

Correlation Between Body Mass Index and Blood Pressure with Severity of Psoriasis Vulgaris

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Abstract

Background: The immune system has a mediating role in psoriasis vulgaris, a skin illness characterized by persistent inflammation that flares up at irregular intervals and is frequently associated with obesity and hypertension. The prevalence of psoriasis vulgaris, hypertension, and obesity, are all recognized to be implicated in the same pathophysiological route, although the specific method through which the disease develops is yet unknown.

Objective: To determine whether there is a correlation between psoriasis vulgaris severity and BMI and blood pressure.

Methods: This was a retrospective study. Medical records of individuals with psoriasis vulgaris were collected from 2018 to 2020. The psoriasis area and severity index were used to assess the severity of psoriasis vulgaris.

Results: A total of 181 patients of psoriasis vulgaris were enrolled. The number of female patients was more than male patients with 92 (50.8%) patients. Severe psoriasis vulgaris a severe degree within 121 (66.9%) patients. Psoriasis was correlated with body mass index and using the Spearman correlation $p=0.002$ with $r=0.233$, while the correlation between blood pressure and psoriasis vulgaris severity had $p<0.001$ with $r=0.262$.

Conclusion: Body mass index and blood pressure are weakly correlated with the severity of psoriasis vulgaris.

Keywords: Psoriasis vulgaris, PASI, body mass index, blood pressure.

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Introduction

Psoriasis is a chronic skin condition characterized by inflammation characterized by immune system. Psoriasis encompasses several types, with psoriasis vulgaris being the most prevalent, affecting about 90% of patients.¹ The condition affects 2-3% of the global population, with prevalence rates varying between 0.27% and 11.4% across different countries. The prevalence of psoriasis vulgaris is infected by age, gender, geographic location, ethnicity, genetic predisposition, and environmental factors.^{2,3}

People who suffer from psoriasis, an inflam-

matory ailment that affects the whole body, often have other health conditions, such as psoriatic arthritis, gastrointestinal issues, mental health issues, metabolic syndrome, and heart problems.⁴ The pathophysiological pathways that psoriasis and cardiovascular disorders have in common include chronic inflammation mediated by Th-1 and Th-17, increased oxidative stress, endothelial cell dysfunction, and angiogenesis. This explain the increased cardiovascular risk associated with psoriasis.⁵ Many diseases accompanied by a systemic inflammatory response, originate from the Th-1 cell immune response. These include

psoriasis, coronary heart disease, obesity, hypertension, diabetes, and hypertension.⁶

Previous studies conducted by Duarte et al, in Brazil and Adışen et al, in Turkey identified a link between obesity and psoriasis, suggesting that obesity could exacerbate the severity of psoriasis.^{6,7} Another study failed to find a statistically significant association between hypertension and psoriasis, although studies by Salihbegovic et al, in Bosnia and Takeshita et al, in England a correlation the two.^{6,8,9} Not many studies have examined how psoriasis vulgaris severity is correlated with blood pressure and body mass index in Indonesia. This retrospective study aimed to examine these relationships of psoriasis with BMI and hypertension.

Methods

This retrospective cross-sectional study was conducted at the Dermatology and Venereology Outpatient Clinic of Dr. Soetomo Hospital in Surabaya, Indonesia. All patients on electronic health record documentation of psoriasis vulgaris were enrolled. The patients who were excluded from this study were those who had a diagnosis of psoriasis vulgaris but had incomplete physical examination data, including body weight, height, blood pressure, and psoriasis area and severity index (PASI) data. Sampling was conducted using a consecutive sampling system obtained from secondary data (electronic medical records of patients with diagnosis of psoriasis vulgaris).

Data regarding psoriasis vulgaris severity, blood pressure, and BMI were collected in this study. The psoriasis severity was assessed based on PASI by assessing erythema, induration, scaling, and the size of the body area involved. Three categories are used to classify the severity of psoriasis vulgaris based on the PASI score: mild (PASI < 5), moderate (PASI 5-10), and severe (PASI > 10). The formula to calculate the body mass index (BMI) is kg/m^2 , which is the product of the square of the height (in meters) and the weight (in kilograms). Underweight (BMI < 18.5), normal weight (BMI between 18.5-24.9), overweight (BMI between 25-29.9), and obese (BMI > 30) are the four

categories into which the World Health Organization (WHO) divides body mass index. Measurement of systolic and diastolic blood pressure from arteries was conducted using blood pressure measuring device or sphygmomanometer. Blood pressure is categorized as follows by the Joint National Committee (JNC) 8, normal blood pressure is when both the systolic and diastolic pressures are below 120 mmHg and 80 mmHg, prehypertension is when the systolic pressure 120-139 mmHg or diastolic pressure 80-89 mmHg, and hypertension is when the systolic pressure more than 140 mmHg or diastolic pressure more than 90 mmHg.

All data collected was entered into the computer using Microsoft Excel. Analysis of data distribution and frequency were conducted using SPSS for Windows software. The relationship between BMI, blood pressure, and psoriasis vulgaris severity was analyzed using the Spearman correlation test using SPSS for Windows software with p-value < 0.05 was considered statistically significant, indicating a meaningful correlation.

