ORIGINAL RESEARCH

Assessment of serum peroxidase enzyme activity in obese subjects

[1]Dr. Ravi Shanker Prasad, [2]Dr. Richa Raj, [3]Dr. Alok Himanshu, [4]Dr. Sude Kumar Singh, [5]Dr. Atulya Prasad

[1,2,3]Tutor, [4]Professor and Head, Department of Biochemistry, DMCH, Laheriasarai, Darbhanga, Bihar, India
[5]Assistant Professor, Department of Anatomy, MMCH, Madhubani, Bihar, India

Corresponding author
Dr. Alok Himanshu
Tutor, Department of Biochemistry, DMCH, Laheriasarai, Darbhanga, Bihar, India

Received Date: 15 September, 2021 Accepted Date: 19 October, 2021

ABSTRACT

Background: The relationship between serum paraoxonase enzyme activity and dyslipidemia in obese individuals has received a lot of attention lately, demonstrating the interdependence of lipid profiles and enzymatic performance in the obesity milieu. The present study was conducted to assess serum paroxanase enzyme activity in obese subjects. **Materials & Methods:** 150 obese subjects of both genders were enrolled. Serum paraoxonase activity was measured using a spectrophotometric enzymatic method, and lipid profiles were determined using automated enzymatic assays. **Results:** Out of 150 patients, 85 were males and 65 were females. The mean BMI was 31.6 kg/m² in males and 33.4 kg/m² in females. The mean age was 46.3 years in males and 47.1 years in females. The mean serum paraoxonase activity was 63.9 U/L in males and 61.4 U/L in females. The difference was significant ($P < 0.05$). There were 35% male and 24% female smokers and 65% male and 76% female non- smokers.There were 29% male and 18% female drinkers and 71% male and 82% female non-drinkers. Physical activity was sedentary in 56% male and 68% females and active 44% male and 32% females. The difference was significant ($P < 0.05$). **Conclusion:** Serum paroxanase enzyme activity in obese subjects found to be lowered.

Keywords: serum paraoxonase, total cholesterol, obese

INTRODUCTION

The relationship between serum paraoxonase enzyme activity and dyslipidemia in obese individuals has received a lot of attention lately, demonstrating the interdependence of lipid profiles and enzymatic performance in the obesity milieu.[1]Paraoxonase 1 (PON1) is an HDL-associated enzyme that protects against oxidative stress and atherosclerosis. Its activity is negatively correlated with the risk of cardiovascular diseases, which are linked to dyslipidemia and obesity.[2] Dyslipidemia, a metabolic disorder characterized by elevated levels of bad cholesterol (LDL), triglycerides, total cholesterol (HDL), and low levels of good cholesterol (HDL), affects a large number of overweight individuals.[3]

This accelerates the development of atherosclerosis and other cardiovascular disorders (CVDs).The findings suggest that obese individuals may be more susceptible to dyslipidemia and cardiovascular issues due to decreased PON1 activity.[4] The PON1 enzyme is thought to be severely impacted by oxidative stress and inflammatory conditions brought on by excessive adiposity, which is why obesity is associated with decreased PON1 activity. Furthermore, studies have connected PON1 activity to lipid profiles, suggesting that negative lipid alterations, such as increased LDL and decreased HDL levels, exacerbate atherogenic profiles when PON1 activity is low.[5]Serum paraoxonase enzyme activity and dyslipidemia in obese people are related, demonstrating the importance of enzymatic activity in controlling lipid metabolism and preventing cardiovascular diseases. Further research in this field may provide helpful insights into novel therapeutic strategies to effectively manage dyslipidemia and reduce cardiovascular risk in obese patients.[6]The present study was conducted to assess serum paroxanaseenzyme activity in obese subjects.

MATERIALS & METHODS

The present study was conducted on 150 obese subjects of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. The activity level of serum paraoxonase enzyme(U/L), lifestyle behaviors, and BMI were recorded. Fasting blood samples were obtained from all participants at the beginning and end of the study period for biochemical analysis. Serum paraoxonase activity was

measured using a spectrophotometric enzymatic method, and lipid profiles were determined using automated enzymatic assays.Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 150		
Gender	**Male**	**Female**
Number	85	65

Table I shows that out of 150 patients, 85 were males and 65 were females.

Table II Assessment of parameters

Parameters	Male	Female	P value
BMI (kg/m²)	31.6	33.4	0.91
Mean age (years)	46.3	47.1	0.62
Serum Paraoxonase Activity (U/L)	63.9	61.4	0.25

Table II shows that mean BMI was 31.6 kg/m² in males and 33.4 kg/m² in females. The mean age was 46.3 years in males and 47.1 years in females. The mean serum paraoxonaseactivity was 63.9 U/L in males and 61.4 U/L in females. The difference was significant (P< 0.05).

