Original Research

AN EVIDENCE BASED ASSESSMENT OF MOST COMMON RISK FACTORS OF MYOCARDIAL INFARCTION: ANALYSIS FROM A LOCAL POPULATION

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Abstract: *The current study was designed for risk assessment of different factors like smoking, diabetes, obesity, and gender in the development of myocardial infarction (MI). A total of one hundred and twelve participants (n=112) was included in this case and control study. They were further divided into two groups. Group A, constituted of fifty controls whereas sixty-two age and sex-matched confirmed cases of Myocardial Infarction were selected for group B. Specially design questionnaire was filled and response form was collected from different hospitals of Lahore. Body mass index (BMI) was used to determine the obesity. The current study demonstrated that the advanced age is itself a risk factor of MI, other factors like smoking, diabetes and obesity were also found to be statistically significant contributory elements. From the results of current study and past literature it is very much evident that above mentioned risk factors have significant role in sudden cardiac death by potentiating the MI. So, by avoiding or controlling these risk factors a deadly event myocardial infarction can be avoided.*

Introduction

Gender, age, hypertension, BMI, smoking and Diabetes are considered leading contributory factors for myocardial infarction (MI) (Nowbar *et al*., 2019). This cardiac disease, also known as Heart Attack in common language, is considered as a major cause of morbidity and mortality worldwide. More than 3 million people each year are estimated to have an acute ST-elevation myocardial infarction (STEMI), with more than 4 million having a non-ST-elevation myocardial infarction (NSTEMI) (Saar *et al*., 2018). Initially this kind of cardiac illness was seen predominantly in developed countries, but myocardial infarction is now becoming increasingly more common in developing countries like Pakistan. In Pakistan, with more than 30% of the population over 45 years of age is affected by this disease (Siddiqui *et al*., 2018). Punjab is the most developed and populated province accounting for more than 45% of the entire population of Pakistan facing not only the financial crisis but also the loss of skilled manpower due to heart attack. Timely diagnosis and management of acute MI can save many precious souls to leave from their biological bodies. Scientist,

researchers and clinicians has joined hands together against this emerging cause of mortality. Many clinical trials have also discovered novel therapeutic strategies, and there is an emerging discipline that assesses health-care systems for the optimum delivery and prevention of MI. Evidence based treatment of myocardial infarction is now playing a pivotal role in waning off the mortality rate as reported in recent studies (Niccoli *et al*., 2019). Prevention is always on top than the cure so; the current study is design to assess the risk of myocardial infarction due to age, smoking, obesity and diabetes.

Material and Methods

The current case and control study included 112 (n=112) participants from different Hospitals of the Lahore (31.5204° N; 74.3587°). Participants were divided in two groups. Group A included fifty-two healthy control and Group B constituted sixty age and sex matched diagnosed individuals of myocardial infarction. Both male and female gender of all ages was included in the study after receiving the informed consent. Those with positive family history for myocardial infarction were excluded from the

study. This current investigation is approved by the ethical review committee of Institute of Molecular Biology and Biotechnology (IMBB), The University of Lahore, Lahore-Pakistan. Participant were stratified into different three age groups (25-40, 41-55, 60 and above). Demographic data and medical history were taken on specially designed questionnaire and used for further analysis. Obesity was determined by calculating body mass index (BMI)

BMI =   Weight (Kg)/Height (m) 2

BMI of 30 was considered as a cut off value. Above this value participant were labelled as obese. Independent t-test was used to determine the significance of variance and for Risk assessment odds ratio was calculated by using SPSS software (version 21). P-value less than 0.05 remained as significant.

Results

Results of the current study showed the assessment of risk factors that are found to be involved in onset of myocardial infarction. Frequencies and percentage of

different variables has been shown in table 1. Age is considered as a major factor in the development of MI, in the present study age stratified into three subgroups. First subgroup ranging from 30 years to 45 years (35-45). In this age group according to collected data 20% MI participants were present, similarly 30% in second age group (46-60) and 50.0% in third age group that was > 60 years. So as the age increases the risk of MI also increases (Graph-1). In Group A 61.5% were the male and 38.5% female whereas in Group B the 81.7% male having the myocardial infarction as compare to female which constitute only 18.3%. analysis of other risk factors showed 80% of smokers developed MI in Group B as compare to non-smoker which were only 20%. But if we see in detail among 20% of non-smoker other risk factor such as obesity and diabetics either co-exist or can be found isolated. Similarly, the frequency of MI due to risk factors diabetes and obesity found to be 68.3% and 50.0% respectively in group B. (Table-1).

