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Research Article
Metabolic

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 forpsoriasis 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

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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 yumellitus. 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 betweenNov 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 Dermatologyoutpatient 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 - 12andsevere >12.

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

BMI = weight in kg/square of height in meters.

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 circum-ference 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 -1: Descriptive statistics of cases and controls.

Characteristics	Case (n=100)	Control (n=100)	Statistical Test	P Value
Age (years) (Mean±SD)	41.60±13.70	42.08±13.97	t-test value= 0.245	0.806 (>0.05) Not Significant
Sex				
Male (n)	67	69	Chi-square test= 0.092	0.762 (>0.05) Not Significant
Female (n)	33	31		
Smoking				
Yes(n)	15	23	Chi-square test= 2.079	0.149 (>0.05) Not Significant
No (n)	85	77		
Alcohol				
Yes(n)	06	13	Chi-square test= 2.079	0.149 (>0.05) Not Significant
No(n)	94	87		
BMI(Kg/m2) (Mean±SD)	22.93±4.70	21.92±4.44	t-test value= 1.565	0.119 (>0.05) Not Significant

[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 forFPG (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

Findings	Case (n=100)	Control (n=100)	Odds Ratio(95% CI)	P Value
Fasting blood glucose (≥100 mg/dl)				
Yes (n)	27	28	0.95(0.51-1.77)	0.874 (>0.05) Not significant
No (n)	73	72		
Blood pressure ≥130/85 mm Hg				
Yes (n)	36	14	3.45 (1.72-6.94)	0.000 (<0.05) significant
No (n)	64	86		
Triglycerides ≥150 mg/dl				
Yes (n)	41	40	1.04 (0.59-1.83)	0.885 (>0.05) Not significant
No (n)	59	60		
HDL < 40 mg/dl in men or < 50 mg/dl in women				
Yes (n)	51	46	1.22 (0.70-2.13)	0.479 (>0.05) Not Significant
No (n)	49	54		
Waist circumference ≥90 cm (35 in) in men or ≥80 cm (32 in) in women				
Yes (n)	36	37	0.96 (0.54-1.70)	0.883 (>0.05) Not Significant
No (n)	64	63		
Metabolic syndrome				
Present (n)	38	23	2.05 (1.11-3.80)	0.022 (<0.05) Significant
Absent (n)	62	77		

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

Types of psoriasis	Metabolic syndrome		Total n (%)
	Present n (%)	Absent n (%)	
Chronic plaque	28 (37.3)	47 (62.7)	75 (100.0)
Erythrodermic	2 (100.0)	00 (0.0)	2 (100.0)
Guttate	00 (0.0)	03 (100.0)	3 (100.0)
Palmoplantar	06 (50.0)	06 (50.0)	12 (100.0)
Scalp	02 (25.0)	06 (75.0)	08 (100.0)
Total	38 (38)	62 (62)	100 (100.0)
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]

Table-4: Association between duration of psoriasis and ms

Duration of psoriasis	Metabolic syndrome			Mann-Whitney U statistics	P value
	Present (n=38)	Absent(n=62)	Over all (n=100)		
Years (Mean±SD)	7.70±9.54	5.16±6.18	6.13±7.69	1080.500	0.487 (>0.05) Not Significant

[Presence or absence of MS was not associated with duration of psoriasis]

Table -5: Association between different types of psoriasis and obesity (bmi scores)

Types of psoriasis	Obesity (BMI scores)					Total n (%)
	Underweight n (%)	Normal n (%)	Over weight n (%)	Moderate obesity n (%)	Severe obesity n (%)	
Chronic plaque	14 (18.7)	29 (38.7)	09 (12.0)	17 (22.7)	06 (8.0)	75 (100.0)
Erythrodermic	00 (0.0)	01 (50.0)	01 (50.0)	00 (0.0)	00 (0.0)	2 (100.0)
Guttate	00 (0.0)	02 (66.7)	00 (0.0)	01 (33.3)	00 (0.0)	3 (100.0)
Palmoplantar	00 (0.0)	06 (50.0)	02 (16.7)	03 (25.0)	01 (08.3)	12 (100.0)
Scalp	00 (0.0)	03 (37.5)	02 (25.0)	03 (37.5)	00 (0.0)	08 (100.0)
Total	14 (14.0)	41 (41.0)	14 (14.0)	24 (24.0)	07 (7.0)	100 (100.0)
Chi-square test value= 11.091, df=16, P value= 0.804 (>0.05), Not significant						

