

Comparison of biophysical variables among psoriatic patients based on the Psoriasis Area and Severity Index (PASI) groups

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ABSTRACT

Introduction: Psoriasis is an immune-related disorder that has also been associated with oxidative stress and dyslipidemia. Disturbances in biophysical variables of psoriasis patients are reported in the literature but their relationship with the disease and its severity has not been established.

Objectives: To assess the gender-wise occurrence of psoriasis and compare the biophysical variables based on PASI Psoriasis groups and with healthy subjects.

Materials & Methods: This cross-sectional case control study was done on 120 subjects and 40 normal health controls, in the Department of Biochemistry, Basic Medical Sciences Institute (BMSI), Jinnah Postgraduate Medical Center (JPMC), Karachi, from July 2014 to April 2015. The patients were divided into three groups of Psoriasis: mild, moderate, and severe. Biophysical variables included age, gender, residential area, ethnicity, occupation, weight, height, blood pressure, pulse, and temperature. Descriptive and comparative statistical analysis was done by SPSS 16.

Results: Males were predominantly affected than females. A statistically significant increase was found in BMI of severe group when compared to control group ($p=0.008$). Moderate psoriasis patients had significant increases in duration of disease ($p=0.001$) and Psoriasis Area and Severity Index (PASI) score ($p=0.001$) compared to mild psoriatic patients. Similarly, severe psoriatic patients had significantly increased mean pulse rate, systolic, and diastolic blood pressures, compared to moderate ($p=0.03$), mild ($p=0.033$) and control ($p=0.030$) subjects.

Conclusion: Psoriasis was more common in male subjects being positively correlated with age, urban dwelling, and industrial occupation; oxidative stress may partially explain these findings as well as the higher systolic and diastolic blood pressures in these patients.

Keywords: Psoriasis; Body Mass Index; Oxidative Stress; Hypertension.

The authors declared no conflict of interest. All authors contributed substantially to the planning of research, data collection, data analysis, and write-up of the article, and agreed to be accountable for all aspects of the work.

INTRODUCTION

Psoriasis affects about 2% of the global population. In USA, 4.6% people are affected but this disease is less prevalent in Indians (0.7%). It is an idiopathic disease that can occur due to abnormalities in essential fatty acid metabolism, lymphokine secretion, and oxidative stress.¹ Oxidative stress (OS) is a condition resulting from an imbalance between free radical generating and scavenging systems.² As a result, the amount of reactive free radicals increase in the cells and thus can oxidize various molecules leading to tissue injury and cell death.³ There are some exogenous sources of free radicals such as radiation, ozone, pollution, pharmacological agents, smoking, alcohol, iron-overload, pesticides and oxygen itself.⁴ The continuous exposure of skin to UV radiations and other environmental factors make it prone to oxidative stress damages. Reactive oxygen species (ROS) cause lipid peroxidation and secretion of inflammatory cytokines resulting in epidermal hyper proliferation.⁵ Keratinocytes of epidermis express the neuronal isoform of nitric oxide synthase, which when exposed to ultraviolet radiations releases nitric oxide in psoriatic lesions. Nitric oxide itself is a free radical that contains oxygen which is a double-edged sword; on one hand it is essential for life and on the other hand it is toxic.⁶

Researchers believed that psoriasis was only a skin disease, but in the mid-1980s, they recognized the cause of psoriasis as an interruption in the immune system.⁷ Psoriatic skin progresses to repair itself by creating new cells, but it is seven times faster than a healthy skin. Normal skin cells mature and get shed off in a month. In psoriatic skin, the turnover increases more rapidly i.e. up to 3-6 days. The body cannot shed off the skin cells faster enough as a result, patches or lesions and plaques of dead epithelium are formed on the skin surfaces.⁶ The incidence as well as the severity of psoriasis has also been associated with obesity. This has become even more relevant after knowing that white adipose tissue is not just an inert energy storage tissue, in addition it is an essential endocrine organ secreting a wide range of soluble mediators involved in immunity, inflammation, and metabolic and appetite regulation.^{8,9}

An Italian study has demonstrated that the risk of psoriasis in an overweight (BMI 26-29) or obese (BMI ≥ 30) population was higher than in normal-weight individuals (odds ratio, OR, 1.6 and 1.9, respectively).¹⁰ The role of ethnicity in this disease was investigated between 2006-2016 in the University of California to determine whether there are any differences in the presenting severity of psoriasis based on ethnicity. The study revealed that their study population was 62% white, 26% Asian, 8% Hispanic, 2% African American, and 2% Middle Eastern.¹¹

The available data regarding age and gender of psoriatic patients are not conclusive¹² and needs further exploration to ascertain the relationship of these variables with psoriasis. Furthermore, there is a need to find out the relevance of psoriasis with ethnicity, BMI, and blood pressure.

