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Prime Risk Factors to Act as Biomarkers for the Diagnosis of Myocardial Infarction

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Authors' contributions

This work was carried out in collaboration among all authors. Authors PK, PS and ANS wrote the research concept. Authors PK, PS, ANS and MKV designed the study. Authors PK, PS and ANS supervised of the work. Author MKV collect the materials and data. Authors MKV, DDS and SK performed data analysis and Interpretation. Authors MKV, PV and RS managed the literature searches. Authors PS, DDS and PV wrote the article, critical review and article editing.

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ABSTRACT

Aims: This study was done to find out retrospective case-control with respect to myocardial infarction diagnosis on the basis of biochemical markers and lipid profile characteristics.
Design and Setting: This study was conducted at the Department of Biochemistry and sample collection at LPS Institute of Cardiology & Cardiac Surgery Department, Kanpur.
Methods: The total number of subjects participated in this study (n=178), of either sex (with age>65years) were included in this study from the case collected from Outpatient Department (OPD) and Indoor Patient Department (IPD) and control from patients attendant, which consisted of two subject groups: The group I: myocardial infarction (cases) n= 89 and Group II: Healthy Subjects

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(controls) n= 89. Laboratory methodology was performed to determine the prime important risk factors such as body mass index (BMI), blood pressure and lipid profile characteristics associated with myocardial infarction. Risk factors were analyzed by Chi-square and Pearson correlation, receiver operating characteristic (ROC) curve method considered significant when the critical, P <0.01level was set up, for a 95% confidence interval.

Results: Total number of (n=178) participants (males=65; mean age of 65 years, females=24, mean age of 58 years) at 95% CI were considered in this study, out of these, 89 individuals were expected to have risk of myocardial infarction (especially observed in case groups), and remaining 89 individuals were considered as control groups, all were included as, study subjects.

Conclusion: The current study concludes the importance of myocardial infarction in presence of prognostic inflammatory markers: higher IL-6 and plasma fibrinogen level, instead of high-sensitivity C-reactive protein, incase and control groups.

Keywords: Myocardial infarction; interleukins-6; body mass index; dyslipidemia; hypertension; diabetes.

1. INTRODUCTION

Myocardial infarction known as acute myocardial infarction (AMI), which is commonly used for an event of heart attack. MI occurs when blood supply is obstructed, due to which oxygen supply is not available to the heart muscles [1] and heart muscles get injured. The basic reason of myocardial infarction or heart attack is narrowing of coronary arterioles, blockage with plaques, cholesterol and fat deposits, resulting in blood clots, which stops the supply of blood into the heart. This is known as hardening of arterial walls; medically termed as atherosclerosis disease [2]. Atherosclerosis is now regarded as an inflammatory disease but the process of atherosclerosis is complex because of the involvement of inflammatory regulatory mechanism. Actually, some pro-inflammatory cytokines like interleukin-6 (IL-6) [3] are thought to be involved in blooming events such as occlusion injury, repair process and scar tissue formation marking the pre-conditional phase of heart. [4] Several parameters of systemic inflammatory markers are also associated with Myocardial Infarction (MI) disease. However, the level of high-sensitivity C-reactive protein (hsCRP) circulating in body fluids have special attention and correlated to IL-6 and Plasma fibrinogen as risk factors, responsible for provoking the myocardial infarction events. [5] Moreover, it has been established that IL-6 induces the hs-CRP level. In addition, many associated risk factors (such as hypercholesterolemia and blood sugar fasting [BSF], dyslipidemia, diabetes, hypertension [HT], alcohol consumption), are linked to, but had significant effect of tobacco intake, cigarette smoking on MI disease progression and complications in a clinical and population-based studies. [6,7] As discussed in prior studies, the age dependent death rate per 100,000 population from cardiovascular disease (CVD)is estimated to be 277.9 (at 95% confidence interval, 16.2% to 12.5%) from 2006 [8]. In a systemic review of coronary artery disease (CAD) incidence from India, Krishnan et al., [9]commented that alone Kerala had a highest prevalence cases of CAD but no recent studies was reported in this state. The MI prevalence varies from 1%-2% in rural populations and 2%-4% in urban populations. [9] Chan et al*.,* [6] reported higher prevalence of MI among Asian group subtypes, Indians, Malaya and Chinese but the risk profile of each racial groups is differed due to genetically differed composition, dietary and lifestyle behavior [6,10]. In the 2016 year, approx. 17.6million (at 95% CI, 17.3-18.1 million) death cases were reported from CVD at the global level, [11] accounting to an increment of 14.5% (at 95% CI, 12.1%-17.1%) from 2006 [8].Thus, the prior studies confirmed difference in mortality risk factors among each Asian group [12]. The aim of the study was to explore Interleukin-6 and Plasma Fibrinogen and association of myocardial infarction (hsCRP, Lipid profile and blood sugar fasting among Myocardial Infarction and healthy controls.