Results

A total of 181 patients with psoriasis vulgaris received treatment from 2018 to 2020. These patients matched the study's inclusion criteria as outlined in Table 1. The proportion of female patients (50.8%) exceeded that of male patients (49.2%). The patients' ages ranged from fourteen years old at the youngest to seventy-two years old at the oldest, with an average age of forty-three years. Most psoriasis vulgaris patients were found in the age range 46 to 55 years with n 50 patients (27.6%).

The distribution of severity degrees based on PASI score of psoriasis vulgaris patients showed that most patients had severe degree with 121 (66.9%) patients (Table 2). Based on BMI, most patients fell into the normal category with 98 (54.1%) patients (Table 3). Based on blood pressure categories, most patients had normal blood pressure with 73 (40.3%) patients (Table 4).

The Spearman correlation test revealed a significant correlation ($p=0.002$) between BMI and

psoriasis vulgaris severity, with a weak positive correlation ($r=0.233$) (Table 5). Additionally, a significant correlation was seen between blood pressure and psoriasis vulgaris severity. The statistical analysis showed a significant correlation ($p<0.001$) with a weak positive correlation ($r=0.262$) (Table 6).

Table 1: Sample demographics.

Variable	Number of Patients (%) (n=181)
Sex, n (%)	
Male	89 (49.2)
Female	92 (50.8)
Mean age (range)	43.2 (14-72)
Age category (Ministry of Health, Indonesia, 2019), n (%)	
0-5 years	0 (0)
6-11 years	0 (0)
12-16 years	5 (2.8)
17-25 years	32 (17.7)
26-35 years	26 (14.4)
36-45 years	25 (13.8)
46-55 years	50 (27.6)
56-65 years	34 (18.8)
> 65 years	9 (4.9)

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pressure and psoriasis vulgaris severity. The statistical analysis showed a significant correlation ($p<0.001$) with a weak positive correlation ($r=0.262$) (Table 6).

Table 2: Psoriasis severity distribution.

Severity (PASI score)	n (%)
Mild (<5)	15 (8.3)
Moderate (5-10)	45 (24.9)
Severe (>10)	121 (66.9)
Total	181 (100.0)

Table 3: BMI distribution.

BMI category (BMI)	n (%)
Underweight (<18.5)	6 (3.3)
Normal (18.5-24.9)	98 (54.1)
Overweight (25-29.9)	62 (34.3)
Obese (>30)	15 (8.3)
Total	181 (100.0)

Table 4: Blood pressure category distribution.

Blood pressure category	n (%)
Normal	73 (40.3)
Prehypertension	51 (28.2)
Hypertension	57 (31.5)
Total	181 (100.0)

Discussion

In our study, we found a weak positive correlation between BMI and psoriasis vulgaris severity. This finding aligns with research conducted by Duarte et al, in Brazil, where they observed that patients

Table 5: Correlation between BMI and psoriasis vulgaris severity.

Variable	n (%)	Psoriasis Vulgaris Severity			p Value
		Mild	Moderate	Severe	
BMI status	Underweight	6 (3.3)	2	2	0.002* $r=0.233$
	Normal	98 (54.1)	9	31	
	Overweight	62 (34.3)	2	11	
	Obese	15 (8.3)	2	1	

Note: BMI: body mass index, *significant

Table 6: Correlation between blood pressure and psoriasis vulgaris severity.

Variable	n (%)	Psoriasis Vulgaris Severity			p Value
		Mild	Moderate	Severe	
Blood pressure classification	Normal	73 (40.3)	9	23	0.001* $r=0.262$
	Prehypertensive	51 (28.2)	5	15	
	Hypertension	57 (31.5)	1	7	

Note: *significant

with a BMI of less than 25 had a median PASI score of 3.9, patients with BMI between 25 and 30 had median PASI score of 6.0, and patients with BMI of more than 30 had median PASI score of 7.0 ($p < 0.01$). These findings suggest that higher BMI levels contribute to increased severity of psoriasis vulgaris.⁷

In this study, people with severe psoriasis vulgaris was more frequently overweight or obese. Another study reported that psoriasis vulgaris patients with obesity had mean PASI score of 32.36 ± 12.79 , which was higher compared to mean PASI score of psoriasis vulgaris patients with normal BMI (25.03 ± 12.43). Furthermore, psoriasis vulgaris patients with severe obesity had mean PASI score of 44.00 ± 3.37 ($p < 0.007$). These results indicated that psoriasis vulgaris patients with greater PASI scores were more likely to be found in obese patients.¹⁰

Another study in Japan stated that the mean BMI of individuals without psoriasis vulgaris was 22.22 ± 3.98 kg/m², while the mean BMI of patients with psoriasis vulgaris was higher (23.96 ± 4.46 kg/m²). This shows that psoriasis vulgaris patients had greater BMI than individuals without psoriasis vulgaris.¹¹ Obesity was more prevalent in psoriasis vulgaris patients, independent of gender or age, according to another French study.¹²

