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EVALUATION OF SERUM FERRITIN IN PATIENTS OF CORONARY ARTERY DISEASE

Preeti Salhan[1], Devinder Singh Mahajan[2], Ashok Khurana[3], Sahiba Kukreja[4]

ABSTRACT: BACKGROUND: Serum ferritin, which measures stored iron, is an inflammatory marker and a potential novel risk factor for CAD. Its role in coronary artery disease like acute myocardial infarction has generated considerable interest in recent times. There is a plethora of articles reporting the relationship between serum ferritin and acute myocardial infarction but with conflicting and contradictory results. **AIMS AND OBJECTIVES:** 1) To compare serum ferritin levels in cases of coronary artery disease with those of controls, in order to assess the relationship of serum ferritin with coronary artery disease. 2) To compare serum ferritin levels in cases of unstable angina with those of AMI (NSTEMI & STEMI) and healthy controls. **MATERIAL AND METHODS:** In this hospital based case-control study, 30 cases of acute myocardial infarction, 30 cases of unstable angina admitted to hospital in SGRD & Rand 30 age, sex and haemoglobin matched healthy controls were enrolled. Patients were allocated into 2 equal groups- Unstable Angina and AMI (NSTEMI & STEMI).Serum ferritin was estimated in cases of acute myocardial infarction on fifth day following occurrence of first symptom and on day 1 in patients in control group. Data was compiled and statistically analyzed. **RESULTS:** In this study, it was observed that the mean serum ferritin levels in controls were comparatively higher (165.13 ± 104.17 ng/ml) than that in the patients with Acute Myocardial Infarction (81.83 ± 97.46ng/ml) and Unstable Angina (90.24 ± 41.88ng/ml). Although the value of mean serum ferritin was within normal limits in both the groups under but it was higher in controls as compared to that in patients with Acute Myocardial Infarction and Unstable Angina and this difference was statistically highly significant (p<0.001). When levels of mean serum ferritin in patients with AMI and UA were compared, the difference was not statistically significant. **CONCLUSION:** The present study concluded that the risk of coronary artery disease is inversely proportional to the serum ferritin level because the mean serum ferritin levels were statistically lower in cases of AMI and UA as compared to those of control group. However, there was no difference of levels between AMI and UA.
KEYWORDS: Serum ferritin, inflammatory marker, acute myocardial infarction, unstable angina, highly significant.

INTRODUCTION: Coronary artery disease has become the most common cause of death in India and all over the world. Serum ferritin, which measures stored iron, is an inflammatory marker and a potential novel risk factor for CAD. Its role in coronary artery disease like acute myocardial infarction has generated considerable interest in recent times. There is a plethora of articles reporting the relationship between serum ferritin and acute myocardial infarction but with conflicting and contradictory results. The present study has been designed to find out the relation of serum ferritin to coronary artery disease and to compare the rise in serum ferritin in patients of unstable angina and those of AMI (both NSTEMI and STEMI).

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1. To compare serum ferritin levels in cases of coronary artery disease with those of controls, in order to assess the relationship of serum ferritin with coronary artery disease.
2. To compare serum ferritin levels in cases of unstable angina with those of AMI (NSTEMI & STEMI) and healthy controls.

MATERIAL AND METHODS: In this hospital based case-control study, 30 cases of acute myocardial infarction, 30 cases of unstable angina admitted to hospital in Sri Guru Ramdas Institute of Medical Sciences ad Research Hospital and 30 age, sex and haemoglobin matched healthy controls were enrolled. Patients were allocated into 2 equal groups- Unstable Angina and AMI (NSTEMI & STEMI).

INCLUSION CRITERIA:
The diagnosis of unstable angina was based on fulfilling any one of the following Criteria:
1. Occurring at rest or on minimal exertion and lasting more than 20 min (If nitroglycerine is not administered).
2. Severe and new onset pain (i.e within 1 month).
3. Occurring with a crescendo pattern (More severe, prolonged or increased frequency than before).

