The Effect of Reciting the Qur’an with Makhraj on Saliva Volume and pH During Fasting

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Research Article

The Effect of Reciting the Qur'an with *Makhraj* on Saliva Volume and pH During Fasting

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Abstract

An oral fluid called saliva contributes to the preservation of oral homeostasis. Both the major and minor salivary glands create saliva. Meanwhile, the practice of not eating or drinking is known as fasting. While fasting, saliva production is quite low, resulting from low stimulation to salivary glands. Salivary production, in fact, can be stimulated by mechanical stimuli, one of which is by reciting the Qur'an. Reciting the Qur'an with *makhorijul huroof* means reciting Qur'anic verses according to where the sound of the *hijaiyah* letters comes out. The resulting movement can stimulate the salivary glands and increase saliva production. The study, therefore, aims to determine the effect of reciting the Qur'an with *makhraj* on the volume and pH of saliva during fasting in Institut Ilmu Kesehatan Bhakti Wiyata Kediri students. This study employed a true experimental method with a pre-test-post-test control group design. The results data were analyzed and interpreted to test the hypothesis using the independent t-test with the variable data scale being ratio. The results revealed the significance value of the independent t-test on the difference between the pre-test and post-test data on volume and pH of the experimental group of 0.000 Asymp. Sig. (2-tailed). The p-value <0.05 indicates that there was a significant effect. This study concludes that reciting the Qur'an with *makhraj* can increase the volume and pH of saliva during fasting.

Keywords: saliva; *Makhorijul Huroof*; recitation of the Qur'an; fasting

INTRODUCTION

Saliva has an important role in maintaining homeostatic conditions in the oral cavity. Some of these are assisting the digestive process, playing a role in the process of swallowing food, helping phonation, and playing a role in oral hygiene.[1] Saliva also helps maintain the pH balance of the mouth, which protects the soft oral tissues and teeth from prolonged exposure to an acidic environment. Saliva contains several signaling molecules, such as EGF (*Epidermal Growth Factor*), FGF (*Fibroblast Growth Factor*), NGF (*Nerve Growth Factor*), and TGF-α (*Transforming Growth Factor alpha),* which are essential for the regeneration of oral and esophageal mucosa. The antibacterial and antifungal components of the saliva, such as lysozymes, immunoglobulins, and lactoferrin, help prevent the progression of bacterial infection and dental caries.[2] Saliva production is generally produced by the activity of the major salivary glands, namely, the submandibular glands, parotid glands, sublingual glands, and minor salivary glands.[3]

Fasting is an act of worship that is done by avoiding consuming food, drink, and all activities that invalidate the fast, from sunrise to sunset. Fasting can be implemented in various ways and for various purposes. In Islam, there are two kinds of fasting, namely mandatory fasting, such as fasting in Ramadan and sunnah fasting, for example, fasting on Monday

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and Thursday. The duration of fasting varies between 11 to 18 hours per day, starting from before dawn (*sahur*) until maghrib adhan.[4]

While fasting, the salivary flow slows down because the salivary glands do not get stimulation either chemically or mechanically. During fasting, human bodies undergo several changes, especially in the oral cavity. One of the changes that will occur is a decrease in saliva production, which will cause many disorders in the oral cavity. Some salivary functions will decrease because the content and amount of salivary flow are influenced by the body conditions and the stimuli in the salivary glands. A decrease in salivary functions, such as the pH of saliva and salivary flow rate, will affect bacterial growth in the oral cavity and will increase the risk of caries development.[5]

Furthermore, the average salivary flow rate during fasting is only 0.561 mL/5 minutes and rises to 0.73 L mL/5 minutes after breaking fast. During fasting, saliva has an average buffer of 7.11 mMol/L and increased to 7.75 mMol/L after food intake.[3] The slow flow of saliva might have an impact on decreasing the buffer capacity of saliva. As a result, the salivary pH will also decrease, which might increase the risk of developing caries in the oral cavity.[6]

Saliva production can be stimulated by mechanical stimulation by carrying out activities that involve movement of the oral cavity, such as speaking, singing, and reciting the Qur'an. A previous study conducted by Nugraheni (2012) on students at an Islamic boarding school revealed that reciting the Qur'an with *makhraj* involves several parts of the organs, such as the mouth, throat, tongue, lips, and bridge of the nose, which can stimulate the salivary glands mechanically to raise the volume and pH of saliva during fasting. However, that study did not quantitatively reveal the value of the increase in pH before and after being given the treatment of reciting the Qur'an with *makhraj* during fasting.[7]

For that reason, this study aims to determine the effect of reciting the Qur'an with *makhraj* on the volume and pH of saliva during fasting in Institut Ilmu Kesehatan Bhakti Wiyata Kediri students aged 19-21 years.

