Incidence of Hepatitis C Virus Seropositivity and its Effect on Coronary Artery Disease among Patients Referred for Coronary Angiography

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ABSTRACT

Background: We studied the incidence and effect of HCV seropositivity in patients with coronary artery disease, referred forcoronary angiography.

Place and Duration: This study was held in the Cardiology Department of Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences Gambat for six-months duration from June 2020 to November 2020.

Methods: This cross-sectional study includes210 patients with coronary artery disease and enrolled for elective coronary angiography. Based on a complete referral interview, laboratory tests which include HCV Ab, coronary angiography and echocardiography were done and assessed. The mean number of coronary lesions and affected coronary vessels were calculated for all patients. The coronary lesions severity levels were assessed viaGensini scale.

Results: The patients who were referred for coronary angiography and were HCV seropositive were approximately 34.0% (this number is higher compared to the incidence of HCV seropositivity in general Pakistani Peoples), patients of HCV(CAD positive) antibodies had seronegative coronary<0.05 and seronegative patients compared to seronegative HCV patients, diabetes and more frequent cardiovascular disease risk factors in patients who were CAD (<0.05) positive for antihypertensive antibodies.

Conclusion: The prevalence of positive HCV antibodies in coronary artery disease is approximately 30.3%, and HCV-positive CAD patients have coronary lesions that are more severe and are less expected to have hypertension or diabetes than individuals with negative (HCV -) antibodies.

Keywords: coronary angiography, echocardiography, antihypertensive antibodies, seronegative.

INTRODUCTION

WHO (The world health organization) recognizes hepatitis C (virus) as a global health problem, resulting in about HCV infection with in more than 185 million people around the globe[1-2]. According to the 2017Pakistani Population and Health Survey commissioned by the Ministry of Health; recent HCV infection in Pakistan is estimated at 15.2% among those aged 15-59 and 19% among the villagers[3-4]. CAD (Coronary artery disease) is aprincipal causeof morbidity and mortality, also result in the lowin quality of life. Coronary Artery Disease is animperativesubject concerning public health, which puts higher economic burden on social costs of living. Sub-clinical/overt atherosclerosis is a chronic disease concerning inflammation,its clinical symptoms are coronary artery disease, limb ischemia and paralysis[5-6]. In experimental studies about atherosclerosis change in rodents is aconceivable role of an infectious agent was first discovered/reported more in the late nineteenth century, and the concept was brought forward to light in the last years[7]. It's been found that chronic HCV infection is responsible for causing systemic inflammation and hepatitis via high levels of pro-atherogenic chemokines and cytokines. HCV has also been shown to colonize and multiply in cervical plaques, possibly causing vasculitis[8-9]. Earlier,some general studies have shown HCV indicatorslinked independently with atherosclerosis[10]. However, a later investigation shows results conflicting to these. In this study however, we aimed to assess HCV seropositivity frequencyamong referred patients with coronary artery disease, another objective of this analysis was to assess impact of HCV seropositivityin patients. Coronary heart disease became one of the leading causes of death worldwide in 2012. It has recently become the leading cause of death in Pakistan, and is starting to affect younger age groups.

Numerous epidemiological studies have shown an association between various infectious etiologies and coronary artery disease (CAD), mainly due to changes in blood lipid levels. The inflammatory hypothesis of atherosclerosis assumes that the key events related to the initiation and progression of trauma are represented mainly by inflammatory and fibroproliferative processes triggered by cytokines and growth factors. However, one of the most interesting recent developments is the idea that infectious agents can cause pro-inflammatory effects and play an important role in arterial thrombosis.

The monoclonal hypothesis was first proposed in the early 1970s. This suggested a potential role of viral infection in the atherosclerotic process. In particular, this theory suggested that a mutation or viral agent could represent events that could transform a single smooth muscle cell into a precursor to a proliferative clone.

Hepatitis C virus (HCV) causes chronic liver disease and contributes to the burden of disease worldwide The World Health Organization, a global health problem that infects HCV in approximately 3% of the population (approximately 170-200 million people) worldwide. Announced. About 3 million people in the United States are chronically infected. Pakistan has the highest prevalence of HCV in the world, with a nationwide incidence of 10–13%.

