



## CORRELATION OF SERUM MALONDIALDEHYDE LEVELS WITH PSORIASIS AREA AND SEVERITY INDEX (PASI) SCORE IN PSORIASIS VULGARIS

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### Abstract

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**Introduction:** Psoriasis is a chronic inflammatory disorder mediated by the immune system which is characterized by skin inflammation, epidermal hyperplasia and other co-morbidities. The measurement tool most often used to assess the severity and extension of psoriasis is Psoriasis Area and Severity Index (PASI) score. Malondialdehyde (MDA) is a biomarker in oxidative stress which functions as a mutagenic marker of lipid peroxidation, can damage DNA and cause cell death. Measurement of serum MDA levels is useful for predicting the level of oxidative stress in various chronic diseases, including psoriasis vulgaris. **Purpose:** To determine the correlation between serum malondialdehyde levels and Psoriasis Area and Severity Index (PASI) score in psoriasis vulgaris. **Methods:** Observational analytic study with a cross-sectional approach (cross-sectional) on 37 psoriasis vulgaris subjects and 37 healthy control subjects at Haji Adam Malik General Hospital Medan. **Results:** The majority of psoriasis vulgaris occurred in men (54.1%) with the most age group being 30-39 years. The mean of PASI score in the psoriasis vulgaris group was  $7.37 \pm 4.13$ . Serum malondialdehyde levels in the psoriasis vulgaris group were higher than in the control group ( $1.84 \pm 0.38$  nmol/ml vs  $1.33 \pm 0.19$  nmol/ml). Spearman's correlation test showed a correlation coefficient (r) of 0.967 with  $p < 0.001$ . **Conclusion:** There is a significant positive correlation between serum malondialdehyde levels and Psoriasis Area and Severity Index (PASI) score in psoriasis vulgaris.

**Keywords:** Psoriasis vulgaris, serum MDA, PASI score

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### Introduction

Psoriasis is an immune system-mediated inflammatory disorder characterized by skin inflammation, epidermal hyperplasia and other co-morbidities. Psoriasis is chronic and can be found in both men and women. Psoriasis has a bimodal age of onset, namely ages 20-30 years and 50-60 years. This disorder usually affects the skin, nails, joints and is associated with a number of other comorbidities.<sup>1,2</sup> Psoriasis can be found in 2% of the world's population, but its prevalence varies from 0.09% to 11.4%, so it is included in a global problem.<sup>3</sup> Based on the medical records of H. Adam Malik Hospital Medan from January to December 2021, 137 patients (9.7%) were diagnosed as psoriasis vulgaris from a total of 1,402 visits for treatment at the Polyclinic of Dermatology and Venereology.<sup>4</sup>

In psoriasis patients, it is important to assess the level (degree) of disease severity to monitor changes due to the effect of treatment given both in clinical trials and daily practice. The

measurement tool most often used to assess the severity and extension of psoriasis is Psoriasis Area and Severity Index (PASI) score.<sup>5-7</sup>

Malondialdehyde (MDA) is one of the biomarkers of oxidative stress which functions as a marker of lipid peroxidation which consists of three highly reactive carbondialdehyde molecules. Malondialdehyde is the most widely produced secondary product of lipid peroxidation which is mutagenic, can damage DNA and cause cell death. Measurement of MDA levels in serum is a useful method for predicting oxidative stress levels in various chronic diseases, one of which is psoriasis. This study aims to analyze the correlation between serum malondialdehyde levels and psoriasis area and severity index (PASI) scores in psoriasis vulgaris.

### Methods

#### Study Design

This research is an observational analytic study with a cross-sectional approach that was

carried out from January 2023 to July 2023. This research was conducted at the Polyclinic Division of Immunodermatology, Dermatology and Venereology Department, Haji Adam Malik General Hospital, Medan.