The diagnosis of AMI was based on fulfilling any two of the following Criteria:
1. Chest pain of <12 hours duration,
2. ST elevation >1 mm in at least two consecutive leads,
3. Increased cardiac markers creatinine phosphokinase-MB (CPK-MB two times the upper limit of normal) and Troponin-T,
4. Presumably new onset bundle-branch block.

EXCLUSION CRITERIA:
Cases with high ferritin levels like:
1. Haemochromatosis, (As per history, clinical examination & ultrasound abdomen),
2. Liver disease,
3. Tuberculosis,
4. Those on iron therapy,
5. And those having past history of AMI or CHD were excluded from the study.

Serum ferritin was estimated in all the subjects by using Dia Metra (ELISA) test kit. In cases of acute myocardial infarction, this test was conducted on fifth day following occurrence of first symptom and on day 1 in patients in control group. Data was compiled and statistically analyzed.

RESULTS: In this study, it was observed that the mean serum ferritin levels in controls were comparatively higher (165.13 ± 104.17 ng/ml) than that in the patients with Acute Myocardial Infarction (81.83 ± 97.46ng/ml) and Unstable Angina (90.24 ± 41.88ng/ml). Although the value of mean serum ferritin was within normal limits in both the groups under but it was higher in controls as compared to that in patients with Acute Myocardial Infarction and Unstable Angina and this

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difference was statistically highly significant (p<0.001). When the levels of mean serum ferritin in patients with AMI and UA were compared according to gender, the difference was not statistically significant.

	Group			P value
	Acute Myocardial Infarction	Unstable Angina	Control	
Mean Serum Ferritin (ng/ml)	81.83 ± 97.46	90.24 ± 41.88	165.13 ± 104.17	<0.001**
TABLE 1: COMPARISON OF MEAN SERUM FERRITIN LEVELS IN ACUTE MYOCARDIAL INFARCTION, UNSTABLE ANGINA (ON 5TH DAY OF ONSET OF SYMPTOMS) AND CONTROLS (ON DAY 1)				

**p<0.001; highly significant.

The above table depicts that mean serum ferritin levels in Acute Myocardial Infarction, Unstable Angina and Controls were 81.83± 97.46, 90.24± 41.88 and 165.13± 104.17. The difference between the 3 groups is highly significant (p<.001). The ranges for ferritin can vary between laboratories but are usually between 30–300 ng/mL (μg/L) for males, and 15–200 ng/mL (μg/L) for females. Although the value of mean serum ferritin was within normal limits in both cases and controls, it washigher in controls compared to that in cases and the difference was statistically highly significant (p<0.001).

Sex	Mean Serum Ferritin (ng/ml)			
	Acute Myocardial Infarction	Unstable Angina	Control	P value
Males	74.05± 94.15	96.87± 31.96	175.55± 120.81	0.009*
Females	97.40± 107.19	85.82± 47.75	154.71± 87.48	0.045*
P value	0.546NS	0.489NS	0.593NS	
TABLE 2: COMPARISON OF MEAN SERUM FERRITIN LEVELS AS PER SEX ON 5th DAY OF ONSET OF SYMPTOMS IN ACUTE MYOCARDIAL INFARCTION AND UNSTABLE ANGINA AND ON DAY 1 IN CONTROLS				

NS: p > 0.05; Not Significant; *p<0.05; Significant.

The above table depicts that the mean serum ferritin levels in Acute Myocardial Infarction group, Unstable Angina and Control group were 74.05± 94.15, 96.87± 31.96 and 175.55± 120.81 respectively in males and 97.4± 107.19, 85.82± 47.75 and 154.71± 87.48 respectively in females. Although the difference in mean serum ferritin levels in all the 3 groups both in male and female patients was statistically significant, its values when compared between males and females in the 3 groups was not statistically significant.

DISCUSSION: The present study was conducted in 30 patients of Acute Myocardial Infarction and 30 cases of Unstable Angina to assess the relationship of serum ferritin with coronary artery disease by

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comparing its levels in patients with coronary artery disease with that in controls. It was observed that the mean serum ferritin levels in controls were comparatively higher (165.13 ± 104.17 ng/ml) than that in the patients with Acute Myocardial Infarction (81.83 ± 97.46 ng/ml) and Unstable Angina (90.24 ± 41.88 ng/ml). The ranges for ferritin can vary between laboratories but are usually between 30–300 ng/mL (μg/L) for males, and 15–200 ng/mL (μg/L) for females. Although the value of mean serum ferritin was within normal limits in both cases and controls, it was statistically higher (p <0.001)in controls and lower in patients with Acute Myocardial Infarction and Unstable Angina and this difference was statistically highly significant (p<0.001). The lower level of serum ferritin in patients with AMI and UA as compared to other studies might be due to difference ethnicity, place and anemia. When levels of mean serum ferritin in males and females were compared, the difference between mean serum ferritin levels was not statistically significant. Out of 90 patients, 47 (52.22%) were male and 43 (47.78%) were female.

These findings correlate well the study by Dominguez et al, in which 584 patients with Acute Myocardial Infarction were enrolled. Serum ferritin levels in controls were higher (210.5) as compared to that in cases (121) and this difference was statistically significant.[1]

The results in the present study also agree with a study by Gupta et al in which it was stated that the levels of serum ferritin were 48.8+/-55ng/ml and 60.9+/-64ng/ml in cases and controls respectively. Serum transferrin saturation in cases (12.5+/-7.8) was lower as compared to those in controls (9.5+/-6.2).[2] Sempos et al in his study concluded that higher transferrin-saturation and serum ferritin levels were not associated with an increased risk of coronary heart disease or Myocardial Infarction. On the contrary, the results indicated that there may be an inverse association of iron stores with cardiovascular diseases.[3] Reunanen also ruled out the direct relationship of serum ferritin with Acute Myocardial Infarction after a study on 739 men and 245 women.[4]

The results of present study were contrary to a study by Arshad et al who concluded that there is a role of iron overload in the development of coronary atherosclerosis and Myocardial Infarction.[5] Nough after a study on 112 cases and 63 controls, concluded that increased ferritin level caused increased risk of Acute Myocardial Infarction and Unstable Angina.[6] In a study by Wadhwa et al, it was seen that patients with higher levels of serum ferritin had higher incidence of coronary artery disease as compared to controls.[7]

Age wise variation of serum ferritin was also studied, in which difference in mean serum ferritin levels was not statistically significant except in the age group of 51-60 years. The maximum number of patients belonged to this age group. The risk factors studied were Body Mass Index, hypertension, diabetes mellitus, dyslipidemia, smoking and alcohol. Body Mass Index >25 kg/m^2 was considered as a risk factor for coronary artery disease. The most common risk factor in this study was dyslipidemia (54.4%) followed by hypertension (23.33%) and diabetes mellitus (21.11%).

CONCLUSION: The present study concluded that the risk of coronary artery disease is inversely proportional to the serum ferritin level because the mean serum ferritin levels were statistically lower in cases of AMI and UA as compared to those of control group. The lower level of serum ferritin in patients with AMI and UA as compared to other studies might be due to difference ethnicity, place and anemia. When the levels of mean serum ferritin in patients with AMI and UA were compared according to gender, the difference was not statistically significant.

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AUTHORS:
1. Preeti Salhan
2. Devinder Singh Mahajan
3. Ashok Khurana
4. Sahiba Kukreja

PARTICULARS OF CONTRIBUTORS:
1. 3rd Year Post Graduate, Department of Medicine, Sri Guru Ramdas Institute of Medical Sciences and Research, Vallah, Amritsar, Punjab.
2. Professor, Department of Medicine, Sri Guru Ramdas Institute of Medical Sciences and Research, Vallah, Amritsar, Punjab.
3. Professor, Department of Medicine, Sri Guru Ramdas Institute of Medical Sciences and Research, Vallah, Amritsar, Punjab.

4. Professor, Department of Biochemistry, Sri Guru Ramdas Institute of Medical Sciences and Research, Vallah, Amritsar, Punjab.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Preeti Salhan,
H. No. 1A, Main Street,
Near Lane 9,
Friends Colony,
Opposite DAV College,
Jalandhar, Punjab.
Email: preeti_salhan@yahoo.com