

Correlation between Superoxide Dismutase (SOD) with Malondialdehyde (MDA) level in blood plasma of seborrheic keratosis



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ABSTRACT

Introduction: Seborrheic keratosis (SK) is a benign tumor of the epidermis, its development is associated with various hypotheses, but none came out as the main culprit. A few study results regarding the oxidative stress strongly associated with skin tumors have been reported. Superoxide dismutase (SOD) is a potent protective enzymatic antioxidant. Malondialdehyde (MDA) is the end product of lipid peroxidation produced by free radicals in the body. Increased levels of MDA usually accompany low levels of antioxidants.

Methods: This study was an observational analytic study with a cross-sectional method involving 42 seborrheic keratosis subjects based on inclusion and exclusion criteria. We recorded the gender, age, family history, and occupation of the subjects. Diagnosis of seborrheic keratosis was made based on history taking and clinical examination—measurement of SOD level by ELISA method and MDA levels by TBARS method. The Spearman correlation test was measured and was considered significant if the p -value was <0.05 .

Results: Seborrheic keratosis was more common in females (92.9%), with the most common age group being 40-50 years old (57.1%), had a family history of SK (26.2%), and worked in agriculture, forestry, and fisheries (26.2%). The average blood plasma SOD level was 1.68 mmol/L, and the blood plasma MDA level was 181.19 U/L. The correlation coefficient between blood plasma SOD levels and blood plasma MDA levels was -0.393 , with a significant value of $p=0.01$. This study showed that the lower the SOD level, the higher the MDA level in the blood plasma of seborrheic keratosis.

Conclusion: There is a significant correlation between SOD and MDA levels in the blood plasma of seborrheic keratosis subjects.

Keywords: seborrheic keratosis, SOD, MDA.

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INTRODUCTION

Seborrheic keratosis (SK) is a benign tumor of the skin originating from the proliferation of the epidermis and the accumulation of keratin on the skin's surface.^{1,2} These lesions often occur in middle age and can also arise in adolescence, interfering with appearance.^{3,4} Seborrheic keratosis has clear boundaries, round or oval in shape, raised and stuck (stuck on) to the skin with a verrucous surface, uneven, with a color that varies from pale white to black. These skin lesions vary in size, with diameters ranging from 0.5 cm to 1 cm.⁵

Several factors, such as genetics, HPV infection, sun exposure, FGFR-3 mutations, and aging mechanisms, have been proposed, but their exact etiology remains unclear.^{6,7} Oxidative stress is a

condition where there is an imbalance between the production of free radicals and the body's antioxidant defense system. Exposure to sunlight is the main cause of oxidative stress.⁸⁻¹⁰

Superoxide dismutase (SOD) is a type of potent protective enzymatic antioxidant that selectively cleans superoxide anion radical (O_2^-) into hydrogen peroxide (H_2O_2). Sun exposure can cause a decrease in SOD activity which in turn can cause oxidative stress.¹¹⁻¹³

Malondialdehyde (MDA) is the end product of lipid peroxidation produced by free radicals in the body. Measurement of blood plasma MDA levels has been widely used as a biomarker to assess oxidative stress levels in the biomedical field.^{14,15} This study aims to determine the relationship between SOD levels and MDA

in the blood plasma of SK patients who visited the Dermatology and Venereology outpatient clinic at the Universitas Sumatera Utara, from May 2022 to June 2022. The result was analyzed statistically with the Spearman test to investigate the correlation between Superoxide Dismutase (SOD) with Malondialdehyde (MDA) levels in the blood plasma of SK.

METHODS

This study is an observational analytic study with a cross-sectional approach on 42 SK subjects, aged 18-50 years old, who visited the Dermatology and Venereology outpatient clinic at the Universitas Sumatera Utara, from May 2022 to June 2022. Informed consent was given to each subject who participated in this study. Patients with diabetes mellitus, hepatitis,

HIV/AIDS, cardiovascular disease, atopic dermatitis, seborrheic dermatitis, acne vulgaris, vitiligo, psoriasis, systemic lupus erythematosus, alopecia areata, pemphigus and skin cancer based on history taking and clinical examination were excluded from the study.

The Health Research Ethics Committee Sumatera Utara Hospital Medan gave ethical permission. The history was taken for all study subjects, clinical examination, and blood sampling test to examine MDA and SOD serum levels.

Blood sampling was used to measure SOD levels using the Enzyme-Linked Immunosorbent Assay (ELISA) kit and MDA methods using the Thiobarbituric Acid Reactive Substance (TBARS) method carried out at the Integrated Laboratory of the Faculty of Medicine, Universitas Sumatera Utara, Medan.

The results were analyzed in descriptive analysis, Saphiro-Wilk normality test, and Spearman test to determine the correlation between Superoxide Dismutase (SOD) with Malondialdehyde (MDA) level in the blood plasma of SK. A p -value < 0.05 was considered significant.

RESULTS

In this study, the demographic characteristics of SK were more common in females (92.9%), with the most common age group was 40-50 years old (57.1%), had a family history of SK (26.2%), and worked in agriculture, forestry, and fisheries (26.2%). Sociodemographic characteristics that include gender, age, family history, and occupation are presented in Table 1.