2. METHODS

2.1 Materials Required

Case subjects participated in this study from September 2016 to February 2020, of either sex (with age >65years) from the Outpatient Department and Indoor Patient of LPS Institute of Cardiology & Cardiac Surgery Department, associated with GSVM Medical College, Kanpur.

2.2 Study Sample

Case groups were confirmed as a study group, and distinguished from Control groups, by following the basic selection criteria prescribed by Physicians and expert's cardiologist. Prescribed selection criteria were as follows:

2.2.1 Inclusion criteria

- Patients more than 55 years of age, electrocardiogram (ECG) findings and biochemical markers: Suggestive of acute myocardial infarction
- Healthy Volunteer (without any suffering disease)
- Elevated level of creatine kinase-MB and Trop T
- Chest pain lasting 24 hours, suggestive of myocardial ischemia of accelerated pattern, or a prolonged one (>20 minutes), or with recurrent episodes at rest, or at minimal excretion, in addition to at least one of the following:

  - (a) New or presumed ECG changes (any of the following three characteristics): ST-segment depression ≥ 0.5 mm, transient ST-segment elevation (< 20 minutes) ≥ 1 mm, T-wave inversion ≥ 3 mm in two or more contiguous leads;
  - Development of pathological Q waves in the ECG
  - (b) Raised levels of cardiac markers (CK ≥ 2X the upper limit of normal).

2.2.2 Exclusion criteria

- Known causes of elevated uric acid level (chronic kidney disease, gout, hematological malignancy, and hypothyroidism).
- Patients on drugs which increase serum uric acid e.g. salicylates (2gm/dl, hydrochlorothiazide, pyrazinamide).
- Chronic alcoholics.
- Acute phase of impaired subject of obesity (body mass index > 30) was excluded. In addition, patients receiving medications affecting lipid metabolism, such as lipid lowering drugs, beta-blockers, oral contraceptives, estrogen, thyroxin and vitamin E was also excluded.
- Present or past aspirin, statins or hormone replacement therapy, autoimmune diseases and malignancies smokers, Subjects with any chronic diseases or acute infections, antioxidant vitamin supplements, hepatic disease etc.
- Renal dysfunction, Myocarditis, Rhabdomyolysis, Cardiomyopathy, Cardiac Surgery, Stroke, etc.

2.3 Laboratory Methodology

2.3.1 Blood samples and biochemical measurements

The fasting blood samples were collected from the study and control subjects for blood glucose, lipid profile (total cholesterol, triglyceride, high and low-density lipoprotein cholesterol), hsCRP, IL-6, and plasma fibrinogen measurements. The diagnostic test blood glucose and lipid profile biochemical parameter assessed using end point method reagent are used Erba Lachema S.R.O. Short Hills, United States. [13] hsCRP kits for human assessed using turbidimetric immunoassay method (Agappe Diagnostics Ltd, Kerala, India) [14]. The biochemical tests were carried out on a Merck Microlab 300 analyzer manufactor by ELITech Group Companies, Puteaux, France [15]. Specimens were stored at -80 ^{o}C in a deep freezer (Thermo Scientific™ Forma™ 89000 Series Ultra-Low Freezers) manufacture by Waltham city, United States [16].

2.3.2 Measurement of hsCRP, IL-6 and plasma fibrinogen concentration

Admitted patients suffering from myocardial infarction were taken from diagnosed cases of myocardial infarction immediately collected venous blood samples and centrifuged (Thermo Scientific™ Sorvall™ Legend™ Micro 21 Microcentrifuge manufacture by Waltham city, United States)[31] at 4000 x g for 5 minutes. Serum and plasma were separated into Eppendorf tubes for analysis. The case and control subjects for the concentrations of human IL-6 serum and plasma fibrinogen were determined using a commercially available immunoenzymatic assay (ELISA) kit (purchased from Elabscience Biotechnology Co., Ltd. Houston, United States) [17]. Absorbance was read at 450 nm using automated Microplate Reader [18] and washer Thermo [19] Scientific (Multiskan™ FC analyzer manufacture by Waltham city, United States). Specimens were stored at -80^{o}C in a deep freezer (Thermo Scientific™ Forma™ 89000 Series Ultra-Low Freezers) manufacture by Waltham city, United States.

