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PREVALENCE OF METABOLIC SYNDROME AND ITS COMPONENTS IN PATIENTS WITH CHRONIC PLAQUE PSORIASIS: A HOSPITAL BASED CASE-CONTROL STUDY

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Abstract:

Study Background: Chronic plaque Psoriasis (PS) is a systemic, immune-mediated, inflammatory recurrent polygenic skin disorder. Metabolic Syndrome (MetS) is a combination of metabolic components that include central obesity, hyperglycaemia, hypertension and hyperlipidaemia.

Study objective: To investigate the prevalence of metabolic syndrome (MetS) in patients with chronic plaque psoriasis (cases group) and in patients with skin diseases other than psoriasis (control group).

Study Methodology: This current study was a hospital based, cross-sectional case-control study. The overall study population (n=264) who participated in the study were categorized into Cases group (n=132) and Control group (n=132). In both the groups diagnosis of MetS was established using International Diabetes Federation (IDF) 2006 definition.

Results and discussion: Metabolic Syndrome (MetS) was found to be more prevalent and significant in patients with chronic plaque psoriasis than in the control group (74.24% Vs 53.78%, OR 2.71, RR 1.44, at 95% CI 1.61-4.55, p=0.0002, x^2 test p = 0.0008 at p<0.05) using IDF 2006 guidelines. The prevalence of MetS was found to be high in the age group of 51-60 and 31-40 years in the cases and controls group respectively. There was a higher prevalence of triglycerides (TGs) and waist circumference (WC) in psoriatic patients, whereas blood pressure (BP), fasting blood sugar (FBS), and high-density lipoprotein cholesterol (HDL-C) levels were not significant. The risk of having MetS is clearly increasing with the increase in severity of psoriasis disease (Mild psoriasis with MetS-52.27%, Moderate psoriasis with MetS-80.35% and severe psoriasis with MetS-93.75%). The order of importance of individual components of MetS for male psoriatic patients is WC> TG>HDL>BMI>FBG>BP, while for female psoriatic patients is TG>BMI>FBG>WC> BP>HDL.

Conclusion: Our study found a strong association between psoriasis and MetS with Psoriatic group having higher prevalence of MetS than the control group especially in patients with age >50 years. Waist circumference and Triglyceride levels were found to be significantly elevated in cases than in

control group. Prevalence of Mets increases with increase in the Severity of Psoriasis disease. We recommend that patients with chronic plaque psoriasis should be evaluated for presence of individual risk factors for MetS and treat accordingly to prevent cardiovascular risk.

Keywords: Chronic Plaque Psoriasis, Metabolic syndrome, International Diabetes Federation (IDF), cardiovascular risk.

INTRODUCTION:

Psoriasis is systemic, immune-mediated, polygenic skin disorder affecting 1-3% of the population worldwide. Various environmental provoking factors including trauma, infection or medications can trigger the disease in predisposed individuals. Psoriasis can develop at any age. Psoriasis vulgaris or the chronic plaque psoriasis is the most common form of psoriasis which accounts for more than 80% of affected patients [1,2]. Patients are more susceptible to inflammatory diseases due to the chronic inflammatory characteristic of psoriasis, with cardiovascular and metabolic disorders being the most common manifestations. Studies that relate psoriasis to diseases such as myocardial infarction (MI) and sleep disturbances as well as cardiovascular risk factors like diabetes, obesity, dyslipidaemia, hypertension, and smoking support this perspective [3]. Although psoriasis affects just a fraction of the body's surface area, it has been associated with serious consequences that may have a major impact on patients' quality of life [4,5]. Metabolic Syndrome (MetS) is a group of risk factors comprising central obesity, hypertension, glucose intolerance, dyslipidaemia [5-7]. The MetS has been reported to occur as a result of insulin resistance and impaired adipocyte activity. Cardiovascular risks associated with the MetS are higher than those associated with any one of its individual components [6]. After taking into consideration conventional cardiovascular risk factors, men with MetS are nearly three times more probable to experience death from coronary artery disease [5].

The major objective of this study was to investigate the prevalence of MetS in patients with and without chronic plaque psoriasis (cases) and control groups, respectively, using the IDF 2006 definition and to examine the prevalence of risk components of MetS [increased waist circumference (WC), high triglycerides (TGL), low high-density lipoprotein cholesterol (HDL-C), high fasting blood glucose (FBG) and high blood pressure (BP)] in cases and control groups.