### Sample

The sample of this study were all patients diagnosed with psoriasis vulgaris who went to the Polyclinic Division of Immunodermatology, Dermatology and Venereology Department, Haji Adam Malik General Hospital who met the inclusion criteria, including were aged  $\geq 20$  years and were willing to participate in the entire study series and signed an informed consent sheet. Exclusion criteria included psoriasis vulgaris patients with diabetes mellitus, hepatitis, HIV/AIDS, cardiovascular disease and cancer based on history, psoriasis vulgaris patients with atopic dermatitis, seborrheic dermatitis, acne vulgaris, vitiligo, systemic lupus erythematosus, alopecia areata and pemphigus based on history, and history of taking antioxidant supplements in the last 1 week. In addition, a control group was also determined, which were healthy individuals who did not suffer from psoriasis vulgaris. The sample size of each group is 37 people.

### Data Collections

The diagnosis of psoriasis vulgaris is obtained from the history and physical examination. Serum malondialdehyde (MDA) levels were measured in laboratory tests using the TBARS method using the QuantiChrom™ TBARS Assay Kit (DTBA-100). PASI score was measured using a PASI score table sheet with a physical examination.

### Research Procedures

Psoriasis vulgaris patients were examined for PASI score based on the quality of the plaque, such as erythema, induration and desquamation. Blood samples were taken as much as 3 ml

from the median cubital vein, then put into a vacutainer tube without EDTA and put into a cooler box filled with ice with a temperature of 2-10°C. Blood samples were centrifuged using a centrifuge at 2000-3000 rpm for 20 minutes to obtain serum. Serum was put into a 1 cc microtube and stored in a freezer at -80°C. Avoid contamination and direct exposure to sunlight. Transfer 100µL of each sample into a labeled 1.5 ml tube and add 200µL of 10% Trichloroacetic acid (TCA) to each sample, then incubate for 5 minutes on ice. Centrifuge at 14,000 rpm for 5 minutes to get the supernatant. Transfer the clear supernatant into a new labeled tube. The tube was vortexed and incubated at 100°C for 60 minutes and then inserted into the well on the microplate. The microplate containing the sample is inserted into the spectrophotometer and read at a wavelength of 535 nm (525 to 545 nm).

### Statistical Analysis

Data analysis was preceded by the Shapiro Wilk normality test. If the data were normally distributed, the Pearson correlation test would be used, while if it was not normal, the Spearman correlation test would be used. Normally distributed data will display the mean and standard deviation, if the data is not normally distributed, the median and range will be displayed. The results of the analysis were declared significant with a p value  $<0.05$ . Data were analyzed statistically with statistical software.

### Results

#### Demographic Characteristics of Research Subjects

This study was followed by 37 psoriasis vulgaris subjects and 37 healthy control subjects who came to the Polyclinic Division of Immunodermatology. Table 1 shows the distribution of research subjects by gender.

**Table 1.** Distribution of research subjects by gender

Gender	Psoriasis Vulgaris		Control	
	n	%	n	%
Male	20	54,1	14	37,8
Female	17	45,9	23	62,2
Total	37	100	37	100

In this study it was found that the majority of subjects in the psoriasis vulgaris group were in the 30-39 year age group, namely 10 people

(27%) with an average age in the psoriasis vulgaris group of  $41.08 \pm 13.25$  years, as shown in table 2 below.

**Table 2.** Distribution of research subjects by age

Age	Psoriasis Vulgaris		Control	
	n	%	n	%
20 - 29	7	18,9	7	18,9
30 - 39	10	27,0	14	37,8
40 - 49	8	21,6	5	13,5
50 - 59	9	24,3	9	24,3
≥ 60	3	8,2	2	5,5
Total	37	100	37	100

**Serum Malondialdehyde (MDA) Levels**

Table 3 shows the proportion of serum malondialdehyde levels in the psoriasis vulgaris and control groups. The average serum MDA level in the psoriasis vulgaris group was  $1.84 \pm 0.38$  nmol/ml with the lowest level being 1.41

nmol/ml and the highest being 3.36 nmol/ml. Meanwhile, in the control group, the average serum MDA was  $1.33 \pm 0.19$  nmol/ml, with the lowest level being 1.03 nmol/ml and the highest being 1.89 nmol/ml.

