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METABOLIC SYNDROME;
SERUM FERRITIN LEVEL IN PATIENTS

1. FCPS
Associate Professor
Department of Cardiology
Liaquat University of Medical and Health Sciences, (LUMHS), Jamshoro, Pakistan
2. Dip. Card, MD (Cardiology)
Consultant Cardiologist
Liaquat University Hospital Hyderabad / Jamshoro
3. FCPS
Associate Professor
Department of Medicine
Bahria University Medical & Dental College Karachi
4. Department of Medicine
Liaquat University Hospital Hyderabad, Sindh, Pakistan
5. Department of Medicine
Liaquat University Hospital Hyderabad, Sindh, Pakistan
6. Department of Medicine
Liaquat University Hospital Hyderabad, Sindh, Pakistan
7. Department of Medicine
Liaquat University Hospital Hyderabad, Sindh, Pakistan

Correspondence Address:
Dr. Syed Zulfiquar Ali Shah
House No: 279, Doctor's Colony
Hirabad, Hyderabad, Sindh, Pakistan
zulfikar229@hotmail.com

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Dr. Syed Fasih Ahmed Hashmi[1], Dr. Mashooq Ali Dasti[2], Dr. Muhammad Sajid Abbas Jaffri[3], Dr. Syed Ali Raza[4], Dr. Shoaib Zahoor Junejo[5], Dr. Saeem Akhtar[6], Dr. Syed Zulfiquar Ali Shah[7]

ABSTRACT… Objective: To determine the frequency of raised serum ferritin level in patients with metabolic syndrome. **Design:** Case series study. **Setting:** Liaquat University Hospital Hyderabad. **Methods:** All the patients with metabolic syndrome for ≥ 01 year duration, ≥20 years of age and of either sex were recruited and entered in the study. The metabolic syndrome was detected according to the NCEP-ATP III protocol. After confirmation of metabolic syndrome, the 2cc venous blood sample was taken in a sterilize 5cc disposable syringe, labeled it and sent to laboratory for evaluation of serum ferritin levels. The data was analyzed in SPSS 16 and the frequency and percentage was calculated. **Results:** Total one hundred patients with metabolic syndrome were evaluated for serum ferritin level during the study period. The mean ±SD for age of patients with metabolic syndrome was 52.73±7.83 while the mean age ±SD of patient with raised ferritin level was 50.23±8.21. The majority patients were 30-49 age group with female predominance ($p<0.01$) and exist four component of metabolic syndrome. The ferritin was raised in 60 patients with female predominance ($p<0.04$). The mean ± SD of raised ferritin level in male and female population was 350.10±19.38 and 270.34±34.39 ($p<0.01$). **Conclusions:** The raised serum ferritin level was identified (60%) with female predominance in patients of metabolic syndrome.

Key words: Ferritin, Iron, metabolic syndrome and syndrome X.

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INTRODUCTION

The metabolic syndrome (insulin resistance syndrome, syndrome X,) consists of metabolic disturbances that lead to increased risk of cardiovascular disorders and diabetes mellitus.[1,2] The components of the syndrome are hypertriglyceridemia, central obesity, hyperglycemia, low HDL cholesterol and hypertension.[3,4]

The prevalence of metabolic syndrome in Pakistan reported by Basit A, et al was 46%,[5] while the proportion for each component of metabolic syndrome formerly reported was increase waist circumference 28%, hypertension 23.8%, hyperglycemia 4.7%, reduced HDL-C 87.6% and hypertriglyceridemia 12.5%.[6] In former studies raised ferritin levels predicted type 2 diabetes mellitus in healthy population. In previous literature, raised ferritin levels associated with dyslipidemia, hypertension, insulin resistance and raised blood sugar and central obesity.[7]The association between elevated iron stores and the metabolic syndrome, however, has been less well researched and studies. Study by Vari I, et al was the former study explored the association between transferring and ferritin with the metabolic syndrome & its components.[8]The incidence of the metabolic syndrome is increased in both gender when there is increase in iron storage.[9]

Therefore, the study was conducted to evaluate the serum ferritin level in patients with MS, as the acute phase reactant property of ferritin is the marker for CV complications in cases with metabolic syndrome, so early detection and appropriate measures to control the iron store and ferritin can save the patients from several metabolic syndrome related complications.