Table-1: Frequencies and percentages of all variables

Individual factors	Category	Frequency (%)		
		[1]Group A	[2]Group B	Total
Disease Status				
	Healthy			52 (46.4)
	Myocardia Infarction			60 (53.6)
Age*				
	30-45 years	12 (23.1)	12 (20.0)	24 (25.9)
	46-60 years	15 (28.8)	18 (30.0)	33 (25.0)
	> 60 Years	25 (48.1)	30 (50.0)	55 (49.1)
Gender				
	Male	32 (61.5)	49 (81.7)	81 (72.3)
	Female	20 (38.5)	11 (18.3)	31 (27.7)
Smoking				
	No	30 (57.7)	12 (20.0)	42 (37.5)
	Yes	22 (42.3)	48 (80.0)	70 (62.5)
Diabetes				
	No	34 (65.4)	19 (31.7)	53 (47.3)
	Yes	18 (34.6)	41 (68.3)	59 (52.7)
Obesity				
	No	36 (69.2)	30 (50.0)	66 (58.9)
	Yes	16 (30.8)	30 (50.0)	46 (41.1)

Age is stratified into three groups   1. Healthy population 2. Confirmed cases of Myocardial infraction

Discussion

Myocardial infarction is a leading cause of sudden death. The pathological disturbance involved in the onset of MI is the formation of atheroma in coronary arteries, thereby damaging the heart muscle (Chandrashekhar *et al*., 2020). Any factor that

facilitates the formation of atheroma is considered as the risk factor of MI. Advanced age and smoking impact on all stages of atherosclerosis formation. Similarly, diabetes and obesity also contribute in disruption of endothelial covering of vessels and inflammation, reported in literature by many

scientists and pathologists (Xi *et al*., 2017). Past studies revealed the frequency and mortality rate due to MI is related to gender difference. Male gender has more prone to have MI if they have risk factors as age, body fat, and smoking whereas systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse rate, and smoking were considered to be significant risk factors for women (Li *et al*., 2017). Population based, analytic epidemiologic study would be needed to confirm or deny hypotheses based on these observations. Smoking proved to be the significant risk factor for both genders and remained the major health hazard leading to MI. Cigarette smoking (CS) impacts all phases of atherosclerosis from endothelial dysfunction to acute clinical events, the latter being largely thrombotic (d'Alessandro *et al*., 2020; Head *et al*., 2017). The exact toxic components of cigarette smoke and the mechanisms involved in CS-related cardiovascular dysfunction are largely unknown, because it is also observed that non- smoker without family history develop MI even in the early ages of the life span. but CS increases inflammation, thrombosis, and oxidation of low-density lipoprotein cholesterol (Chu *et al*., 2020). Recent experimental and clinical data support the hypothesis that cigarette smoke exposure increases oxidative stress as a potential mechanism for initiating cardiovascular dysfunction. Besides gender and smoking, other risk factors such as obesity and increased adipose tissue influence the pathogenesis of atherosclerosis. The adipose tissue, which is in fact a dynamic organ, is divided in white adipose tissue (WAT) and brown adipose tissue (BAT) and is associated with metabolic and inflammatory systems, with protective effects on energy homeostasis (Cercato and Fonseca, 2019). WAT secretes peptides and proteins that act by regulating biological and physiological conditions and play an important role in obesity, insulin resistance, inflammatory and immune functions, atherosclerosis and cardiovascular disease. Inflammatory infiltrate into adipocytes are a common finding in subjects with obesity or metabolic syndrome (Reddy *et al*., 2019). An inflammatory status can also be detected by circulating biomarkers. Diabetes is a metabolic disorder, defined as the dysregulation of processes involved in metabolism of glucose (López-Pastor *et al*., 2020). Mostly diabetes

