ORIGINAL ARTICLE

FREQUENCY OF TRIPLE-VESSEL CORONARY ARTERY DISEASE IN ADULT TYPE 2 DIABETICS VERSUS NON-DIABETICS IN CORONARY ARTERY DISEASE POPULATION OF ISLAMABAD, PAKISTAN

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ABSTRACT

Background: Coronary artery disease is a major cause of morbidity and mortality globally as well as in Pakistan. The objective of the study was to compare the frequency of triple-vessel coronary artery disease (triple-vessel CAD) in adult type 2 diabetics versus non-diabetics in coronary artery disease (CAD) population of Islamabad, Pakistan.

Materials and Methods: This cross-sectional study was conducted in Department of Cardiology, Pakistan Institute of Medical Sciences, Islamabad, Pakistan from June 21, 2016 to December 20, 2016. 300 patients were selected from population including adult CAD patients who were candidates for coronary angiography. Those with conduction defects, renal failure and prior CABG surgery were excluded. 150 diabetics and 150 non-diabetics were subjected to coronary angiography. Age, sex and presence of triple-vessel CAD were research variables. Age was analyzed by mean and SD while sex and presence of triple-vessel CAD were analyzed by count and percentage for each group separately. Confidence interval for proportion was calculated at 80% confidence level for each group. Frequency of presence of triple-vessel CAD in two groups was compared using McNemar chi-square test at alpha 0.5.

Results: Mean age was 55.02±8.48 for diabetics and 54.02±24.4 years for non-diabetics. Out of 300 patients with CAD, 184 (61.33%) were men and 116 (38.67%) were women. Triple-vessel CAD was present in 60/150 (40%) cases in diabetics and in 3/150 (2%) cases in non-diabetics. Frequency of triple-vessel CAD was significantly higher in adult type 2 diabetics versus non-diabetics in CAD population of Islamabad, Pakistan (p<0.0001).

Conclusions: Frequency of triple-vessel CAD was significantly higher in adult type 2 diabetics versus non-diabetics in CAD population of Islamabad, Pakistan.

KEY WORDS: Coronary artery disease; Diabetes mellitus; Type 2 diabetes mellitus; Triple-vessel coronary artery disease; Coronary angiography.


INTRODUCTION

1.1 Background: Coronary artery disease (CAD) is a major cause of morbidity and mortality in developed countries, has declining mortality rates over the past four decades. However, in individuals over the age of 35, it still is the reason for about one-third or more of all deaths.¹ ² The severity of CAD depends upon the number of coronary arteries involved. Percutaneous coronary intervention (PCI) is the mainstay of treatment; however, it can be managed medically if the disease is mild (single-vessel disease) and blockage of vessels is diffuse or partial less than 50% (double-vessel disease). Triple-vessel coronary artery disease is almost always managed by coronary artery bypass grafting (CABG). The risk factors for CAD i.e.
We have adopted “Marwat’s Logical Trajectory of Research Process” for our project. Our Research Problem was unawareness of the frequency of triple-vessel CAD in adult type 2 diabetics versus non-diabetics in CAD population of Islamabad, Pakistan. No relevant studies were available on different search engines/databases like PakMediNet, PubMed, PubMed Central, ScienceDirect, Emerald Publishing, Google Scholar, Google, Pakistan Research Repository; this was our Knowledge Gap. Which one group out of adult type 2 diabetics versus non-diabetics would have higher frequency of triple-vessel CAD in our population was our Research Question. To answer this research question, to fill this knowledge gap and to solve this research problem were justifications of our project.

1.3 Research Objective: The objective of the study was to compare the frequency of triple-vessel coronary artery disease in adult type 2 diabetics versus non-diabetics in coronary artery disease population of Islamabad, Pakistan.

1.4 Research (Null) Hypothesis (H₀): The frequency of triple-vessel coronary artery disease is same in adult type 2 diabetics versus non-diabetics in coronary artery disease population of Islamabad, Pakistan.

1.5 Significance and Applicability of the study: This study will generate comparative base line data for future research in this domain for global, regional, national and local research.