2.3.3 Body Mass Index (BMI) assessment

Anthropometric, lifestyle, and dietary data were derived from the questionnaire administered to

female and male group, with missing information substituted from previous questionnaires.

BMI calculated using the equation BMI = weight [Kg]/height[m]^2

2.3.4 Blood pressure measurement

Systolic and diastolic blood pressure measured in a sitting position, after a five-minute rest, using a mercurial sphygmomanometer instrument.

2.4 Statistical Analysis

Statistical data were compared using brand IBM SPSS Statistics software, statistical package for the social sciences (SPSS) version 21 developed by country of United States. Mean, Standard deviation, testing of hypothesis can be performed by using an un-paired Student t-test, chi square test. While the drawn ROC curves through the SPSS version 21software; the entire stats test were also performed by using this software. Statistical comparative analysis of data was performed in columns, followed by the unpaired *t*-test, based on data distribution; Graphical plot with diagnostic ability were analyzed using receiver-operating characteristic method. The tested parameters were considered significant when critical, P >0.01level was set up, for a 95% CI.

3. RESULTS

Current study is case-control, discussing the lipid and biochemical marker characteristics. Total number of (n=178) individuals (males=65; mean age of 65years, females=24, mean age of 58 years at 95% CI)) participated in this study, out of these, 89 individuals were expected with risk of myocardial infarction (cases), and remaining 89 individuals were of healthy persons (controls), study subjects. Case-control population study is summarized in Table 1. discussing the coronary heart disease (CHD) incidence in studied population of participants, involving both males' and females' individuals, all the participated subjects were found to be almost similar age group during the past 5-year study duration.

Table 1. Basic characteristics of studied populations of myocardial infarction

Characteristics	Sex	Myocardial infarction	Healthy Subject
Hypertension	Male	39 (43.8)	26 (29.2)
	Female	16 (17.9)	8 (8.9)
Diabetes	Male	35 (39.3)	30 (33.7)
	Female	13 (14.6)	11 (12.3)
Dyslipidemia	Male	46 (51.6)	19 (21.3)
	Female	14 (15.7)	10 (11.2)
Alcohol	Male	49 (55.0)	16 (17.9)
	Female	18 (20.2)	6 (6.7)
Tobacco	Male	44 (55.0)	21 (23.5)
	Female	19 (21.3)	5 (5.6)
Smoking	Male	56 (62.9)	9 (10.11)
	Female	21 (23.5)	3 (3.3)
Physical activity	Male	7 (7.8)	60 (67.4)
	Female	5 (5.6)	22 (24.7)
Sweating	Male	9 (10.11)	56 (62.9)
	Female	1 (1.1)	23 (25.8)
Shortness of breath	Male	19 (21.3)	46 (51.6)
	Female	7 (7.8)	17 (19.1)
Vomiting	Male	1 (1.1)	64 (71.9)
	Female	1 (1.1)	23 (25.8)
Cough	Male	1 (1.1)	64 (71.9)
	Female	2 (2.2)	22 (24.7)
Palpitation	Male	9 (10.11)	56 (62.9)
	Female	4 (4.4)	20 (22.4)
Dizziness	Male	7 (7.8)	58 (65.1)
	Female	2 (2.2)	22 (24.7)
Abdominal pain	Male	4 (4.4)	61 (68.5)
	Female	2 (2.2)	22 (24.7)

Abbreviation: Myocardial Infarction (Case); Healthy Subject (Control)

Table 1 Prevalence of, hypertension, diabetes, dyslipidemia, Tobacco, Sweating, Cough and palpitation characteristics were appeared more significantly in males, at (P <0.01) compared to females, and rest of the factors showed no significance, at P >0.01 level. However, hypertension, diabetes and dyslipidemia conditions, are the most common causes of development of plaque formation and rupture of the capillary artery, which leads to announcement between the lipid content of the plaque and the blood flowing through the arterial lumen, lastly occlusion of the coronary artery by the thrombus reduces the blood supply to the myocardial tissues leading to ischemia and necrosis, eventually causing myocardial infarction. Some symptoms for example: sweating, cough and palpitation were found more significantly expressed in males than females, as in myocardial infarction patients. It means, male individuals were more prone to high risk of myocardial infarction than female individuals.

