

The Effect of *Sunnah* Fasting on Blood Pressure and Oral Hygiene Level

Erlina Sih Mahanani^{1*}, Hana Aulia Hapsari², Dinda Triani Ahyati²

¹ Department of Dental Biomedical, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Special Region of Yogyakarta, Indonesia

² Dental Hospital, Universitas Muhammadiyah Yogyakarta, Special Region of Yogyakarta, Indonesia

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***CORRESPONDENCE:**

erlina.sih@umy.ac.id

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Abstract: The Monday-Thursday fasting, as one of the *sunnah* highly recommended by Rasulullah, can be a key to maintaining health. This research aims to determine the difference in blood pressure and oral health among the *santriwati* in Madrasah Mu'allimat Muhammadiyah Yogyakarta who have gotten used to doing and those who have not gotten used to doing Monday-Thursday fasting. It is an observational quantitative research using a cross-sectional design. They were 48 *santriwati* of 14-18 years old as subjects. Blood pressure was measured thrice with a minimum measurement interval of 15 minutes. The dental and oral hygiene level was obtained using the OHI-S measurement index. The students who habitually carried out *sunnah* fasting had a normal blood pressure of 20.8% (of a total of 27.1%), and all students had a good level of OHI (27.1%). Meanwhile, among students who are not accustomed to fasting, 45.8% had abnormal blood pressure (a total of 72.9%), and the good level of OHI was only 47.9%. The analysis of Mann-Whitney data showed a significant value for the blood pressure category variable of 0.015 and the OHI-S category of 0.015. The significance level of $p < 0.05$ for each measurement variable (blood pressure and OHI-S categories) illustrated that there were differences in blood pressure and oral hygiene among the *santriwati* who had gotten used to doing and those who had not gotten used to doing Monday-Thursday fasting.

Keywords: monday-thursday fasting; blood pressure; OHI-S; oral hygiene

INTRODUCTION

Blood pressure is one of the vital signs that can be used to determine a person's health level. Since teeth and mouth, in general, are also part of the human body, maintaining oral health is one of the efforts to maintain general health. Dental and oral health can be maintained by brushing our teeth every day, after breakfast in the morning, before bed in the evening, and by regular teeth checking at least once every six months¹. If a person's dental and oral health is good, so is their general health. It makes their blood pressure indicator within normal limits and vice versa. Human blood pressure will change according to their body condition. Blood pressure variety can be influenced by age, physical activity, stress, changes in body position, and food intake². Four factors will affect the health, including dental and oral health, of the people in a community, the environment (physically and socio-cultural), behavior, heredity, and health services. Behavior factors, especially those who do not maintain health, such as not brushing their teeth before bed, overeating, and high-fat food consumption, often trigger various diseases related to blood pressure and oral hygiene³.

Students, especially high school students, often ignore their health due to their busy activities in and after school. In the end, this busy life often makes students forget about their health. Not only are they busy with their obligations at school, but female students at Madrasah Mu'allimat Muhammadiyah Yogyakarta are also required to follow all the rules and various crowded dormitory programs. It often makes female students pay less attention to their diet and care less about their body health. Irregular eating patterns, unhealthy food intake, staying up late habits, and lack of rest can affect blood pressure to be abnormal blood pressure. In addition, this busy life often makes female students forget to brush their teeth before sleep since they are

exhausted from all their activities. In the end, an unhealthy lifestyle impacts health, causing toothache, gastritis, abnormal blood pressure, or other various diseases⁴.

One of the preventive efforts to make regular and unexcessive eating patterns is fasting. Fasting by language is refraining from eating, drinking, emotions, and lust, and worshipping sincerely because of Allah Ta'ala starting from sunrise to sunset⁵. Fasting plays an important role in keeping blood pressure within normal limits. Excessive consumption of food, especially foods containing much fat, can increase cholesterol and fat levels in the blood, affecting blood pressure. It occurs because fat and cholesterol will form sludge on the blood vessel walls that will block the rate of blood flow⁶. People who fast do not eat or drink for almost twelve hours, so the amount of food intake is not as much as when they are not fasting. It affects the number of bacteria in the mouth since the more food types enter the mouth, the more varied the bacteria are. Therefore, getting used to fasting is expected to prevent dental and oral diseases⁷.