MATERIALS AND METHODS

This study employed a true experimental research method with a pre-test-post-test control group research design. The research procedure has been declared to have passed ethical eligibility by the Institut Ilmu Kesehatan Bhakti Wiyata Research Ethics Commission No. 154/FKG/EP/II/2023.

The scaling of the oral cavity samples was carried out at the dentist office. Meanwhile, measurements of salivary pH and saliva volume after the treatment (reciting the Qur'an with *makhraj*) were carried out at the Bacteriology Laboratory of Institut Ilmu Kesehatan Bhakti Wiyata Kediri.

The population of the study was students of the Institut Ilmu Kesehatan Bhakti Wiyata Kediri, and the sample was those who had met the inclusion criteria. The inclusion criteria in this study were students who were active as members of the Student Activity Unit of the Islamic Studies Forum, who could recite the Qur'an with tajwid, were healthy students, who had no systemic disease, were not taking any medications, had no caries, had no prosthodontics or orthodontics appliances, fasted Monday and Thursday, aged 19-21 years, were willing to participate, and were willing to have their oral cavity scaled.

After that, a simple random sampling technique was conducted using the Slovin formula:

$$n = \frac{N}{1+N\alpha^2} = \frac{50}{1+50(0.1)^2} = 33{,}33 \approx 34$$

n = sample
N = population
A = the significance level

The sample of this study consisted of 34 people, divided equally into two groups: 17 samples of the control group (fasting without reciting the Qur'an with *makhraj*) and 17 samples of the experimental group (fasting and reciting the Qur'an with *makhraj*).

The research instruments comprised a sterile saliva pot tube, pH meter (HI98107 pHep® Hanna, Rumania),[8] measuring cylinder (Pyrex), 6 ml syringe, paper and stationery Al-Qur'an, rubber gloves, mask, hand sanitizer, camera, and stopwatch.

Before carrying out the study, they filled out informed consent in advance as a form of approval. Furthermore, a week before taking saliva samples, oral cavity scaling was carried out to create a homogeneous oral cavity. The type of surah read at the time of recitation was surah An-Naba. The recitation of the surah with *makhraj* was checked by an *ustadzah* (teacher).

Those in the experimental group were given the treatment of reciting the Qur'an with *makhraj*, while the rest in the control group did not recite the recitation and were given a 10-minute pause during saliva sampling as an assumption to wait for the recital. The saliva collection of the sample was done before (pre-test) and after reciting the Qur'an (post-test). Saliva collection was done at 09.00 – 12.00 AM, with the length of fasting ranging from 5 to 6 hours.[8,9] The saliva volume measurement of this study utilized the spitting method. This method allows saliva to accumulate in the oral cavity and then be released into a measuring cylinder every minute. The saliva collection of each sample was done for five minutes and counted using a stopwatch.[10]

Salivary pH was measured using a calibrated pH meter to obtain quantitative results.[11] Measurement of salivary pH was done by entering the pH meter into the saliva pot until the sensor electrode was submerged into the saliva and then left for a few seconds until it showed the pH level of the saliva and was recorded by the researchers.[12]

The data obtained were then analyzed. The normality test was carried out using the *Shapiro-Wilk* test to determine the distribution of data and the homogeneity test using the *Levene* test.[1] Following that, a statistical test was performed using the independent *t-test* statistic to determine the difference in pre-test and post-test values on the volume and pH of the saliva of the experimental group.[13]

RESULT

The results of the study in the control group (Table 1), where the respondents were fasting, showed a decrease in average salivary volume from 1.9 ml to 1.7 ml. The experimental group's salivary volume increased significantly from 2.1 ml to 2.3 ml when the respondents were fasting and reciting the Qur'an. The average salivary pH in the experimental group rose from 7.09 to 7.26. Meanwhile, in the control group, the average salivary pH decreased from 7.01 to 7.03.