Table 2. Case-control comparison study is represented, depicting, case with myocardial infarction and healthy persons treat as control group, having same age and sex were affected in both the groups. Risk factors which are taken under consideration in this study are blood sugar fasting (BSF), Total cholesterol (TC), Triglyceride (TG), Low density lipoprotein (LDL), Very low-density lipoprotein (VLDL), Triglyceride/High density lipoprotein (TG/HDL-c), Total cholesterol/High density lipoprotein (TC/HDL-c), Low density lipoprotein/High density lipoprotein (LDL/HDL-c); high sensitivity c-reactive protein (hsCRP), Interleukin-6 (IL-6) and Plasma Fibrinogen. Current studied risk factors were found significantly higher in level, at (P<0.01), in case groups, except High density lipoprotein (HDL). In Levene's test analyses, proves the key controlling factors are: hsCRP, IL-6, and plasma fibrinogen, and level of these found significantly higher, at (P <0.01),>4mg/l of hsCRP, 36.37 of

Table 2. Clinical characteristics of the study subjects

Considered Risk factors	Group	n	Mean ±standard deviation	P-value
BSF (mg/dl)	Case	89	170.31±40.22	< 0.001
	Control	89	84.35± 12.83	
TC (mg/dl)	Case	89	208.34±62.20	<0.001
	Control	89	155.79±42.92	
TG (mg/dl)	Case	89	166.09±46.94	<0.001
	Control	89	108.38± 34.61	
HDL (mg/dl)	Case	89	40.40±4.47	<0.001
	Control	89	82.61±21.38	
LDL (mg/dl)	Case	89	134.72±58.28	<0.001
	Control	89	51.50±29.96	
VLDL (mg/dl)	Case	89	33.21±9.38	<0.001
	Control	89	21.67±6.92	
TG/HDL-c	Case	89	4.17±1.33	<0.001
	Control	89	1.33±.35	
TC/HDL-c	Case	89	5.32±1.60	<0.001
	Control	89	1.92±.44	
hsCRP (mg/l)	Case	89	4.57±1.48	<0.001
	Control	89	.48±.21	
IL-6 (pg/ml)	Case	89	36.37±23.63	<0.001
	Control	89	8.08±3.26	
Plasma Fibrinogen	Case	89	25.85±25.90	<0.001
(ng/ml)	Control	89	4.80±1.71	
BMI (kg/m^2)	Case	89	26.99±3.13	<0.001
	Control	89	24.44±3.96	

Independent sample t test is significant at the 0.01 level

n= Number of Participated subjects; BSF = blood sugar fasting; TC = total cholesterol; TG = triglycerides; HDL =high-density lipoprotein; LDL= low-density lipoprotein cholesterol; VLDL = very low-density lipoprotein cholesterol; hsCRP = high sensitivity C-reactive protein; IL-6 = interleukin-6

IL-6 pg/ml and 25.85ng/ml was observed in males (of case group) than control groups. Highlighted key controlling factors are: hsCRP, IL-6, and plasma fibrinogen, directly influence the lipid and non-lipid profile factors. Out of the considered risk factors, only body-mass index (BMI), total cholesterol (TC), LDL cholesterol, and triglycerides (TG) were found significant with positive correlated in case group, while negatively correlated with HDL cholesterol. Furthermore, the prevalence of smoking, hypertension, and diabetes risk factors had found significant higher in case group, as depicted in Table 3. In univariate analysis was taken under consideration for, hsCRP, IL-6, and plasma fibrinogen risk factors, an observed factor were significantly higher in case groups compare to control group. However, after adjustment with other risk factors, a significant association of hsCRP and hypertension were lost but the significance was observed between the diabetes and dyslipidemia. Fig. 1 described the dyslipidemia association with alcohol intake at P =0.161; diabetes at P =0.674 and least with hypertension at P =0.746 while Fig. 2 discussed the diabetes association, majorly with IL-6 at P =0.172, and hsCRP at P =0.435, least association with plasma fibrinogen, at P =0.795.

Etiological study of myocardial infarction is complex and dependent on several risk factors such as alcohol consumption, hypertension, diabetes, tobacco intake and physical activity significantly and moderately provoked the risk of dyslipidemia, except one, insignificant risk factors, that is, cigarette smoking. This can be demonstrated by ROC curve for smoking, indicated by yellow line, which is fallen below the reference line/baseline, as indicated by sky-blue color. In addition, the most influential risk factors affecting the dyslipidemia condition followed the

