Metabolic Syndrome in psoriasis: a hospital based cross-sectional study in Central India

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Background: Psoriasis is a chronic immune-mediated inflammatory disorder, reported to be associated with obesity, dyslipidaemia and diabetes via common immunological mechanisms. All of these components ultimately increase the risk of metabolic syndrome and cardiovascular morbidities. Aims and Objectives: To assess the association of Metabolic Syndrome (MS) and its components in patients suffering from psoriasis. To study the relationship between the duration and severity of psoriasis and MS. Materials and Methods: A hospital based cross-sectional study was conducted involving 100 adult patients with psoriasis and 100 controls. All participants were evaluated for psoriasis and the components of MS. Psoriasis was categorized as mild, moderate and severe based on Psoriasis Area and Severity Index (PASI) (<7, 8–12 and >12, respectively). In all patients and controls, body mass index was calculated, blood pressure and waist circumference were measured and fasting blood sugar and lipid profile were estimated. Results: In the present study, a higher prevalence of MS in Psoriasis patients than in controls (38% v/s 23%) was observed. Psoriatic patients had higher prevalence of hypertension (36% v/s 14%). It can be concluded that association of MS and psoriasis is independent of the type, duration and severity of psoriasis. Conclusion: The present study suggests that subjects with psoriasis present a greater risk of MS and should trigger a higher clinical suspicion for their co-existence. Psoriasis is a systemic disease with significant morbidity and mortality. This study emphasizes the critical need for providers to screen psoriasis patients for early diagnosis and treatment of associated MS.

Keywords: Psoriasis, Metabolic Syndrome, Hypertension, Obesity, Diabetes
Introduction

Psoriasis is a common, chronic, immune-mediated inflammatory and proliferative condition of the skin characterized by red, scaly, sharply demarcated, indurated plaques, present particularly over extensor surfaces and scalp[1]. The prevalence varies from 0.1% to 3% across geographical regions of the world, greatest in northern colder climates [2] [3]. In India, it varies from 0.84% to 5.6% in different studies [4]. The disease is characterized by T cell-mediated hyperproliferation of keratinocytes and inflammatory processes based on a complex genetic background [5-7]. Psoriasis has been reported to be associated with metabolic disorders including obesity, dyslipidaemia and diabetes [8-11]. MS is a clustering of several medical conditions such as central obesity, arterial hypertension, glucose intolerance, high serum triglycerides and low high-density lipoprotein (HDL) levels (4).

It has been recognized as a pro-inflammatory, prothrombotic state associated with elevated levels of C-reactive protein (CRP), interleukin (IL)-6, and plasminogen activator inhibitor (PAI)-1 [12]. This ymellitus. The prevalence of MS varies according to the studied population as it suffers influence of genetics, aging, sedentary behaviour and diet. [13]. Metabolic syndrome (MS) and psoriasis share certain common immunological mechanisms. The exact mechanism for this interaction remains uncertain but the link between them may be the effects of pro-inflammatory cytokines and adipocytes on glucose regulation, lipid status, and endothelial function. The present study is undertaken to evaluate more about the epidemiological and clinical profile of psoriasis and to assess its association with MS.

Materials and Methods

Study duration: Across sectional study was conducted over a period of two years between Nov 2015 and Nov 2017 at a Tertiary Care Hospital in Central India.

Inclusion criteria: All clinically diagnosed cases of psoriasis with age more than 18 years, attending Dermatology outpatient department were included.

Exclusion criteria: Pregnant women, patient on current treatment and those who received cyclosporine, acitretin, psoralens and methotrexate at least one month before enrolment were excluded.

