International Journal of Research in Medical Sciences
Prathibha K et al. Int J Res Med Sci. 2016 Sep;4(9):4001-4004
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20162923

Research Article

Evaluation of serum paraoxonase level and dyslipidemia in psoriasis

Prathibha K*, Aliya Nusrath, Rajeshwari A.

Department of Biochemistry, Adichunchanagiri Institute of Medical Sciences, B. G. Nagara, Nagamangala Taluq, Mandya, Karnataka 571448, India

Received: 04 July 2016
Accepted: 30 July 2016

***Correspondence:**
Dr. Prathibha K,
E-mail: prathibha.keshavamurthy@gmail.com

ABSTRACT

Background: Psoriasis is a chronic recurrent inflammatory skin disorder that is associated with oxidative stress, altered lipid metabolism and with high risk of cardiovascular events. High density lipoprotein (HDL) bound serum paraoxonase enzyme exhibits anti-atherogenic properties. It protects against the development of coronary heart disease by preventing low density lipoprotein (LDL) oxidation. The aim of our work was to evaluate the serum paraoxonase levels and dyslipidemia in psoriasis.
Methods: Present study involved 100 participants of which 50 were diagnosed cases of psoriasis and 50 were age and sex matched healthy controls, who fulfilled inclusion criteria. Serum paraoxonase (PON), and lipid profile were estimated in cases and controls. Lipid profile was estimated by using autoanalyser EM 200 and serum paraoxonase by spectrophotometric method.
Results: Patients presented risk changes in lipid profile [(increase in triglycerides ($p=0.005$), low density lipoprotein cholesterol ($p=0.009$), very low density levels ($p=0.002$) and a reduction in high density lipoprotein cholesterol ($p\leq0.001$)] which were highly significant when compared to controls. Serum paraoxonase levels was decreased in psoriasis patient compared to control which was statistically highly significant ($p= 0.001$).
Conclusions: Present data suggest that psoriasis patients must be considered as a group at risk for cardiovascular disease.

Keywords: PON, Psoriasis, Dyslipidemia, HDL, Cardiovascular disease

INTRODUCTION

Psoriasis is probably as old as mankind. Today it is a well-defined dermatological disease with genetic, environmental and immunological factors participating in etiopathogenesis.

It is a chronic inflammatory skin disease affecting 2% to 3% of white population and 0.8% - 5.6% in India.[1,2] It is a multifactorial disease since its development depends on a complex interplay of genetic and environmental factors. It is currently considered as an immune-mediated inflammatory disorder (IMID), alongside the other entities such as rheumatoid arthritis, crohn's disease or multiple sclerosis.[3]

The disease is characterized by macroscopic and corresponding microscopic skin alterations that lead to considerable impairment of quality of life of affected patients. The overall clinical course is highly variable. The symptoms may worsen, wane and occasionally go for spontaneous remission.[4]

Psoriatic patients present with an increased incidence of cardiovascular events due to dyslipidemia, higher oxidative stress. The worsening of psoriasis has been associated with enhanced oxidative stress and dyslipidemia, suggesting that the risk for cardiovascular

disease (CVD) events might be higher in severe psoriasis.[5-7]

Serum paraoxonase is a high density lipoprotein (HDL) bound enzyme exhibiting antiatherogenic properties.[8,9] This enzyme plays an important role in preventing low density lipoprotein (LDL) oxidation and is considered to protect against the development of coronary heart disease.[10] PON activity is inversely correlates with the risk of developing an atherosclerotic lesion, which contains cholesterol-loaded macrophages foam cells.[11]

Another important contributory factor in the pathogenesis of psoriasis may be altered lipid metabolism. Several reports have shown increased cardiovascular events which have resulted because of increased proatherogenic lipid profile.[12,13] Inflammation, which is a hallmark of psoriasis and drugs, which are used for treatment of psoriasis results in disturbances in lipid parameters. However there are certain studies showing conflicting results.[13,14]

Hence the present study was undertaken to assess the cardiovascular risk factors in psoriasis patients by measuring the antioxidant enzyme, serum paraoxonase, and lipid profile.

METHODS

50 clinically diagnosed cases of psoriasis patients who attended Sri Adichunchanagiri hospital and research center (SAH&RC) were included in the study. Age and sex matched healthy individuals were taken as control group. Psoriasis patients who were on only topical treatment and with PASI score of >10 were included for the study. Each gave informed consent and the study was approved by ethical and research committee of SAH and RC. The study span was over a period of 18 months. Patients with acute and chronic inflammatory conditions, diabetes, obesity, renal failure, liver failure, psychiatric disorder, smokers, alcoholics, hypertensive patients, pregnant women, children <18 years, psoriatic patients on systemic therapy and on lipid lowering agents were excluded from study. Detailed medical history and relevant clinical examination was done and data of these patients were collected.