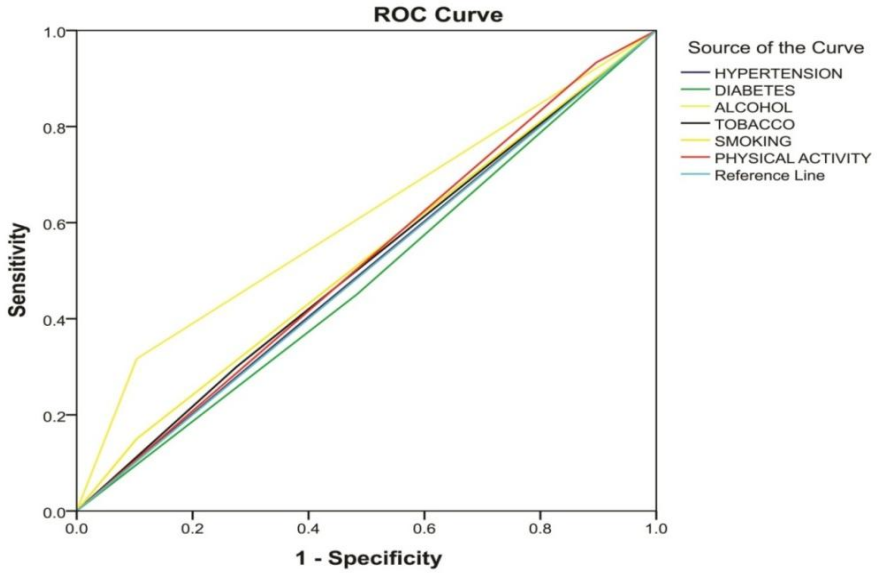

Fig. 1. Receiver-operating characteristic (ROC) curves with respective areas under the ROC curve showing the dyslipidemia association with hypertension, diabetes, alcohol, tobacco, smoking and physical activity, for myocardial infarction risk identification in a subject group

Table 3. Depicts the favorable risk factor for identification of myocardial infarction

Variables	Area under the curve	P-value	Sensitivity	Specificity
Hypertension	0.520	0.746	0.400	0.640
Diabetes	0.526	0.674	0.406	0.646
Alcohol	0.586	0.161	0.472	0.701
Tobacco	0.517	0.789	0.397	0.637
Smoking	0.490	0.876	0.369	0.612
Physical activity	0.499	0.986	0.378	0.619

descending order, in this way: physical activity, diabetes, hypertension and alcohol consumption, as represented in a coordinate curve table, identifying the dyslipidemia condition. When considering the whole test variables, the obtained best cutoff scores for physical activity, diabetes, hypertension, tobacco intake, alcohol consumption and cigarette smoking for diagnosing the dyslipidemia, indirectly defines the myocardial infarction condition are 90.5 (area under the curve, AUC, 0.499, sensitivity 90.4% and 90.6%),49.5 (AUC, 0.526, sensitivity 52.1% and 46.9%),36.4(AUC, 0.520, sensitivity 38.4% and 34.4%),29.8(AUC, 0.517, sensitivity 31.5% and 28.1%), 24.25 (AUC, 0.586, sensitivity 32.9% and 15.6%), and 14.65 (AUC, 0.490, sensitivity 13.7% and 15.6%), respectively, following the maximum Youden's index method. Table 3 also defines the significance test at 95% CI for under the AUC. Since, at 95% CI (0.400-0.701), reject the null hypothesis, even at 0.500 value. It was noted that the obtained data result was found significant as depicted from AUC, indicating the positive correlation of risk factors with dyslipidemia but it may be moderately affected by considered risk factors.

Fig. 2&3. Receiver-operating characteristic (ROC) and Scatter diagram curves depict the Dyslipidemia associated risk factors, interleukin(IL-6)(pg/ml) and Plasma Fibrinogen (ng/ml), for the identification of myocardial infarction. IL-6(pg/ml) had strong positive correlation with Plasma fibrinogen (ng/ml), that is, predicted from r^2 =0.767, and showed the significance, at P=0.000 level, as depicted in a Fig. 3 compare to case group.