**Table 3.** Serum MDA levels in the psoriasis vulgaris and control groups

Group	MDA Serum Levels		p
	Mean $\pm$ SD	Median (Min-Max)	
Psoriasis Vulgaris	$1.84 \pm 0.38$	1.74 (1.41-3.36)	<0.001
Control	$1.33 \pm 0.19$	1.31 (1.03-1.89)	

**Psoriasis Area and Severity Index (PASI) Score**

Table 4 below shows Psoriasis Area and Severity Index (PASI) score in the psoriasis

vulgaris group, where the mean value (average) of PASI score is  $7.37 \pm 4.13$ , the median value of PASI score is 5.9 with a range of 1.5 - 15.6.

**Table 4.** PASI scores in the psoriasis vulgaris group

Group	PASI Score	
	Mean $\pm$ SD	Median (Min-Max)
Psoriasis Vulgaris	$7.37 \pm 4.13$	5.90 (1.50-15.60)

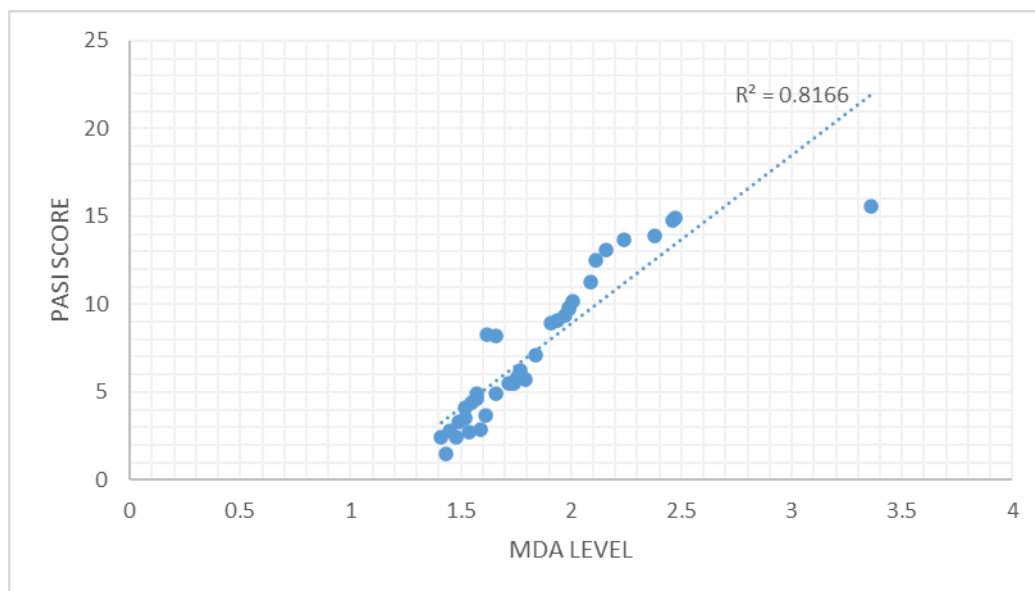
**Correlation of Serum MDA Levels and PASI Scores**

Table 5 is a correlation table for serum MDA

levels and PASI scores in the psoriasis vulgaris group. In this study, the value of the correlation coefficient (r) was 0.967 with a significance value (p) of 0.001.

