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Original Article

Association of Hypertension with serum ferritin level in local population of Mirpurkhas.

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Abstract:

Introduction: Raised serum ferritin causes disturbance in the body metabolism leading to dyslipidemia, adiposity and hypertension.

Objective: is to investigate the ferritin level and its possible effects on arterial blood pressure of local population.

Methodology: This prospective, case control study was conducted during June 2017 to November 2018 in the Department of Physiology, Muhammad Medical College; Mirpurkhas Sindh after taking approval from ethical review committee. 50 hypertensive patients without any comorbid of either genders and an equal number of healthy age and sex matched controls were included in the study. Arterial pressure was measured by mercuric sphygmomanometer using standard method while serum ferritin was estimated by ELISA.

Results: The mean age of patients was 55.2 ±11.14, and of controls was 47.12 ±14.29. The mean BMI of patients was 24.27 ±3.347 and of controls was 24.71±2.57. The difference in mean systolic blood pressure of patients (129.90 ±17.2mmHg), and controls (118.80 ±11.89) was statistically significant (p=0.013). Similarly, the mean diastolic blood pressure of patients was 83.60 mmHg ± 10.83 and for controls it was 76.40 ±7.63 with significant difference (p=0.025). The difference between mean serum ferritin level of patients (226.32±99.83) and controls (224.0 ±69.62) was also statistically significant (p=0.001). The correlation coefficient was statistically significant showing r value of ferritin with diastolic pressure r = 0.14, with systolic pressure r = 0.16 and with hypertension (both systolic and diastolic pressures) r = 0.21.

Conclusion: This study showed significant association of Hypertension with serum ferritin.

Keywords: Ferritin, BMI, Hypertension.

Introduction:

Serum Ferritin is a reliable measure of iron stores and currently considered main surrogate markers used in daily clinical practice[1].In the cell, ferritin protein sequesters free iron and the synthesis of ferritin is increased in response to an increase in the iron availability[2]. Very high body iron stores have been associated with various pathologies, including cardiac failure, liver cirrhosis, hepatic cancer and diabetes[3, 4]. It is evident from published studies that serum ferritin concentration had a significant positive correlation with blood glucose, serum triglycerides and serum apolipoprotein B concentration, while inversely correlated with serum HDL cholesterol, all of which are components of insulin resistance syndrome[5]. Similarly, cross-sectional studies suggest that elevated ferritin levels have been associated with hypertension, dyslipidemia, elevated fasting insulin, blood glucose

and central adiposity[6]. Iron catalyzes the formation of reactive oxygen species through the Fenton and Haber –Weiss reactions[7]. Free radicals cause lipid peroxidation, leading to the modification of LDL at the molecular level, facilitating its deposition and leading to the formation of atherosclerotic plaque.[8, 9] In a study conducted by Hong Ryoo et al it was found that elevated serum ferritin level is independently associated with the incidental risk for hypertension. This finding suggests the value of elevated ferritin level as an early predictor of hypertension.[10, 11] It is obvious that the prevalence of hypertension in male increases according to incremental increases in ferritin levels and serum ferritin levels can also be used as a subsidiary indicator to evaluate hypertension on high variant blood pressure checks.[12] Some investigations revealed that high serum ferritin in obese premenopausal women is associated with the main obesity-related comorbidities like type2 diabetes mellitus and hypertension; these findings reflect complex nature of obesity as it interacts with different metabolic pathways in the genesis of its comorbidities.[13] Aung et al explained that an increase in both serum GGT and ferritin levels in the hypertensive group suggests that oxidative stress is involved in the pathophysiology of essential hypertension, and they might rather act as prooxidants in hypertension[14] Li et al found that in the early stage of hypertensive Intracranial hemorrhage, early use of angiotensin-converting enzyme inhibitor (ACEI), angiotensin receptor blocker (ARB), and calcium channel blocker (CCB) can improve the prognosis of patients, whose mechanism may be related to the improvement of level of serum inflammatory factors and Serum P and Serum Ferritin.[15]

Objective:

Although several studies have shown an association between ferritin and hypertension only a few studies have investigated the longitudinal relationship between them. Thus, we plan to evaluate the incidental risk for hypertension association with baseline ferritin level in local population of Mirpurkhas.

Methodology:

This prospective case control study was conducted during June 2017 to November 2018 at the Department of Physiology, Muhammad Medical College; Mirpurkhas Sindh in collaboration with the Medical OPD Civil Hospital Mirpurkhas. After approval from the ethical review committee; informed written consent was taken from all participants; the demographic, clinical and laboratory data recorded on a prescribed Performa. After clinical evaluation hypertensive patients of either gender were included in the study. However, patients with other medical comorbidities like diabetes mellitus, tuberculosis, heart failure, myocardial infarction, renal and hepatic disorders were excluded. For estimation of serum ferritin levels, 5ml of blood sample was obtained from each subject after taking aseptic measure and centrifuged for 5 minutes at 3000 rounds per second and estimated on ELISA (enzyme-linked immunosorbent assay). The arterial blood pressure was measured with mercuric sphygmomanometer by auscultatory method using standard procedure. The Data was analyzed by using SPSS version 15 for descriptive statistics and comparison of means. To identify correlation, Pearson correlation test was used.

