



Original Research Article

Evaluation of serum ferritin levels in patients of hypertension

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ABSTRACT

Introduction: Elevation of serum ferritin levels leads to serious complications. Increased serum ferritin levels leads to increased oxidative stress, further leading to inflammation, endothelial damage and consequently increasing the risk of hypertension.

Aim: The aim of the present study was to estimate and compare serum ferritin levels in the hypertensive patients and control group.

Material and Methods: The present study was a hospital-based observational and analytical study. The study was conducted over a period of 1 year on 102 patients. The study group comprised of 51 patients (diagnosed with hypertension), and the control group comprised of 51 (age and gender matched) individuals. The levels of serum ferritin were analysed by the Sandwich ELISA method.

Result: The results of the present study show that, the mean value of serum ferritin was 293.27 ± 219.84 ng/ml in study group and 72.23 ± 29.75 ng/ml in control group. The mean SBP was 151.45 ± 14.77 mm/Hg in study group and 109.88 ± 5.43 mm/Hg in control group. The mean DBP was 95.56 ± 7.46 mm/Hg in study group and 72.43 ± 2.97 mm/Hg in control group. The results of the present study indicate that the difference between the mean serum ferritin and mean SBP, mean DBP among the study group and control group was found to be significant statistically ($p < 0.05$).

Conclusion: The present study concluded that there exists a positive correlation between the mean serum ferritin levels and hypertension among the study group (patients with hypertension).

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1. Introduction

Serum ferritin is the main protein performing the important function of regulation of iron homeostasis in the human body. The levels of serum ferritin is a useful clinical biomarker of the amount of iron that is stored in the body. Several studies have suggested, however, that an iron overload might contribute to production of reactive oxygen species (ROS), further increasing the oxidative stress and inflammation which could often result in increased blood pressure.¹

The elevated levels of blood pressure is positively correlated to the risk of stroke and coronary heart disease. In addition to coronary heart disease and stroke the

complications of elevated BP levels include heart failure, renal impairment, peripheral vascular diseases, visual impairment and retinal haemorrhages.² Worldwide, it has been reported that around 7.5 millions deaths or 12.8% of the total of all annual deaths occur due to high blood pressure.² It is predicted that about 1.56 billion adults would be suffering from hypertension by the year 2025.³

The prevention and prediction of HTN are essential for decreasing the global disease burden and morbidity leading to mortality. Several authors have suggested that elevated serum ferritin levels can cause damage to cellular membranes, lipids, proteins, and deoxyribonucleic acid.⁴ Several authors have suggested a positive correlation between serum ferritin levels and the risk for development of HTN. However, still the clinical evidence for a concrete etiological association between high serum ferritin level

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Table 1: Comparison of systolic blood pressure(mm/Hg), Diastolic blood pressure (mm/Hg) and Ferritin levels (ng/ml) in study group and control group

	Study group	Control group	p value
Mean $\pm$ SD SBP (mm/Hg)	151.45 $\pm$ 14.77	109.88 $\pm$ 5.43	<0.001
Mean $\pm$ SD DBP (mm/Hg)	95.56 $\pm$ 7.46	72.43 $\pm$ 2.97	<0.001
Mean $\pm$ SD Ferritin (ng/ml)	293.27 $\pm$ 219.84	72.23 $\pm$ 29.75	<0.001

Table 2: Correlation of Ferritin levels (ng/ml) with SBP (mm/Hg) in study group

No. of Patients	SBP (mm/Hg) Mean $\pm$ SD	Ferritin (ng/ml) Mean $\pm$ SD	r value	p value	Significance
51	151.45 $\pm$ 14.77	293.27 $\pm$ 219.84	$\pm$ 0.28	<0.05	S

Table 3: Correlation of Ferritin levels (ng/ml) with DBP (mm/Hg) in study group

No. of Patients	DBP (mm/Hg) Mean $\pm$ SD	Ferritin (ng/ml) Mean $\pm$ SD	r value	p value	Significance
51	95.56 $\pm$ 7.46	293.27 $\pm$ 219.84	$\pm$ 0.28	<0.05	S

and incidence of hypertension remains limited due to the scarcity of studies analysing this relationship.^{5,6}

Hence, the present study was conducted to assess the relationship between serum ferritin and hypertension (HTN).

