

MODIFIABLE RISK FACTORS AND CORONARY ARTERY DISEASE SEVERITY: INSIGHTS FROM A CASE-CONTROL ANALYSIS

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Abstract: Atherosclerotic coronary disease stands as a leading cause of both mortality and morbidity globally. The well-documented risk factors for coronary artery disease (CAD) include abnormal lipid levels, obesity, smoking, high blood pressure, and diabetes. The established association between these cardiovascular risk factors and ischemic heart disease is widely recognized. However, the correlation between risk factors for ischemic heart disease and the severity of CAD on coronary angiography remains less explored, with varying findings across studies. Our research involved a total of 200 patients aged 30 to 70 years, comprising 100 cases diagnosed with severe CAD and 100 controls with insignificant CAD. Factors contributing to CAD, such as smoking, high sugar levels, high blood pressure, lipid profiles, family history of CAD, and obesity, were assessed in all patients. Statistical analysis, employing the chi-square test, was conducted, and a significant association was considered when the odds ratio value exceeded 1. The mean age in our study population was 51.01 ± 7.76 years, with 159 (79.50%) being male. Among the patients, 99 (49.50%) were obese, 90 (45.0%) were diabetic, 94 (47.0%) were hypertensive, 77 (38.5%) were smokers, 53 (26.5%) had a positive family history, and 17 (8.5%) were dyslipidemic. In evaluating the association of cardiovascular risk factors with CAD severity, smoking (odds ratio 1.73, p-value 0.04), hypertension (odds ratio 1.6, p-value 0.05), diabetes (odds ratio 1.6, p-value 0.05), and obesity (odds ratio 1.98, p-value 0.016) emerged as independent factors significantly linked to the severity of CAD. Our findings underscore the independent roles of smoking, hypertension, diabetes, and obesity as risk factors contributing to the severity of ischemic heart disease.

Keywords: Coronary Artery Disease, Smoking, Diabetes, Hypertension, Obesity

Introduction

Ischemic heart disease (IHD) is number one reason of death worldwide and it progresses over time (Prapas et al., 2014). We know many risk factors of coronary artery disease. Some risk factors are non modifiable such as age and gender and genetic effects. Contrary to this, the risk factors for IHD that the patient can modify or at least can change them are hypercholesterolemia, obesity, smoking, hypertension and diabetes (Akhbarue et al., 2014; Silverman et al., 2014). The effect of these risk factors is higher when multiple of these are present. The major risk factors for IHD in terms of morbidity and mortality are also the same (Ford, 2013; Lee et al., 2014). The association of these risk factors with presence of CAD and its harmful effects is well established. Less consistency has found among risk enhancers and CAD severity on correlation, and many studies have produced conflicting results (Banerjee et al., 2012; Koliaki et al., 2011; Larifla et al., 2014). Larifla et al conducted a study to find the association of these factors and disease severity in coronaries and found that diabetes and male gender are independent risk factors of severity of CAD (Larifla et al., 2014). In there study the prevalence of diabetes was 52.5% in patients with severe CAD versus 35.6% in patients with insignificant CAD. The prevalence of male gender was 71.6% in severe CAD patients and 63.1% in the insignificant CAD group. other study, Josef Yanan found only hypertension as an independent predictor of severity of CAD, with prevalence rate of 84.0% and 37.5% in severe CAD group and insignificant CAD group respectively." In these and other studies the prevalence of

diabetes has been described from 30.2% to 52.5% in patients with severe CAD versus 12.5% to 42.6% in insignificant CAD patients' prevalence of dyslipidemia from 24.5% to 37.8% in severe CAD versus 25.0% to 37.6% in insignificant CAD patients, smoking 14.2% to 35.8% in severe CAD versus 0.0% to 32.4% in insignificant CAD patients (Larifla et al., 2014). Veeranna et al. found prevalence of diabetes 31.6% in patients with severe CAD versus 27.7% in insignificant CAD patients, prevalence of dyslipidemia was 37.7% in severe CAD versus 31.4% in insignificant CAD patients, prevalence of smoking was 32.5% severe CAD versus 35.8% in insignificant CAD patients (Veeranna et al., 2010).