Humans tend to have stronger self-control when fasting because fasting will protect humans from the impulse of lust^{2,7}. If humans have been able to control despicable lusts, then they will get a peaceful life¹. It, of course, can reduce emotional stress. The reduction of emotional stress causes a sense of calm in an individual⁶. A sense of calm can stimulate the parasympathetic nerves, which cause a decrease in blood pressure. In addition, reducing emotional stress can also affect the secretion and pH of saliva in the oral cavity, which is very useful for self-cleansing in the oral cavity⁸.

The effect of Monday-Thursday sunnah fasting on blood pressure and the level of oral hygiene is not known for certain. Fasting Muslims have their meal time twice, eating immediately at sunset, marked by the entry of the *maghrib* prayer time (iftar), and eating before dawn (*sahur*)⁹. The length of time for fasting varies amongst countries but generally ranges from 11 to 18 hours every day¹⁰. During fasting, humans are not allowed to eat or drink, so during that time, the condition of the oral cavity will change due to changes in pH and secretion of saliva as a self-cleaning agent of the oral cavity. Reduced fluid intake during fasting can also reduce the fluid volume in the body, causing blood pressure to drop^{6,11}.

Fasting on Mondays and Thursdays is one of the *sunnah* practices recommended by the Prophet Muhammad. Cardiovascular disease and diseases due to poor oral hygiene are still increasing.^{6,7,11} This study needs to be conducted to determine differences in blood pressure and oral hygiene levels among female students with habitual and no habitual Monday-Thursday fasting.

MATERIAL AND METHOD

This research is an analytical observational quantitative research using a cross-sectional design. The sampling technique used was simple random sampling. The target population was all female students of Madrasah Mu'allimat Muhammadiyah Yogyakarta and the accessible population was female students of Madrasah Mu'allimat Muhammadiyah Yogyakarta who lived in Halimatus Sa'diyah Dormitory. The sample consisted of 48 respondents. The number of samples was taken using the Slovin formula from the accessible population and added with a drop out of 10%. The Ethical clearance was obtained from Ethical Clearance Committee No. 076/EC-KEPK FKIK UMY/III/2020.

The inclusion criteria in this study were healthy female students (both physically and spiritually), who fasted Monday and Thursday, aged 14-18 years, and were willing to participate. Exclusion criteria in this study were female students who smoked, wore fixed orthodontic appliances, and brushed their teeth less than twice a day.

Blood pressure measurement

The study began by explaining the research to the respondents, then the selected respondents filled out informed consent, and an interview was conducted regarding the habit of fasting on Mondays and Thursdays (accustomed to/not accustomed to).

Blood pressure was measured three times with a minimum measurement interval of 15 minutes using a digital sphygmomanometer, and then the results were averaged. Blood pressure classification refers to the classification of blood pressure based on age by the American Heart Association (AHA) and the classification of systolic and diastolic pressure by WHO-ISH and ESH-ESC (2014), so the normal systolic pressure range for ages 14-18 years is 105-139 while the normal diastolic is 70-89. Normal or abnormal conditions cannot be determined only by systolic or diastolic pressure. In other words, if one of the results of blood pressure measurements, either systolic or diastolic blood pressure, is not normal, then the blood pressure is declared abnormal, and vice versa.

Oral hygiene index measurement

The dental and oral hygiene level was checked using a mouth mirror, a probe, and a flashlight with an OHI-S measurement index. The OHI-S index measurement was obtained by adding the Simplified Debris Index (DI-S) and Simplified Calculus Index (CI-S). The index category was divided into three groups, including good (0 - 1.2), moderate (1.3 - 3.0), and bad (3.0 - 6.0). The research data for the blood pressure category and the OHI-S index collected were analyzed using the SPSS application with the Man Whitney U-Test analysis.

RESULT

The female students of Madrasah Mu'allimat Muhammadiyah Yogyakarta who lived in Halimatus Sa'diyah Dormitory were the volunteers in this study. The Descriptive analytical sample was based on age, dominated by 15-year-old students.

Table 1. Distribution of the Participant Based on Age

Age (years)	Frequency (n)	Percent (%)
14	1	2.1
15	26	54.2
16	13	27.1
17	7	14.6
18	1	2.1
Total	48	100.0

The characteristics of respondents based on their habits on Mondays-Thursdays fasting and the categories of blood pressure measurement results and the OHI-S index are presented in Table 2.