Considered risk factors such as IL-6 and plasma fibrinogen, were not perfectly correlated with dyslipidemia, as depicted in a Fig. 2. ROC curve depicted ROC curve, for test variables was found in significant, as predicted in Table 4 representing the area under curve (AUC) values, which lies in between the 0.497-0.527 of IL-6 and Plasma fibrinogen. Since, the (AUC) Table 4 predicts insignificant correlation between the risk factors: IL-6, plasma fibrinogen, with dyslipidemia, at 95% confidence interval (CI). In terms of effectiveness, IL-6 had found more significant effect than plasma fibrinogen on dyslipidemia condition. However, the best cutoff scores value for IL-6 and plasma fibrinogen were 66.6 (AUC 0.497), and 66.6 (0.527). It was noted from these studied cutoff values for IL-6 and plasma fibrinogen factors against dyslipidemia, representing their test sensitivity, which are equally decreased while diagnosing the dyslipidemia condition among case subjects. Observed study demonstrate the dyslipidemia and diabetes condition were appeared in case subject groups because, it follows the descending trends of IL-6 (sensitivity =0.381) and (sensitivity =0.313), plasma fibrinogen (sensitivity =0.409) and (sensitivity =0.374) and hsCRP (sensitivity =0.0) and (sensitivity =0.345) compare to control group.

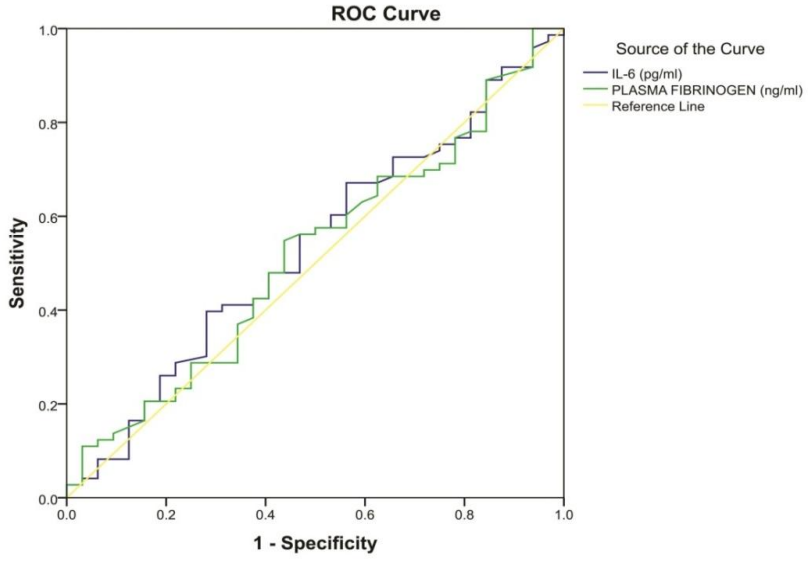

Fig. 2.Receiver-operating characteristic (ROC) Dyslipidemia with interleukin -6 (pg/ml) and Plasma Fibrinogen (ng/ml) correlated of myocardial infarction

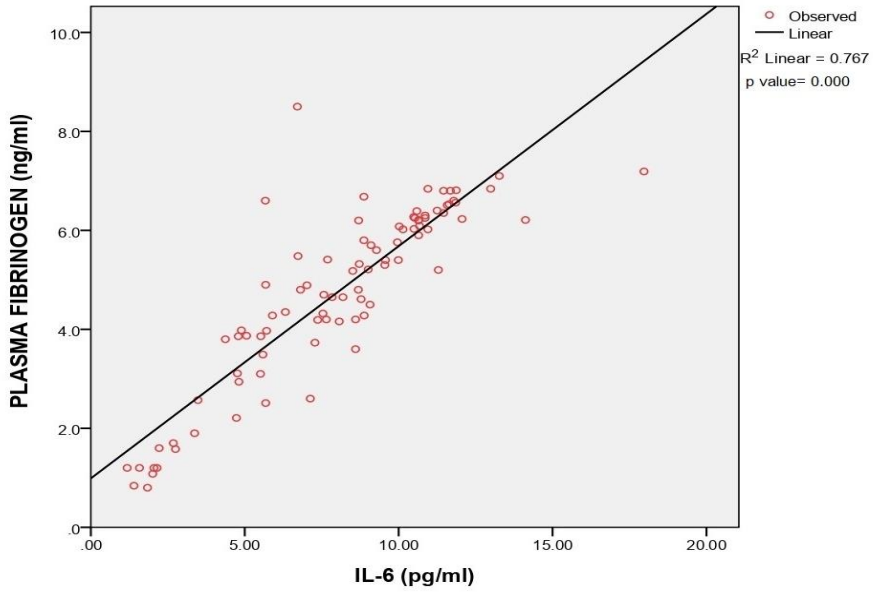

Fig. 3. Scatter diagram Dyslipidemia with interleukin -6 (pg/ml) and Plasma Fibrinogen (ng/ml) correlated of myocardial infarction

Table 4. Represent the associated risk factors for myocardial infarction identification

Variables	Area under the curve	P-value	Sensitivity	Specificity
IL-6, pg/mL	0.497	0.966	0.381	0.614
Plasma Fibrinogen, ng/ml	0.527	0.647	0.409	0.644

Receiver-operating characteristic (ROC) curves, explain the Diabetic association with high sensitivity C-reactive protein (hsCRP) (mg/l), IL-6 (pg/ml) and plasma fibrinogen (ng/ml) risk factors, for identification of myocardial infarction risk in a subject group.

