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The *Superoxide Dismutase* Activity of Healthy Volunteers in Yogyakarta

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Abstract:

Introduction: Free radicals (oxy radicals, such as superoxide, hydroxyl ions and nitric oxide) cause cell injury, when they are generated in excess or when the antioxidants defense are impaired. SOD activity can be used as an indicator of free radicals in the body. SOD as an antioxidants to prevent the increase production of ROS such as superoxide ion (O2-) and hydroxyl ions, therefor oxidative stress can be prevented. The effects of the decreased of SOD activity was cause oxidative stress.

Aim: Investigating the profiles activity of SOD in the Yogyakarta based on sex, age and physical activity.

Methodology: We used the cross sectional design. Forty fourof healthy subjects (females 33 and males 11) were involved in this study (18-60 years old). Total of 44 respondents who had met the inclusion criteria and were willing to fill out informed-consent. SOD activity were measured in plasma and analysed by ELISA method**.** The results of the study will be presented in the form of descriptive and statistic alanalysis with 95% confidence level.

Results and discussion: The result of the study showed that the SOD activity 82,72± 3,22 U/mL. The mean of SOD activity based on sex indicates that mean level of SOD on the respondent male were higher than female. The mean of SOD activity in female respondents was 83,62± 3,35 U/mL where as in male respondents is 78,55±1,47 U/mL. Based on Independent sample t-test statistical correlation p value = 0.494 (p>0.05), which means there was no significant correlation between the means activity of SOD on respondents female and male. Analysis of data the mean of SOD activity by age showed that respondents who under 25 years old higher than over 25 years old respondents. SOD activity under 25 years old respondents was meansured 82,72±3,22 U/mL while over 25 years old respondents was 80,41± 1,34 U/mL. Based on statistical analysis p value = 0.756 (p>0.05), which means there was no significant correlation of SOD activity between under 25 years old and over 25 years old. Measurement for physical activity subject who did not regular physical activity had higher of SOD activity is compared with the subject who did regular physical activity. The mean of SOD activity based on physical activity showed that respondent who regular activity was 70,84±2,40 U/ml, and not regular activity at at 87,73±3,10 U/mL and Obtained p=0.060(p> 0.05).

Conclusions: The results of the analysis carried out that there is no correlation between SOD activity with age, sex and physical activity.

Keywords: Profile, Activity, Superoxide Dismutase

1. INTRODUCTION

Reactive oxygen species (ROS) generated in the human body is scavenged by the intrinsic antioxidant system. Imbalance in the rate of ROS generation andantioxidant capacity causes oxidative stress, that isoxidative damage to such components of the humanbody as lipids, proteins and DNA. It is known thatoxidative stress induces or promotes various diseases (Evans, et al., 2004; Ochi & Sakai, 2003). In the living organisms the first line of defense against free radical is the oxidative stress enzymes superoxide dismutase (SOD) (Aksoy,2004). Increased levels of SOD in the blood showed a high influence of free radicals in the body (Onyeka et al, 2012 and Elekofehinti et al, 2012). SOD is an antioxidant to prevent the increased production of ROS such as superoxide ion ($O2^-$) and hydroxyl ions, there by oxidative stress can be prevented. Even when we are inactive, the body still produces small amounts of reactive oxygen species (ROS), which also includes free radicals. The effects decreased SOD activity is the absence of resistance against ROS resulting in oxidative stress (Harjanto,2003). Oxidative stress is a condition of imbalance between free radicals with antioxidants, where of free radicals more when compared with the antioxidant (Halliwell, 2006). Stres oxidative implicated in the pathogenesis of many cardiovascular diseases, including hypercholesterolemia, atherosclerosis, hypertension, diabetes, and heart failure (Tohru, 2011). Superoxide dismutase in the living body, there are three isoform of SOD, Copper-Zinc Superoxide dismutase (Cu / ZnSOD), the major extracellular SOD enzyme contained in the interior of the cell, Manganese Superoxide dismutase (MnSOD), synthesized in the cytoplasm, then sent to the mitochondria, Extracellular Superoxide dismutase (EC-SOD) (Osunomena, 2012).

2. METHODE

The method of this study is *cross sectional*. This study was conducted in Yogyakarta. Populations are people living in Yogyakarta. This study was performed on 44 respondents of age group ranging from 18 to 60 years (females 33 and males 11) in Yogyakarta with a normal respondentswho meet the following criteria: healthy respondens as evidenced by a health certificate from the competent healthy care.Written informed consent was obtained from all respondent before into the study. The independent variable in this study were age, sex and physical activity while the dependent variable is SOD activity. The study instrument used in this study ELISA Reader is used to measure the levels of SOD. Results of the study will be presented in the form of descriptive and statistical analysis with a 95%confidence level.

3. RESULTS AND DISCUSSION

Superoxide dismutasi an antioxidant to prevent the increased production of ROS such as superoxide ion ($O2^-$) and hydroxyl ion, as such oxidative stress can be prevented. Even when body are inactive, the body still produces small amounts of reactive oxygen species (ROS), which also includes free radicals. The effects if the decreased SOD activity is the absence of resistance against ROS causing oxidative stress, if this situation persisted it would disturb in the long term would damage the DNA that would eventually lead to cancer and arteriosclerosis (Harjanto, 2003).