Graph I Assessment of parameters

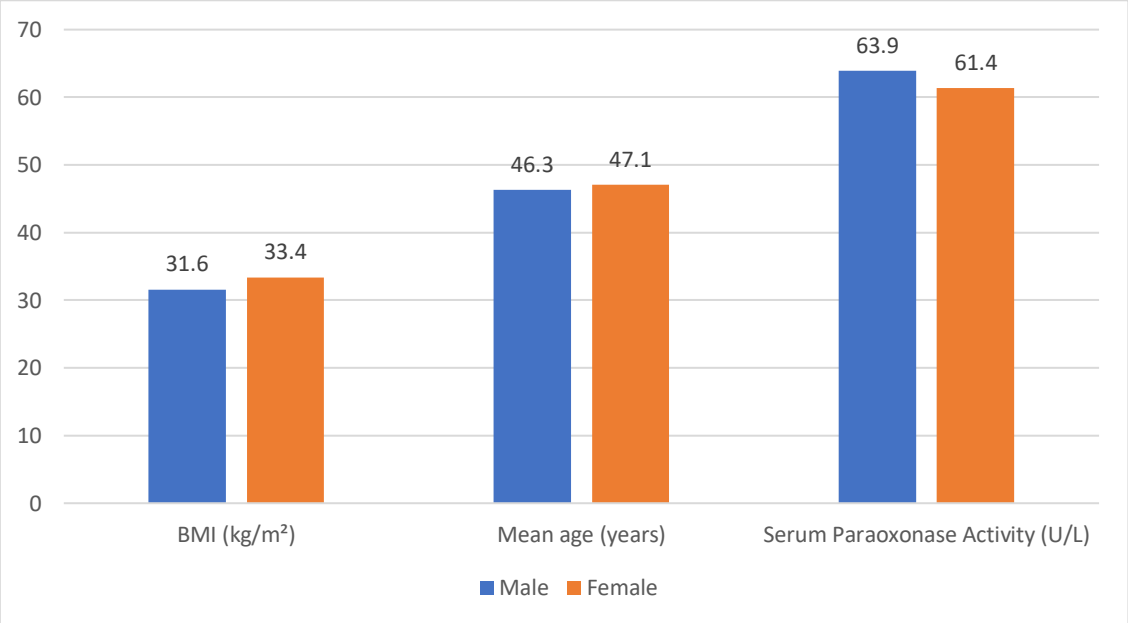

Table III Assessment of lifestyle

Parameters	Variables	Male	Female	P value
Smoking	Smokers	35%	24%	0.02
	Non- smokers	65%	76%	
Alcohol	Drinker	29%	18%	0.01
	Non- drinker	71%	82%	
Physical activity	Sedentary	56%	68%	0.74
	Active	44%	32%	

Table III shows that there were 35% male and 24% female smokers and 65% male and 76% female non-smokers.There were 29% male and 18% female drinkers and 71% male and 82% female non- drinkers. Physical activity was sedentary in 56% male and 68% females and active44% male and 32% females. The difference was significant (P< 0.05).

DISCUSSION

Obesity is associated with several alterations in the lipid metabolism, leading to changes in lipoprotein levels and composition.[7] The relative risk values for developing diabetes, hypertension, dyslipidemia, insulin resistance, dyspnea, and apnea for obese individuals are more than three.[8,9] Several studies have demonstrated an increase in oxidative stress in

obese subjects, with a higher susceptibility to lipid peroxidation of LDL isolated from obese subjects compared with healthy subjects.[10,11]The present study was conducted to assess serum paroxanase enzyme activity in obese subjects.

We found that out of 150 patients, 85 were males and 65 were females. Bharti et al[12] in their study nearly two hundred people with a body mass index (BMI) of 30 kg/m² or more, ranging in age from 18 to 65, were considered participants. Validated assays were used to quantify serum paraoxonase activity and lipid profiles. Among obese people, the study found that serum paraoxonase activity was negatively associated with the advancement of dyslipidemia over six months. The possible involvement of paraoxonase in the pathogenesis of dyslipidemia was demonstrated by the substantial correlation between decreases in paraoxonase activity and increases in LDL cholesterol and triglycerides.

We found that mean BMI was 31.6 kg/m² in males and 33.4 kg/m² in females. The mean age was 46.3 years in males and 47.1 years in females. The mean serum paraoxonase activity was 63.9 U/L in males and 61.4 U/L in females. Rosenblat et al[13]analyzed serum paraoxonase 1 (PON1) distribution among HDL and lipoprotein-deficient serum (LPDS) in atherosclerotic patients, and compared PON1 biological functions in these fractions. Serum HDL and LPDS fractions were isolated from control healthy subjects, diabetic and hypercholesterolemic patients. PON1 activities and protein in HDL/LPDS, as well as its ability to protect against lipid peroxidation and to stimulate HDL/LPDS-mediated macrophage cholesterol efflux were measured. In LPDS from controls, PON1 protein and a significant paraoxonase activity were found, whereas arylesterase and lactonase activities were substantially reduced compared to HDL, by 78% and 88%, respectively. In diabetic patients, PON1 protein and paraoxonase activity in HDL were significantly decreased by 2.8- and 1.7-fold, respectively, compared with controls' HDL. In parallel, in these patient's LPDS, PON1 protein and paraoxonase activity were markedly increased by 3.7- and 1.7-fold, respectively, compared with controls' LPDS. PON1 in HDL (but not PON1 in LPDS) significantly decreased AAPH-induced lipid peroxides formation by 33%, and increased macrophage cholesterol efflux by 31%.