The correlation between psoriasis vulgaris and obesity is becoming increasingly evident apparent nowadays. This correlation is thought to be influenced by the role of adipose tissue. Insulation and mechanical protection are two functions of adipose tissue, which is also the body's most efficient lipid storage organ. Patients with obesity are known to have excess adipose tissue. At the beginning of the adipogenic process, adipose tissue actively releases adipocyte cells, which promote inflammation by creating antimicrobial peptides like cathelicidin. As it activates plasmacytoid dendritic cells through the toll-like receptor (TLR), cathelicidin plays a role in inflammation. As a result, this process triggers the production of interferon (IFN)- α and activates the adaptive immune response via T cells. Individuals with obesity exhibited significantly elevated levels of

cathelicidin, indicating a potential role for this protein in the development of psoriasis vulgaris.¹³

During this process, adipose tissue generates proinflammatory adipokines, which encompass conventional cytokines such as interleukin (IL)-6 and tumor necrosis factor (TNF)- α , as well as specialized molecules like leptin and adiponectin. Leptin specifically has the capability to stimulate the secretion of TNF- α and IL-6, which are critical in the progression of psoriasis vulgaris. The inflammatory environment characteristic of psoriasis vulgaris may be aggravated by TNF- α and IL-6 released by adipose tissue. The coexistence of psoriasis vulgaris and obesity suggests an interplay between these conditions, with adipokines potentially contributing to the development of both psoriasis vulgaris and obesity.¹⁴

High blood pressure was more prevalent among patients with severe psoriasis vulgaris, and our findings indicated a weak positive correlation between psoriasis vulgaris severity and blood pressure. We found the same thing as a South Korean study by Kim et al, which found that patients with hypertension were more likely to get psoriasis vulgaris.¹⁵ The correlation between hypertension and psoriasis vulgaris severity was found to be positive ($r = 0.36$, $p < 0.001$) in a study conducted in Bosnia, where 54.28% of psoriasis vulgaris patients had increased blood pressure.⁸ Similar results were also reported in other studies as well.^{16,17}

Oxidative stress and chronic inflammation, aberrant angiogenesis, and certain genetic variables are all risk factors for psoriasis vulgaris, just as they are for hypertension.¹⁸ Psoriasis and hypertension may be linked by biological factors including increased stress, damage caused by oxygen or oxidative stress, general inflammation processes involving molecules like TNF- α and IL-17, and the overproduction of a substance called endothelin in cells lining blood vessels and skin.¹⁵

Researchers found that a gene called leucyl/cystinyl aminopeptidase (LNPEP) is expressed at much lower levels in psoriatic lesions. This gene codes for an enzyme called aminopeptidase that also acts as a receptor for angiotensin IV in the

renin-angiotensin system that is important for blood pressure regulation. Similar to how other signaling pathways worsen psoriasis, angiotensin IV, working through LNPEP, can increase inflammation by boosting activity of a key cellular pathway (NF- κ B). This suggests that psoriasis can occur even without the typical high blood pressure markers.¹⁵

The correlation between psoriasis vulgaris and hypertension may be attributed to the presence of angiotensin II. Angiotensin II plays a role in regulating blood vessel constriction, influencing blood pressure, and promoting the release of pro-inflammatory cytokines that can exacerbate the development of psoriasis lesions.²⁰ The angiotensin-converting enzyme (ACE) generates angiotensin II, which causes vasoconstriction and activates physiological processes that contribute to high blood pressure. Angiotensin II also affects the growth of psoriasis lesions by promoting T cell proliferation and the secretion of inflammatory cytokines.¹⁵

The weak positive correlation observed between BMI, blood pressure, and psoriasis vulgaris severity suggests that factors other than BMI and blood pressure may also influence the severity of psoriasis vulgaris. Factors that might affect its severity are divided into extrinsic and intrinsic factors. These extrinsic factors include trauma, infection, and a history of smoking and alcohol consumption. Intrinsic factors other than obesity and hypertension that influence psoriasis vulgaris severity are genetics, metabolic syndrome, diabetes mellitus, dyslipidemia, and mental stress.²¹

Conclusion

The relationship between BMI, blood pressure, and psoriasis vulgaris severity shows a weak correlation. Conducting a cohort study would be crucial to assess long-term impacts on PASI scores in patients, particularly in relation to changes in BMI and blood pressure over time.

Ethical Approval: The study was approved by the Ethical Committee vide letter Ref. No. 1338/LOE/301.4.2/VI/2023.

Conflict of Interest: There was no conflict of interest to be declared by any author.

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Author's Contribution

KSP: Conception and design, acquisition of data, analysis and interpretation, drafting of article, critical revision for important intellectual content, final approval of the version

CRSP: Conception and design, analysis and interpretation, drafting of article, critical revision for important intellectual content

MDA: Analysis and interpretation, final approval of the version

TS: Analysis and interpretation

LA: Analysis and interpretation

BU: Analysis and interpretation

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