MATERIALS & METHODS

This cross-sectional case control study was conducted in the Department of Biochemistry, Basic Medical Sciences Institute (BMSI), Jinnah Post Graduate Medical Centre (JPMC) Karachi, from 1st July 2014 to 30th April 2015 in collaboration with the Department of Dermatology JPMC, and Institute of Skin Diseases, Karachi. Ethical approval was taken from Ethical Committee of BMSI, JPMC Karachi for conducting research work vide ref. No. F.1-2/2015/BMS E. COMT/021/JPMC.

One hundred and twenty diagnosed psoriatic patients, of either sex, with ages ranging from 15-70 years were included in the study. The diagnosis was based on clinical findings, although histopathological examination was done whenever needed to confirm psoriasis disease. Forty normal healthy and age-matched individuals were included as controls. The patients were divided into three groups (Mild, Moderate, Severe) based on Psoriasis Area and Severity Index (PASI), each group having 40 subjects. The purpose of the study was explained to subjects and informed consent was taken from both patients and controls. A Performa was used to collect baseline data including age, sex, gender, ethnicity, detailed medical history, and appropriate investigations as part of the methodology.

Alcoholics, smokers, and patients suffering from chronic liver and/or kidney disease, any other skin disease, and hypothyroidism were excluded from the study.

Biophysical variables included age, gender, residential area (Rural/Urban), ethnicity, occupation, weight, height, blood pressure, pulse, temperature, and general physical examination.

Measurement of weight & height

The weight & height of all the subjects were measured in kilograms and meters respectively, using weighing with height scale machine (MIC Health Scale made in China). Body Mass Index (BMI) was calculated by applying formula: weight (kg) / height (m²).

RESULTS

Results are given in Tables 1 to 4, with comparisons of socio-demographic and biophysical variables among the control and psoriasis groups.

Table 1: Gender-based distribution of psoriatic and control subjects

Socio Demographic Variables	Cases (n=120) f (%)	Control (n=40) f (%)
Gender		
Male	112 (93.3%)	37 (92.5%)
Female	08 (6.7%)	03 (7.5%)
Occupation		
Industrial worker	48 (40%)	-
Labor	31 (25.8%)	11 (27.5%)
Driver	23 (19.2%)	08 (20%)
Office workers	17 (14.2%)	20 (50%)
Housewives	01 (0.8%)	01 (2.5%)
Ethnicity		
Sindhi speaking	44 (36.7%)	14 (35%)
Pushto speaking	30 (25%)	11 (27%)
Urdu speaking	16 (13.3%)	06 (15%)
Hindko speaking	14 (11.7%)	05 (12.5%)
Punjabi speaking	11 (9.2%)	03 (7.5%)
Balochi speaking	05 (4.2%)	01 (2.5%)
Residence		
Urban	77 (64.2%)	23 (57.5%)
Rural	43 (35.8%)	17 (42.5%)

Comparison of Biophysical Variables among the Study Groups

Table 2 shows the comparison of biophysical parameters among all the study groups (Control, Mild, Moderate, Severe).

Data analyzed by one-way ANOVA (post hoc analysis) showed no significant difference in age and height among all the study groups. Statistically significant increase was found in the mean weight of severe group when compared to mild and control groups. ($p=0.023$). Statistically significant increase was found in mean BMI of severe group when compared to control group ($p=0.008$).

Table 2: Comparison of biophysical variables among the study groups

Variables	Study Groups (n=40 each) Mean \pm SD			
	Control	Psoriasis Patients		
		Mild	Moderate	Severe
Age (Years)	49 \pm 9.4	50.3 \pm 11.5	50 \pm 10.7	50 \pm 10.3
Weight (Kg)	64.9 \pm 6	65 \pm 6.9	66.3 \pm 6.7	69 \pm 6.9* [□]
BMI (Kg/m ²)	23.4 \pm 3.1	24.2 \pm 3.1	24.9 \pm 2.9	25.6 \pm 2.8*

* Statistically significant as compared to controls $p < 0.05$

[□] Statistically significant as compared to Mild, Psoriasis $p < 0.05$

[△] Statistically significant as compared Moderate Psoriasis $p < 0.05$

[☆] Statistically significant as compared to Severe Psoriasis $p < 0.05$

Comparison of Vital Signs among the Study Groups

Data analyzed by one-way ANOVA (post hoc analysis) show that the mean pulse, systolic and diastolic blood pressures were significantly increased in severe psoriatic patients when compared to moderate, mild and control subjects ($p=0.03$), ($p=0.033$), ($p=0.030$) respectively. The body temperature was found higher in severe disease group but could not attain the statistical significance when compared to moderate, mild, and control groups (Table 3).