MATERIALS AND METHODS

2.1 Design, Settings & Duration: This comparative cross-sectional study was conducted in the Department of Cardiology, Pakistan Institute of Medical Sciences, Islamabad, Pakistan from June 21, 2016 to December 20, 2016. The proposal of the study was approved by the Institutional Research & Ethics Committee. An informed consent was taken from all the patients after explaining the study protocol.

2.2 Population & Sampling (size, technique & selection): The population of our study included adult (> 19 years) CAD patients who were candidates for coronary angiography from Islamabad Capital Territory & its surrounding areas; Islamabad the capital city of Pakistan. With prevalence rate of 10% of CAD in the reference population, population at risk was estimated to be 100,000. A sample size of 300 patients was calculated with margin of error of 3.39%, confidence level of 95%, population size of 100,000 and prevalence rate of 10% through an online sample size calculator Raosoft®. Sampling technique was non probability consecutive. The CAD patients with established conduction defects, renal failure and prior CABG surgery were excluded. A total of 150 diabetics and 150 non-diabetics were registered.

2.3 Conduct of Procedure: All these patients were admitted, detailed history was taken and thorough examination was performed. Routine investigations including fasting blood sugar and HbA1c were performed. ECG and echocardiography of the patients were performed to look for old ischemic changes and wall motion abnormalities. Then coronary angiography was performed to look for old ischemic changes and wall motion abnormalities.
**DISCUSSION**

4.1 Prevalence rate of triple-vessel CAD in adult type 2 diabetics and non-diabetics in CAD population of Islamabad, Pakistan

In our study we had a sample of 300 subjects undergoing coronary angiography (CAG); out of these, 150 were diabetics and 150 were non-diabetics. The prevalence rate of triple-vessel CAD in our adult type 2 diabetic sample and population was 40% (80% CI 34.87-45.13%) and in non-diabetics it was 2% (80% CI 0.54-3.5). We had a much higher prevalence rate of triple-vessel CAD in diabetics.

Similar to our study, higher prevalence rate in diabetics 32.78% (20/61) versus non-diabetics 27.15% (19/70) was reported by Girdhar, et al. in positive CAG patients for the period from December 2016 to June 2018 from Bangalore, India.

Similar report is from Silva et al. from Clydebank, Scotland, published in 1995 that diabetic patients (8/50) had a higher prevalence rate of triple-vessel CAD (47.05% versus 31.57%) than non-diabetic patients (12/38) on coronary angiography.

Also higher prevalence rate of triple-vessel CAD in diabetics 44% (22/50) versus non-diabetics 16% (8/50) was reported by Hedge, et al. in patients of acute coronary syndrome for the year 2014 from Davangera, Karnataka, India.

Higher prevalence rate in diabetics 32.43% (12/37) versus non-diabetics 26.19% (11/42) was reported by Afsar, et al. in patients having positive coronary angiographic lesions for the period from January 2013 to June 2013 from Sylhet, Bangladesh.

Higher prevalence rate in diabetics 42.1% (85/202) versus non-diabetics 19.63% (116/591) was reported by Sharma, et al. in suspected CAD patients undergoing CAG for the period from March 2017 to January 2019 from Udaipur, Rajasthan, India.

Higher prevalence rate in diabetics 56% (28/50) versus non-diabetics 32% (16/50) was reported by Moosavi, et al. in suspected CAD patients undergoing CAG from Tehran, Islamic Republic of Iran.

Higher prevalence rate in diabetics 58% (28/50) versus non-diabetics 38% (16/50) was reported in 2006 by Uddin et al. in patients undergoing clinically indicated elective CAG from Mymensingh, Bangladesh (p< 0.001).

**RESULTS**

3.1 The mean (SD) age in years was 55.02±8.48 for diabetics (n=150) and 54.02±24.4 for non-diabetics (n=150), almost similar in both the groups.