MATERIALS AND METHODS

This cross-sectional studywas held in the Cardiology Department of Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences Gambat forsix-month duration from June 2020 to November 2020. The patients in this study were selected who hadcoronary artery disease. Contraindications to stenting such as coronary angioplasty/coronary-stenting with percutaneous coronary intervention (PCI) were excluded from the study also previously if the patients had coronary artery bypass graft (CABG), allergy presentation with dye and also renal failure. At the time of admission, clinical history and demographic data were collected from all patients.We collected information about the risk factors i.e., age, gender, smoking history, hypertension, diabetes,dyslipidemia, smoking, and coronary artery disease history in family.We also collected information regardingIndications for priorperipheral vascular disease (PVD), coronary angiography, chronic obstructive pulmonary disease (COPD), cerebrovascular disease (CVS), congestive heart failure (CHF), myocardial infarction (MI) and obstructive sleep apnea (OAS). Laboratory tests that were done on the patients included fasting plasma glucose (FPG), lipid profile (fasting TC, HDL, TG and LDL), hepatitis C ELISA test and serum creatinine levels.

Echocardiographic examination. The examination included endsystolic and diastolic dimensions of left ventricle including ejection fractionand wall motion assessment index(WMSI).

Coronary Angiography: All patients underwent Coronary angiography. All individuals were done forCoronary angiograms (digital)using guide catheter (dye filled) as a reference viaPhilips Integris 5000 automated edge detection system (The Netherlands), to accurately investigatelesionsin a multi-dimension. Two angiographers who had no knowledge of clinical or demographic data interpreted angiographic results. To identify plaques (20% or more) coronary angiography was used which showed atherosclerosis. The mean coronary lesions as well as the mean pretentious coronary vessels of every subject were analyzed. The patient's percentagewho had complete chronic coronary occlusion was also calculated. Coronary lesions severity was calculatedvia the Gensini scale, which was based on the lumen obstruction degree, that may include both the changes concentric or eccentric. To reflect the importance of a specific segment the score was multiplied by a weighting factor for each segment. Gensini score = $\sum$ (score × weighting factor for each section). The results were doubled for each occlusion level increasing with 25% occlusion.

SPSS version 21.0 was used to analyze data. Mean ± SD showed continuous data. The Mann Whitney test or the student's t-test was performed as abnormal and normal respectively, among the groups to find the differencesin constant variables. Percentages are used to present categorical variables and Chi-square test or Fisher's exact test was used to make this comparison. Pearson's correlation was applied to assess relationship among two continuous variables.

RESULTS

210 patients were included in this study, they were qualified by coronary angiography to the group per coronary artery disease (1) also normal coronary angiography (2). CAD positive and negative CAD groups (Demographic Classification). Similarities were found among both positive and negative CAD groupsregarding gender distribution, family history and age.

Table 1:

	Group 1A HCV positive (n = 51)	Group 1B HCV negative (n = 112)	*p* value
Variable			
	X ± SD	X ± SD	
Age (years)	53.18 ± 8.07	53.02 ± 8.07	0.506
Gender			0.808
(i) Male (%) 85 (56.7%) 40 (66.7%) (ii) Female (%) 65 (43.3%) 20 (33.3%)			
Risk factors			<0.0001
(i) DM	17 (33.3%)	67 (59.8%)	
(ii) HTN	27 (52.9%)	83 (74.1%)	<0.0001
(iii) Dyslipidemia	35 (68.6%)	73 (65.2%)	0.717
(iv) Smokers	20 (39.2%)	53 (47.3%)	0.077
(v) Positive family history	13 (25.5%)	26 (23.2%)	0.735

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Both the HCV negative and positive Ab groups had a comparable clinical picture. Table 3 shows segmentation of ejection fraction.

Variable	Group 1A HCV positive (n = 51) X ± SD	Group 1B HCV negative (n = 112) X ± SD	p value
Clinical presentation			
(i) Stress positive test (%)	2 (3.9%)	5 (4.5%)	
(ii) Unstable angina (%)	20 (39.2%)	42 (37.5%)	0.974
(iii) NSTEMI (%)	12 (23.5%)	24 (21.4%)	
(iv) STEMI (%)	17 (33.3%)	41 (36.6%)	
Echocardiographic data EF (%)	55.22 ± 10.21	55.14 ± 9.75	0.95
Angiographic data Gensini score	65.68 ± 7.71	57.32 ± 32.04	0.01

Table 1 shows a significant statistical varianceamong both groups who had a history of diabetes, hypertension, dyslipidemia, HCV and smokingthese variables were common in all positive coronary heart disease groups. 1) (CEA positive), patients with HCV antibodies were divided into group (1A) and HCV negative group (1B). 1-A(HCV A-b positive) and 1-B (HCV A-b negative) both of these groups had similar gender, age distribution, smoking, family history and dyslipidemia. However, the significant statistical difference was found between the two groups when it came to variables such as diabetes and hypertension, while diabetes and hypertension were found to be more common in the group HCV-Ac-negative and shown in Table 2.