So different studies have found different risk factors of severity of CAD. The causes of different results are diverse like different disease prevalence and different interaction among risk factors and geographic differences (Harding et al., 2008). Coronary artery disease is highly prevalent in Pakistan and is an important cause of death in our population (Jafar et al., 2005).

Hypertension, diabetes, smoking and obesity are common documented cardiovascular risk factors of CAD in our population. Previous researches are very limited on this issue of distribution of cardiovascular risk factors among patients with ischemic heart disease in Pakistani population. The effect on severity of CAD has not been thoroughly evaluated. So, we believe that the outcome may be different in Pakistani population as compared to the other populations because of Geographic variations. Therefore,

objective of our research is to study association of these with IHD and with anatomical severity. This study will help in risk stratification and diagnosis of severe CAD in patients with CAD based on the presence of these cardiovascular risk factors.

Thus, this study aimed to determine the association of cardiovascular risk factors in patients with severe versus non-severe coronary artery disease (CAD).

Methodology:

Following ethical approval from the Institutional review board, a total of 200 patients who underwent coronary angiography at the Cardiology Department, Sheikh Zayed hospital, Rahim Yar Khan, were selected through non-probability consecutive sampling from January 16, 2018, to June 15, 2018. This case-control study classified patients with coronary artery stenosis >70% of the total artery diameter as cases and those with stenosis <70% as controls. Inclusion criteria encompassed individuals of both genders aged between 30 and 70 years, and informed consent was obtained using a standardized written form.

Cardiovascular risk factors, including smoking, diabetes, hypertension, dyslipidemia, family history of CAD, and obesity, were diagnosed based on operational definitions. Patient data, such as age, gender, and CAD duration, were recorded. Coronary angiography was performed and analyzed to assess the severity of CAD. All data were entered into a pre-designed proforma.

Quantitative and qualitative data were analyzed using SPSS 20.0. Mean and standard deviation were calculated for age and CAD duration, while frequency and percentages were determined for qualitative variables. The Chi-square test and odds ratios were employed to establish the association of cardiovascular risk factors with CAD severity. Stratification of confounding variables, namely age, gender, and CAD duration, was conducted, and post-stratification Chi-square tests with odds ratios were computed, considering odds ratio values >1 as indicative of significant association.

Results

Mean was calculated for age of patients included and it was 51.01±7.76 years. Minimum age was 31 years and maximum age was 70 years. Mean duration of coronary artery disease (CAD) in studied patients was 5.15±4.16 years. Minimum duration of CAD was 1 month and maximum duration was 24 years. There were 159 (79.50%) male patients and 41 (20.50%) female patients. There were 99 (49.50%) obese patients and 101 (50.50%) non-obese patients included in this study. There were 90 (45.0%) diabetic patients and 110 (55.5%) non-diabetic patients. There were 94 (47.0%) hypertensive patients and 106 (53.0%) non-hypertensive patients in this study. There were 77 (38.5%) smokers and 123 (61.5%) non-smoker patients.

Positive family history of CAD was presented in 53 (26.5%) patients, while remaining 147 (73.50%) were not having any family history of CAD. Hyperlipidemia was diagnosed in only 17 (8.5%) patients. While remaining 183 (91.5%) patients were having normal lipid profile.

Regarding association of cardiovascular risk factors with severity of CAD, smoking was significantly associated with severity of CAD. There were 45% smokers in cases and only 32% smokers in control group, the odds ratio was 1.73 and p-value was 0.04. Regarding association of hypertension with severity of CAD. There were 53% hypertensive patients in cases group and 41% hypertensive patients in control group with odds ratio of 1.6 and p-value 0.05. Regarding the association of diabetes mellitus with severity of CAD, there were 51 diabetic patients in cases group and 39 diabetic patients in control group. There was significant association of diabetes with severity of CAD with odds ratio of 1.62 and p-value of 0.05. In this study, I also found significant association of obesity with severity of CAD. There were 58% obese patients in cases group and only 41% obese patients in control group with odds ratio of 1.98 and p-value of 0.016. However, did not find any association of dyslipidemia and family history of CAD with severity of CAD (Table 1). Stratification of age, gender and duration of CAD was done to determine the effect of these confounder variables on the association of CAD risk factors with severity of CAD. There was no significant effect of any confounder variable on this association.