Table 3: Comparison of vitals among the study groups (n=40 each).

Variables	Control	Mild	Moderate	Severe
	Mean \pm SD			
Systolic Blood Pressure (mmHg)	119.5 \pm 6.4	119.8 \pm 2.8	120.4 \pm 3.6	124.5 \pm 9* \square Δ
Diastolic Blood Pressure (mmHg)	78 \pm 7.6	79 \pm 3	80 \pm 2.3	82 \pm 6.9**
Pulse (Rate/min)	76 \pm 7.1	76 \pm 7.1	80.6 \pm 12.5	83.4 \pm 14.1
Temperature ($^{\circ}$ F)	98.6 \pm 0.1	98.6 \pm 0.1	99.2 \pm 1.2	99.7 \pm 1.7

* Statistically significant as compared to controls $p < 0.05$; \square Statistically significant as compared to Mild, Psoriasis $p < 0.05$

Δ Statistically significant as compared Moderate Psoriasis $p < 0.05$; \diamond Statistically significant as compared to Severe Psoriasis $p < 0.05$

Duration of disease as well as PASI score was significantly increased in moderate group as compared to mild Psoriatic patients ($p=0.001$) and ($p=0.001$) respectively. Similarly, a highly significant increase was observed in the duration of disease and PASI in severe Psoriatic patients as compared to moderate ($p=0.001$, $p=0.001$) and mild group.

Table 4: Comparison of duration of disease and PASI in the study groups

Variable	Mild (n=40)	Moderate (n=40)	Severe (n=40)
	Mean \pm SD		
Duration of disease (Years)	1.5 \pm 0.5	5.4 \pm 1.0	7.9 \pm 3.0
PASI score	21.5 \pm 5.32	50 \pm 7.46	76.5 \pm 8.15

DISCUSSION

The study population comprised of 112 (93%) males and 8 (6.7%) females showing that males were more affected than females. The higher incidence of psoriasis in males might be due to more exposure to sun light and environmental pollutants.¹³ It was observed that increasing age is a risk factor for Psoriasis. In this study a positive correlation between age and oxidative stresses was observed and found that in old age the oxidative stress is higher, therefore elders are more prone to psoriasis endorsing the reports of some studies.^{12,14} The present study also found that psoriasis is more common in urban area as has been reported by Bas et al (2016), substantiating the fact that the oxidative stress in the urban area may be, at least, causative in this disease.¹⁵

It was observed that psoriasis was more prevalent in industrial workers, indicating that oxidative stress was more in these workers. Similar, data have been reported by Suryakar et al (2010) and Polat et al (2013).^{16,17} In this study we also found

higher incidence of psoriasis in Sindhi and Pashtu speaking population. Higher prevalence in Pushtun community may be due to their fair skin as evident by the reports of Alex and Blackcloud (2014)¹⁸ and Parisi et al (2013)¹⁹ while the higher prevalence in Sindhi population could not be explained and may need further investigation.

In the current study, a significant increase in mean systolic and diastolic blood pressure was observed in severe psoriatic group which might be attributed higher oxidative stress in these patients. These observations are in agreement with Takeshita et al (2015) who reported that increased blood pressure of psoriatic patients was due to oxidative stress, dyslipidemia and inflammatory cytokines.²⁰ Similarly, Qureshi et al (2010) and Kaye et al (2008) reported that incidence of hypertension was significantly high among psoriatic patients when compared to controls.^{21,22} In the present study significantly increased pulse but comparable temperature was observed in moderate and severe psoriatic groups which is in partial agreement with Menter et al (2012)²³ and Hazarika (2009)²⁴ who reported that in psoriasis altered thermoregulatory properties leads to hyperthermia, chill, fluid loss and dehydration. In this study, a significant increase in PASI score was observed in severe psoriatic group when compared to other study groups, showing that PASI score is a reliable indicator of the severity of disease endorsing the findings of Agnieszka Bożek et al (2017).²⁵

CONCLUSION

Psoriasis was more common in male subjects and was positively correlated with age. The severity of psoriasis based on PASI score may be associated with oxidative stress in relation to the higher prevalence of the disease in urban subjects and industrial workers, as may also be the higher systolic and diastolic blood pressure in these patients.

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