Table 1. Comparison of Average Saliva Volume and pH Results Before and After Reciting the Qur'an with *Makhraj*

	Experimental Group		Control Group	
	pre-test	post-test	pre-test	post-test
Volume Saliva	.1	.3	.9	.7
pH Saliva	.09	.26	.01	.03

The results of the normality test using *Shapiro-Wilk* uncovered that the data were normally distributed, indicating that parametric tests could be carried out. Furthermore, the *homogeneity* test using the *Levene* test found that the variance of the

data was not homogenous. The independent *t-test* as a parametric test was then carried out to investigate the difference in the pre-test and post-test values of salivary volume and pH in the experimental group (Table 2).

Table 2. Independent *T-test* Results of Volume and pH of Saliva in the Experimental Group

t-test		Sig. (2-tailed) *p*-value
pH	Pre-test Eks – Post-test Eks	.000
Volume	Pre-test Eks – Post-test Eks	.000

The significance value of the independent *t-test* (Table 2) on the volume and pH data of the experimental group in the pre-test and post-test treatment was 0.000 sig. (2-tailed). This value was smaller than the specified research error rate, 95% (0.05), indicating that there was a significant increase in volume and salivary pH in respondents while fasting and reciting the Qur'an. These values mean that H_0 was rejected and H_1 was accepted, denoting that there was an effect of reciting the Qur'an with *makhraj* on the volume and pH of saliva during fasting in Institut Ilmu Kesehatan Bhakti Wiyata students.

DISCUSSION

The study results for the control group (Table 1), consisting of fasting respondents, indicated an increase in salivary volume from 2.1 ml to 2.3 ml, alongside a decrease in salivary volume from 1.7 ml to 1.9 ml. According to Booy (2016), the volume and buffer of saliva are lower than normal conditions during fasting, where the average volume of saliva during fasting is 0.112 ml/min.[14] This study found that saliva production was lower during fasting but still within physiological limits. The average unstimulated salivary flow rate was 0.12–0.16 mL/min, and the average flow rate of unstimulated salivary flow rate for 16 hours was 0.3 mL/min. The average stimulated salivary flow rate was <0,7 mL/min (hypofunction), 0.7-1 mL/min (minimum), and 1-3 mL/min (maximum). During fasting, the flow rate was low in the range of 0.08 – 0.1 mL/min.[5]

This supports a previous study done by Almeida (2008), which revealed that fasting in the short term can reduce salivary flow but cannot be categorized as hyposalivation, and salivary flow will return to normal after the fasting period is over.[15] The decrease in salivary secretion has an impact on decreasing the salivary pH value. Sharmila et al. (2013) suggest that the normal value of salivary pH is in the range of 6.2-7.6 with an average pH of 6.7.[16] The research of Novy and Young (2010) demonstrated that the average pH of saliva without stimulation ranged from 6.10 to 6.47.[6]

In comparison, in this study, where respondents were fasting and reciting the Quran, the salivary pH of the experimental group increased to 7.26, higher than the average normal salivary pH. This indicates that the stimulus of reciting the Quran can raise salivary pH to a more alkaline level.

The degree of salivary acidity is influenced by psychological factors, gender, and oral hygiene. Measurement of salivary pH is required to pay attention to factors that may affect the measurement results, such as differences in diet, gender, psychology, and smoking habits. In this study, the psychological condition of the respondents was thought to be a factor influencing salivary pH.[4,5]

Moreover, Haryani (2016) puts forward that psychological conditions, one of which is stress, can inhibit secretion, while tension can inhibit salivary gland stimulation.[17] Reciting the Qur'an with *makhraj* in this study was carried out for fasting people. Reciting the Qur'an was done by reading the verses of the Qur'an, Surah An-Naba, using the correct as well as precise *makhraj* guided and corrected by the *ustadzah*. The results uncovered that there was an effect of reciting the Qur'an

with *makhraj* on increasing the volume and pH of saliva in fasting people. This is evidenced by the results of the parametric statistical test independent *t-test* on the volume and pH data of the experimental group in the pre-test and post-test conditions, namely p = 0.00 Asymp. Sig. (2-tailed). This value was lower than the specified error range of 95% (0.05), indicating that there was an effect. From the results of observations, the volume of saliva obtained from respondents by reciting the Qur'an with *makhraj* was the lowest at 2 ml/minute and the highest at 3.8 ml/minute. These findings signify an increase in salivary volume after stimulation.[10] This is consistent with an experiment conducted by Indriana (2011) by providing a mechanical stimulus (chewing) to respondents by measuring salivary flow.[18]