STUDY METHODOLOGY:

The current study was a hospital-based, cross-sectional case control study involving a series of 132 psoriatic patients (cases) and 132 controls consecutively attending the male and female dermatology out-patient wards of King George Hospital (KGH) in Visakhapatnam, Andhra Pradesh, India. Inclusion criteria for cases includes Out-patients of either gender, with age greater than 18 years and with a clinical diagnosis of chronic plaque psoriasis (lasting at least since the previous 6 months). Patients receiving any systemic treatment for Psoriasis vulgaris and components of metabolic syndrome from the previous one month were excluded from the study. The controls group included the patients referred for dermatological conditions other than psoriasis. The source population for both cases group and controls group were similar. All subjects who voluntarily signed the informed consent were visited by the dermatologist who recorded the demographic and other relevant data on a case report form. The required data was collected from the patient medical records which included demographic details such as age, gender, sex, weight, height, body mass index (BMI), and onset, type and severity of the disease, and by measuring the parameters such as blood pressure (BP), fasting blood sugar (FBS), waist circumference (WC), Smoking and alcohol habits. BMI was calculated as the ratio of weight in kg to the square of height in metre square [Weight (kg)/Height (m^2)]. The upper hip was located and a measuring tape was placed at the level of the uppermost part of the hipbone around the abdomen (ensuring the tape measure was horizontal) and the waist circumference (WC) was measured. Blood pressure (BP) was recorded as the average of two measurements after subjects had been sitting for 10 minutes. The severity assessment of plaque psoriasis was made by calculating

the Psoriasis Area Severity Index (PASI) score and Body Surface Area (BSA) measurement. Due to its high inter-observer variability, BSA was not considered as an adequate tool to define the severity of plaque-type psoriasis, as it does not consider the intensity of the psoriatic lesion. Metabolic syndrome (MetS) was diagnosed in the presence of three or more criteria of the IDF 2006 consensus: waist circumference (WC) ≥ 90 cm in Asian-Indian men or > 80 cm in women; Hypertriglyceridemia ≥150 mg/Dl or on specific drug treatment; high density lipoprotein cholesterol (HDL-C) <40 mg/dL in men or <50 in women or on specific drug treatment; blood pressure ≥ 130/85 mm Hg or on specific drug treatment; fasting plasma glucose ≥ 100 mg/dL or on specific drug treatment [8]. Venous blood samples were taken in all patients and controls, after overnight fasting (at least 8 h). Serum triglycerides, high density lipoprotein and cholesterol and, fasting blood sugar were measured with enzymatic methods.

STATISTICAL ANALYSIS:

Analysis of data was carried out using Statistical Package for Social Sciences (SPSS) version 20 (IBM, India) and Med Calc easy-to-use medical and Statistical Software Version 18. Categorical parameters were expressed as the number (percentage) of patients and continuous data were expressed as mean ± standard deviation (SD). The differences between means were analysed using student *t*-test. Chi-square test was used to compare categorical parameters between the groups where appropriate and odds ratio (OR) and relative risk (RR) were calculated for the risk components of metabolic syndrome (MetS). The age-specific distributions of the prevalence of MetS were calculated for the study groups and were described in percentages. A P-value of < 0.05 was taken to show statistical significance between the two groups.

RESULTS:

The study population included 132 cases and 132 controls. The descriptive characteristics of the study population were represented in Table 1.

Table 1. *Differences in characteristics of the study population including the prevalence of MetS (IDF 2006 consensus)*

	Cases (n = 132)	**Controls** (n = 132)	**P-value**
Sex M/F	71/61	69/63	0.8
Age, mean ± s.d, yrs	45.2 ± 14.7	42.4 ± 14.2	0.9
BMI, mean ± s.d, Kg	26.5 ± 3.6	24.8 ± 3.9	0.00019
Waist circumference ≥ 90 cm (M), ≥ 80 cm (F), n (%)	102 (77.2)	89(67.4)	0.07
Triglyceridemia > 150 mg/dL, n (%)	102 (77.2)	55 (41.6)	0.05
High density lipoprotein (HDL-C) < 40mg/dL (M), <50 mg/dL (F), n (%)	19 (14.3)	49 (37.1)	0.0001
Fasting blood glucose ≥ 100 mg/dL	107(81.0)	86 (65.1)	0.005
Systolic blood pressure ≥ 130 mm Hg	65 (48.4)	56 (42.4)	0.32
Diastolic blood pressure ≥ 85 mm Hg	75 (56.8)	42 (31.8)	0.0001
Smoking status, n (%)			
Current smokers	27 (20.45)	24 (18.18)	
Ex-smokers	13 (9.84)	5 (3.78)	
Non-smokers	92 (69.69)	103 (78.03)	
Physical activity, n (%)			
Sedentary	43 (32.57)	35 (26.51)	
Moderate active	27 (20.45)	37 (28.03)	
Active	10 (7.57)	16 (12.12)	
Metabolic syndrome, n (%)	98 (74.2)	71 (53.7)	0.0002

