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Original Article

Association between psoriasis, diabetes mellitus, hypertension and obesity

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ABSTRACT

Problem statement: Psoriasis affects up to three percent of the global population. The study was conducted to find the association of hyperglycaemia, hypertension and obesity with psoriasis. **Methods:** In this collaborative study conducted at a tertiary care teaching hospital in eastern India, 40 persons suffering from psoriasis, diagnosed at the Dermatology Outpatients, were compared with 40 analogous non-psoriatic patients recruited from Medicine Outpatients. **Results:** Among the psoriasis participants 27.50 percent of cases and 12.50 percent of controls had higher fasting blood glucose level [$\chi^2 = 2.813$, P value = 0.0935] with overall male predominance. Significantly higher number of cases (35%) had post-prandial blood glucose value (>140 mg/dl) than controls (15.00%) [$\chi^2 = 4.267$, P value = 0.038]. Similarly, significantly higher number of cases (35.00%) had glycated haemoglobin value more than control group (15.00%) [$\chi^2 = 4.267$, P value = 0.0388]. Systolic blood pressure was higher in psoriatic groups (25.00%) compared to controls (20.00%) [$\chi^2 = 0.287$, P value = 0.592]; diastolic blood pressure was also higher in cases (27.50%) than in control (22.50%) [$\chi^2 = 0.267$, P value = 0.606]. Body Mass Index was higher in 32.50 percent in cases and 52.50 percent in control groups. Waist circumference was more than 90 for 42.85 percent male and >80 for 36.84 percent female psoriatic patients and in controls it was 12.50 percent and 31.25 percent male and female respectively. **Conclusion:** In our study it was observed that psoriatic patients had higher concentrations of fasting glucose, post-prandial glucose, glycated haemoglobin percentage and higher waist circumference.

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1. Introduction

Psoriasis is a chronic multifactorial immune mediated inflammatory disorder of skin affecting one to three percent of the global population and there were associated obesity, cardiovascular disease, diabetes mellitus and metabolic syndrome.^{1–3} In several epidemiological studies obesity had been associated with severe psoriasis and was reported about twice as frequently among psoriasis patients as in the general population.^{4–5} The role of the adipocytes for development of insulin resistance associated with dyslipidemia, hypertension, and premature heart disease is well known. Obesity is considered as one of the major risk factors for the development of psoriasis and improvement was observed after reduction of weight.⁶ Other research groups concluded that psoriatic patients had associated higher prevalence of cardiovascular risk factors of diabetes⁷ and hypertension.⁸ Several studies showed that patients with psoriasis carried an increased risk of developing comorbidities related to the metabolic syndrome⁹ that included arterial hypertension, obesity and abnormalities in lipid and glucose metabolism.

The study was conducted with the objectives to the study to find association of fasting and post-prandial blood glucose and glycated haemoglobin levels, hypertension and obesity with psoriatic population compared to the non-psoriatics.

2. Methods

This hospital based case control study was conducted in the department of Dermatology and Medicine, and Biochemistry in M.G.M. Medical College & Lions Seva Kendra Hospital, Kishanganj, Bihar during one year. Necessary clearance was obtained from Institutional Ethical Committee.

2.1. Study approach

All the consecutive psoriatic patients attending the Dermatology Outpatients department during the days of data collection, according to case definition, constituted the sample size. Thus, 40 psoriasis patients from Dermatology and 40 non-psoriatic patients were recruited from Medicine Outpatients department to make the total sample of 80. The study was conducted in two working days per week during the whole study period.

2.2. Data collection tool

A predesigned, pretested, semi-structured questionnaire (in local vernacular) was used to collect the data relating to the psoriasis. The data collection tool was developed at the Institute with the assistance from the faculty members, statistician and experts in the field.

The pilot study was carried out at the out patients department among comparable participants after pre-testing some of the questions from the interview schedule and modified in the questionnaire to make it custom-made for the study.

2.2.1. Case definition

Psoriasis was defined as a chronic immune mediated inflammatory disease with the erythematous papules forming plaques and loose micaceous scaling.¹⁰

2.2.2. Inclusion criteria

All the participants presenting with the morphological variants of psoriasis with or without joint involvement, whether pre-treated or untreated, were included in the study.

2.2.3. Exclusion criteria

The drug-induced psoriasiform lesions, psoriatic arthropathy without skin involvement, nail psoriasis without skin involvement, generalized pustular psoriasis without any history of psoriatic plaque, sebo-psoriasis and in cases of non-consent.