Research conducted on the volunteer of Yogyakarta aims todetermine how the profile SOD activity in people of Yogyakarta. Respondents were used in this study amounted to 44 (females 33 and males 11) . Age of respondents in this study ranged from 18-60 years consisting of 37people under 25 years old and 7 persons over 25 years old. Characteristics ofrespondents in this studycan be seen in table 1.

Tabel 1. Characteristics of respondents

Characteristics of respondens	n	%
Sex		
Male	11	25
Female	33	75
Total	44	100
Age		
<25 year old	36	81,81
>25 year old	8	18,19
Total	44	100
Educations		
High School	10	22,73
DIII	1	2,27
S1	32	72,73
S3	1	2,27
Total	**44**	**100**
Work		
Collage student	34	77,27
Swasta	7	15,91
Wiraswasta	3	6,82
Total	**44**	**100**

Superoxide dismutasi an antioxidant to prevent the increased production of ROS such as superoxide ion ($O2^-$) and hydroxyl ion, as such oxidative stress can be prevented. Even when body are inactive, the body still produces small amounts of reactive oxygen species (ROS), which also includes free radicals. The effects if the decreased SOD activity is the absence of resistance against ROS causing oxidative stress, if this situation persisted it would disturb in the long term would damage the DNA that would eventually lead to cancer and arteriosclerosis (Harjanto, 2003).

Tabel 2. Distribution of SOD activity based on sex

Sex	N	Mean of SOD activity ± SD (U/mL)	SOD activity minumum (U/mL)	SOD activity maksimum (U/mL)	P
Male	11	78,55± 1,47	57,45	103,59	0.494
Female	33	83,62± 3,35	23,96	218,93	

The results showed that of the 44 respondents on means of SOD activity was 83,36 ± 2,99 U/mL with a minimum activity of 23,96 U/mL and a maximum activity of 218,93 U/mL. The results of data analysis based on sex showed that the mean level of SOD in male respondents is lower than female. The means of SOD activity of male respondents was 78,55 ± 1,47 SOD U/mL. Minimum of SOD activity 57,45 U/mL and a maximum activity of 103,59 U/mL. In women respondents SOD activity on mean is 83,62 ± 3,35 U / mL with a minimum of SOD actvity 23,96 U/mL and a maximum of 218,93 U/mL. there was no significant corelations between the mean of SOD activity in male and female respondents(p =

0,494).. Increased levels ofreactive oxygen species (ROS) due to increased activity of the enzyme oxidase and hormonal dysregulation adiposity. Increased oxidative stress causes metabolic disorders, good intake of glucose in muscle and adipose tissue, decreased insulin secretion and cellular damage resulting in endothelial dysfunction, at herosclerotic vascular disease until finally occurs which can result into metabolic syndrome(Faraci, 2004).

Tabel 3.Distribution of SOD Activity based on age

Age (years)	N	Mean of SOD activity ±SD (U/mL)	SOD activity minumum (U/mL)	SOD activity maksimum (U/mL)	P
≤25 years	37	82,72± 3,22	23,96	218,93	0,756
>25 years	7	80,41± 1,34	64,89	103,59	

The mean of SOD activity by age shows that respondents age under 25 years old higher than the age of over 25 years old. The mean of SOD activity in under 25 years old 82.72±3.22 U/mL with minimum of activity SOD 23,96U/mL and maximum of 21,93U/mL. Respondents were age over 25years old had an mean SOD activity are 80.41±1.34U/mL with minimum of SOD activity 64.89 U/mL and a maximum of 103.59U/mL. Based on statistical analysis ANOVA p =0.756(p>0.05), which means there is no significant difference between of SOD activity were age under 25 years old and over 25 years old.

Tabel 4. Distribution of SOD activity in physical activity

Physical activity	N	Means of SOD activity ± SD (U/mL)	SOD activity minumum (U/mL)	SOD activity maksimum (U/mL)	P
Regular physical activity	14	70,84± 2,40	23,96	107,31	0,060
Not regular pgysical activity	30	87,73± 3,10	47,03	218,93	

The results test of analysis with independent sample t-test showed no significant correlation between the mean of SOD activity on respondents who did not regular physical activity with the regular physical activitwith p = 0,060 Based on the results of the study known to the means of SOD activity respondents regular physical activity is 70,84 ± 2,40 U/mL with a minimum level of 23.96 U/mL and a maximum level of 107,31 U/mL, while the respondent did not exercise regularly with the means of SOD activity was 107,3 U/mL with a minimum level of 147,03 U/mL and levels a maximum of 218,93 U/mL. This shows the mean levels of SOD respondents who do not pass regular physical activity is higher than the exercise routine. This is consistent with research Harjanto (2003) which states that the production of SOD can be decreased during strenuous physical activity. Superoxide ($\bullet O_2^-$) which is formed during strenuous physical activity are reactive and harmful to the body.

Physical activity contributes to the occurrence of these diseases through increased endogenous oxidant. Endogenous oxidants mainly originate from natural biological process involving reactive oxygen species (ROS). ROS are reactive compounds derived from oxygen, compounds are required by all aerobic

organisms including humans (Suryohudoyo 2005). SOD enzyme can neutralize it by changing two •O_2^- molecules into hydrogen peroxide (H_2O_2) and O_2. Increased •O_2^- ongoing resulted in increased hydrogen peroxide, these conditions resulted in SOD activity disrupted, even levels may decrease,resulting in an imbalance between oxidants and endogenous antioxidants(Hairudin, 2005).

4. CONCLUSIONS

Based on the results of the analysis carried out that there was no correlation between SOD activity with age, sex and physical activity.

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