Considered risk factors such as hsCRP, IL-6 and plasma fibrinogen were not perfectly correlated with diabetes as depicted in Fig. 4. ROC curve. Both the risk factors, IL-6 and hsCRP, were equally correlated with diabetes but no significant correlation of plasma fibrinogen was observed in this study. The best cutoff scores of hsCRP, IL-6 and plasma fibrinogen for diagnosing the diabetes were 0.076(AUC 0.423), 0.076(AUC 0.485) and 0.0(AUC 0.456), as depicted in area under curve. Table 5. By following the Youden index (YJ) method. It was noted that the cutoff point value was found low for IL-6 and hsCRP risk factors, but the test for sensitivity, which is used to predict the IL-6 and plasma fibrinogen level was found good but no significant effect of plasma fibrinogen was observed in the study.

4. DISCUSSION

Myocardial infarction (MI), commonly known as heart attack, is caused by the coronary artery lesions due to insufficient supply of oxygen (also known as ischemia); generally observed in old aged patients of more than 65 years [20]. Limited research studies have demonstrated an association of inflammatory markers with MI [21]. An elevated level of inflammatory marker signals to restrict the supply of blood to the heart muscles, which leads to muscle necrosis and ischemia events, eventually causing myocardial infarction [22,23]. Present study is a case-control comparative study, diagnosing MI risk in hundreds of seventy-eight participants through the marker system characterizing lipid profile factors by demonstrating the level of non-lipid profile risk factors. Earlier reported studies extensively discuss about the hsCRP biomarker [24]. Mean hsCRP level was higher in present study than those earlier reported studies, [25] it was noted from this study, that higher hsCRP level depicts the high risk of patients for the

development of cardiovascular disease (CVD) [26,27].

The vast majority of examined case groups were affected and had (>4mg/l of hsCRP) level in >90% case groups were detectable in this study whereas other studies reported above 3mg/l level of hsCRP in 50% patients of CVD [24,28]. Mean of IL-6 and plasma fibrinogen is elevated significantly in this study but lesser than the other reported studies [29]. An elevated level of these markers can be explained by differences in age, body mass index (BMI) ,excessive consumption of alcohol, and other inherent intake of tobacco. Smoking had a slight activity among the studied case groups. Mean of Lipid profile factors such as total cholesterol (TC), triglycerides (TG) and LDL cholesterol level is enhanced drastically, whereas HDL level is lowered especially in male case groups compared to female case groups.Similarl findings reported by Pokharelet al. [30] Interleukin-6 (IL-6) is the key promoter of hsCRP production and secreted out from hepatocytes. It has also been reported that the IL-6 also predicts the future risk of myocardial infarction in a middle-aged individual [31] similarly reported in this study. The studied mean data of IL-6 represent the development of dyslipidemia and diabetes with myocardial infarction (MI) as previously reported in Pakistan, suggesting that Coronary arterial disease (CAD) were found in patients with diabetes [32]. It was noted that lowered blood serum of IL-6 and higher plasma fibrinogen factors, found in case subjects but it developed diabetes and dyslipidemia condition, compare to control subjects. Same can be found in study done by Ali et al.,[33] in a more elaborate way on the basis of hypertension, alcohol consumption but no significant risk was observed by the intake of tobacco, cigarette smoking and physical activity. Mahalleet al., [34] reported that the age, sex, BMI and IL-6 had no significant correlation with the hypertension (HTN), and this study reported the same [34]. Fibrinogen is an acute phase protein and well-known coagulation factor in the blood [35]. It is associated with those patients who had Carotid atherosclerosis and Myocardial infarction disease [36]. A positive relation was found in between the fibrinogen and risk of cell death of myocardial muscles similarly reported in this current study. Constant cardiac output occurred, if the fibrinogen level is exceeded from 400mg/dl plasma concentration [37], as noted in this study, that fibrinogen level (>400mg/dl) is much lesser than reported value, thus, no significant effect of fibrinogen on myocardial infarction was found, in this study. Further studies are warranted to investigate the underlying mechanism of depression emphasized on dyslipidemia and diabetic condition, causing the increased risk of myocardial infarction and CHD death.