2.3. Data collection technique

Direct interview of the eligible study participants were carried out by the principal investigator and the treatment sheets were reviewed. All the participants were explained about the purpose of the study after duly explaining the procedures in their local languages along with the scope of future intervention, if necessary. They were assured that the information collected would be kept confidential and would be used only for academic purpose and not for their interventions. They were ensured strict confidentiality, and then informed consent was obtained from each of the participants before the total procedure. The participants were given the options not to participate in the study, if they wanted. Then only the detailed demographic records were recorded.

2.4. Anthropometric measurements

Weight of the study participants were measured in standing posture. A calibrated and standardized mechanical weighing scale was used to measure weight with a precision of 0.1 kg. Height was measured by a World Health Organization approved wall-mounted height measuring scale with a precision of 0.1 cm.

According to these two measurements, measurement of obesity was assessed by calculating the BMI, waist circumference. Body mass index (BMI) was calculated as weight (in kg)/height² (in meters). According to Indian guidelines, BMI from 23 to 24.9 as overweight, BMI greater than or equal to 25 as obese was considered in this study as operational definitions.¹¹ The waist circumference was measured by placing the measuring tape snugly around the abdomen at the level of the iliac crest. A waist circumference of more than 90 cm for men and 80 cm for women was considered to be abdominal obesity.¹¹

Blood pressure was measured by mercury sphygmomanometer in sitting posture. Systolic blood pressure of 140 or more and diastolic blood pressure of more than 90 mm of Hg was considered in this study as operational definitions for hypertension.¹²

2.5. Biochemical parameters

Blood samples were collected in Fluoride containing vials for fasting and post-prandial (PP) plasma glucose estimation, EDTA vials were used for glycated haemoglobin estimation.

Table 1 – Distribution of plasma glucose and glycated haemoglobin levels.

Age group	Case (n = 40)			Control (n = 40)		
	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)
1–10	0 (0.00)	3 (7.50)	3 (7.50)	0 (0.00)	0 (0.00)	0 (0.00)
11–20	2 (5.00)	4 (10.00)	6 (15.00)	0 (0.00)	0 (0.00)	0 (0.00)
21–30	3 (7.50)	1 (2.50)	4 (10.00)	4 (10.00)	1 (2.50)	5 (12.50)
31–40	8 (20.00)	6 (15.00)	14 (35.50)	0 (0.00)	2 (5.00)	2 (5.00)
41–50	5 (12.50)	3 (7.50)	8 (20.00)	7 (17.50)	9 (22.50)	16 (40.00)
51–60	2 (5.00)	2 (5.00)	4 (10.00)	5 (12.50)	3 (7.50)	8 (20.00)
61–70	1 (2.50)	0 (0.00)	1 (2.50)	4 (10.00)	1 (2.50)	5 (12.50)
71–80	0 (0.00)	0 (0.00)	0 (0.00)	4 (10.00)	0 (0.00)	4 (10.00)
Total	21 (52.50)	19 (47.50)	40 (100.00)	24 (60.00)	16 (40.00)	40 (100.00)
Fasting blood glucose (mg/dl)						
High	6 (15.00)	5 (12.50)	11 (27.50)	4 (10.00)	1 (2.50)	5 (12.50)
>110 mg/dl						
Normal	15 (37.50)	14 (35.00)	29 (72.50)	20 (50.00)	15 (37.50)	35 (87.50)
>110 mg/dl						
Total	21 (52.50)	19 (47.50)	40 (100.00)	24 (60.00)	16 (40.00%)	40 (100.00)
Post-prandial blood glucose (mg/dl)						
High	7 (17.50)	7 (17.50)	14 (35.00)	4 (10.00)	2 (5.00)	6 (15.00)
>140 mg/dl						
Normal	14 (35.00)	12 (30.00)	26 (65.00)	20 (50.00)	14 (35.00)	34 (85.00)
>140 mg/dl						
Total	21 (52.50)	19 (47.50)	40 (100.00)	24 (60.00)	16 (40.00)	40 (100.00)
Glycated haemoglobin (percent)						
>6%	8 (20.00)	6 (15.00)	14 (35.00)	4 (10.00)	2 (5.00)	6 (15.00)
4 to 6%	13 (32.50)	13 (32.50)	26 (65.00)	20 (50.00)	14 (35.00)	34 (85.00)
Total	21 (52.50)	19 (47.50)	40 (100.00)	24 (60.00)	16 (40.00)	40 (100.00)

Glucose estimation was done by Enzymatic GOD-POD method¹⁹ End Point, by using the kit from M/S Accurex; Biological reference value 70–110 mg/dl – fasting, 90–140 mg/dl – post prandial. Glycated Haemoglobin was estimated by Ion Exchange Resin Method¹³ by using kit of M/S Diazyme; Biological reference value 4–6 percent.