[Obesity was not associated with type of psoriasis]

Table-6: Association between severity of psoriasis (according to PASI) and MS

Severity of psoriasis	Metabolic syndrome		Total n (%)
	Present n (%)	Absent n (%)	
Mild	24 (40.7)	35 (59.3)	59 (100.0)
Moderate	04 (25.0)	12 (75.0)	16 (100.0)
Severe	10 (40.0)	15 (60.0)	25 (100.0)
Total	38 (38.0)	62 (62.0)	100 (100.0)
Chi-square test value= 1.370, df=2, P value= 0.504 (>0.05), Not significant			

[Presence or absence of MS was not associated with severity of psoriasis]

Type of psoriasis- Presence or absence of MS was not found to be associated with type of psoriasis (*P=0.170*). (Table 3)

MS and duration of psoriasis- Presence or absence of MS was not associated with duration ofpsoriasis(P=0.487). (Table 4)

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], Neimannet 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 TG level ≥ 150 (41% cases vs 40% controls OR=1.04, P=0.885) & HDL level <40 for males &<50 for females (51% cases vs 46% controls OR=1.22 P=0.479) does not support 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), Prathapet al [25], Mehta NN et al [27].

The present study observed no correlation between risk of 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 Gisondiet al (19.2% cases vs 20.9% controls, P=0.6)[20], Khunger N et al [24], Prathapet al. [25]. On the other hand, Qureshi, A. et al [9], Neimannet al [11], Takahashi H et al[21], Madanagobalaneet al. [22], Nisa and Quazi [23], Ilkin Z et al [26], Mehta NN et al [27], Ghiasi, M.et al [28], Azfar RS et al [29] reported a significantly higher prevalence of impaired FPG levels in psoriatic patient as compared to controls.

Although obesity is reported more frequent among psoriatic patients, BMI and waist circumference were not found significantly higher in psoriatic patients [abdominal obesity ≥90 cmin females and ≥100 cm in females (36% cases vs 37% controls, OR=0.96, P=0.883)], these results were consistent with the findings of Ilkin Z et al (73% cases vs 83.6% controls)[26].

In contrast to our findings,studiesdone by Gisondiet al (57.1% cases vs 47.6% controls, P=0.01) [20], Madana-gobalaneetal. [22], Nisa and Quazi [23], Khunger N et al[24] & Prathapet al [25] reported significantly higher prevalence of increased waist circumference in psoriatic patients. MS is a strong predictor of cardiovascular diseases, diabetes and stroke and significantly increases the risk of cardiovascular mortality compared with the individual factors [30,31]. In Western Europe the prevalence of MS is similar to the U.S.A. ranging from 15% to 35% [32] in developing countries the prevalence of MS is lower, but recent epidemiological studies are registering a rapid increase [33].

The link between psoriasis and hypertension may be related to the increased levels of angiotensinconverting enzyme, endothelin-1 (ET-1) and rennin in patients with psoriasis.[44,45] It was also observed that higher prevalence hypertension ≥ 130/85 mm of Hg (36/100 vs 14/100 OR=3.45, P=0.000) which is in accordance with studies done by Qureshi A. et al[9], Sommer et al[10], Neimannet al [11], Takahashi H et al [21], Madanago-balaneet 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 Gisondiet al (40.8% cases vs 39.5% controls P=0.7) [20], Prathapet 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 Gisondiet 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], Prathapet al [25], Langan SMet 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 Madanago-balaneet al [22]. Contrary to this, study by Gisondiet 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], Prathapet 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 assessmentof the association of Psoriasis with individual components of MS, which gives a finer ideaof 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

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