capacity³,⁴ and increased risk for cardiovascular morbidity and mortality⁵,⁶. Despite its widespread prevalence and negative associations with quality of life, morbidity, and mortality, PAD remains under diagnosed and undertreated²,⁸,⁹. Preventable or treatable risk factors for PAD are generally thought to mirror other forms of cardiovascular disease and include cigarette smoking, type 2 diabetes, and clinically elevated levels of blood pressure and cholesterol, which are the main therapeutic targets in clinical and prevention guidelines¹⁰,¹¹. However, their respective associations with risk of PAD and the extent to which they are jointly associated with the incidence of PAD are not well established. Furthermore, despite the ongoing identification of novel risk factors for PAD¹²,¹³ this disease may have a less prominent component of thrombosis than does ischemic stroke or myocardial infarction (MI)¹⁴,¹⁵, raising the possibility that traditional atherosclerotic risk factors may be even more important in this form of cardiovascular disease.

Therefore, our objective in the present study was to analyze and compare risk factors for PAD, CAD, and for normal
controls under the hypothesis that risk factors for PAD and CAD are different from those for normal controls.

Subjects and Methods

Study population and design
We reviewed the records of patients diagnosed with PAD and CAD at the department of Cardiology, Ibrahim Cardiac Hospital & Research Institute from January 2010 to December, 2014 who underwent duplex study of lower limb vessels with history of stable or unstable angina with risk factors like hypertension (HTN), diabetes mellitus (DM), dyslipidaemia, smoking habit, positive family history and history of CKD. We excluded patients who suffering multi-organ failure or cancer. The enrolled subjects consisted of 1) patients with clinical history of intermittent claudication of lower limb or limb ischemia who had over 50% peripheral artery occlusion confirmed by duplex study of lower limb vessels, 2) patients those with previous ischemic heart disease with or without risk factor.

Diagnostic criteria

Cardiovascular risk factors
Subjects were defined as having hypertension if they were taking an anti-hypertensive agent, had been clinically diagnosed with hypertension (HTN), or had either a systolic blood pressure (SBP) ≥140 mm Hg or a diastolic blood pressure (DBP) ≥90 mm Hg. Subjects who met one of the following requirements were defined as having diabetes mellitus (DM): on an oral hyperglycemic agent, using insulin, clinical diagnosis of diabetes, or a fasting glucose level >126 mg/dl and 2 hours after blood sugar >mg/dl. Subjects were defined to have dyslipidaemia if they met one of the following requirements: diagnosis of hypercholesterolemia or a medication history of hypercholesterolemia or TChol >200 mg/dL or LDL-C >130 mg/dL. The following body mass index (BMI) categories were recognized: normal (18.5≤BMI<24.9), overweight (25≤BMI<30) and obese (BMI≥30). A patient who had smoked within a year prior to the study was defined as a smoker. The estimated Glomerular Filtration Rate (eGFR), which was used as an indicator of kidney function, was calculated using the Modification of Diet Renal Disease Study formula: eGFR (mL/min/1.73 m²). The National Kidney Foundation Kidney Disease Outcome Quality Initiative defined CKD as an eGFR <60 mL/min/1.73 m². Statistical analysis The age and gender differences and hypertension, diabetes, dyslipidaemia, smoking habit, family history of IHD, CKD, peripheral artery and coronary artery profile were statistically analyzed to find if they influenced in any way the incidence of SD. Data were entered in computer using SPSS for windows version 16.0 (SPSS Inc., Chicago, IL). Results were cross-tabulated to find out the relationships between the variables. Statistical analysis was performed using 2 -square for test of association and Fisher’s exact test as appropriate. A p-value of less than 0.05 was considered significant in all statistical analysis.