PATIENTS AND METHODS

The case series study was conducted at Liaquat University Hospital Hyderabad. All the patients with metabolic syndrome for ≥ 01 year duration, ≥20 years of age and of either sex were recruited and entered in the study while the patients who were known cases of chronic kidney disease, hemolytic and other hereditary anemias, cases of heart failure & thyroid hormonal disorders, knows cases of hemochromatosis and porphyrias, acute bacterial infections / sepsis, familial dyslipidemia, malignancy, pregnant ladies / women during menstruation, liver and other autoimmune disorders, the patients already on lipid lowering therapy, on beta blockers, steroids, thiazide diuretics, oral contraceptives pills, iron and folic acid therapy, immunosuppressive therapy and on hormone replacement therapy (HRT) were placed in the exclusion criteria. The detail history, clinical examination was done and specific investigations were advised for every relevant patient while the written consent was taken from every specific patient for participation in the study. The metabolic syndrome was detected according to the NCEP-ATP III protocol[10] i.e. 1. TG ≥150 mg/dL; 2. WC (≥40 inches for men and ≥36 inches for women); 3. HDL <40 mg/dL for male and <50 mg/dL for female; 4. Blood pressure ≥130/85 mm Hg and 5. FBS ≥110 mg/dL. The metabolic syndrome was diagnosed when there is existence of any ≥03 out of above 05 components. After confirmation of metabolic syndrome, the 2cc venous blood sample was taken in a sterilize 5cc disposable syringe, labeled it and sent to laboratory for evaluation of serum ferritin levels while the data was collected on pre-designed proforma. After that, the data of all patients was entered and analyzed in SPSS version 16.00. The frequency and percentage (%) was calculated for raised ferritin level in patients with MS as far as age and gender was concerned. The serum ferritin was considered raised when it was >300 ng/mL in males and >150 ng/mL in females. The mean and standard deviation (SD) was calculated for age, WC, TG, HDL, BP and FBS. The stratification was done for age, gender and components of metabolic syndrome. The chi-square test and independent sample t-test was applied on categorical and numerical variables and the statistical significance was considered on p-value ≤0.05.

RESULTS:

Total one hundred patients with metabolic syndrome were evaluated for serum ferritin level during the study period. The mean ±SD for age of patients with metabolic syndrome was 52.73±7.83 while the mean age ±SD of patient with raised ferritin level was 50.23±8.21. The age in relation to gender and serum ferritin is shown in Table-I and II while the gender in context to ferrritin level is mentioned in Table III.

		GENDER		Total
		Male	Female	
AGE	20-29	4	12	16
		11.8%	18.2%	16.0%
	30-39	5	26	31
		14.7%	39.4%	31.0%
	40-49	15	10	25
		44.1%	15.2%	25.0%
	50-59	6	12	18
		17.6%	18.2%	18.0%
	60 +	4	6	10
		11.8%	9.1%	10.0%
Total		34	66	100
		100.0%	100.0%	100.0%

Table-I. The age and gender distribution

**P-value <0.01*

		FERRITIN		Total
		Raised	Normal	
AGE	20-29	8	8	16
		13.3%	20.0%	16.0%
	30-39	25	6	31
		41.7%	15.0%	31.0%
	40-49	10	15	25
		16.7%	37.5%	25.0%
	50-59	11	7	18
		18.3%	17.5%	18.0%
	60 +	6	4	10
		10.0%	10.0%	10.0%
Total		60	40	100
		100.0%	100.0%	100.0%

Table-II. The age in context to ferritin level

**P-value <0.03*

		FERRITIN		Total
		Raised	Normal	
GENDER	Male	25	9	34
		41.7%	22.5%	34.0%
	Female	35	31	66
		58.3%	77.5%	66.0%
Total		60	40	100
		100.0%	100.0%	100.0%

Table-III. The gender distribution in relation to ferritin level

**P-value <0.04*

The mean ±SD of waist circumference, serum triglycerides and HDL-C for whole population was 48.41±5.20 (male) and 49.41±7.42 (female), 204.93±6.21 (males) and 220.71±6.94 (females) and 24.53±3.21 (males) and 23.63±7.32 (females) while the systolic and diastolic blood pressure for male and female population was 160.53±10.51 and 110.43±5.42. The mean ±SD of serum ferritin in relation to sex is presented in Table-IV whereas the elevated ferritin level in context to components of metabolic syndrome is shown in Table-V.

