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Malondialdehyde (MDA) Profile of Healthy Volunteers in Yogyakarta Based on Their Sex, Age and Body Mass Index

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Abstract:

Introduction: MDA is an aldehyde compound which is the end product of lipid peroxide in the body. MDA is also a product that can be produced by free radicals through ionization reactions in the body and waste products of biosynthesis of prostaglandins which is the end product of membrane lipid oxidation. MDA is one of the parameters of oxidative stress, where a high concentration of MDA indicate oxidation processes in the cell membrane resulting in oxidative stress.

Aim: To assay the correlations MDA levels in the Yogyakarta based on sex, age and body mass index (BMI).

Methodology: We used the cross sectional study design. Total respondent is forty four people consisting of 11 males and 33 females who live in Yogyakarta. A total of 44 respondents who had met the inclusion criteria were male and female 18-60 years old and are willing be respondents to fill informed consent, healthy respondents as evidenced by a health certificate from the competent healthy care. Examined the levels of plasma MDA using ELISA method. Results of the study will be presented in the form of descriptive and statistical analysis with a confidence level of 95 %.

Results and discussion: Data analysis research results obtained the mean level of MDA as a whole is 83.54 ± 4.01 ng/ml, while based on sex showed that the mean level of MDA in the male respondents is lower than female. Mean levels of MDA on male respondents is 75.36 ± 2.90 ng/ml while on the female respondents is 86.27 ± 4.32 ng/ml. However, based on statistical analysis Independent sample t-test p value = 0.353 ($p > 0.05$), the which means there is no significant correlation between plasma MDA concentration on male and female respondents. Analysis of the data the mean levels of MDA the based on age showed that the mean level of MDA on respondents aged under 25 years lower compared to respondents aged over 25 years, where respondents were aged under 25 years had an mean level of MDA is 85.85 ± 4.27 ng/ml while those aged over 25 years is 71.38 ± 1.88 ng/ml. However, based on statistical analysis Independent sample t-test p value = 0.163 ($p > 0.05$), the which means there is no significant correlation between plasma levels of MDA among respondents aged under 25 years and the respondents that were aged over 25 years. Analysis of the data the mean levels of MDA based on BMI indicates that respondents who are not obese have an mean level of MDA were higher 85.24 ± 4.50 ng/ml, while the that obese have an average level of MDA 79.51 ± 2.57 ng/ml. However, based on statistical analysis Independent sample t-test p value = 0.599 ($p > 0.05$), the which means there is no significant correlation between MDA levels on that obese respondents and respondents who were not obese.

Conclusions: There was no significant correlation between MDA levels with sex, age and BMI (Body Mass Index) of healthy subjects in Yogyakarta.

Keywords: Profile, Levels, Malondialdehyde

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1. INTRODUCTION

Reactive oxygen (reactive oxygen species or ROS) can be formed by endogenous or exogenous, as part of the regular metabolic activity, physical activity, lifestyle and diet. Oxidative stress in humans, especially in urban areas tend to increase. Oxidative stress is caused by exposure to such radiation, smoking, air pollution, heavy metals, pesticides and food additives (Miharja, 2005).

Free radicals are highly reactive and tend to react with other molecules to find a pair electrons into a more stable form. Free radicals can react with various molecules, especially lipid membranes, proteins and DNA, so that it can change its structure and function, which eventually leads to cell death (Halliwell B, 1991; Kontos, 2001; Droge, 2002).

Under conditions of free radicals is higher than the antioxidant, there will be oxidative stress. Conditions of oxidative stress of the body can be measured by parameters malondialdehyde levels (MDA) in plasma. The higher levels of plasma MDA, the higher the oxidative stress that occurs in the cells of the body (Valko *et al.* 2006). MDA is the final product in the process of lipid peroxidation caused by free radical reactions in unsaturated fats in cell membranes (Jovanović *et al.*, 2012).

2. METHODE

This type of research is descriptive with cross sectional study design. This study was conducted in Yogyakarta. Examination of blood samples carried out in the laboratory. The population used is the people who reside in Yogyakarta. The sample is part of a population with total 44 people consisting of 11 men and 33 women who have fulfilled the inclusion and exclusion criteria, namely healthy volunteers as evidenced by a health certificate from the hospital authorities, men and women aged 18-60 years old and are willing to become respondents (fill informed consent). The independent variable in this study were age, gender and BMI (Body Mass Index), while the dependent variable is MDA. MDA is the final product in the process of lipid peroxidation caused by free radical reactions in unsaturated fats in cell membranes (Jovanović *et al.*, 2012). The research instrument used in this study is ELISA Reader that is used to measure the levels of MDA. Respondents who had met the inclusion criteria and were willing to fill informed consent then examined plasma MDA concentration using ELISA method. Results of the study will be presented in the form of descriptive and statistical analysis with a confidence level of 95%.

3. RESULTS AND DISCUSSION

The research aimed to find out how the image of the plasma MDA concentration on the people of Yogyakarta. Respondents were used in this study amounted to 44 people consisting of 11 people male and 33 people female. Age of respondents in this study ranged from 18-60 years consisting of 37 people aged under 25 years and 7 persons aged over 25 years. Characteristics of the subjects in this study can be seen in Table 1.

