Research Article

Evaluation of serum paraoxonase level and dyslipidemia in psoriasis

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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=0.001)] 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. 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. 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.

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.\textsuperscript{5,7}

Serum paraoxonase is a high density lipoprotein (HDL) bound enzyme exhibiting antiatherogenic properties.\textsuperscript{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.\textsuperscript{10} PON activity is inversely correlates with the risk of developing an atherosclerotic lesion, which contains cholesterol-loaded macrophages foam cells.\textsuperscript{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.\textsuperscript{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.\textsuperscript{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 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.\textsuperscript{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.

![Figure 1: Mean values of basal and salt stimulated PON activity in study groups.](image-url)
Table 2: Comparison of lipid profile in study groups.

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

**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.7

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 PON1 decreases the inflammatory responses in body by preventing the oxidation of LDL.3,20 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 psoriatic patients when compared to 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 LDL 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.

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