The result exposed an increase in the salivary flow rate of 1.24 ml/minute from the value of the unstimulated salivary volume of 0.81 ml/minute. Besides volume, the results of the study also revealed an increase in salivary pH after reciting the Qur'an with a *makhraj*. The lowest pH was 6.6, and the highest pH was 7.8. Indriana (2011) believes that the average pH of saliva without stimulation was 6.61, and the average pH with mechanical stimulation (chewing) was 8.82.[18,19]

The findings of this study reinforce the study conducted by Nugraheni (2011) on students at the Nurul Haq orphanage by measuring the degree of acidity (pH) of saliva using pH strips. The results of the study reported that there were differences in the increase in the volume and pH of saliva before and after reciting the Qur'an with the correct *Makhraj*. This is due to the pressure when pronouncing letters, which stimulates saliva.[7]

Reciting the Qur'an means reciting the verses of the Qur'an in accordance with the law of recitation (*Tajwid*) and studying the content of the verse of the Qur'an to be implemented in the life of the world and the hereafter. *Makhraj* letters are classified into 5, namely *halq* (throat), *jauf* (space in the mouth), *syafatain* (lips), *lisan* (tongue), and *khoisyum* (the deepest bridge of the nose).[20]

Reciting the Qur'an with *makhraj* produces movements that can stimulate the salivary glands mechanically. For example, the movement of the mouth and throat, which is obtained from pronouncing the letters *Kha', Ghain, Ha, Ain, Hamzah*, and *Ha',* can stimulate the major salivary glands, including the submandibular, parotid, and sublingual glands. Movement of the tongue and lips obtained from the pronunciation of the letters *Qaf, Kaf, Kha', Ya', Syin', Lam, Nun, Ra, Wau, Mim, Wau, Fa', Tha, Dal, Ta', Tsa, Zha, Dzal, Sin, Zai,* and *Shad* can stimulate the major salivary glands, namely the sublingual glands and minor salivary glands spread over the buccal, labial, and lingual parts.[7]

Furthermore, salivary secretion increases with the salivary reflex being stimulated. The salivary reflex after being stimulated begins when the chemoreceptors or receptors that play a role in the occurrence of pressure start to be sensitive to the presence of food in the cavity. These receptors will send signals to afferent nerve fibers to convey information to the salivary center in the brainstem medulla. The salivary center, in the form of sympathetic nerves, will then continue the impulse through the extrinsic autonomic nerves to the salivary glands to secrete saliva. Chewing activity will produce movements that can increase the stimulation of salivary secretion even though no food is consumed due to manipulation of the pressure receptors in the oral cavity.[5,21]

The speed of salivary secretion after mechanical stimulation is related to the increase in salivary pH value.[22] Much stimulated saliva is produced by the parotid glands, and the salivary pH ranges from 6.0 to 7.4 with a secretion time of 1 ml/minute. Salivary pH and bicarbonate concentration influence each other; with an increase in the rate of secretion of the parotid gland spout, it increases. Therefore, the saliva produced is thinner and richer in enzymes.[13]

The salivary reflex can be stimulated through mechanical movements in the mouth by stimulation of taste receptors that occur in the trigeminal nerve (N.V) and facial nerve (N.VII).[23] Mechanical stimulation of the salivary glands will provide stimulation that stimulates the sympathetic nerves. Then, the blood vessels in the salivary glands will experience vasodilation. Thus, the glands get adequate nutrition from blood to increase salivary secretion.[24]

CONCLUSION

Reciting the Qur'an with *makhraj* can increase the volume and pH of saliva during fasting because the mechanical stimulation from the movements produced when pronouncing *hijaiya* letters can suppress various receptors in the salivary glands. Accordingly, it is necessary to conduct further study on the effect of reciting the Qur'an with *makhraj* on the volume and pH of saliva during fasting by taking into account other factors such as the comparison of the use of saliva collection methods, duration of fasting, age, gender, and oral conditions such as the use of dentures, orthodontic appliances, and other dental treatments.

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