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Correlation between Superoxide Dismutase Level and Disease Activity of Vitiligo



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ABSTRACT

Background: Vitiligo is a chronic systemic acquired disease that has an unpredictable clinical course, characterized by the appearance of macules and achromic or hypochromic patches on the skin and mucous membranes due to the disappearance of melanocytes in the affected area. Until now, the underlying pathogenesis of vitiligo is still unclear. The role of superoxide dismutase (SOD) in vitiligo is mentioned that it can be a biomarker to determine vitiligo activity and progressivity.

Aim: To determine correlation between SOD and vitiligo disease activity score (VIDA)

Materials and methods: This study was a cross-sectional analytic study which involved 39 vitiligo patients that were diagnosed by clinical and Wood's lamp examinations. VIDA score

was determined to assess lesion activity, which is categorized in the six-point scale. We conducted blood sampling and measurement of SOD level to the patients by ELISA.

Results: We found mean SOD in +4 group was 37.55 ng/ml, +3 group was 25.32 ng/ml, +2 group was 4.67 ng/ml, +1 group was 5.60 ng/ml, and 0 group was 3.88 ng/ml. There was no difference of SOD level based on VIDA score ($p=0.775$ $r=-0.047$). In this study, we found the highest mean SOD level in subjects with vitiligo activity lasting from 6 weeks to 3 months and the lowest level in group with lesion activity stable for 1 year.

Conclusion: There was no significant correlation between SOD and VIDA score in vitiligo patients.

Keywords: vitiligo, superoxide dismutase, VIDA

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INTRODUCTION

Vitiligo is a chronic systemic acquired disease that has an unpredictable clinical course, characterized by the appearance of macules and achromic or hypochromic patches on the skin and mucous membranes due to the disappearance of melanocytes in the affected area.¹ Worldwide, vitiligo is the most frequent depigmenting disorder, affecting 0.3%–0.5% of the population.² A retrospective study in Cosmetic Division H. Adam Malik General Hospital Medan showed in 2015 the highest proportion of pigmentation disorder were hypomelanosis with diagnosed as vitiligo.³

Until now, there has been a lack of simple clinical methods for reliably and efficiently assessing macule activity in vitiligo.⁴ The vitiligo disease activity score (VIDA) is a six-point scale for assessing vitiligo stability over time. It depends on the patient's reports of disease activity. It helps to assess interventions' effectiveness at stopping and reversing the extent of depigmentation. Active vitiligo involves either the expansion of existing lesions or the appearance of new lesions.⁵

MATERIALS AND METHODS

This study was a cross-sectional analytic study which involved 39 vitiligo patients who were 16 to 75 years old and submitted to the outpatient Dermatology and Venereology Clinic in Haji Adam Malik General Hospital, Medan, North Sumatera, Indonesia and signed informed consent were included in this study. Consumption of supplement antioxidant one month before, breastfeeding, pregnancy, and using vitiligo treatment during the last one months were considered as exclusion criteria. All subjects were diagnosed by clinical and Wood's lamp examinations, VIDA score was determined by recalling the history of the disease in each subject to assess the activity of vitiligo. VIDA Score +4: activity lasting 6 weeks or less; +3: activity lasting 6 weeks to 3 months; +2: activity lasting 3–6 months; +1: activity lasting 6–12 months; 0: stable for 1 year or more; and –1: stable with spontaneous repigmentation for 1 year or more.⁵⁻⁶ A low VIDA score indicates less vitiligo activity. Active vitiligo involves either the expansion of existing lesions or the appearance of new lesions.

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We conducted blood sampling and measurement of SOD level to the patients by using ELISA – QAYEE-BIO®.

RESULTS

Most subjects involved in this study were women, 46-55 years old, the most duration of vitiligo were 1-5 years, and nonsegmental types. We found VIDA score range from 0 to +4 and did not find any subject with -1 score. Mean SOD was found highest in +4 group (37.55 ng/ml) and lowest in 0 group (3.88 ng/ml). Statistically, by Spearman correlation test there was no difference of SOD level based on VIDA score ($p=0.775$ $r=-0.047$).

DISCUSSION

It remains unclear what causes damage to melanocytes and their subsequent disappearance in affected skin of vitiligo patients. There is four hypothesis that mostly described are genetic, autoimmune, neural and biochemistry. The biochemistry hypothesis is associated with oxidative stress and antioxidants.^{2,7-8}

Superoxide dismutase (SOD) is a major antioxidant defense mechanism that acts to prevent radical superoxide (O₂⁻). The increased of SOD activity is associated with the accumulation of hydrogen peroxide (H₂O₂) which is toxic to melanocytes. High accumulation of H₂O₂ can inactivate catalase (CAT) second-line antioxidants that should convert H₂O₂ to H₂O and O₂. The accumulation of H₂O₂ if it continues to accumulate will lead the reaction of hydroxide (OH⁻) which is also toxic to melanocytes and can cause the death of melanocyte.⁹ In our previous study SOD level were found in female higher than male, the highest in age 56-65 years old group and the duration of disease 11-15 years. Vitiligo nonsegmental type higher than 500 level segmental type.¹⁰

In another study, we found SOD level was twice higher in vitiligo group than control group, but there was no correlation between SOD and vitiligo area scoring index (VASI) score.¹¹

The vitiligo disease activity score is a six-point scale for assessing vitiligo stability over time. It depends on patient's reports of disease activity. It helps to assess interventions' effectiveness at stopping and reversing the extent of depigmentation. Active vitiligo involves either the expansion of existing lesions or the appearance of new lesions.⁵⁻⁶

In this study, we found the highest mean SOD level in subjects with vitiligo activity lasting from 6 weeks to 3 months and the lowest level in group with lesion activity stable for one year. We did not find any subject with -1 score. It is probably because if repigmentation occurred, vitiligo patients often did not search for medical attention anymore.

This study concluded that patients who had more vitiligo activity under three months showed SOD levels higher compare to patients had stable vitiligo activity, but statistically, there was no significant correlation between SOD and VIDA score in vitiligo patients. Different result from the study of Sudarsa which was found a moderate positive correlation ($r = 0.494$; $p < 0.005$) between SOD level with disease activity based on VIDA score.¹² Further investigation is needed to evaluate the role of antioxidants in vitiligo activity and progressivity.

Table 1 Subject Characteristics

Characteristics	n	(%)	
Sex	Man	15	38.5
	Woman	24	61.5
Age (years old)	16-25	6	15.4
	26-35	8	20.5
	36-45	6	15.4
	46-55	13	33.3
	56-65	3	7.7
	66-75	3	7.7
Duration of disease (years)	1-5	16	41.0
	6-10	4	10.2
	11-15	3	7.7
	16-20	5	12.8
	>20	11	28.2
Types of vitiligo	Nonsegmental	38	97.4
	Segmental	1	2.6

Table 2 Correlation between SOD level and VIDA score.

VIDA Score	n (%)	Mean SOD (ng/ml)	p	r
+4	12 (30.8)	3.88	0.775	-0.047
+3	10 (25.6)	5.60		
+2	7 (17.9)	4.67		
+1	5 (12.8)	25.32		
0	5 (12.8)	37.55		

CONCLUSION

There was no significant correlation between SOD and VIDA score in vitiligo patients.

CONFLICT OF INTEREST

None declared

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