Blood samples were collected in fasting state and were analysed for serum paraoxonase and serum lipid profile. Serum total cholesterol (TC), HDL and Triglyceride (TG) were measured by using standard kits from ERBA diagnostics on EM-200 autoanalyser. VLDL was calculated by dividing TG by five (TG/5). Low density lipoprotein (LDL) level were calculated using Friedwald's formula, LDL = TC – (HDL+TG/5). Serum Paraoxonase was measured by spectrophotometric method using p-nitro phenyl acetate as a substrate, where paraoxonase catalyzes the cleavage of p-nitro phenyl acetate resulting in the formation of phenol. The rate of formation of phenol is measured by monitoring the increase in the absorbance at 412 nm.[15,16]

Statistical analysis

Results are represented as mean ± SD. Statistical analysis was done using student "t" test and statistical significance was compared between the cases and the controls. Probability value (p) of <0.05 was considered as statistically significant. Statistical analysis was done using the statistical software: SPSS-16.

RESULTS

Mean comparisons of Basal and Salt Stimulated PON activity between two groups is shown in Table 1 and Figure 1. The mean value of both Basal and salt stimulated PON activity in psoriasis patient were decreased when compared to healthy controls and is statistically highly significant with p<0.001. Comparison of lipid profile in study groups is shown in Table 2 and Figure 2. An increase in mean values of Total cholesterol, TG, LDL, VLDL was seen in cases when compared to controls and was statistically highly significant except for total cholesterol. A statistically significant decrease was seen in HDL cholesterol in psoriasis patient as compared to healthy controls.

Table 1: Comparison of basal and salt stimulated PON activity in study groups.

Biochemical parameters	Healthy controls (mean±SD)	Psoriasis cases (mean±SD)	p value
Basal PON activity (nmol/ml/min)	72.57±9.58	63.24±13.9	<0.001**
Salt stimulated PON activity (nmol/ml/min)	82.72±8.87	72.5±15.17	<0.001**

**p≤0.01; Highly significant.

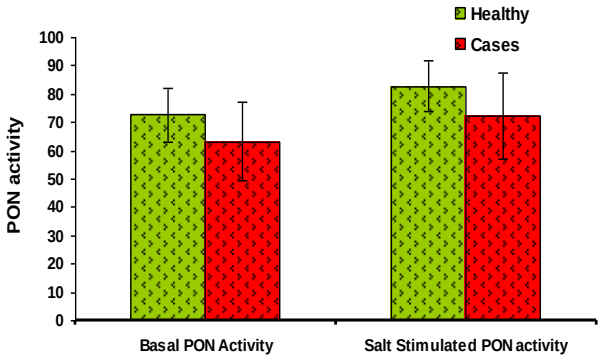

Figure 1: Mean values of basal and salt stimulated PON activity in study groups.

Table 2: Comparison of lipid profile in study groups.

Biochemical parameters	Healthy controls (mean±SD)	Psoriasis cases (mean±SD)	p value
Total cholesterol (mg/dl)	190.18±23.08	197.84±36.19	0.210
TG (mg/dl)	123.14±22.73	141.1±32.75	0.002**
HDL (mg/dl)	45.9±4.79	32.52±7.07	<0.001**
LDL (mg/dl)	119.65±20.13	137.1±33.84	0.002**
VLDL (mg/dl)	24.63±4.55	28.22±6.55	0.002**

**p≤0.01; Highly significant.

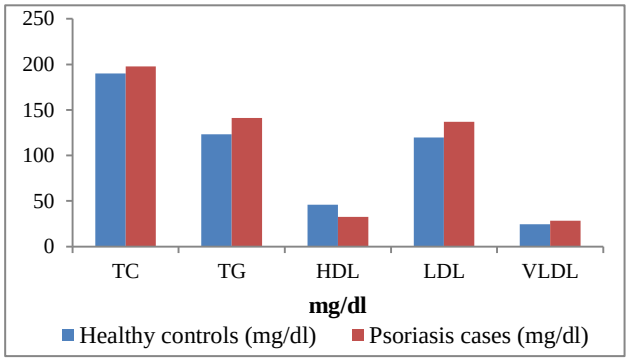

Figure 2: Comparison of lipid profile in study groups.