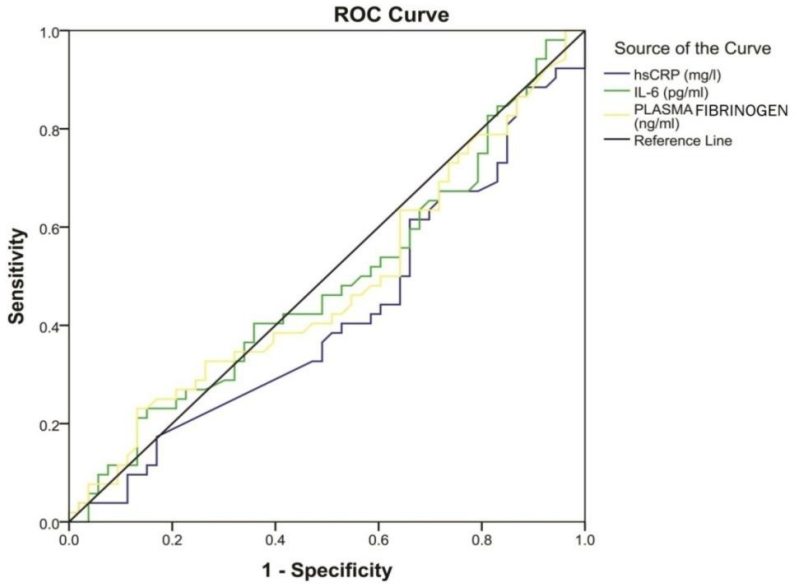

Fig. 4. Receiver-operating characteristic (ROC) diabetic with hsCRP, interleukin -6 (pg/ml) and plasma fibrinogen (ng/ml) correlated of myocardial infarction

Table 5. Depicts the favorable risk factor for identification of myocardial infarction

Variables	Area under the curve	P-value	Sensitivity	Specificity
IL-6, pg/mL	0.423	0.172	0.313	0.533
Plasma Fibrinogen, ng/ml	0.485	0.795	0.374	0.597
hsCRP, (mg/l)	0.456	0.435	0.345	0.566

IL-6 = interleukin-6; hsCRP = high sensitivity C-reactive protein.

5. CONCLUSION

This study concludes the importance of risk factors involving higher Interleukin-6 and plasma fibrinogen level instead of high sensitivity C-reactive protein in coronary arteries blockage or cardiac heart disease. The lipid profiles and markers for lipids are used to distinguish the two studied groups: Case and control groups. These markers play a vital role in diagnosing an association between the lipid and non-lipids profile markers which includes the age, smoking, alcohol consumption, tobacco intake, body mass index and cholesterol, triglyceride level provokes dyslipidemia, diabetes, and arterial hypertension conditions, especially observed in case groups, and no significant effect of physical activity was observed. Body mass index (BMI) was significantly covariate at P =0.01 level with hsCRP of the case group while it was not significantly correlated with hsCRP in the control group. However, study results showed that the cholesterol, LDL cholesterol, and triglycerides were significantly higher in the case group, whereas HDL cholesterol was lower compare to the control group. The current study identifies the male individuals of case groups were found at higher risk than female case groups.

6. STUDY LIMITATIONS

This study will be considering a large population size of each etiology, the study population comprised of newly diagnosed Myocardial Infarction. We should be added biochemical parameters of Lipoprotein-associated phospholipase A2 (Lp-PLA2) & Fatty acid-binding proteins it is a newly (FABP 3) that will be estimated. FABP 3 is more cardio-specific. The early elevation of FABP 3 in blood detection is approx. 30 mins, time to peak 6-12 hrs, and return to normal in 24 hrs in comparison to myoglobin initially shows elevation in blood approx. 1-3 hrs, time to peak 5-8 hrs and return to normal 16-24 hrs and leads to an earlier diagnosis of myocardial injury whereas current 'gold standard' troponin T initial elevation in blood approx 3-6 hrs, time to peak 10-48 hrs, and return to normal 10-15 days. The positive correlation between IL-6, FABP 3, Plasma Fibrinogen, and Lp-PLA2 new risk marker needs to be biologically plaque formation, measurable, repeatable, and show a strong and graded relationship to Myocardial Infarction. The results of the study may be helping the clinician to develop more novel therapeutic strategies for the management of MI patients.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The study was approved by the Institute Ethics Committee, Santosh University, Ghaziabad, India letter number- F.No. Su/2017/1226(16) and date of 18-December-2017 Questionnaire and informed consent were obtained from all the patients.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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