We observed that there were 35% male and 24% female smokers and 65% male and 76% female non-smokers.We found that there were 29% male and 18% female drinkers and 71% male and 82% female non-drinkers. Physical activity was sedentary in 56% male and 68% females and active 44% male and 32% females. Zaki et al[14]investigated the serum paraoxonase 1 (PON1) concentration and oxidative stress markers and assess its relations with the biochemical parameters in obese adolescents.One hundred and fifty obese adolescents (range 16-18 years) and 150 healthy age- and sex-matched controls were enrolled in the study. The data were extracted from a project entitled “Obesity among Youth: Lifestyle and Genetic Factors” funded by the Science and Technology Development Fund, Egypt. Serum paraoxonase 1 (PON1), nitric oxide (NO), and malonaldehyde were measured. Anthropometry, fasting glucose, insulin concentrations, total cholesterol, high density lipoprotein–cholesterol, low density lipoprotein–cholesterol, triglycerides, systolic and diastolic blood pressure (BP) were measured. Insulin resistance was determined by Homeostasis Model Assessment of Insulin Resistance (HOMA-IR). Diagnostic accuracy of oxidative markers to identify dyslipidemia was calculated with ROC analysis.The study showed that PON1 activity was significantly lower in obese adolescents than controls. Obese adolescents had significant lower NO level and significant increased MA values as compared to controls. PON1 was negatively correlated with MAD and body mass index in obese subjects. Obese adolescents showed dyslipidemia and increased blood pressure and HOMA-IR values. PON1 had high area under the curve in ROC analysis for identifying dyslipidemia in obese subjects.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that serum paroxanase enzyme activity in obese subjects found to be lowered.

REFERENCES

1. Kota SK, Meher LK, Kota SK, Jammula S, Krishna SV, Modi KD. Implications of serum paraoxonase activity in obesity, diabetes mellitus, and dyslipidemia. Indian journal of endocrinology and metabolism. 2013 May;17(3): 402.
2. Mackness MI, Harty D, Bhatnagar D, Winocour PH, Arrol S, Ishola M, et al. Serum paraoxonase activity in familial hypercholesterolaemia and insulin-dependent diabetes mellitus. Atherosclerosis 1991;86:193-9.
3. Sentí M, Tomás M, Fitó M, Weinbrenner T, Covas MI, Sala J, et al. Antioxidant paraoxonase 1 activity in the metabolic syndrome. J Clin Endocrinol Metab2003;88:5422-6.
4. Van Gaal LF, Vertommen J, De Leeuw IH. The in vitro oxidizabilitiy of lipoprotein particals in obese and non-obese subjects. Atherosclerosis 1998;137 (suppl):S39-44.
5. Tack CJ, Smits P, Demacker PN, Stalenhoef AF. Troglitazone decreases the proportion of small dense LDL and increases the resistance of LDL to oxidation in obese subjects. Diabetes Care 1998;21:796-9.
6. Prazny M, Skrha J, Hilgertova J. Plasma malondialdehyde and obesity: Is there a relationship? Clin Chem Lab Med 1999;37:1129-30.
7. Halliwell B, Gutteridge JMC, Cross CE. Free radicals, antioxidants, and human disease: Where are we now? J Lab Clin Med 1992;119:598-620.
8. Maniscalco M, de Laurentiis G, Zedda A, Faraone S, Giardiello C, Cristiano S, et al. Exhaled nitric oxide in severe obesity: Effect of weight loss. Respir PhysiolNeurobiol2007;156:370-3.

9. Mather KJ, Lteif A, Steinberg HO, Baron AD. Interactions between endothelin and nitric oxide in the regulation of vascular tone inobesity and diabetes. Diabetes 2004;53:2060-6.
10. Gruber HJ, Mayer C, Mangge H, Fauler G, Grandits N, Wilders-Truschnig M. Obesity reduces the bioavailability of nitric oxide in juveniles. Int J Obes (Lond) 2008;32:826-31.
11. Grundy SM. Hypertriglyceridemia, insulin resistance, and the metabolic syndrome. Am J Cardiol1999;83:25F-9.
12. Neha Bharti, Nisha Jha, Vibha Sushilendu, C. Selva Kumar. Association between Serum Paroxanase Enzyme Activity and Dyslipidemia in Obese Individuals. International Journal of Pharmaceutical and Clinical Research 2024; 16(3); 132-135.
13. Rosenblat M, Karry R, Aviram M. Paraoxonase 1 (PON1) is a more potent antioxidant and stimulant of macrophage cholesterol efflux, when present in HDL than in lipoprotein-deficient serum: relevance to diabetes. Atherosclerosis. 2006 Jul 1;187(1):74-e1.
14. Zaki ME, El-Bassyouni H, Kamal S, ElGammal M, Youness E. Association of serum paraoxonase enzyme activity and oxidative stress markers with dyslipidemia in obese adolescents. Indian journal of endocrinology and metabolism. 2014 May;18(3):340.