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ORIGINAL RESEARCH

A Study on Evaluation of Serum Ferritin Levels in Patients of Hypertension in A Tertiary Care Teaching Hospital

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ABSTRACT

Background: Elevation of serum ferritin levels leads to serious complications. increased serum ferritin levels lead 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.

Methods: The present study was a hospital-based observational and analytical study. The study was conducted over a period of 1 year on 200 patients. The study group comprised of 100 patients (diagnosed with hypertension), and the control group comprised of 100 (age and gender matched) individuals. The levels of serum ferritin were analysed by the Sandwich ELISA method.

Results: The results of the present study show that, the mean value of serum ferritin was 272.21±35.67 ng/ml in study group and 69.33 ± 28.12 ng/ml in control group. The mean SBP was 149.65±14.77 mm/Hg in study group and 106.12 ± 6.93 mm/Hg in control group. The mean DBP was 93.4± 9.12 mm/Hg in study group and 70.31±3.62 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 elevated serum ferritin level was significantly associated with the incidental risk for hypertension. This finding suggests the value of elevated ferritin level as an early predictor of hypertension.

Keywords: Serum Ferritin, hypertension

INTRODUCTION

Ferritin is the cellular storage protein for iron. The principal factor that controls cellular ferritin contentis the intracellular level of free iron. Thus, Ferritin provides a means of storing the metal within cells in available safe manner. Ferritin is also present at a very low concentration in blood but the role of circulating Ferritin is still unknown. However, serum ferritin has been used widely in clinical medicinechiefly as an indicator of body iron stores. It is an acute-phase reactant involved in cellular defense against oxidative stress and inflammation along with transferring

In addition, serum ferritin is known to reflect systemic inflammation as an acute phase reaction, and several studies have shown that inadequately elevated iron stores may adversely affect healthoutcomes. Several studies have shown that elevated serum ferritin levels are associated with insulin resistance and type 2 diabetes[1], metabolic syndrome[2], dyslipidemia[3], and obesity[4].

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Recent animal experiments have suggested that iron overload contributes to the development of vascular diseases by promoting thrombosis after arterial injurysupported by study done by Day et al, 2003[5].High serum Ft on admission of acute stroke patients (within 24 to 48 h after stroke onset) was reported to predict a bad prognosis supported by Davalos et al, 1994, 2000[6]; Erdemoglu and Ozbakir, 2002[7] studies, implicating that increase in body iron stores before stroke onset can aggravate the cytotoxicity of brain ischemia

The relationship between serum ferritin and hypertension has not been well established in women and has been controversial, but reports have found an association between serum ferritin and hypertension in men. The elevated levels of blood pressure are positively correlated to the risk of stroke and coronary heart disease. In addition to coronary heart disease and stroke the complicationsof elevated BP levels include heart failure, renal impairment, peripheral vascular diseases, visual impairment and retinal haemorrhages[8]. Worldwide, it has been reported that around 7.5 million deaths or 12.8% of the total of all annual deaths occur due to high blood pressure[9].

There has been not much study about the relationship between serum ferritin and hypertension in our geographical location according to the working type. We conducted this research to explore the association between serum ferritin levels and hypertension.

MATERIALS AND METHODS

This study was conducted over a period of one year on 200 patients after getting permission from institutional ethics committee. Clinically confirmed cases of hypertension in the age group of 20-65 years were included in the study. The study sample constituted of 100 individuals (diagnosed with hypertension) and the control group constituted of 100 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. Hypertension was defined as a systolic blood pressure (SBP) greater than or equal to 140 mmHg, or a diastolic blood pressure (DBP) greater than or equal to 90 mmHg. Those taking antihypertensive medications were also considered to have hypertension regardless of blood pressure values.

General characteristics of participants were derived by a descriptive method for continuous variables and Chi-square test for categorical variables after data weighting. Data were analyzed using SPSS 20.0.

RESULT

In our study among 200 patients, in 100 patients with hypertension, 37 (18.5%) were overweight and 30 were obese (15%); In our study six patients (3%) had diabetes mellitus or glucose intolerance and seven (3.5%) had increased uric acid. There were no significant differences between men and women regarding BMI and glucose.

In our study population, serum ferritin and prevalence of hyperferritinemia were significantly greater in the hypertensive than in the control group. A similar trend was observed in both men and women although the between-group differences were not statistically significant. In the whole hypertensive patient group, serum ferritin significantly correlated with blood pressure levels - (r value -0.50, P, 0.001),

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.

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Table 1: Comparison between groups

PARAMETERS	**STUDY GROUP**	**CONTROL GROUP**	**P VALUE**
SBP	151.45 ± 14.77	109.88 ± 5.43	<0.001
DBP	95.56 ± 7.46	72.43 ± 2.97	<0.001
SERUM FERRITIN	293.27 ± 219.84	72.23 ± 29.75	<0.001

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). and also, positive correlation between the serum ferritin levels (ng/ml) and diastolic blood pressure (mm/Hg) an were statistically significant (p=<0.05).