DISCUSSION

Psoriasis is characterized by hyper proliferation and abnormal differentiation of epidermal keratinocytes, prominent endothelial vascular changes in dermis and infiltration by neutrophils and T lymphocytes.[2]

Psoriasis is associated with multiple cardiovascular risk factors, which are strongly seen in severe psoriasis than in mild psoriasis.[13] The inflammatory process in psoriasis may also affect the arterial wall, promoting the atherosclerotic process.[17] Changes of lipoproteins during inflammation may be the potential mechanisms that account for the epidemiologic observations linking inflammatory conditions and atherosclerosis. But the research data concerning the levels and role of lipid profiles in patients with psoriasis are contradictory.[3,5,8]

Increased oxidative stress is another important contributory factor for CVD risk in psoriasis. Human serum PON is an esterase enzyme which has lipophilic antioxidant characteristics and plays an important role in decreasing oxidative stress. PON1 in particular hydrolyzes pro-inflammatory oxidized lipids and ruins their potentially atherogenic characteristics.[9,15] This enzyme is synthesized in liver and is closely associated with HDL.[18] It is one of the major antioxidant enzymes present in the plasma that limit the accumulation of oxidized phospholipids in plasma lipoproteins.[18] Many studies have indicated that PON1 prevent lipid-peroxide accumulation on LDL and acts in tandem with platelet-activating factor acetyl hydrolase and lecithin-cholesterol acyl transferase to protect LDL from oxidative modification.[19]

Few studies reports that PON1decreases the inflammatory responses in body by preventing the oxidation of LDL.[9,20] There is a significant decrease in PON1 activity during acute phase reaction, thus PON1 associated HDL fails to prevent LDL from oxidation.[9,20] Navab and his colleagues have also reported that a failure of HDL to protect LDL from oxidation in patients with coronary atherosclerosis which they proposed was due to low serum PON1 activity despite relatively normal HDL levels.[20] Significant lower PON activities have been reported in psoriasis patients when compared with age and gender controls. Therefore PON activity may reflect the antioxidant and anti-atherogenic capacity.

In the present study, significant decrease in PON activity in psoriatic patients when compared to controls (p<0.001) was observed. From the above findings psoriatic patients can be considered as risk group for development of atherosclerosis.

This decrease in PON activity plays a pivotal role in the atherosclerotic process, as HDL-PON activity modulates the susceptibility of LDL to atherogenic modifications such as glycation and homocysteinylation.[21,22]

Multiple risk factors of CVD like hypertension, obesity, diabetes mellitus including abnormal lipids and lipoprotein profile have been associated with psoriasis. Dyslipidemia seems to be related to the severity of psoriasis as it occurs more frequently in patients presenting with large areas of body affected with lesions.

Study by Rocha-Pereira P et al demonstrated increased in apoB and Lp(a) levels and other lipid profile parameters except HDL.[13] The study also reported increased oxidative stress.[13] Another study compared HDL and triglyceride levels in male and females which showed increase of above lipids in male psoriatic patient than females who had an additional decrease in HDL phospholipid levels.[14]

The present study echoes similar findings as that of Vanizor Kural B et al who concluded that psoriasis patients, as high risk group for atherosclerosis.[12]

CONCLUSION

Psoriasis is associated with an increased cardiovascular risk profile. The results of this study indicate that impairment of antioxidant system and abnormal lipid metabolism may play a role in the pathogenesis and progression of psoriasis and its related complications. Hence patients with psoriasis should be considered as a

group at risk for CVD and must be evaluated at the earliest.