**Table 5.** Correlation of serum MDA levels and PASI scores

Variable	r	p
MDA serum and PASI score	0.967	<0.001



**Figure 1.** Scatter plot of correlation between serum MDA level and PASI score

## Discussion

In this study it was found that subjects in the psoriasis vulgaris group with male sex were more dominant than female. In a study conducted by Zenahlik et al. (2023) in Austria, of 107 psoriasis vulgaris subjects, the highest prevalence was found in male, namely 60 people (56.07%) compared to women, namely 47 people (43.93%).<sup>10</sup> Psoriasis vulgaris can occur in both men and women. women, without any significant difference in the frequency of psoriasis vulgaris between the sexes. However, there is some literature which states that psoriasis vulgaris can be found more often in men than women, because women have a tendency to smoke and drink alcohol which is less than men which is associated with exposure to free radicals.<sup>11-12</sup>

In this study it was found that the majority of subjects in the psoriasis vulgaris group were in the age group of 30-39 years. The results of this study are in line with research conducted by Effendy et al. (2021) in Medan, where it was found that the age group with the highest number of psoriasis vulgaris was in the age group 30-39 years (30.4%).<sup>13</sup> Based on the theory, psoriasis vulgaris is a chronic inflammatory disease with a bimodal age of onset, where type I (early) appears at the age of <40 years and type II (advanced) appears at age > 40 years. Psoriasis can affect all age groups but appears most often at the age of 15-30 years and most rarely at the age of under 10 years.<sup>14</sup>

There was a significant difference in serum

MDA levels between the psoriasis vulgaris and control groups. The results of this study are in accordance with the results of a study conducted by Akdag et al. (2022) in Turkey, that of 50 psoriasis vulgaris subjects and 50 control subjects, the serum MDA level in the psoriasis vulgaris group was  $0.19 \pm 0.20$  nmol/ml, while in the control group it was  $0.09 \pm 0.10$  nmol/ml.<sup>15</sup> Although the exact pathogenesis of psoriasis vulgaris is still being studied and growing, several studies have described the involvement of oxidative stress in this chronic skin disorder. Increased levels of oxidative products result in activation of Th1, Th17 cells and keratinocytes through the MAPK, NF- $\kappa$ B, and JAK-STAT pathways. Oxidative stress and high TNF- $\alpha$  induce endothelial dysfunction, which can consequently contribute to psoriasis vulgaris.<sup>16</sup> The mean value (average) of the PASI score is  $7.37 \pm 4.13$ , the median value of the PASI score is 5.9 with a range of 1.5 - 15.6. In a previous study conducted by Zenahlik et al. (2023) in Austria, in 107 psoriasis vulgaris subjects, the mean (average) PASI score was  $7.01 \pm 8.44$ .<sup>10</sup> In psoriasis patients, it is important to assess the level (degree) of severity of psoriasis vulgaris disease in order to monitor changes due to the effects of treatment given both in clinical trials and daily practice. The most frequently used measure for assessing the severity and extension of psoriasis is the PASI score. The PASI score is usually calculated before, during and after treatment to determine the patient's level of improvement to the therapy given.<sup>17</sup>

The value of the correlation coefficient ( $r$ ) in

this study indicates that the direction of the correlation is positive with a very strong correlation and that the correlation between serum MDA levels and PASI scores is statistically significant. The results of this study are in accordance with a study conducted by Paul et al. (2021) in India, where a significant increase in serum MDA levels was found in the psoriasis vulgaris group compared to the control group.<sup>18</sup>

The findings are in accordance with most of the previous studies which state the state of oxidative stress in psoriasis vulgaris patients. The plasma membrane of skin cells in psoriatic lesions has a significant increase in arachidonic acid, which is a natural substrate for the synthesis of MDA, which is an end product of lipid peroxidation and a marker of oxidative stress of reactive aldehydes and is one of many reactive substances that cause toxic stress in cells.<sup>18</sup> This study has also proven significantly increased levels of MDA in the psoriasis vulgaris group.

### Conclusion

It can be concluded that there is a significant correlation between serum malondialdehyde levels and Psoriasis Area and Severity Index (PASI) score in psoriasis vulgaris. Examination of serum MDA levels can be proposed as an additional examination for biological markers of oxidative stress which can affect the severity of psoriasis vulgaris.

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