There were more males (n=71, 53.7 %) than females (n=61, 46.2%) in the cases group. Among the 132 psoriatic patients studied in this research, patients were graded to have the disease in its mild,

moderate and severe stages respectively [n=44 (33.33%), n=56 (42.42%), n=32 (24.24%)]. Psoriasis was more frequent in current smokers (n=24,88.8%) and alcohol dependants (n=19,76%). Triglycerides (n=102, 78.5%), waist circumference (n=102, 78.5%) were significantly higher in psoriatic patients than controls group. In contrast, no significant difference was observed in fasting blood glucose, systolic blood pressure (SBP), diastolic blood pressure (DBP), high density lipoproteins and cholesterol (HDL-C) and BMI between the cases and controls group. There was a higher prevalence of metabolic syndrome (MetS) in cases than in controls (74.2 % vs. 53.7 %, odds ratio (OR) 2.71, 95% CI 1.61-4.55; P = 0.0002). The serum triglyceride levels (OR 4.76; 95% CI 2.7-8.1; RR 1.85) and waist circumference (OR 1.64; 95% CI 0.9-2.8; RR 1.15) were found to have significant correlation with the severity of psoriasis, whereas there was no significant correlation between HDL-C, fasting blood sugar and blood pressure with the severity of psoriasis. Analysis by t-test on averages of the two groups proved that psoriatic group of patients were comparatively poor in maintaining good health conditions than control group of patients with respect to certain parameters (which mostly have to do obesity) like BMI, waist circumference and triglycerides. They were as good as the control group of patients with respect to certain parameters like HDL, FBG, SBP and DBP. The age of the study population ranged from 21-79 and 20-78 with a mean age of 45.2 and 42.4 years in the cases and controls group, respectively (Fig. 1). It was observed that the patients in cases or controls tend to have MetS in the middle age i.e., 31-60 years. The order of importance of individual components of MetS for male psoriatic patients is WC>TG>HDL>BMI>FBG>BP, while for female psoriatic patients is TG>BMI>FBG>WC>BP>HDL. The greater the severity of psoriasis, the greater number of patients liable to possess the risk factors for metabolic syndrome (MetS).

Table 2. *Comparison of components of metabolic syndrome in cases and controls group.*

	Cases (mean ± s.d)	**Controls** (mean ± s.d)	**P-value**
Waist circumference (cm)	93.9 ± 11.7	90.8 ± 13.1	0.02
Triglycerides (mg/dL)	158.0 ± 23.2	143.4 ± 40.5	0.0002
High density lipoproteins (mg/dL)	34.8 ± 9.4	39.4 ± 15.0	0.99
Fasting blood glucose (mg/dL)	121.7 ± 29.3	126.7 ± 41.9	0.19
Systolic blood pressure (mm Hg)	127.0 ± 15.0	129.0 ± 15.0	21.7
Diastolic blood pressure (mm Hg)	86.1 ± 1	81.8 ± 9.0	0.99