3.2 Out of a sample of 300 patients with CAD, 150 (50%) were diabetics and 150 (50%) were non-diabetics. Out of a sample of 300 patients with CAD, 184 (61.33%) were men and 116 (38.67%) were women. (Table 1)

3.3 Triple-vessel CAD was present in 60 (40%) cases in diabetics and in 3 (2%) cases in non-diabetics. Triple-vessel CAD was not present in 90 (60%) cases in diabetics and in 147 (98%) cases in non-diabetics. Corresponding estimated prevalence in the specified population is given as confidence interval (CI) for proportion at 80% confidence level (CL) by an on line statistical calculator for each group separately. The frequency (count) of presence of triple-vessel CAD in the two groups was compared using McNemar chi-square test at alpha 0.05. With p-value of <0.0001 at alpha 0.5 using an online statistical calculator GraphPad.

3.4 Frequency of triple-vessel CAD in diabetics versus non-diabetics was compared by McNemar chi-square test at alpha 0.05. With p-value of <0.0001 (less versus alpha), the null hypothesis was proved to be false and hence rejected, showing highly statistically significant difference between the two groups in our population. In simple words, the frequency of triple-vessel CAD was significantly higher in diabetics versus non-diabetics in CAD population of Islamabad, Pakistan. (Table 3)

**Table 1: Frequency of men and women in adult type 2 diabetics and non-diabetics in CAD population of Islamabad, Pakistan (n=300)**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Diabetics (n1=150)</th>
<th>Non-diabetics (n2=150)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>84 (56%)</td>
<td>100 (66.67%)</td>
<td>184 (61.33%)</td>
</tr>
<tr>
<td>Women</td>
<td>66 (44%)</td>
<td>50 (33.33%)</td>
<td>116 (38.67%)</td>
</tr>
<tr>
<td>Total</td>
<td>150 (100%)</td>
<td>150 (100%)</td>
<td>300 (100%)</td>
</tr>
</tbody>
</table>

**2.4 Data Collection Plan:** Age in years and sex were two matching variables while presence of triple-vessel CAD was a research variable. The data type for age in years was ratio (numeric), while it was nominal for both the sex and presence of triple-vessel CAD (two attributes of yes and no).

**2.5 Data Analysis Plan:** Age in years was analyzed by mean and SD for each group separately. Sex and presence of triple-vessel CAD were analyzed by count and percentage for each group separately. Interval estimate for presence of triple-vessel CAD was calculated as confidence interval (CI) for proportion at 80% confidence level (CL) by an online statistical calculator for each group separately. The frequency (count) of presence of triple-vessel CAD in the two groups was compared using McNemar chi-square test at alpha 0.05. With p-value of <0.0001 at alpha 0.5 using an online statistical calculator GraphPad.

Corresponding estimated prevalence in the specified population is given as confidence interval (CI) for proportion at 80% confidence level (CL) by an online statistical calculator GraphPad.

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Higher prevalence rate in diabetics 35.2% (132/375) versus non-diabetics 24% (42/171) was reported in 2009 in patients undergoing selective CAG from Shanghai, PR China (p=0.009).24 No studies were found showing similar or higher prevalence of triple-vessel CAD in non-diabetics versus diabetics.

4.2 Comparison of prevalence rate of triple-vessel CAD in adult type 2 diabetics versus non-diabetics in CAD population of Islamabad, Pakistan

Frequency of triple-vessel CAD in adult type 2 diabetics versus non-diabetics was compared by McNemar chi-square test. With p-value of <0.0001 (less versus alpha), the null hypothesis was proved to be false and hence rejected, showing that the frequency of triple-vessel CAD was significantly higher in adult type 2 diabetics versus non-diabetics in CAD population of Islamabad, Pakistan.

No studies were found in local, national, regional and global literature where proper inferential analysis through relevant hypothesis testing is conducted like our study to compare the two groups for the frequency of triple-vessel CAD, so our study will be an innovated addition to the global literature.

CONCLUSION

The frequency of triple-vessel CAD was significantly higher in adult type 2 diabetics versus non-diabetics in CAD population of Islamabad, Pakistan.

ACKNOWLEDGMENT:

The authors acknowledge Dr. Muhammad Marwat for organizing our manuscript as per his innovated "Marwat’s Logical Trajectory of research Process" and for advanced statistical analysis. We also acknowledge Prof. Dr. Iftikhar Ahmad for revision of our manuscript. Both are from Gomal Medical College, D.I.Khan, Pakistan.

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