Results:

Among 100 subjects enrolled for the study, 50 were patients of both genders and 50 were normal healthy controls. The age of patients ranged between 31-72 with mean 55.2 ±11.14, while for controls ranged between 31-82 with mean 47.12±14.29. The height of patients ranged between 1.49-1.83 meters with mean height of 1.67 ±0.09 meters and of controls ranged between 1.46-1.73 with mean 1.623±0.08. The weight of patients ranged between 47-96 kg with mean 65.5 kg ±11.68; for control body weight ranged between 50 -79 with mean 64.32±8.54. The BMI of patients ranged between 16.95-33.74 with mean 24.27 ± 3.347 and of controls ranged between 19.52-29.27 with mean 24.71±2.57. The duration of disease was ranged between 1.0-25.0 years with mean 6.68± 5.26 as shown in table 1.

The systolic blood pressure of patients was ranged between 100-170 mmHg with mean systolic pressure 129.90 mmHg ±17.2 and of controls ranged between 100-150 mmHg with mean 118.80 ±11.89 and difference was statistically significant (p=0.013). The diastolic blood pressure ranged between 70-110 mmHg with mean 83.60 mmHg ±10.83. The diastolic pressure in control group was ranged between 65-100 mmHg with mean 76.40±7.63 (p=0.025). Serum ferritin level of patients was ranged between 46-450 ng/ml with mean 226.32±99.83 and of controls ranged between 112-360 ng/ml with mean 224.0 ±69.62 (p= 0.001) as

shown in table 2.

The correlation of hypertension was analyzed by applying Pearson's correlation test and was found that the Diastolic pressure is significantly correlated with serum ferritin with correlation coefficient r=0.142. Similarly, it was observed that systolic pressure has a significant correlation with serum ferritin with correlation coefficient 0.157. This shows that hypertension with both systolic and diastolic pressures is strongly correlated with serum ferritin with statistically significant correlation coefficient r=0.211 as shown in table 3.

Table: 1 Descriptive Statistics of Demographic Data

	Study Group n=50		Control Group n=50	
Variables	Range	Mean ± SD	Range	Mean ± SD
Height (meters)	1.49-1.83	1.67 ±0.09	1.46-1.73	1.623±0.08
Weight (kgs)	47-96	65.5 ±11.68	50-79	64.32±8.54
Body Mass Index (kg/m^2)	16.92-33.74	24.27±3.37	19.52-9.27	24.708±2.57
Duration of Disease (years)	1.0-25.0	6.68±5.26		

Table: 2 Descriptive Statistics of Arterial Pressures and Serum Ferritin Level N=100 .

	Study Group n=50		Control Group n=50		
	Range	Mean ± SD	Range	Mean ± SD	P value
Systolic Blood Pressure (mmHg)	100-170	129.90±17.02	100-150	118.80±11.89	0.01
Diastolic Blood Pressure (mmHg)	70-110	83.60 ±10.83	65-100	76.40 ±7.63	0.02
Serum Ferritin ng/ml	46-450	226.32±99.83	112-360	224.0 ±69.62	0.001

Table: 3 Correlation coefficient *(r)* of serum ferritin with cardiovascular variables N=100

Variables	Control Group (r) n=50	Case Group (r) n=50
Systolic pressure mmHg	-0.174	0.157
Diastolic pressure mmHg	-0.301*	0.142
Hypertension	-0.338*	0.211

Discussion:

To find association between serum ferritin and hypertension, 50 hypertensive subjects were compared to 50 healthy subjects. It is evident from various studies that the ferritin concentration is an independent risk factor for cardiovascular disease including hypertension. Low levels of ferritin reduce the cardiovascular risk factors, especially acute myocardial infarction[3, 16]. This is in agreement with our study that serum ferritin has a significant association with hypertension. The high serum ferritin levels have been associated with various pathologies including hypertension. In our study, we found raised serum ferritin level among hypertensive subjects as compared to normotensive controls with significant difference. This is in agreement with a study by Moe et al showing that Iron represents a paradox for human health by being essential for many important biological processes, but also having an ability to be harmful in many different processes [14]. High blood pressure (BP) results from either an increased output of blood by the heart or, most often, increased resistance to blood flow in the arteries. In those with high blood pressure, the heart must work harder than normal to force blood through the arteries[10].This was in agreement with our study showing statistically significant p values for both systolic and diastolic hypertension as compared to normal healthy controls.

Previous studies in Pakistan suggest that lipid peroxidation may play a role in the etiology of the pre-eclampsia[17]. Iron and hematin proteins, play important role as catalysts of lipid peroxidation in tissues. Iron promotes lipid peroxidation perhaps facilitated by the hyperlipidemia consequent to tremendous mobiliza-

tion of lipid that occur in the latter half of human gestation[18,19]. The study by Zafar et. Al showed that the mean ferritin is correlated with systolic pressure and diastolic pressure[20]**.** All these studies are in line with our study and show some association between serum ferritin levels and systolic and diastolic hypertension.

Conclusion:

This study showed significant association of hypertension both systolic and diastolic with serum ferritin. Mere regular cheek of serum ferritin may be beneficial or not is debatable as research at molecular and genetic level is still is process.

Conflict of Interest:

The authors declare no competing interest.

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