ACKNOWLEDEGMENTS

Authors are thankful to Dr. Aliya Nusrath, Professor and Head, Department of Biochemistry, Adichunchanagiri Institute of Medical Sciences, BG Nagara for her constant support during the research work. Authors would sincerely thanks to Dr. Rajeshwari A., Associate Professor, Adichunchanagiri Institute of Medical Sciences, B G Nagara for her continuous guidance during the research.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Aldona P, Anna MS, Grazyna C, Jacek CS. Lipid disturbances in psoriasis: An update. Mediators of Inflammation. 2010.
2. Pavithra K, Karunakaran M, Aparna P, Ragunath S. Disorders of keratinization. In Valia RG, Ameet RV. IADVL Textbook of Dermatology, vol 1. 3rd ed. Mumbai, Bhalani publishing house. 2008;1021-56.
3. Traub M, Marshall KMS. Psoriasis – Pathophysiology, Conventional, and alternative approaches to treatment. Alternative Medicine Review. 2007;12(4):319-30.
4. Balato A, Balato N, Megna M, schiattarella M, Lembo S, Ayala F. Pathogenesis of psoriasis: The role of pro – inflammatory cytokines produced by keratinocytes. DOI: 10.5772/26163.
5. Nijsten T, Wakkee M. Complexity of the association between psoriasis and comorbidities. Journal of Investigative Dermatology. 2009;129(7):1601-3.
6. Pietrzak A, Janowski K, Janowski K. Psoriasis and heart. Something new under the sun. Giornale Italiano di Dermatologia e Venereologia. 2006;141(5):457-63.
7. Pietrzak A, Lecewicz-Toruń B, Kądziela-Wypyska G. Changes in the digestive system in patients suffering from psoriasis. Annales Universitatis Mariae Curie-Sklodowska. Sectio D. 1998;53:187-94.
8. Blatter MC, James RW, Messmer S, Barja F, Pometta D. Identification of a distinct human high-density lipoprotein subspecies defined by a lipoprotein-associated protein, K-45. Identity of K-45 with paraoxonase. Eur J Biochem. 1993;211(3):871-9.
9. Watson AD, Berliner JA, Hama SY, La Du BN. Protective effect of high density lipoprotein associated paraoxanase. Inhibition of the biological activity of minimally oxidized low density lipoprotein. J Clin In-vest. 1995;96(6):2882-91.
10. Sanghera DK, Saha N, Aston CE, Kamboh MI. Genetic polymorphism of paraoxonase and the risk of coronary heart disease. Arterioscler Thromb Vasc Biol. 1997;17(6):1067-73.
11. Mackness B, Davies GK, Turkie W. Paraoxonase status in coronary heart disease: are activity and concentration more important than genotype? Arterioscler Thromb Vasc Biol. 2001;21(9):1451-57.
12. Vanizor KB, Orema A, Cimsit G, Yandi YE, Calapoglu M. Evaluation of atherogenic tendency of lipids and lipoprotein content and their relationships with oxidant and antioxidant system in patients with psoriasis. Clin Chim Acta. 2003;328(1-2):71-82.
13. Rocha-Pereira P, Santos-Silva A, Rebelo I, Figueiredo A, Quintanilha A, Teixeira F. Dyslipidemia and oxidative stress in mild and in severe psoriasis as a risk for cardiovascular disease. Clin Chim Acta. 2001;303(1-2):33-9.
14. Pietrzak A, Lecewicz-Torun B. Activity of serum lipase [EC 3.1.1.3] and diversity of serum lipid profile in psoriasis. Med Sci Moniy. 2002;8(1):CR9-CR13.
15. Nagane NS, Ganu JV. Lipid profile and serum paraoxonase1 activity in CRF patient's pre and post hemodialysis. Al Ameen J Med Sci. 2011;4(1):61-8.
16. Menys VC, Liu Y, Durrington PN. Semiautomated method for determination of serum paraoxonase activity using paraoxon as substrate. Clinical chemistry. 2006;52(3):453-7.
17. Toker A, Kadi M, Yildirim AK, Aksoy H, Akcay F. Serum Lipid Profile Paraoxonase and Arylesterase activities in Psoriasis. Cell biochemistry and function. 2009;27:176-80.
18. Cabana GV, Rearddon CA, Feng N, Neath S, Lukens J, Getz GS. Serum paraoxonase; Effect of the apolipoprotein composition of HDL and the acute phase response.
19. Mackness B, Durrington PN. High density lipoprotein, its enzyme and its potential to influence lipid peroxidation. Atherosclerosis. 1995;115:243-53.
20. Navab M, Hama SY, Van Lanten BJ, Fonarow GC, Cardinez CJ, Castellani LW. Mildly oxidized LDL induces an increased apolipoprotein j /paraoxonase ratio. J Clin Invest. 1997;99:2005-19.
21. Ferretti G, Bacchetti T, Marchionni C, Caldarelli L, Curatola G. Effect of glycation of high density lipopro-teins on their physicochemical properties and on paraoxonase activity. Acta Diabetol. 2002;38:163-69.
22. Ferretti G, Bacchetti T, Marotti E, Curatola G. Effect of homocysteinylation on human high-density lipoproteins: a correlation with paraoxonase activity. Metabolism. 2003;52:146-51.

Cite this article as: Prathibha K, Nusrath A, Rajeshwari A. Evaluation of serum paraoxonase level and dyslipidemia in psoriasis. Int J Res Med Sci 2016;4:4001-4.