2. Aims and Objectives

The aim of the present study was to estimate and compare serum ferritin levels in the study group (n=51) i.e patients of hypertension and control group (n=51) of the same age group and were statistically analysed.

3. Materials and Methods

The present hospital-based observational and analytical study was conducted over a period of one year on 102 patients. Clinically confirmed cases of hypertension in the age group of 20-65 years were included in the study. The study sample constituted of 51 individuals (diagnosed with hypertension) and the control group constituted of 51 age and gender matched individuals. The ferritin levels of all the participants were analysed by the Sandwich ELISA method. The patients of Diabetes, Liver Disease, Hyperlipidaemia and Anaemia were excluded from the study.

3.1. Statistical analysis

The data was analysed using Microsoft excel 7, Pearson's correlation and Anova tests.

4. Results

Table 1 observed that maximum levels of SBP and DBP (mm/Hg) was higher in study group as compared to control group and serum ferritin levels (ng/ml) were statistically significant in study group (p<0.001) as compared to control group.

Table 2 shows a positive correlation between the serum ferritin levels (ng/ml) and systolic blood pressure (mm/Hg) and were statistically significant (p<0.05).

Table 3 shows a positive correlation between the serum ferritin levels (ng/ml) and diastolic blood pressure (mm/Hg) and were statistically significant (p<0.05).

5. Discussion

The present study showed a comparison of SBP (mm/Hg), DBP (mm/Hg) and ferritin levels (ng/ml) in study group (patients of hypertension) and control group. It was observed that there was statistically significant difference between the SBP and ferritin levels, DBP and ferritin levels of study and control groups. The results of the study are consistent with the results of other studies conducted by various authors Piperno A et al. (2002),⁵ Galen P et al. (2010),⁷ Kim MK et al. (2012),⁶ Choi B et al (2015).⁸ In the present elevated serum ferritin level were found to be associated with hypertension. There are several possible mechanisms explaining the association between serum ferritin levels and hypertension. One of which includes the development of atherosclerosis by elevated ferritin levels. Inflammation has a relationship with prevalent and/or incident hypertension and is also related to the ferritin level, which is also known as a positive inflammatory marker.⁶

Serum ferritin concentrations reflect not only body iron stores but also systemic inflammation.⁹ Also elevated body iron produces oxidative stress which can convert less reactive free radicals to more reactive free radicals like hydroxyl, hydroxide and super oxide anions. Elevated ferritin levels also causes damage to cellular membranes, lipids, proteins and deoxyribonucleic acid (DNA).⁴ Elevation of ferritin levels increase vascular oxidative stress and impairs vaso-reactivity, which leads to inflammation, endothelial damage and consequently atherosclerosis. Atherosclerosis can develop and accelerate due to iron

overload directed endothelial toxicity and oxidizing low-density lipoprotein and isoprostanes which are biomarkers for the oxidative stress. Atherosclerosis process follows after, and the risk of hypertension can be increased.

6. Conclusion

The present study showed that the elevated serum ferritin levels were positively correlated to the hypertension (p value= <0.05) because the elevated ferritin levels increase with increase in BP. Increased ferritin levels causes vascular oxidative stress and impair vaso-reactivity, which leads to inflammation, endothelial damage and consequently atherosclerosis leading to BP elevation. Hence the risk of incident hypertension was proportional to the serum ferritin level as an early predictor of the development of hypertension. Hence the estimation of the serum ferritin levels can help the medical professionals to predict early development of hypertension.

7. Source of Funding

None.

8. Conflict of Interest

None.

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