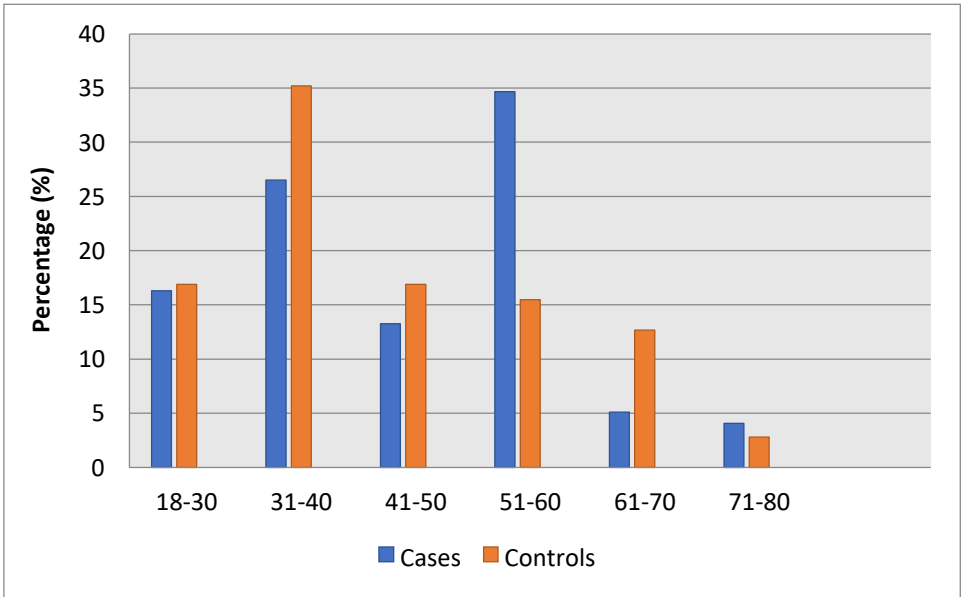

Fig. 1. *Prevalence of MetS in the study population of different age groups.*

DISCUSSION:

Chronic plaque psoriasis is systemic, immune-mediated, polygenic skin disorder affecting 1-3% of the population worldwide [5]. In the United States, 35% of individuals have been demonstrated to have metabolic syndrome [9]. It has been determined that among the Turkish population, it is 34.9% by Gundogan et al. and 33.9% by Gemalmaz et al [10,11]. In the current study, there was a greater prevalence of MetS in chronic plaque psoriatic patients compared to the controls group (74.24% Vs 53.78%).

In our study, there were more males (n=71, 53.7 %) than females (n=61, 46.2%) in the cases group. In several studies, age and gender had varying roles in the emergence of the metabolic syndrome in psoriasis patients. Kim et al. demonstrated that the prevalence of metabolic syndrome was marginally higher in men and significantly greater in older psoriasis patients [12]. It is uncertain how exactly psoriasis and metabolic syndrome are related. However, several epidemiologic studies have revealed a high prevalence of metabolic syndrome in patients with psoriasis compared with other skin diseases with genetic susceptibility and overlapping inflammatory pathways as the potential biologic links underlying this association [13].

This can be explained by the chronic and systemic pro-inflammatory pathways mediated especially by T-1 and T-17 cells through a complex process, which alter the functioning and expression of adipokines, leading to the dysfunction of adipocytes and inhibition of insulin secretion [14]. Prevalence of Mets increases with increase in the Severity of Psoriasis disease. When we considered the various metabolic syndrome characteristics, we discovered that while HDL levels were significantly lower in the metabolic syndrome group, the outcomes of fasting blood glucose, BMI, triglyceride, blood pressure and waist circumference, were considerably greater. Therefore, our findings support the assumption that people with psoriasis are at risk of suffering the symptoms of metabolic syndrome. Psoriasis, as well as the cardiovascular, metabolic, and hepatic effects resulting from metabolic syndrome, may be caused or made worse by alcohol use and smoking. Fortes et al. found that smokers had a 30% higher risk of developing severe psoriasis. According to studies, the quantity of cigarettes smoked each day, not the period of cigarette smoking or age at which one first starts, is what determines the severity of a disease is. Patients who smoked over 20 cigarettes per day had a two-fold higher risk of developing severe psoriasis than those who smoked fewer (10 cigarettes/day) [15]. Patients with chronic plaque psoriasis were found to be more adipose with increased waistlines compared to individuals without psoriasis [15,16]. Central obesity was found to be more prevalent in psoriatic patients than in the general population [17]. Increased levels of TNF, IL-6, & C-reactive protein have been correlated with a rise in BMI, and several recent studies have demonstrated persistent mild inflammation induced by obesity; these proinflammatory cytokines may also affect the progression and presentation of psoriasis [15]. The correlation between psoriasis and dyslipidaemia showed an increase in the total cholesterol and triglycerides, decreased HDL, and no alteration in LDL in psoriatic patients compared to the patients in controls [18]. Several researchers came to the conclusion that psoriatic patient's poor lipid metabolism may be genetically determined [19].

Conclusion:

Metabolic Syndrome and its risk components are strongly associated with Chronic Plaque Psoriasis. Our study findings also conclude that MetS is more common in patients with severe psoriasis than in those with mild-moderate disease severity. Chronic plaque psoriasis and MetS share common multiple metabolic risk factors, pathological pathways, familial history, and with clinical implications.

The actual mechanisms behind the association of Psoriasis vulgaris and MetS and the effects of systemic therapies in such cases cannot be determined from this study as it needs much deeper

research. We suggest additional studies to explore the mechanisms behind this higher prevalence of metabolic syndrome in different types of psoriasis and to determine it as one of the risk factors for cardio-metabolic disorders.

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