Gender	n = 60	Serum ferritin (mean ±SD)	P-value
Male	25 (%)	350.10 ± 19.38	<0.01*
Female	35 (%)	270.34 ± 34.39	

Table-IV. The mean ±sd of serum ferritin level in both genders

**Statistically significant*

		FERRITIN		Total
		Male	Female	
Metabolic Components	Three	4	6	10
		16.0%	17.1%	16.7%
	Four	16	12	28
		64.0%	34.3%	46.7%
	Five	5	17	22
		20.0%	48.6%	36.7%
Total		25	35	60
		100.0%	100.0%	100.0%

Table-V. The components of metabolic syndrome in relation to elevated ferritin level

*P-value 0.04**

DISCUSSIONS

The present study observed that the serum ferritin level was raised in metabolic syndrome patients and also observed the relation between number of components of metabolic syndrome and plasma ferritin. There were 10 patients with 3 components of metabolic syndrome, 28 with 04 components and 22 with 05 components of metabolic syndrome.

The present study observed that serum ferritin was increasing significantly with number of components of metabolic syndrome (p=0.04). In a study conducted by Bozzini C, et al, raised serum ferritin level was independently associated with the metabolic syndrome.[11] In another study conducted by Jehn M, detected that the prevalence of the metabolic syndrome is increased in those with raised serum ferritin level and the components are directly proportional to serum ferritin.[12]

A study by Sun L, identified that elevated ferritin concentrations was also linked to risk of type 2 diabetes and metabolic syndrome independent of inflammation, obesity, adipokines and other associated risk factors and presented the major role of iron overload in metabolic disorders.[13]A study conducted by Tsimihodimos V et al noted that subjects with metabolic syndrome have increased concentration of serum ferritin as compared to control population.[14]

A former study conducted by Vari I, et al observed the association of transferring and ferritin to the metabolic syndrome & its components with female predominance, the observation is also consistent with the present study.[8] Another population based study of over one thousand middle aged men in Finland noted that blood glucose and fasting level of serum insulin were elevated in cases with raised serum level of ferritin (marker for increase iron stores).[15] Iron is a catalyst of free radical stress, and it has been reported that lipid peroxidation and free radicals plays a role in the etiology of diabetes.[16]

The pathophysiology of disease is due to

reversible oxididation and reduction, this function is important for metabolic functions, makes iron hazardous due to its property to participate in the formation of oxidant species i.e. hydroxyl radical.[17]

Thus, in our study, we observed a positive correlation between elevated iron stores (measured by serum ferritin levels) and the metabolic syndrome. The ferritin level was also correlates to the number of components of metabolic syndrome.

CONCLUSION

The present study concluded the positive association between metabolic syndrome and serum ferritin levels also with increasing number of components of the metabolic syndrome. Therefore the serum ferritin is acute phase marker of inflammatory events occurs in the pathogenesis of metabolic syndrome.

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PREVIOUS RELATED STUDY

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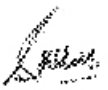
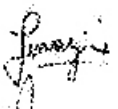
Mohammad Mohsin Rana, Muhammad Saeed Akhtar, Muhammad Badar bashir, Abaid-ur-Rehman. TYPE 2 DIABETICS COMPONENTS OF THE METABOLIC SYNDROME (Original) Prof Med Jour 13(3) 453-459 Jul, Aug, Sep, 2006.

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Dr. Syed Fasih Ahmed Hashmi	Contribution to conception and design, acquisition of data, analysis and interpretation of data.	
2	Dr. Mashooq Ali Dasti	Drafting the article and shares its expert research opinion and experience in finalizing the manuscript.	
3	Dr. Muhammad Sajid Abbas Jaffri	Contributed in conception and interpretation of data and give his expert view for manuscript designing.	
4	Dr. Syed Ali Raza	Analysis and interpretation of data, contributed in conception and shares its expert research opinion.	
5	Dr. Shoaib Zahoor Junejo	Collecting & acquisition of data.	
6	Dr. Saeem Akhtar	Collecting & acquisition of data.	
7	Dr. Syed Zulfiquar Ali Shah	Data analysis & interpretation