2.6. Statistical analysis

The collected data were thoroughly screened and entered into Excel spreadsheets and were analysed. Using SPSS version 11.0 for windows proportions, and significance tests was done.

3. Results

Psoriasis was higher among males in our study population; maximum affected participants belonged to the fourth decade and minimum in the seventh decade (Range 7 and 65 years, Mean 35.20 ± 15.27 SD years).

High fasting blood glucose levels were observed in 27.50 percent of cases and 12.50 percent of controls with overall male predominance. [$\chi^2 = 2.813$, $d.f. = 1$, p value = 0.0935]. Significantly higher number of psoriatic participants (35.00%) had PP blood glucose value more than 140 mg/dl than the controls (15.00%). [$\chi^2 = 4.267$, $d.f. = 1$, p value = 0.038]. Similarly, significantly higher number of psoriatic participants (35.00%) had glycated haemoglobin value more than six percent than in control group (15%) [$\chi^2 = 4.267$, $d.f. = 1$, p value = 0.0388] [Table 1].

Systolic blood pressure was noted to be higher in psoriatic groups (25.00%) than in controls (20.00%) [$\chi^2 = 0.287$, $d.f. = 1$, p

value = 0.592] and diastolic blood pressure was also higher in psoriatic groups (27.50%) than in control (22.50%) [$\chi^2 = 0.267$, $d.f. = 1$, p value = 0.606]. In both the times the difference was not significant. BMI was higher in 32.50 percent in cases and 52.50 percent in controls [Table 2].

Waist circumference more than 90 cm was noted in 42.85 percent ($n = 9$) male psoriatic patients and it was more than 80 cm for 36.84 percent ($n = 7$) female psoriatic patient; in control group it was observed 12.50 percent ($n = 3$) for male and 31.25 percent ($n = 5$) for female respectively.

4. Discussion

It was observed in our study psoriasis was associated with higher fasting glucose, post-prandial glucose, glycated haemoglobin levels with higher waist circumference.

4.1. Age

In our study, the maximum psoriatic cases were noted in the fourth decade. A study done in Switzerland by Brown and Korman¹⁴ showed that the major peak of onset was in 3rd decade and a small peak was observed in the 6th decade.

Our study revealed that the majority of the patients had onset before the age of 40 years (Type 1 psoriasis). This finding conforms to the study of Buntin et al¹⁵ that showed that 75 percent were of Type 1 psoriasis. It was reported by Ejaz et al,¹⁶ that they observed the early onset of psoriasis only in 51 percent of cases with the conclusion that the age 30 years should be the demarcating age between the early and late onset of psoriasis.

Table 2 – Distribution of hypertension, gender and BMI.

	Case (n = 40)			Control (n = 40)		
	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)
Blood pressure						
Systolic ≥ 140	5 (12.50)	5 (12.50)	10 (25.00)	8 (20.00)	0 (0.00)	8 (20.00)
Systolic < 140	16 (40.00)	14 (35.00)	30 (75.00)	16 (40.00)	16 (40.00)	32 (80.00)
Total	21 (52.50)	19 (47.50)	40 (100)	24 (60.00)	16 (40.00)	40 (100.00)
Diastolic > 90	7 (17.50)	6 (15.00)	11 (27.50)	9 (22.50)	0 (0.00)	9 (22.50)
Diastolic ≤ 90	14 (35.00)	13 (32.50)	29 (72.50)	15 (37.50)	16 (40.00)	31 (77.50)
Total	21 (52.50)	19 (47.50)	40 (100.00)	24 (60.00)	16 (40.00)	40 (100.00)
Overweight/obese						
Yes	12 (30.00)	1 (2.50)	13 (32.50)	14 (35.00)	7 (17.50)	21 (52.50)
No	9 (22.50)	18 (45.00)	27 (67.50)	10 (25.00)	9 (22.50)	19 (47.50)
Total	21 (52.50)	19 (47.50)	40 (100.00)	24 (60.00)	16 (40.00)	40 (100.00)

4.2. Gender

The male:female ratio in our patient group was 21:19, Griffith et al¹⁷ however noticed that both the genders were equally affected.

