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# Superoxide dismutase level profile in vitiligo patients at H. Adam Malik General Hospital Medan



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## ABSTRACT

**Background:** Vitiligo is an idiopathic acquired pigmentation disorder of skin and mucosa, with clinical manifestations of milky white patches. Until today, the underlying pathogenesis of vitiligo is still unknown. The four most commonly described hypothesis are genetic, autoimmune, neural and biochemistry. The biochemistry hypothesis is associated with oxidative stress and antioxidants. Superoxide dismutase (SOD) is a first line antioxidant defense mechanism that plays a role in converting radical superoxide ( $O_2^-$ ) to hydrogen peroxide ( $H_2O_2$ ). The accumulation of  $H_2O_2$  can cause melanocyte death.

**Aim :** To determine SOD level profile in vitiligo patients in H. Adam Malik General Hospital Medan

**Subject and method:** This was a cross-sectional descriptive study of 26 vitiligo patients who were diagnosed by clinical and Wood's lamp examinations. We conducted blood sampling and measured

the patients' SOD levels, and the results obtained are presented in tabulation form.

**Results:** In this study, the mean SOD level was  $110,69 \pm 167,50$  ng/ml. When compared based on characteristics, the mean SOD level was higher in the female group ( $130,23 \pm 182,35$  ng/ml). The highest SOD level was found in the 56-65 years old group ( $191,90 \pm 270,15$  ng/ml), the group with 11-15 years duration of disease ( $191,17 \pm 267,21$  ng/ml), and the nonsegmental group ( $113,98 \pm 170,10$  ng/ml).

**Conclusion:** Mean SOD levels in vitiligo patients was 110,69 ng/ml. Higher SOD levels were found in females compared to males and in nonsegmental type vitiligo compared to segmental type. SOD levels were highest in the 56-65 years old group and the group with 11-15 years duration of disease.

**Keywords:** vitiligo, SOD, antioxidant

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## INTRODUCTION

Vitiligo is a chronic systemic acquired disease with an unpredictable clinical course, characterized by the appearance of milky white macules on the skin and mucous membranes due to the disappearance of melanocytes in the affected area.<sup>1</sup> In H. Adam Malik General Hospital Medan, Jusuf found the percentage of vitiligo patient visit in 2012 was 18,10%, in 2013 was 9,21%, in 2014 was 8,53%, and in 2015 was about 8,45% from all patients who visited the Cosmetic Dermatology Clinic.<sup>2</sup> To this day, the underlying pathogenesis of vitiligo is still unknown. The four most commonly described hypothesis are genetic, autoimmune, neural and biochemistry.<sup>3,4</sup> The biochemistry hypothesis is associated with oxidative stress and antioxidants. Superoxide dismutase (SOD) is a first line antioxidant defense mechanism that plays a role in converting radical superoxide ( $O_2^-$ ) to hydrogen peroxide ( $H_2O_2$ ). The continued accumulation of  $H_2O_2$  can cause melanocyte death.<sup>5</sup>

## SUBJECTS AND METHODS

This was a cross-sectional analytic study which involved 26 vitiligo patients aged 18 to 70 years old who visited the dermatology and venereology outpatient clinic in Haji Adam Malik General Hospital, Medan, Indonesia from May until October 2017. All subjects signed an informed consent form. Consumption of antioxidant supplement within the last 1 month, breastfeeding, and pregnancy were the exclusion criteria. All subjects with vitiligo were diagnosed through clinical and Wood's lamp examinations. Blood samples from subjects were then processed into plasma. Superoxide dismutase level were measured using ELISA - QAYEE-BIO\*.

## RESULTS

Mean SOD level was  $110,69 \pm 167,50$  ng/ml. When compared based on characteristics, the mean SOD level was higher in females ( $130,23 \pm 182,35$  ng/ml). We found the highest SOD level in the 56-65 years old group ( $191,90 \pm 270,15$  ng/ml),

the group with duration of disease of 11-15 years ( $191,17 \pm 267,21$  ng/ml), and the nonsegmental group ( $113,98 \pm 170,10$  ng/ml).