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Table 1. Characteristics Responden

Characteristics Responden	n	%
Sex		
Male	11	25
Female	33	75
Amount	44	100
Age		
<25 years	37	84,09
>25 years	7	15,91
Amount	44	100
Education		
High School	10	22,73
DIII	1	2,27
S1	32	72,73
S3	1	2,27
Amount	44	100
Work		
Student	34	77,27
Swasta	7	15,91
Wiraswasta	3	6,82
Amount	44	100

MDA research results on Yogyakarta society based on gender can be seen in Table 2.

Table 2. Distribution of MDA levels based on sex and correlations sex with levels of MDA.

	n	Mean MDA Levels \pm SD (ng/ml)	MDA Levels of minimum (ng/ml)	MDA Levels of maximum (ng/ml) Sex	p
Male	11	75,36 \pm 2,90	35,67	132,33	0,353
Female	33	86,27 \pm 4,32	5,67	175,67	

Results of the study data analysis based on sex showed that the mean level of MDA in male respondents is lower than female. It is shows that female have levels of MDA higher which means that female are more at risk happen of oxidative stress than male. In some studies, the most widely

is 86.27 ± 4.32 ng / ml with minimum MDA levels of 5.67 ng / ml and a maximum of 175.67 ng / ml. Test results analysis with independent sample t-test showed no significant correlation between the average levels of MDA on respondents male and female with $p = 0.353$.

MDA research results on the Yogyakarta community based on age can be seen in Table 3.

Table 3. Distribution of MDA levels based on Age

Age (Years)	n	Mean MDA Levels \pm SD (ng/ml)	MDA Levels of minimum (ng/ml)	MDA Levels of maximum (ng/ml)	P
<25	37	$85,85 \pm 4,27$	5,67	175,67	0,163
>25	7	$71,38 \pm 1,88$	35,67	85,67	

Analysis of data the mean levels of MDA based on age showed that respondents aged under 25 years higher than the age that over 25 years. Respondents that were aged under 25 years had higher levels of MDA 85.85 ± 4.27 ng / ml with minimum MDA levels of 5.67 ng / ml and a maximum of 175.67 ng / ml. Respondents that were aged over 25 years had an mean MDA levels is 71.38 ± 1.88 ng / ml with minimum MDA levels of 35.67 ng / ml and a maximum 85,67ng / ml. Based on statistical analysis Independent sample t -test p value = 0.163 ($p > 0.05$), which means there is no significant correlation between plasma MDA levels in subjects aged under 25 years and over 25 years.

This is not in accordance with previous studies, in which the research conducted by Benchter et al that showed an increase in plasma MDA associated with age. The older the more it will increase plasma levels of MDA (Ramatina, 2011). The more parents here refers to the habits and lifestyles that increasingly extreme, such as jobs and the environment. Heavy work that is mostly carried out by adults is different from the student (D Yesilbursa et al, 2005). This difference may be caused by differences in factors age that is too small so unspecific.

MDA research results on the Yogyakarta community based on BMI can be seen in Table 4 .

Table 4. Distribution of MDA levels based on Body Mass Index (BMI) and correlations BMI with MDA

	n	Mean MDA Levels \pm SD (ng/ml)	MDA Levels of BMI minimum (ng/ml)	MDA Levels of maximum (ng/ml)	P
Non Obese	31	$85,24 \pm 4,50$	5,67	175,67	0,599
Obese	13	$79,51 \pm 2,57$	42,33	129,00	

Based on the reaserch results showed mean of MDA plasma on respondents that not obese is 85.24 ± 4.50 ng / ml with minimum levels of 5.67 ng / ml and a maximum levels of 175.67 ng / ml , while mean of MDA plasma on respondents that obesity is 79.51 ± 2.57 ng / ml with minimum levels 42.33 ng/ml and maximum levels 129.00 ng/ml. This is shows the mean levels MDA on respondents with obesity lower than with respondents that are not obese . Test results analysis with independent sample t-

test showed no significant correlation between mean plasma MDA concentration on respondents who are not obese with obesity with $p = 0.599$.

Obesity increases the metabolic mechanisms and processes, thereby increasing myocardial oxygen consumption. Increased oxygen consumption can produce ROS, such as superoxide, hydroxyl radicals and hydrogen peroxide as a result of an increase in mitochondrial respiration (Mutlu-Turkoglu et al, 2003). Electron discharge can stimulate one electron reduction of molecular oxygen in the formation of superoxide radicals (Severina C.V.C. Lima1 et al, 2004). The incidence of lipid peroxide as a result of oxidative stress can be judged by the oxidative stress marker. In some literature describes patients obese have levels MDA higher than non- obese. However, based on the results of the analysis showed different results where the obese group had average levels of MDA were lower than the group who are not obese but the value of $p = 0.599 (> 0.005)$ so that there is no significant difference. That is because BMI of respondents who do not differ much between respondents.

4. CONCLUSIONS

There was no significant correlation between MDA levels with sex, age and BMI (Body Mass Index) of healthy subjects in Yogyakarta.

5. ACKNOWLEDGEMENT

I thanks responden for their participation in this study, Mr. Dr. dr. Akrom, M.Kes and Dr. rer. nat Endang Darmawan, M.Si., Apt for their support in realization of the study.

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