4.3. Hyperglycaemia

4.3.1. Fasting blood glucose level

Fasting blood glucose was significantly higher in the cases in our study. A study conducted by Nazhatun Nisha et al¹⁸ observed significant impaired fasting plasma glucose level; 18.00 percent higher among cases versus 5.33 percent among controls (p value < 0.05). The discrepancy of relation of fasting blood glucose level with psoriatic patient between our study and their study may be explained by the fact of different profile group of our patients.

4.3.2. Post-prandial (PP) blood glucose level

Post-prandial blood glucose was high in [35.00% (n = 14)] of psoriatic group and [15.00% (n = 6)] in the control group (p value < 0.05). This finding conforms to the study of Cohen et al¹⁹ showed that diabetes mellitus was present in 13.80 percent of the patients with psoriasis as compared to 7.30 percent of the controls.

Data from large cross-sectional studies also revealed that, when compared with control subjects, the risk for diabetes mellitus rises substantially in patients with psoriasis, with a 62 percent increase in risk noted in patients with severe psoriasis.^{8,20}

Several cross-sectional studies in various settings had observed an increased prevalence of diabetes in patients with psoriasis.^{20–22}

4.3.3. Glycated haemoglobin percentage (HbA_{1c})

Glycated haemoglobin level was high among psoriatic group though we were not able to compare our data as there remains paucity of data to the horizon of our knowledge.

Our study revealed that fasting and post-prandial blood glucose concentration of psoriatic group was increased in 27.50 percent and 35.00 percent respectively. The patients from both the groups were diabetic and it was further supported by increased levels of Glycated haemoglobin level; 35 percent of our study cases had more than 6 percent glycated

haemoglobin. It may be postulated that psoriasis and diabetic mellitus have a close relation.

4.4. Hypertension

In our study, systolic blood pressure was higher in psoriatic group than in controls and diastolic blood pressure was also higher in psoriatic group. In a study done by Cohen et al¹⁹ hypertension was observed in 27.50 percent of the patients with psoriasis and in 14.40 percent of the controls (p < 0.001). Sommer et al reported that patients with psoriasis had more than threefold higher prevalence of hypertension compared to non-psoriasis.²¹ Several cross-sectional studies in various settings had also found an increased prevalence of hypertension in psoriasis.^{19,23}

4.5. Obesity and waist circumference (WC)

Increased Body mass index was observed in psoriatic group than controls in our study. In a study done by Cohen et al,¹⁹ obesity was present in 8.4 percent patients of psoriasis. Kumar et al²⁴ conducted a study showed that compared to women with updated BMI of less than 25, the multivariate relative risks (RRs) of incident psoriasis were 1.21 for a BMI of 25.0–29.9, 1.63 for a BMI of 30.0–34.9 and 2.03 for a BMI of 35.0 or greater. The researchers concluded that the combination of obesity and psoriasis is an important health care concern as both are associated with chronic inflammation, which may exacerbate the cardiovascular disease pathogenic process such as atherosclerosis.²⁵

In the present study, waist circumference in psoriatics of both genders was noted higher compared to controls. A study conducted by Kumar et al²⁴ observed higher waist circumference, hip circumference and waist-hip ratio were associated with a higher risk of psoriasis. A study by Nazhatun Nisha et al¹⁸ observed that 14.66 percent in cases and 20.66 percent in control groups WC was higher.

5. Strength of the study

There had been few available published data on psoriasis with diabetes mellitus in Indian population till date. This prompted us to conduct the present study to reveal Indian

scenario in this context. Glycated Haemoglobin percentage was also estimated in the study which was not explored other studies.

6. Limitation of our study

We had several limitations. Firstly, in our infrastructure poor establishment we could not perform the laboratory investigations viz. atherosclerotic markers i.e. homocysteine, apolipoprotein A and Lp(a), obesity markers like adiponectin, which could have helped in better prognosis of psoriasis. Secondly, our sample size was also small. Lastly, we could not rule out the influence of confounders in our hospital based control.

7. Future directions of the study

In the next phase of our study we wish to conduct community based study with a robust as well as representative sample.

8. Conclusion

In our study, fasting blood glucose and PP blood glucose level and glycated haemoglobin levels were high among psoriatic groups. Both systolic and diastolic blood pressures were higher with increased waist circumference in psoriatic groups.

Conflicts of interest

All authors have none to declare.

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