## DISCUSSION

Superoxide dismutase (SOD) is a major antioxidant defense mechanism that acts to prevent  $O_2^-$  to reduced the toxicity of cells. In the presence of

$O_2$  exposure, SOD activity acting as a first-line enzymatic antioxidant works by converting  $O_2^-$  into  $H_2O_2$  which is subsequently converted to oxygen and water by the second enzymatic antioxidant catalase (CAT).<sup>5</sup>

Increased SOD activity is associated with the accumulation of  $H_2O_2$ , which is toxic to melanocytes. Accumulation of  $H_2O_2$  can deactivate CAT enzymes that should convert  $H_2O_2$  to  $H_2O$  and  $O_2$ . The continued accumulation of  $H_2O_2$  will lead to the reaction of the substance, forming hydroxide (OH) compounds, which are also toxic to melanocytes and can cause the death of melanocyte.<sup>5</sup>

In this study, we found the mean SOD level was 110,69 ng/ml, SD 167,50 ng/ml (19,68 – 503,78 ng/ml). There were some differences in SOD levels in various studies. Zeng et al in 2013 found lower mean SOD levels in vitiligo subjects ( $106.20 \pm 26.10$  ng/ml) compared with healthy controls ( $144.70 \pm 32.50$  ng/ml).<sup>6</sup>

Studies which use the same measurement (ng/ml) are rare, but Sravani et al, using other measurements, found SOD levels in subjects with vitiligo ( $2,474 \pm 966$  U/mg protein) were higher than non vitiligo subjects ( $969,15 \pm 388,56$  U/mg protein).<sup>7</sup> Different results were found by Koca et al on 17 subjects of vitiligo and 24 controls. In the study it was found that SOD levels in vitiligo patients ( $12.86 \pm 2.90$  U/ml) were lower than with healthy controls ( $14.86 \pm 2.31$  U/ml).<sup>8</sup> In contrast to Koca's results, Agrawal et al dan Arican et al found there were no differences in SOD levels regarding gender.<sup>9,10</sup>

In this study, the highest level of SOD was found in age group 56-65 years and lowest in age group 36-45 years. Similarly, Agrawal et al found the highest increase in SOD activity in the 36-45 year age group compared with other groups.<sup>10</sup> The conclusion by Junqueira et al in normal individuals the aging process is associated with systemic oxidative stress.<sup>11</sup>

Kamel et al found no significant differences between nonsegmental and segmental type vitiligo.<sup>12</sup> Similarly, Agrawal et al study found no significant difference between nonsegmental and segmental vitiligo. The results contrasted with our study that found higher levels of SOD in nonsegmental vitiligo than in segmental vitiligo.<sup>9</sup>

## CONCLUSION

In this study, mean SOD levels in vitiligo patients was 110,69 ng/ml. Higher SOD levels were found in females compared to males and in nonsegmental type vitiligo compared to segmental type. SOD levels were highest in the 56-65 years old group and the group with 11-15 years duration of disease.

**Table 1.** Profile of SOD in vitiligo patients

SOD	n	Mean	SD	Min	MX
SOD Level (ng/ml)	26	110,69	167,50	19,68	503,78

**Table 2.** Profile of SOD in vitiligo patients based on sex

Sex	SOD Level (ng/ml)				
	n	Mean	SD	Min	Max
Male	10	79,43	144,06	24,14	488,52
Female	16	130,23	182,35	19,68	503,78

**Table 3.** Profile of SOD in vitiligo patients based on age

Age (Years Old)	SOD Level (ng/ml)				
	n	Mean	SD	Min	Max
18-25	4	34,27	15,07	21,91	56,20
26-35	4	145,88	228,61	24,14	488,52
36-45	4	26,59	4,83	19,68	30,59
46-55	9	154,65	191,89	26,64	499,60
56-65	3	191,90	270,15	30,03	503,78
66-70	2	41,73	7,47	36,45	47,02

**Table 4.** Profile of SOD in vitiligo patients by duration of disease

Duration of Disease (Years Old)	SOD Level (ng/ml)				
	n	Mean	SD	Min	Max
1-5	9	134,07	190,10	24,14	488,52
6-10	1	26,64	.	26,64	26,64
11-15	3	191,17	267,21	29,11	499,60
16-20	5	25,46	4,52	19,68	30,59
>20	8	117,99	167,50	28,48	503,78

**Table 5.** Profile of SOD in vitiligo patients by clinical type

Clinical Type	SOD Level (ng/ml)				
	n	Mean	SD	Min	Max
Nonsegmental	25	113,98	170,10	19,68	503,78
Segmental	1	28,52	.	28,52	28,52

**CONFLICT OF INTEREST**

None declared

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