Results:
Mean age was 56.83±13.64 years, Male mean age was 53.98±15.08 years and female mean age was 54.5±1.73 years. There were four different age groups in this study. 16 patients were in 30-45 years of age group, 34 patients were in 46-60 years age group, 20 patients were in 61-75 years age group & 7 patients were in more than 76 years age group. 93.51% were male and 6.49% were female. Out of 77 patients 7 patients BMI was less than 18.5, 48 patients BMI range was 18.5-24.9, 19 subject had 25-29.9 and rest 3 patients had more than 30. Out of 55 patients who had PVD, 45 patients and Out of 55 patients who had CAD, 35 patients BMI was same range 18.5-24.9 and only 1 patient who suffered both PVD & CAD his BMI was >30. (Fig.1)

Fig.-1: Bar chart showed population in different range of BMI

Hypertension were detected in 55.8%, diabetes in 87%, dyslipidaemia in 81.8%, smoking habits in 79.2% and 58.4% had positive family history who had PAD. On the other hand Hypertension were detected in 78.18%, diabetes in 94.5%, dyslipidaemia in 87.2%, smoking habits in 80% and 14.5% had positive family history who had CAD. (Table-1)
After catheterization 88.3% had peripheral arterial disease and 71.4% had coronary artery disease. Out of 77 patients 52 had both coronary and peripheral arterial disease which was statistically significant (p<.014). Coronary angiogram revealed 28.6% (22) patients had triple vessel disease, 23.3% (18) had single vessel disease, 19.5% (15) had double vessel disease and 28.6% (22) were normal coronary arteries. (Table-2)

### Table-I

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>CAD p-value</th>
<th>PAD p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTN</td>
<td>.079</td>
<td>.031</td>
</tr>
<tr>
<td>DM</td>
<td>.005</td>
<td>.003</td>
</tr>
<tr>
<td>Dyslipidaemia</td>
<td>.055</td>
<td>.052</td>
</tr>
<tr>
<td>Smoking Habit</td>
<td>.507</td>
<td>.035</td>
</tr>
<tr>
<td>Family History for IHD</td>
<td>.000</td>
<td>.024</td>
</tr>
<tr>
<td>H/O CKD</td>
<td>.615</td>
<td>.621</td>
</tr>
</tbody>
</table>

Peripheral angiogram revealed 51.9% had superficial femoral artery disease, 24.7% had anterior tibial artery disease, 26% had posterior tibial artery disease, 15.6% had common iliac artery and common femoral artery disease and 2.6% had renal artery disease.

### Table-II

<table>
<thead>
<tr>
<th>Sex</th>
<th>SVD</th>
<th>DVD</th>
<th>TVD</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>15</td>
<td>14</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total(77)</td>
<td>18</td>
<td>15</td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

Name of Coronary artery Frequency Percentage (%)

- Left main: 1 (1.3)
- LAD: 43 (55.8)
- LCx: 36 (46.8)
- RCA: 34 (44.2)

After coronary angiogram 33.8% patient advised PCI, 23.4% advised CABG, 14.3% had optimized medical management and 28.6% recommendation was primary prevention. (Fig.2)

### Table-III

<table>
<thead>
<tr>
<th>Name of Peripheral Artery</th>
<th>Frequency</th>
<th>Percentage(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal</td>
<td>2</td>
<td>2.6</td>
</tr>
<tr>
<td>Superficial Femoral</td>
<td>40</td>
<td>51.9</td>
</tr>
<tr>
<td>Post.Tibial</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>Anterior Tibial</td>
<td>19</td>
<td>24.7</td>
</tr>
<tr>
<td>External Iliac</td>
<td>8</td>
<td>10.4</td>
</tr>
<tr>
<td>Common Femoral</td>
<td>12</td>
<td>15.6</td>
</tr>
<tr>
<td>Aorto-iliac or Femoral</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Common Iliac</td>
<td>12</td>
<td>15.6</td>
</tr>
</tbody>
</table>

Recommendation after peripheral angiogram revealed 48.1% patients advised bypass graft surgery, 35.1% advised peripheral angioplasty (PTA), 5.2% medical management and 11.7% recommended primary prevention.

### Discussion:

Peripheral arterial disease is the occlusive disease of arteries distal to the aortic bifurcation\(^\text{16}\). The term, however, is widely used to refer to chronic arterial disease of the legs of atherosclerotic origin. Atherosclerosis is by far the most common cause (>90%) of arterial problems in the legs\(^\text{17}\).

The overall findings of this study revealed that hypertension, diabetes, dyslipidaemia, obesity, smoking habit and CKD are risk factors for peripheral artery and coronary artery disease. However, obesity as a risk factor showed inconsistent results between PAD and CAD.