This study found that the average MDA level of the 42 SK patients in this study was 1.68 mmol/L, with the lowest level being 1.03 mmol/L and the highest being 3.42 mmol/L. The average SOD level was 181.19 U/L, with the lowest level 184 U/L and the highest 796 U/L (Table 2).

The Spearman correlation test found a relationship between SOD and MDA levels in SK subjects ($p=0.01$), with a correlation coefficient (r) of -0.393. Based on the closeness of the correlation coefficient value with a range between 0.20-0.399, resulting in a weak correlation (Table 3).

Table 1. Subject distribution based on Gender, age group, family history, and job.

Subject Characteristics	SK (n = 42)	
	n	%
Gender		
Male	3	7.1
Female	39	92.9
Age group		
18 – 28 years	5	11.9
29 – 39 years	13	31
40 – 50 years	24	57.1
Family history		
Present	11	26.2
None	31	73.8
Occupation		
Agriculture, forestry, fishing	11	26.2
Civil servant	10	23.8
Professional technicians and assistants	8	19
Business and sales force	6	14.3
Unemployment	5	11.9
Cleaning service	1	2.4
Administrative staff	1	2.4

Table 2. MDA and SOD levels in SK patients.

Variable	Mean	Median	SD	Min–Max
MDA, mmol/L	1.68	1.71	0.48	1.03–3.42
SOD, U/L	181.19	121.5	145.07	84–796

Table 3. Relationship between SOD and MDA levels in SK patients.

	MDA	
	p	r
SOD	0.010*	-0.393

*Spearman

DISCUSSION

This study found that most subjects were female (92.9%), and the highest age group range was 40-50 years old (57.1%) (Table 1). Putra et al. also found that most subjects who came to the Dermatology and Venereology clinic in the H. Adam Malik General Hospital Medan were female (55%), and most were 41-50 years old (33%).¹⁶ Cheong and Lee in Korea 2020, SK patients were found to be more common in females (78.6%) and mainly aged 43-79 years old (45%).¹⁷ Seborrheic keratosis is often found in women because women tend to pay more attention to the appearance of the skin and are more likely to seek treatment for complaints that occur on the skin. Age is another factor that influences the increased risk

of SK, where the prevalence of SK lesions increases with age. With increasing age, the skin's antioxidants also tend to become less weak, and the resulting oxidative stress contributes to intrinsic aging. Aging skin is also intrinsically characterized by the development of various benign neoplasms resulting from disturbances in the regulation of cell proliferation.¹⁸

Most SK subjects worked in agriculture, forestry, and fisheries, amounting to 11 people (26.2%) (Table 1). Outdoor work can increase exposure to sunlight, directly increasing the risk of developing SK. This fact is in line with that found in the study of Kwon et al. that exposure to sunlight can increase the risk of developing SK.¹⁹ Meanwhile, the study by Putra et al. found that the subjects who suffer the most from SK are farmers (55%).¹⁶

Repeated exposure to UV light can increase oxidative stress, which can cause DNA damage. Kwon et al. reported that most SK lesions were found in sun-exposed areas, namely the face, neck, and back of the hands (80.5%).¹⁹ Research by Widiatmoko et al. also reported the location of most SK lesions on the face and neck (55%).²⁰ Hafner et al. reported that FGFR3 mutations increased in locations with high sun exposure, namely the head and neck ($p < 0.01$).⁷ The mean MDA level of the 42 SK patients in this study was 1.68 mmol/L, with the lowest level being 1.03 mmol/L and the highest being 3.42 mmol/L. The average SOD level in this study was 181.19 U/L, with the lowest level being 184 U/L and the highest being 796 U/L (Table 2).

This study showed that the highest mean plasma SOD level in SK patients was in the age group of 18-28 years old (474.6 U/L) and the lowest in the age group of 29-39 years old (136.7 U/L). The average blood plasma MDA level in SK patients in this study was highest in the age group of 40-50 years old (1.87 mmol/ml) and lowest in the age group of 18-28 years old (1.18 mmol/ml). Research by Ridlo et al., who measured the levels of 40 patients with serum MDA on skin tags and 40 control patients, the mean value of MDA levels on skin tags was higher in subjects aged 50-59 years old.²¹ The increasing age of a person is followed by increased production of free radicals that cause the cells in the body to degenerate and work less optimally. These will result in the low activity of cellular enzymes.^{22,23}

We found a significant relationship between SOD and MDA ($p = 0.010$). The correlation value (r) obtained was -0.393, meaning there is a negative correlation between blood plasma MDA and SOD levels in SK patients. The negative correlation indicates a decrease will follow an increase in SOD levels in SK patients in MDA levels. Conversely, if the SOD blood plasma level of SK decreases, the MDA blood plasma level of SK will increase (Table 3). These results are consistent with a study conducted by Ugochukwu et al. reported that increased MDA levels followed decreased SOD levels in smokers.²³ Based on the correlation coefficient values in this study, we obtained a range of 0.20-0.399

which resulted in a weak correlation. The research conducted by Widiatmoko et al. on the SK network found the strength of the correlation coefficient values with a range between 0.40-0.599, which resulted in moderate correlations.²⁰

CONCLUSION

There is a significant correlation between SOD and MDA levels in the blood plasma of seborrheic keratosis subjects.

DISCLOSURES

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No specific funding was received for this study.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this article.

Author Contribution

All authors have contributed to all processes in this research, including preparation, data gathering, analysis, drafting, and approval for publication of this manuscript.

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