Table 1. Association of Cardiovascular Risk Factors with Severity of Coronary Artery Disease (CAD).

Variable	Cases (>70%)	Controls (≤70%)	Odds Ratio	P-value
Smoking				
Yes	45	32	1.73	0.04
No	55	68		
HTN				
Yes	53	41	1.6	0.05
No	47	59		
Diabetes Mellitus				
Yes	51	39	1.62	0.05
No	49	61		
Dyslipidemia				
Yes	10	7	1.47	0.44
No	90	93		
Obesity				
Yes	58	41	1.98	0.016
No	42	59		
Family History				
Yes	31	22	1.59	0.15
No	69	78		

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Discussion

In this study, we evaluated the association between cardiovascular risk factors and the severity of CAD among patients booked for angiogram for coronaries who have documented ischemic heart disease. In present study, researchers come finding that smoking, hypertension, diabetes mellitus and obesity as significant risk factors associated with severity of CAD. Other traditional risk factors such as family history and dyslipidemia were not strongly related with anatomical severity of disease.

Our results also match with a research conducted by Veeranna et al. He concluded that diabetes is an important determinant of IHD and its severity (Veeranna et al., 2010). Diabetes is also recognized as a factor responsible for progression of disease (Abrahams et al., 1978; Rajan and Prabhakaran, 2017). Glucose intolerance and insulin resistance or even impaired fasting levels still are responsible IHD development and progression (Konstantinou et al., 2010; Leon and Maddox, 2015). Findings of our research support the fact that conventional risk factors responsible for CAD prevalence and its related morbidity and fatality may not have the similar effect in showing relation between severe anatomical disease burden or progressive increase in disease (Koliaki et al., 2011). Reality is that, many researchers have shown discrepant results and many other researchers have concluded that many of the conventional risk enhancers are also strongly correlated with anatomical severity. while some have shown that only few of these factors are good predictors of anatomical severity (Banerjee et al., 2012; Krishnaswami et al., 1994). Different study designs and geographic and ethnic factors are responsible for this. A study conducted by Yanan et al. concluded that hypertension is an independent risk factor of severity of CAD in elderly patients. However these authors did not found smoking, diabetes, obesity, family history and dyslipidemia as independent risk factors of severity of CAD. Other studies have found that traditional cardiovascular risk factors such as progressing age, diabetes mellitus, hypertension, dyslipidemia, smoking, and obesity are well co related with CAD (Members et al., 2009). In our study, we found that obesity is a risk factor for severity of CAD. la et al. found that obesity is associated with lower risk of severity of CAD. This opposite association has also been seen in other studies. In all these researches, a referral bias can be reason of the fact that obesity is responsible for early occurrence of coronary heart disease and these patients are relatively younger. Referring doctors sending obese patients early because they consider obesity as a strong risk enhancer of CAD and disease severity is less in these patients because they are at earlier spectrum of CAD (Rubinshtein et al., 2006).

Ko et al. concluded that the association between diabetes, hypertension, and smoking with obstructive coronary disease was stronger in women as compared to men. These differences are even more pronounced when the impact of individual risk factors is combined, such that we observed twice the magnitude of association in predicting obstructive coronary artery disease in women than men. So our research shows that anatomical severity is related with strongly associated with the well established risk factors, some differences observed may be due to

ethnicity and geographical factors and spectrum of disease state when patients were studied

Conclusion

Smoking, hypertension, diabetes, and obesity are independent risk factors of severity of coronary artery disease.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department Concerned.

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Author contribution

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Conception of Study, Development of Research Methodology Design, Study Design, Review of Literature, Drafting article, Review of manuscript, final approval of manuscript

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Study Design, Review of Literature, Drafting article, Review of manuscript.

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Review of Literature, Drafting article

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