Table 2: Correlation to serum ferritin

Paremeters	**Mean value**	**Serum ferritin**	**R Value**	**P Value**
SBP	151.45 ±14.77	293.27 ± 219.84	- 0.28	<0.05
DBP	95.56±7.46	293.27 ± 219.84	- 0.50	<0.05

DISCUSSION

This cross-sectional study was conducted to determine the association between serum ferritin level and hypertension. This study showed the risk of having hypertension was greater in patients whose serum ferritin levels increased.

Some studies have consistently reported significantassociations between hypertension and serum ferritin level in men [10]. Two of these studies were cross-sectional studies [11], and others werelongitudinal studies[12]. According to a recent study, 7104 healthy Korean men who visited a healthexamination center were surveyed to assess hypertension incidence from 2005 to 2010[13]. Anelevated serum ferritin level was found to be independently associated with the incidental risk for hypertension.

There is insufficient evidence to explain the underlying mechanism. There are several possible mechanisms about the association between serum ferritin levels and hypertension. One of which includes the development of atherosclerosis by elevated ferritin levels. Inadequately elevated bodyiron as oxidative stress can convert less reactive free radicals to more reactive hydroxyl radicals. Elevation of ferritin causes oxidative stress, which leads to inflammation, endothelial damage and consequently atherosclerosis. Atherosclerosis process follows after, and then risk of hypertension can be increased. Experimental studies have shown that hypertension is associated with oxidative stress that can contribute to endothelial dysfunction and leads to BP elevation [13].

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. These results suggest thatserum ferritin have an effect on the development ofhypertension. Further studies are needed to evaluatethe underlying mechanism.

There are some limitations in this study. First, our study population very low. Second, our study was conducted cross-sectionally, so it was insufficient to clarify the causative relationship between serum ferritin levels and development of hypertension.

CONCLUSION

The present study showed that the elevated serum ferritin levels were positively correlated to the hypertension because the elevated ferritin levels increase with increase in BP. Increased ferritin

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levels causes vascular oxidative stress and impairs 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.

REFERENCES

1. Jiang R, Manson JE, Meigs JB, Ma J, Rifai N, Hu FB. Body iron stores in relation to risk of type 2 diabetes in apparently healthy women. JAMA. 2004;291:711–7.
2. Lee BK, Kim Y, Kim YI. Association of serum ferritin with metabolic syndrome and diabetes mellitus in the south Korean general population according to the Korean National Health and nutrition examination survey 2008. Metabolism. 2011;60:1416– 24.
3. Yoo KD, Ko SH, Park JE, Ahn YB, Yim HW, Lee WC, et al. High serum ferritin levels are associated with metabolic risk factors in non-obese Korean young adults: Korean National Health and nutrition examination survey (KNHANES) IV. Clin Endocrinol. 2012;77:233–40.
4. Williams MJ, Poulton R, Williams S. Relationship of serum ferritin with cardiovascular risk factors and inflammation in young men and women. Atherosclerosis. 2002;165:179–84.
5. Day, SM, Duquaine, D, Mundada, LV, Menon, RG, Khan, BV, Rajagopalan, S, Fay, WP (2003) Chronic iron administration increases vascular oxidative stress and accelerates arterial thrombosis. Circulation 107:2601–2606
6. Davalos, A, Castillo, J, Marrugat, J,Fernandez-Real, JM, Armengou, A, Cacabelos, P, Rama, R (2000) Body iron stores and early neurologic deterioration in acute cerebral infarction. Neurology 54:1568–74
7. Erdemoglu, AK, Ozbakir, S (2002) Serum ferritin levels and early prognosis of stroke. Eur J Neurol 9:633–7
8. World Health Organisation; 2010. Global status report onnon communicable diseases 2010. 3. Tabrizi JS, Sadeghi-Bazargani H, Farahbakhsh M, Nikniaz L, Nikniaz
9. Prevalence and Associated Factors of Prehypertension and Hypertension in Iranian Population: The Lifestyle Promotion Project (LPP). PLOS ONE. 2016;11(10).
10. Suwazono Y, Dochi M, Sakata K, Okubo Y, Oishi M, Tanaka K, et al. Shift work is a risk factor for increased blood pressure in Japanese men: a 14-year historical cohort study. Hypertension. 2008;52:581–6.
11. Puttonen S, Härmä M, Hublin C. Shift work and cardiovascular disease—pathways from circadian stress to morbidity. Scand J Work Environ Health. 2010;36(2):96–108.
12. Hansson GK. Inflammation, atherosclerosis, and coronary artery disease. N Engl J Med. 2005;352:1685–95
13. Knutsson A. Health disorders of shift workers. Occup Med. 2003; 53:103–8