These findings are consistent with those of previous studies that reported that risk factors for PAD are similar to those for CAD. For instance, HTN\(^\text{20}\), DM\(^\text{21}\), dyslipidaemia\(^\text{22}\), smoking\(^\text{23}\), and CKD\(^\text{24}\), are known risk factors for CAD. Furthermore, HTN\(^\text{25}\), DM\(^\text{26}\), dyslipidaemia\(^\text{27}\), smoking\(^\text{28}\), and CKD\(^\text{19}\), are risk factors for PAD. Obesity is one of the major risk factor for CVD, including PAD.\(^\text{21}\) Obesity is also associated with high mortality related to chronic disease\(^\text{32}\). However, patients with CAD or PAD have an inverse correlation between BMI and cardiovascular mortality after adjustment for confounding variables in the Factores de Riesgo y ENfermedad Arterial registry\(^\text{33}\).

This study population when analyzed age wise, the prevalence in age group of 30–45 years was 20.8%. It
increased to 44.2% in 46–60 years age group, 26% in the age group 61–75 years and 9.1% in more than 76 years age group. Peripheral arterial disease occurrence increased with age. Most studies have shown a linear relation between age and PAD. The Rotterdam Study showed a prevalence of 7.6% in age group of 55–59 years, which increased to 59.6% in age >85 years. Newman et al. have shown a prevalence of 26% in a population aged e” 60 years. This is comparable to the present study which has a prevalence of PAD of 44.2% of the patients in the study population 46-60 years of age. In this study population, the male subjects comprised 93.5% and female subjects comprised 6.5%. The occurrence of PAD among males was 92.6% and females was 7.4% . The impact of sex on PAD, however, did not reach statistical insignificance in this study. Most of the studies have shown a similar incidence of PAD with men to be slightly more than women. Schroll and Munk have shown an incidence of 16% in men and 13% in women. The Cardiovascular Health Study has shown a prevalence of 14% for men and 11% for women. Vogt et al. have shown the gap in prevalence narrows after 70 years of age. However, Meijer et al. in the Rotterdam Study found a higher prevalence rate among women being at 20.5% and for men being at 16.9%. Another interesting fact observed was the presence of claudication seen more among subjects who also had associated CAD. Reunanen et al. had also made a similar observation in their study. In this study, among the patients diagnosed to having PAD, 21%.

This study showed that 87% of patients with DM had PAD and the P value for DM as a risk factor was statistically significant. A cross-sectional study by Adler et al. found a prevalence of 23.5% PAD among type 2 DM patients. In the study by Beckman et al., 50% of patients with DM were found to have PAD. In our study, the occurrence of PAD in diabetics 46-60 years of age went up to 47%. However, regardless of high prevalence and complication that can result from PAD, it is still not a common practice to routinely screen for the disease in diabetics.

In our study, 96.1% were smokers and most of them were males. Occurrence of PAD among smokers was around 98.5% which was significantly higher than among non-smokers (1.5%). 91.89% of the PAD-positive cases were smokers. Smoking as a risk factor had a statistically significant P value (0.035). Studies like Framingham Study, Cardiovascular Health Study, and Edinburgh Artery Study showed that amongst smokers PAD was 2–5 times higher. Willingdael et al. have shown that PAD is 2.5 times more in smokers. In our study, PAD was higher in smokers than in nonsmokers with a significant P value.

The present study had 55.8% of subjects as hypertensive; % had PAD whereas a similar proportion of 39.7% among non-hypertensive had PAD. The P value was statistically significant (P value 0.035). According to the Framingham Heart Study, hypertension doubles the risk of PAD. However, Reunanen et al. showed that hypertension was not significantly related to PAD. In our study occurrence of PAD in both groups was similar. The present study had PAD among patients who had CAD was 2 times more than those without PAD. Among PAD-positive cases, CAD was present in 94.5%. Only 5.5% of PAD-negative cases had CAD.

A strong correlation was found to occur between PAD and CAD (P = 0.014; statistically significant). The PARTNERS program showed that 16% of patients had PAD and CAD, 13% had only PAD, and 24% had only CAD. In our study 94.5% had PAD and CAD, 23.5% had only PAD, and 5.45% had only CAD.

Conclusions:
There is a definite and strong correlation between PAD and CAD. In view of the increasingly aging population and associated increase in atherosclerotic vascular disease, confrontation with patients of PAD will increase, which however, continues to be under diagnosed and under treated. Correct diagnosis and supervision of patients with these disorders is important for the prevention of local progression of the disease and effective secondary prevention of any future coronary and cerebrovascular events.

References:


