

# An Evaluation of Comparative Study of Serum Ferritin Levels in Myocardial Infraction Cases

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## Abstract

**Background:** MIs occur mostly due to coronary artery disease. The major risk factors of MIs are high blood pressure, smoking, diabetes, lack of exercise, obesity, high blood cholesterol, poor diet and excessive alcohol intake. MI usually involves the complete blockage of a coronary artery. **Subjects and Methods:** This study conducted in the department of cardiology & biochemistry in LPS institute of cardiology, GSVM medical college ,Kanpur.. The population of this case – control study was 50 for each group. The duration of study was over a period of one year. **Results:** We were found that 42% patients were belongs to 41-50 age group in case group, whereas in control group 52% followed by other age group. In this study we showed association of acute myocardial infraction with high serum ferritin. **Conclusion:** To reduce cardiovascular morbidity and mortality it is essential to monitor serum ferritin levels regularly.

**Keywords:** Myocardial infarction (MI), Electrocardiograms, Serum ferritin, Angiography

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## Introduction

It has been estimated by World Health Organization (2004) that 12.2% of deaths were due to ischemic heart disease which is leading cause of death in myocardial infarction (MI). MIs occurs mostly due to coronary artery disease.<sup>[1]</sup> The major risk factors of MIs are high blood pressure, smoking, diabetes, lack of exercise, obesity, high blood cholesterol,<sup>[2,3]</sup> poor diet and excessive alcohol intake. MI usually involves the complete blockage of a coronary artery.<sup>[4]</sup> It is caused by a rupture of an atherosclerotic plaque. The less common cause of MIs are coronary artery spasms. It may be due to cocaine, significant emotional stress and extreme cold.<sup>[5,6]</sup> There are number of tests which are beneficial with diagnosis of MIS. It includes electrocardiograms (ECGs), blood tests and coronary angiography.<sup>[7]</sup> If ST elevation is present then an ECG may confirm it.<sup>[8]</sup> The most commonly used blood tests are troponin and 7creatinine kinase Mb.<sup>[9]</sup> According to WHO criteriatio diagnose MI are clinical history of ischemic type, chest pain lasting for more than 20 minutes, changes in serial ECG tracings, rise and fall of serum cardiac biomarkers. Ferritin is abundant intracellular protein that stores iron and release it in controlled manner. The protein is produced by almost all living organism. It includes algae, bacteria, higher plants and animals. It acts as a buffer against iron deficiency and iron overloading in humans. In most tissues, ferritin is found as a cytosolic protein, but a very little amount is secreted into the serum where it

functions as an iron carrier <sup>[10]</sup>. It stores iron in non-toxic form, deposits in safe form and transports to areas where it is required. Free iron is toxic to cells.<sup>[11]</sup> As itacts as a catalyst in the formation of free radicles from reactive oxygen species via the Fenton reaction. Vertebrates evolve an elaborate set of protective mechanism to bindiron in various tissue compartments. Iron is stored in a protein complex as ferritin or hemosiderin within cells. Free iron has been related with ischemic myocardial damage and lipid peroxidation (LP). It has been hypotheses as to how free iron may accelerate the progression of atherosclerosis or contribute to myocardial injury after ischemic event in several researches. National Health and Nutrition Examination Survey (1988-1994) reported a significant positive correlation in iron storage and heart disease risk. There are very few studies available in the literature. Therefore, the present study was done to find out the relation of serum ferritin with myocardial infarction.

## Subjects and Methods

**Study area:** This study conducted in the department of cardiology & biochemistry in LPS institute of cardiology, GSVM medical college, Kanpur.

**Study Population:** The population of this case – control study was 50 for each group.

**Study duration:** The duration of study was over a period of one year.

**Data collection:** All subjects were subjected to detailed

history, physical examination and relevant investigations. Study subjects were evaluated for serum creatine kinase-MB fraction (CK-MB), Trop-T, serum ferritin along with complete blood counts etc. All patients were interviewed as per the prepared proforma and then complete clinical examination and laboratory investigations were done.

**Data Analysis:** Data were analyzed by using Microsoft excel.

## Results

In this study, we were including 50 patients as cases and 50 as a control. Out of 50 cases we had 70% male and 30% female in cases, while in control 72% male & 28% female. We were found that 42% patients were belongs to 41-50 age group in case group, whereas in control group 52% followed by other age group. In this study we showed association of acute myocardial infraction with high serum ferritin [Table 5].

**Table 1: Distribution according to gender**

Gender	Cases	%	Control	%
Male	35	70%	36	72%
Female	15	30%	14	28%
Total	50	100%	50	100%

**Table 2: Distribution according to age**

Age	Cases	%	Contrl	%
21-30	5	10%	1	2%
31-40	6	12%	8	16%
41-50	21	42%	26	52%
51-60	7	14%	11	22%
>60	11	22%	4	8%
Total	50	100%	50	100%

**Table 3: Distribution according to comorbidities**

Comorbidities	Cases	%	Control	%
Hypertension	16	32%	14	28%
DM	13	26%	11	22%

**Table 4: Association of acute myocardial infraction with high serum ferritin**

Serum Ferritin Level	Cases	%	Control	%
<100	5	10%	17	34%
100-199	10	20%	13	26%
200-299	7	14%	11	22%
>300	28	56%	9	18%
Total	50	100%	50	100%

## Discussion

The present study consisted of 100 patients (50 cases and 50 controls) to evaluate the levels of serum ferritin in acute myocardial infraction. Globally, the incidence of acute myocardial infraction is increasing among all age groups and in both sexes. In AMI, due to sustained ischemia, irreversible tissue injury occurs. Recent studies have revealed that the innate immune system is activated sequentially and mediating both injury and repair

mechanisms.<sup>[12,13]</sup> The role of ferritin in pathogenesis of coronary artery disease (CAD) has generated considerable interest now a days. A positive relationship between body iron stores and coronary artery diseases have been found in epidemiological studies.<sup>[14,15]</sup> Afterward, evidence of an association of elevated serum ferritin and increased risk of AMI were observed by various authors.<sup>[16,17]</sup> These findings are similar to our findings. Though findings other studies did not show significant correlation between high ferritin and risk of AMI.<sup>[18,19]</sup> It could be possible that overloading of iron leads to increased lipid peroxidation and foam cell formation. But apart from this the chemical properties of oxidized lipoproteins were found to be chemotactic to blood monocytes, facilitate the entry of lipoproteins by a cytotoxic endothelial injury, and give rise to smooth muscle cell proliferation<sup>[20,21&22]</sup>. In contrast native low density lipoprotein lacks all these atherogenic potentials. 20,22A study showed a strong relation between sonographically assessed carotid atherosclerosis and prominent iron stores in both sexes mainly when associated with hypercholesterolemia.<sup>[23]</sup> Therefore, lipid peroxidation may establish an initiating and crucial step in the development of fatty streaks and plaques. Blood donation has also been reported to be linked with decreased risk of cardiovascular events.<sup>[24]</sup>

In this study, mostly patients belonged to 41-50 years in both the groups. Mostly patients, in both the groups were males and the difference was statistically not significant as per Chi-square test ( $p > 0.05$ ). In a study by Vijaya BM et al, 25 found the mean age were  $45.7 \pm 3.8$ ,  $46.4 \pm 4.1$  and  $46.2 \pm 4.5$  in control group and group I and II respectively. The average number of Male and female were 82/19.

In our study, hypertension and diabetes mellitus were more common in Cases Group as compared to Control Group (32% vs. 26% and 28% vs. 22% respectively). Moradi M et al, 26 conducted a study which consisted of 50 consecutive patients with first acute myocardial infraction (AMI), and a control group ( $n = 50$ ) without history of AMI. The study found no significant difference in risk factors including diabetes mellitus, hypertension between the groups.

## Conclusion

This study concludes that, For AMI, higher levels of ferritin, seems to be a strong risk factor. Along with other risk factor, higher ferritin level can easily be identified during routine hematological analysis. To reduce cardiovascular morbidity and mortality it is essential to monitor serum ferritin levels regularly.

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