Data collection: After obtaining the informed consent, detailed history was taken including duration of the disease, alcohol intake, smoking, anyconcomitant illness, intake of medications in the past for psoriasis or other illnesses. Clinical examination was conducted, which included the anthropometric measurements and blood pressure. Fasting Plasma Glucose (FPG) and Fasting Lipid Profile (FLP) were done in all patients. Similar examination and investigations were done in controls as well Under current guidelines, revised in 2005 by the National Heart, Lung, and Blood Institute (NHLBI) and the American Heart Association (AHA), MS was diagnosed when a patient has at least 3 of the following 5 conditions:

- FPG ≥100 mg/dL (or receiving drug therapy for hyperglycaemia)
- Blood Pressure (BP) ≥130/85 mm Hg (or receiving drug therapy for hypertension)
- Triglycerides (TG) ≥150 mg/dL (or receiving drug therapy for hypertriglyceridemia)
- High Density Lipoprotein (HDL)< 40 mg/dL in men or < 50 mg/dL in women (or receiving drug therapy for reduced HDL)
- Waist circumference ≥102 cm (40 in) in men or ≥88 cm (35 in) in women

(If Asian American, ≥90 cm (35 in) in men or ≥80 cm (32 in) in women).

Scoring systems used

- PASI: Extent of involvement was assessed using Psoriasis Area and Severity Index (PASI), a composite score from 0 to 72 that evaluates the erythema, induration, and scaling of the lesions in four body areas (head, trunk, arms and legs).

Mild psoriasis classified as a PASI between 0 - 7, moderate between 8 - 12 and severe >12.

- BMI: The Body Mass Index (BMI) was determined by weight and height calculations using the following equation:

\[
\text{BMI} = \frac{\text{weight in kg}}{\text{height in meters}^2}
\]

According to Indian guidelines, a BMI from 23 to 24.9 is overweight, a BMI greater than or equal to 25 is moderate obesity, and a BMI greater than or equal to 30 is severe obesity.

Data analysis: Frequencies, percentages, mean and standard deviation (SD) values of variables in case and control group were calculated. Categorical (Qualitative) variables (percentages and
Frequencies) were analysed using Pearson’s Chi square test.

Continuous variables were compared using unpaired t-test (normal distribution of data) and Mann-Whitney U test (non-normal distribution of data). Shapiro-Wilks test was applied to evaluate whether data follows normal distribution. Binomial logistics regression analysis was done to calculate odds ratio to determine association of Psoriasis with FPG, BP, TG, HDL and waist circumference and MS in comparison with controls.

P values <0.05 were considered statistically significant.

Data analysis was done using Statistical Package for Social Sciences (SPSS) v.21.

Results

The total of 100 patients were enrolled in the study, out of which 67 were men and 33 were women. The mean age for cases and controls were 41.60 years and 42.08 years respectively. There was no significant difference between cases and controls for age and sex distribution. (Table 1)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case (n=100)</th>
<th>Control (n=100)</th>
<th>Statistical Test</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>41.60±13.70</td>
<td>42.08±13.97</td>
<td>t-test value= 0.245</td>
<td>0.806 (&gt;0.05) Not Significant</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (n)</td>
<td>67</td>
<td>69</td>
<td>Chi-square test= 0.092</td>
<td>0.762 (&gt;0.05) Not Significant</td>
</tr>
<tr>
<td>Female (n)</td>
<td>33</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes(n)</td>
<td>15</td>
<td>23</td>
<td>Chi-square test= 2.079</td>
<td>0.149 (&gt;0.05) Not Significant</td>
</tr>
<tr>
<td>No (n)</td>
<td>85</td>
<td>77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes(n)</td>
<td>06</td>
<td>13</td>
<td>Chi-square test= 2.079</td>
<td>0.149 (&gt;0.05) Not Significant</td>
</tr>
<tr>
<td>No (n)</td>
<td>94</td>
<td>87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI(Kg/m2)</td>
<td>22.93±4.2</td>
<td>21.92±4.4</td>
<td>t-test value= 1.565</td>
<td>0.119 (&gt;0.05) Not Significant</td>
</tr>
<tr>
<td>(Mean±SD)</td>
<td>70</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[No significant difference between cases and controls for age, sex distribution, smoking status, alcohol status and BMI.]