Table 2. Distribution of Blood Pressure and OHIS Index Category Based on Habit on Monday-Thursday Fasting

Habit on Monday-Thursday fasting		Blood Pressure Category			OHIS Category		Total
		abnormal	normal	Total	Good	Moderate	
No habit	Count	22	13	35	23	12	35
	% of Total	45.8%	27.1%	72.9%	47.9%	25.0%	72.9%
Habit	Count	3	10	13	13	0	13
	% of Total	6.3%	20.8%	27.1%	27.1%	0%	27.1%
Total	Count	25	23	48	36	12	48

35 female students (72.9%) were not accustomed to having Monday-Thursday fasting, and 13 female students (27.1%) were accustomed to having Monday-Thursday fasting. Based on the table, 22 female students (45.8%) in the group who were not accustomed to having Monday-Thursday fasting had abnormal blood pressure, 13 female students (27.1%) had normal blood pressure. Three students in the group accustomed to having Monday-Thursday fasting had abnormal blood pressure (6.3%), and 10 students (20.8%) had normal blood pressure.

The data for calculating the OHI-S index in the group of female students who were not accustomed to having Monday-Thursday fasting showed that 23 female students (47.9%) had a good OHI-S index category, 12 students (25.0%) had a medium OHI-S index category, and no students (0%) had a poor OHI-S index. In the group of female students who had a habit of Monday-Thursday fasting, all-female students (27.1%) had a good OHI-S index category, so there was no moderate OHI index category (0%) and poor OHI index (0%).

The non-parametric test result using Man Whitney U-test obtained a Z value for the blood pressure category of -2.426 with a significance of 0.015 and Z for the OHI-S category of -2.412 with a significance of 0.016 (Tabel 3). The significance level was <0.05 for each variable measurement (blood pressure category and OHI-S category), so it can be concluded that there were differences in blood pressure and oral hygiene levels between female students who had a habit of Monday-Thursday fasting and female students who did not have a habit on the *sunnah* fasting.

Tabel 3. The Result of Different Tests of Blood Pressure and Oral Hygiene between Female Students Who Have Monday-Thursday Fasting Habit and Those Who Do Not

	Blood Pressure Category	OHI-S Category
Mann-Whitney U	137.000	149.500
Wilcoxon W	767.000	240.500
Z	-2.426	-2.412
Asymp. Sig. (2-tailed)	0.015	0.016

DISCUSSION

Blood pressure can vary depending on many factors, including age, race, gender, stress, medication, activity, and hormones¹². In this study, it has been proven that there is an effect of Monday-Thursday fasting on blood pressure in female students who are accustomed to it. By having Monday-Thursday fasting, most of them have normal blood pressure. The wisdom of the habit of having Monday-Thursday fasting on blood pressure health is related to self-control against lust. Lust can be in the form of oral lust (eating, drinking, talking about bad things), genital lust, or emotional lust. When fasting, a person is not allowed to eat and drink and must stay away from things that can break the fast. The self-control against lust during fasting will trigger a sense of psychological calm so that a person can control themselves in any situation, not rashly take action, and not get angry easily. This calm feeling affects the sympathetic and parasympathetic nervous systems, which regulate blood pressure. When a person gets angry, there will be sympathetic nerve stimulation which can increase the speed of heart muscle contraction and affect the production of the hormone epinephrine (adrenaline). The production of this hormone will cause blood vessels to narrow (vasoconstriction) so that blood pressure increases. In addition, this hormone also causes an increase in heart rate and a decrease in secretory function¹³. According to the results of Afifi's research, decreased emotional stress with the emergence of a sense of calm can prevent the release of epinephrine so that there is no increase in blood pressure⁶. In contrast to the sympathetic nerves, stimulation of the parasympathetic nerves lowers blood pressure. The sense of calm during fasting triggers a balance between the sympathetic and parasympathetic nervous systems. Therefore, good emotional control that can be made accustomed to fasting often can keep blood pressure within normal limits¹⁰.