and obesity share a common mechanism in development of inflammatory process lead to the atherosclerosis and ultimately the MI (De Rosa *et al*., 2018). One of the drastic complications of diabetes is MI due to accelerated atherosclerotic plaque formation and thrombosis. Other complications include nephropathy retinopathy vascular damage and neuropathy (Yokoyama *et al*., 2018). Mostly diabetic patients present with atypical symptoms due to autonomic neuropathy and make it difficult to diagnose MI (Jung *et al*., 2017). Hence diabetes hampers in timely initiation of treatment that lead to permeant damage of cardiac muscles. Metabolic homeostasis is regulated by incretins, like GLP-1, which are gut hormones released in response to a meal and influence regulation of insulin and the cardiovascular system. GLP-1 stimulates insulin release by modulating the GI functions and control appetite (Meyer-Gerspach *et al*., 2016). It is degraded by enzyme dipeptidyl peptidase-4 (DPP-4), involved in adipose tissue inflammation, which in its way is related to insulin resistance. Obesity increases DPP-4 expression reducing the cardiovascular and metabolic effects mediated by GLP-1 levels (Zhuge *et al*., 2016). This impairment in the incretin axis promotes an imbalance between GLP-1 and GLP-2 which in turn contributes to insulin resistance and dyslipidemia. In addition, secretion of GLP-1 is reduced causing an incretin dysregulation and consequently blocking satiety in obese population (Deacon, 2018). Whereas DPP-4 either aggravates the incretin defect or stimulates T cell proliferation, increased concentrations have shown to be positively related with BMI, insulin and leptin levels, and negatively associated with adiponectin (Mikov *et al*., 2020). These aspects seem relevant in the management of obesity. In addition, an increased in the amount of reactive oxygen species (ROS) and reactive nitrogen species (RNS) can also be detected in parallel to the disturbances in the microbiota that are related to increased lipopolysaccharide (LPS) release in the bloodstream which in turn activates toll like receptor 4 (TLR4) (Ishimoto *et al*., 2018). Finally, increased perivascular adipose tissue promotes local inflammation and impairment of endothelium function. Results of our study reinforce the finds of past literature related to the risk factors of myocardial infarction. Pathological mechanism

proposed clearly that smoking, age, diabetes and obesity are among the most common risk factors MI.

Graph-1: Correlation of MI with Age in Group B
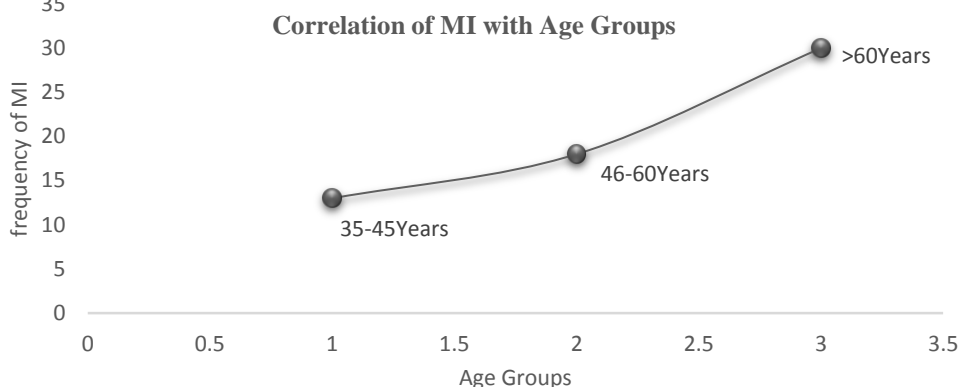
To check the significance of various factors chi square test was applied and *p*- valve of less than 0.05 considered significant (Table 2)

Table-2: Association between heath status with gender, age, smoking, diabetes and BMI

| | Health Status | | | *p*-Value* |
	Healthy	Myocardial Infarction	Total	
Gender				
Male	32	49	81	**0.018**
Female	20	11	32	
[2]**Age**				
35-45 Years	11	13	24	
45-60 Years	15	18	33	[1]**0.640**
> 60 Years	25	30	55	
Smoking				
No	30	12	42	**0.000**
Yes	22	48	70	
Diabetes				
No	34	19	53	**0.000**
Yes	18	41	59	
Obesity				
No	36	30	66	**0.039**
Yes	16	30	46	

Chi-square test was used to check the significance of variance 1. The p valve is insignificant because we took age and sex matched control group. 2. Age is stratified in to three categories, as the age increases in Group B the percentage of MI also increases with linear correlation.

Conclusion

From the results of the current analysis of local population, it can be inferred that the smoking, diabetes and obesity are the major contributory factors in the development of myocardial infarction.

Recommendation

Prevention is always better then cure and prevention costs less than cure of a disease both financially and morbidity. So everyone should focus of the elimination of risk factors of MI and Nutritionist and Dietitian also should pay their role in the community awareness in this regard.

Limitation

Sample size is small to justify the risk assessment of different factors related to myocardial infraction

Conflict of interest

Author declared no conflict of interest.

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