Smoking, alcohol consumption and BMI: There was no significant difference between cases and controls for smoking status (P=0.149), alcohol status (P=0.149) and BMI (P=0.119). (Table 1)

MS in cases and controls- The prevalence of MS was significantly higher in cases than controls (38/100 vs 23/100: P=0.022) (Table 2)

Hypertension- Hypertension was found to be significantly more common in cases than controls (36/100 vs 14/100: P=0.000) (Table 2)

FPG, TG, HDL, Waist Circumference- There was no significant difference between cases and controls for FPG (P=0.874), TG (P=0.885), HDL (P=0.479) and Waist circumference (P=0.883). (Table 2)

Table-2: The distribution of clinical and laboratory findings in cases and controls

<table>
<thead>
<tr>
<th>Findings</th>
<th>Case (n=100)</th>
<th>Control (n=100)</th>
<th>Odds Ratio(95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting blood glucose (≥100 mg/dl)</td>
<td>Yes (n)</td>
<td>27</td>
<td>0.95(0.51-1.77)</td>
<td>0.874 (&gt;0.05) Not significant</td>
</tr>
<tr>
<td></td>
<td>No (n)</td>
<td>73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood pressure ≥130/85 mm Hg</td>
<td>Yes (n)</td>
<td>36</td>
<td>3.45(1.72-6.94)</td>
<td>0.000 (&lt;0.05) Significant</td>
</tr>
<tr>
<td></td>
<td>No (n)</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triglycerides ≥150 mg/dl</td>
<td>Yes (n)</td>
<td>41</td>
<td>1.04(0.59-1.83)</td>
<td>0.885 (&gt;0.05) Not significant</td>
</tr>
<tr>
<td></td>
<td>No (n)</td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL &lt; 40 mg/dl in men or &lt; 50 mg/dl in women</td>
<td>Yes (n)</td>
<td>51</td>
<td>1.22(0.70-2.13)</td>
<td>0.479 (&gt;0.05) Not significant</td>
</tr>
<tr>
<td></td>
<td>No (n)</td>
<td>49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist circumference ≥90 cm (35 in) in men or ≥80 cm (32 in) in women</td>
<td>Yes (n)</td>
<td>36</td>
<td>0.96 (0.54-1.70)</td>
<td>0.883 (&gt;0.05) Not significant</td>
</tr>
<tr>
<td></td>
<td>No (n)</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolic syndrome</td>
<td>Present (n)</td>
<td>38</td>
<td>2.05 (1.11-3.80)</td>
<td>0.022 (&lt;0.05) Significant</td>
</tr>
<tr>
<td></td>
<td>Absent (n)</td>
<td>62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-3: Association between different types of psoriasis and MS

<table>
<thead>
<tr>
<th>Types of psoriasis</th>
<th>Metabolic syndrome</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic plaque</td>
<td>28 (37.3)</td>
<td>75 (100.0)</td>
</tr>
<tr>
<td>Erythrodermic</td>
<td>2 (100.0)</td>
<td>2 (100.0)</td>
</tr>
<tr>
<td>Guttate</td>
<td>00 (0.0)</td>
<td>3 (100.0)</td>
</tr>
<tr>
<td>Palmoplantar</td>
<td>06 (50.0)</td>
<td>12 (100.0)</td>
</tr>
<tr>
<td>Scalp</td>
<td>02 (25.0)</td>
<td>08 (100.0)</td>
</tr>
<tr>
<td>Total</td>
<td>38 (38)</td>
<td>100 (100.0)</td>
</tr>
</tbody>
</table>

Chi-square test value= 6.423, df=4, P value= 0.170 (>0.05), Not significant

[Presence or absence of MS was not associated with type of psoriasis]
Obesity and psoriasis- No correlation was found between type of psoriasis and obesity (P=0.804) (Table 5)

PASI- According to PASI score out of 100 cases - 59/100 had mild psoriasis (PASI ≤ 7), 16/100 had moderate psoriasis (PASI = 8 to 12), and 25/100 had severe psoriasis (PASI > 12).