In terms of dental and oral hygiene, this study has proven the effect of Monday-Thursday fasting on a person's dental and oral hygiene. It was found that most female students who were accustomed to having Monday-Thursday fasting had good dental and oral hygiene. It is related to the sense of calm that arises when fasting due to self-control against emotional and other lusts. The sense of calm could control saliva pH and secrecy in the mouth to remain normal. A study concluded that psychological factors such as depression, anxiety, and stress played an important role in causing xerostomia. In another study, it was proven that increasing stress levels would reduce salivary pH¹⁴. Saliva, as a self-cleaning agent in the mouth, is very important to maintain normal pH and secretions so that the normal flora in the mouth remains balanced. The acidity level of saliva under normal conditions is between 5.6–7.0, with an average pH of 6.7. Several factors that cause changes in salivary pH include the average salivary flow rate, oral microorganisms, and the buffering capacity of saliva. The oral cavity's low acidity level (pH) between 4.5-5.5 will facilitate the growth of acidogenic bacteria such as *Streptococcus* mutants and *Lactobacillus*, which are the main causes of dental caries. Several physiological processes affected by pH are enzymatic activity, demineralization, remineralization of hard tissue, and acid-binding. A decreased pH in the oral cavity can cause rapid demineralization of dental elements, thereby increasing the risk of caries¹¹. On the contrary, an increase in pH more than normal can trigger the formation of bacterial colonization and calculus on the tooth surface¹⁵.

Fasting habits aside from Ramadan fasting, such as the Monday-Thursday fasting routine, will affect the body's metabolism. When people fast or have no food intake, the role of glucagon is even greater in the body's effort to obtain glucose. In this condition, glucose is obtained from the breakdown of liver glycogen (glycogenolysis). If glycogenolysis has not met the needs of glucose in the body, lipolysis will be carried out, or the breakdown of fat into glycerol will then be converted into glucose in the liver¹⁶. The breakdown of fat to meet the body's glucose needs can prevent the formation of cholesterol deposits on the blood vessels' walls which, if it occurs, can block the blood flow rate and cause blood pressure to be disturbed⁵.

Appetite control during fasting also affects the health and hygiene of the oral cavity. Many studies linked sugar consumption with the prevalence of tooth decay and showed a clear relationship between the

frequency of consumption, the mealtime distance, and the prevalence of cavities. Various food characteristics cause these foods to be potentially cariogenic, such as sucrose concentration, consistency, food combinations, order, frequency of consumption, and food pH 11^{17,18}. It is in line with the results of research by Holbrook et al., stating that extrinsic sugar intake more than 4 times per day was found to be associated with an increased risk of dental caries. When fasting, a person does not eat and drink for almost 12 hours and only eats and drinks at dawn and iftar. It causes the frequency of eating less, and the distance between the long time and the amount of food that enters the mouth is not as much as when not fasting. Therefore, the number of disease-causing bacteria in the oral cavity is also less and getting accustomed to fasting can prevent dental and oral diseases if balanced with regular brushing efforts after eating *sahur* and before going to bed¹⁵.

Students accustomed to fasting on Mondays and Thursdays have regularly fasted on Mondays and Thursdays weekly for a long time. In medical science, not eating and drinking for a certain time that is done regularly can also be called intermittent fasting. Intermittent fasting has been proven in various studies to have many benefits¹⁸. According to Faris et al., intermittent fasting can improve the health of the cerebrovascular and cardiovascular systems; inhibits the aging process; lowers insulin resistance and triggers insulin sensitivity action; improve mitochondrial health, DNA repair, and autophagy; lose weight; improve the cardiovascular health of obese diabetics, and reduce the risk of cardiovascular disease. Changes in fluid and dietary intake and reduced eating frequency can result in various chronobiological changes, such as the circadian distribution of body temperature, melatonin, cortisol, and glycemic control, as well as changes in daytime alertness and sleep at night. These physiological changes have been investigated to improve inflammatory and oxidative stress markers predisposing factors for chronic diseases, such as cancer and cardiovascular disease¹⁹. It is also supported by research by Malinowski et al., which proved the effect of intermittent fasting in preventing hypertension. In this study, it was explained that intermittent fasting caused an increase in BDNF (Brain-Derived Neurotrophic Factor) which can activate parasympathetic nerve stimulation, so that blood pressure decreases²⁰. This result will be different from female students who are not accustomed to having Monday-Thursday fasting or only have Monday-Thursday fasting at certain times as research result of Toledo et al. on improving the health and well-being of 1422 respondents by routinely fasting on a different number of days (4-21 days). This study showed a greater reduction in blood pressure in the group that fasted longer. Based on the result, it can be concluded that fasting that was not done regularly or not for a long time would not have a significant health effect as if it was done regularly.¹⁷

CONCLUSION

The accustomed Monday-Thursday *sunnah* fasting affected the blood pressure and oral hygiene index in female Madrasah Mu'allimat Muhammadiyah Yogyakarta students. Students who routinely performed Monday-Thursday *sunnah* fasting had normal blood pressure and a better oral hygiene index.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest concerning this article's content, authorship, and publication.

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