Among two groups in the Gensini score there were statistically significant differences, the Gensini score was higher was found to be higher than the group which was HCV positive. Table 3 and Figure 1 Ab show the difference.

DISCUSSION

It is backed by many studies that cellular and molecular changes can be cause by some infectious agents that support the atherosclerosis pathogenesis[9-10]. It is indicated by the data that viral genome's identification in the proatherosclerotic effect of viral infection and atherosclerotic plaques on cells responsible in atherosclerosis (monocyte macrophages, smooth muscle cells, endothelial &T cells). HCV infection is found to have higherprobability of atherosclerotic disease[11-12]. Undeniably, hepatitis and systemic hepatitis with high pro-atherogenic chemokines and cytokines levels and the fatty liver characteristic of this infection is cause by chronic HCV infection. HCV has also been shown to colonize and multiply in cervical plaques, possibly causing vasculitis[13-14]. Early general population studies show that HCV markers are associated with atherosclerosis, independently. Later studies however, show conflicting results - some studies have confirmed this type of association and others have contradicted it. However, more data indicate excessive cardiovascular mortality during chronic HCV infection. Taking into account the high frequency of HCV infections in Pakistan and the world, and cardiovascular diseases are an important cause of mortality, it is necessary to comprehensively investigatemore that HCV is a cardiovascular risk factor. This study, assessesand tests HCV seropositivity incidence and impressions on CAD in patients and their correlation in our catheterization laboratory at the Cardiology Department. The form and severity of the involvement of the coronary arteries with the use of cardiovascular disease factors and the angiographic evaluation system on the Gensini scale[15-16]. Our study found an approximately 34.0% HCV seropositivity incidence in patients; this is more than the HCV seropositivity which is estimated at around 15.2 in the general Pakistani population, percentageamong adolescents aged 15-59, according to the Pakistan Health and Population Survey of 2016. The occurrence of positive HCV-Ab was found higher in patients who demonstrated CAD in angiography as compared to the other group which presented normal coronary angiography (< 0.05). Patients with HCV Ab-positive CAD in this study, the incidence of cardiovascular risk factors (<0.05) is comparable to patients with seronegative CAD, with the exception of more common diabetes and hypertension in seronegative patients. However, the intensity of changes in the coronary arteries was found to be greater in the group (HCV Ab-positive), as assessed by the Gensini scale (<0.05). Butt et al., showed similar results,this was the largest conducted in US veteransas an epidemy (82,083 infected and 89,582 uninfected HCV cases) over a five-year period[17-18]. The data indicates younger HCV-infected patients and cardiometabolic risk. more favorable. This study shows results consistency withVassalle et al, a case-control study that was conducted among 686 patients. HCV infection was found to be an independent factor to foresee angiographically documented CAD (adjusted OR = 4.2, 95% CI: 1.4-13.0). Another study by Alyan et al. showed similar resultsin CAD patients[19-20].

A study conducted by Maruyama et al. consisted of 217 successive chronic HCV infection cases lacking open heart disease[21].The study found that 87% chronic hepatitis C patients presented with myocardial perfusion defects, they recovered with IFN therapy after viral eradication[22].It should be noted that the studies which show a positive relationship tend to cover a very large patient population, but studies that show no relationship are mostly found to be conducted in smaller patient groups, and have a high risk of atherosclerosis[23]. In HCV infected individuals varying levels of cytokines may be correlated with higher risk of CAD,these are inflammation markers, thrombosis, behavioral profile and social risk outline, and endothelial dysfunction; inflammatory activation, malnutrition or liver damage[24]. The combination of these factors is more likely to work together to eliminate the positive risk profile protection effect and increase CAD risk.

The limitations of this study were as follows: results were from one medical center and the sample size was small. In addition, some risk factors, such as dyslipidemia, were not matched, while others, such as diabetes and hypertension, were not matched in terms of disease severity or control that could affect the coronary arteries.

CONCLUSION

Approximately 34.0% of patients, referred (1) HCV seropositive patients are responsible for coronary artery

disease and angiography (higher prevalence of HCV seropositivity in the general Pakistani populace, among which approximately 15.2% and 19% are residents of rural areas). (2) Patients with Ab-positive HCV-positive CAD were found to have coronary lesions more severe(viaGensini's score prediction) compared to seronegative patients. (3) The cardiovascular risk factors incidence in HCV positive CAD patients can be compared with seronegative patients, other than common hypertension and diabetic seronegative patients. As HCV infection is endemic and fairly common, a significant proportion of patients with abnormal angiography were HCV positive and there was a significant association between HCV infection and the number of infected vessels, this may require further studies involving more cases. and longer time to document associations

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