Severity of Psoriasis and MS- No correlation was found between severity of psoriasis and MS (P=0.504). (Table 6)

Discussion

A direct correlation between severity of psoriasis and the prevalence of obesity, dyslipidemia and hyperhomocysteinaemia has been reported in psoriatic patients [14,15] suggesting that skin changes (inflammation) caused by psoriasis have a direct role in determining these risk factors. Psoriasis has also been found to be associated with relevant cardiovascular risk factors [16].

The concomitant occurrence of dyslipidemia, glucose intolerance, obesity and hypertension constitute the MS, which has been similarly defined by the WHO, the NCEP ATP III and the EGIR [17,18].

Mallbriset al. in 2006 discussed the metabolic disorders in patients with psoriasis and psoriatic arthritis [19]. In the same year, Sommer et al. showed that MS was more prevalent in psoriasis patients [10]. Since then, there have been many studies from various parts of the world showing the same findings [20,21].

In this study it was found that prevalence of MS is present in 38% of psoriatic patient as compared to 23% of controls which shows MS is significantly higher in psoriatic patients compared with controls (P=0.022). Similar results were found in Indian studies done by Madanagobalaneet al. (44% cases vs 30% controls, P=0.025) [22], Nisa & Quazi [23], Khunger N et al [24] & Prathapet al [25].

Studies by Gisondiet al (37.8% cases vs 23.3% controls had hypertriglyceridemia, P=0.001 and 18% cases vs 21.2% controls had low HDL, P=0.2) [20], Neimann et al [11], Takahashi H et al [21], Madanagobalaneet al. [22], Nisa & Quazi [23], Khunger N et al [24] demonstrated that a dyslipidemic profile consisting of either increased levels of TG or decreased levels of HDL cholesterol is exhibited by patients with psoriasis.
In contrast to these studies, our findings show that TG level ≥ 150 (41% cases vs 40% controls, OR=1.04, P=0.885) and HDL level <40 for males & <50 for females (51% cases vs 46% controls, OR=1.22, P=0.479) do not support the association of dyslipidemia with psoriasis. The present study supports the findings of Ilkin Z et al (45.2% cases vs 39.3% controls had hypertriglyceridemia, P=0.340 and 43.5% cases vs 32.9% controls had low HDL, P=0.082), Prathap et al [25], Mehta NN et al [27].

The present study observed no correlation between DM II/high FPG >100 mg% (27% cases vs 28% controls, OR=0.95, P=0.874) with psoriasis which was consistent with the results of Gisondi et al (19.2% cases vs 20.9% controls, P=0.6) [20], Khunger N et al [24], Prathap et al. [25]. On the other hand, Qureshi, A. et al [9], Neimann et al [11], Takahashi H et al [21], Madanagobalaneet al. [22], Nisa & Quazi, Khunger N et al [24], Ilkin Z et al [26], Mehta NN et al [27], Ghiasi M et al [28]. In contrast, Gisondi et al (40.8% cases vs 39.5% controls, P=0.7) [20], Prathap et al [25] found no correlation between psoriasis & hypertension. There are conflicting reports regarding the duration of disease and severity of psoriasis with MS. It was observed that no association was present between severity of psoriasis & MS. Similar observations were seen by Gisondi et al (no difference in prevalence of MS in patients with PASI score lower or higher than 10, 30.1% vs 29.4% respectively, p=0.9) [20], Takahashi H et al [21], Madanagobalaneet al [22], Niza & Qazi [23].

In contrast, Sommer et al [10], Prathap et al [25], Langan S Met al [36] observed that MS is significantly more prevalent in patients who have moderate and severe psoriasis. The present study observed no association between presence or absence of MS with duration of psoriasis which is consistent with the findings of Madanagobalaneet al [22]. Contrary to this, study by Gisondi et al (longer duration of disease in cases having MS 18.1±16.1 years as compared to cases not having MS 13.3±12.0 years) [20], Niza & Qazi [23], Prathap et al [25] has shown a positive association between longer duration of psoriasis and MS. It was also observed that presence or absence of Metabolic Syndrome was not associated with type of psoriasis (Chi-square test value= 6.423, df=4, P value= 0.170 (>0.05), Not significant).

**Conclusion**

In the present study, an association between psoriasis and the presence of MS independently of psoriasis severity, alcohol & smoking habit have been confirmed. The hypothesis that obesity can favour psoriasis needs to be addressed in prospective studies. It can be suggested that all patients with psoriasis should be encouraged to correct aggressively their modifiable cardiovascular risk factors, in particular, metabolic syndrome. It is also suggested that patients with psoriasis should be assessed for the concomitant presence of diseases, such as ischemic heart disease, hypertension, DM and obesity.
The present findings also have important clinical implications. First, a diagnosis of psoriasis should trigger a high clinical suspicion and investigation for a potential coexistence of the metabolic syndrome. If present, the syndrome needs to be recognized as a potential risk factor for CV disease and more life threatening than psoriasis given the serious associated complications[37].

**Limitation**

This is the first study on the association of MS in Central India patients with psoriasis. Although the sample may not represent the whole country but it gives an idea of co-morbidities of psoriasis.

The present study has several limitations. As it is a cross-sectional study which does not allow the direction of the association to be ascertained. Secondly, the study is conducted in Central India and the population analyzed may not be representative of the entire country.

**What does this study add to existing knowledge?**

Some studies have been previously done to speculate the association between Psoriasis and MS. In the present study, there was also an assessment of the association of Psoriasis with individual components of MS, which gives a finer idea of the association of both these conditions.

**Author’s contributions**

- **Dr. Surendra Singh Bhati**: Principal investigator, Data collection, Data analysis
- **Dr. Akhil Shah**: Co-investigator, Data collection
- **Dr. Subhash Chaudhary**: Data Collection
- **Dr. Saket Kumar**: Data collection
- **Dr. Anushtha Tomar**: Data collection
- **Dr. Shubhang Jain**: Data collection

**Reference**


02. Baker H. Psoriasis a review. Dermatol. 1975;150(1)16-25. [Crossref]

03. Linden KG, Weinstein GD. Psoriasis- current perspectives with an emphasis on treatment. Am J Med. 1999;107(6)595-605. DOI: 10.1016/S0002-9343(99)00284-3 [Crossref]

04. Bedi TR. Clinical profile of psoriasis in North India. Indian J Dermatol Venereol. 1995;61(4)202-5. [Crossref]


07. Griffiths TW, Griffiths CEM, Voorhees JJ. Immuno-pathogenesis and immunotherapy of psoriasis. Dermatol Clinics. 1995;13(4)739-49. [Crossref]


12. Ridker PM, Buring JE, Cook NR, Rifai N. C-reactive protein, the metabolic syndrome, and risk of incident cardiovascular events- an 8-year follow-up of 14719 initially healthy American women. Circulation. 2003;107(3)391-7. doi: 10.1161/01.cir.0000055014.62083.05 [Crossref]


23. Nisa N, Qazi MA. Prevalence of metabolic syndrome in patients with psoriasis. Indian J Dermatol Venereol Leprol. 2010;76(6)662-5. doi: 10.4103/0378-6323.72462 [Crossref]


25. Prathap P, Asokan N, Manjula VD. A case control study to determine the association of psoriasis with metabolic syndrome in a tertiary care centre. IJSRP. 2014;4(5)1-4. [Crossref]

27. Mehta NN, Azfar RS, Shin DB, Neimann AL, Troxel AB, Gelfand JM. Patients with severe psoriasis are at increased risk of cardiovascular mortality- cohort study using the General Practice Research Database. Eur Heart J. 2010;31(8)1000-6. doi: 10.1093/eurheartj/ehp567 [Crossref]


35. Das UN. Is angiotensin-II an endogenous pro-inflammatory molecule?. Med Sci Monit. 2005;11(5)RA155-162. [Crossref]
