

Concentration of total protein and degree of acidity (pH) of saliva when fasting and after breakfasting



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Abstract

Objective: The aim to examine the concentration of total protein and the degree of acidity (pH) in saliva in people who are fasting compared to people who have had their break-fast. While fasting, the mouth does not work to eat and drink so that the salivary glands become less active. Therefore the saliva production is decreased and there is a change in eating time which is related to the mastication process that impact changes in the degree of acidity (pH).

Material and Methods: The study was an observational analytic design with longitudinal data conducted in Dental Hospital Hasanuddin University, Makassar, Indonesia, in July 2015, the sampling method was purposive sampling. Population was 35 clinical students at the

Department of Dental Public Health, Faculty of Dentistry, Hasanuddin University with a total sample of 16 students who fit the criteria of the study subjects. The data was analyzed using SPSS version 17.0 (paired t-test, $p < 0.05$).

Results: The mean of total protein (%) while fasting was at $0.135\% \pm 0.026$ and the mean total protein (%) after breakfast was at $0.179\% \pm 0.035$, while the average degree of acidity (pH) during fasting was at 7.26 ± 0.24 and the average degree of acidity (pH) after breakfast was at 7.66 ± 0.23 with p-value (0.000).

Conclusions: There is an increase in the total protein concentration and acidity (pH) after breakfast.

Keywords: Total protein, Degree of acidity (pH), Saliva, Fasting, Breakfast

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Introduction

Ramadhan is the ninth month of the Islamic lunar calendar (AH) which has great meaning for all Muslims in the world. Abstinence to eat and drink or to have sexual relations, is the feature of this period. During Ramadhan, Muslims fast every day from dawn to sunset.¹ There are diverse microbial colonies in the oral cavity, where the differences in physical, chemical and mechanical properties in oral cavity affect the spread of the colony and ecological system of normal micro flora. Dental caries and periodontal disease come from the complex relationship between diet and microflora in the mouth. Some patients typically experience pain and damage to tissues surrounding the teeth. At the time of fasting in the holy month of Ramadhan, oral cavity indicates a change in oral hygiene, time and amount of food intake and since there is a modification so that they can change the micro flora in the mouth.²

Saliva is one of the most important protectors of body fluids in oral cavity. Saliva has various functions in the oral environment such as cleaning of food debris and bacteria, neutralizing the atmosphere of oral cavity tissue damaged by strong bases and acids, giving the state of saturation of calcium needed for remineralization of teeth: also has an antibacterial, antifungal, and antiviral property. Saliva contains a number

of proteins that participate in the protection of oral tissues, for example lysozyme, lactoferrin, lactoperoxidase, immunoglobulins, agglutinin and mucin.³ Saliva is largely composed of water (99.5%), also contains protein (0.3%) inorganic, and other substances (0.2%).⁴ Salivary proteins have five roles: A. For microbial agglutination, B. For the lysis of microbial membranes, C. For anti-fungal, D. anti-virus and E. is used as an immune regulatory processes at mucosal tissues.⁵ In addition, saliva has a very important role in neutralizing acidic conditions. The degree of acidity (pH) of saliva is determined by the composition of the electrolyte in saliva. If there is a change in salivary components, the degree of acidity (pH) can affect the function and role in the oral cavity, which can cause harmful effects to the health of the oral cavity.^{1,6}

At the time of fasting, the mouth does not work to eat and to drink properly so that the salivary glands become less active, hence the production of saliva decreases and there is a change in the degree of acidity (pH) of saliva, therefore the authors researchers are interested to examine the concentration of total protein and the degree of acidity (pH) in saliva in people who are fasting compared to people who have had their breakfast.

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Material and Methods

Analytic observational study with a longitudinal design was carried out in Dental Hospital Hasanuddin University, Makassar, Indonesia. The research was conducted in July 2015. The population in this study was 35 clinical students at the Department of Dental Public Health, Hasanuddin University with the number of sample saliva that was taken from 16 students who were fasting, were not undergoing orthodontic treatment, were not currently taking antibiotics, were not currently using a prosthesis, did not have systemic disease and did not smoke. The sampling technique method used was purposive sampling technique.

While fasting, the samples were taken during the morning at 11.00 am where the subjects were in a state of rest with bowed head for taking saliva and stored into sterile plastic bottles up to half or less than about 5 ml, then measured using a pH meter. Sterile plastic bottles were plastered with paper labels for identification. Saliva was stored in sterile plastic bottles and preserved in the cooler to prevent changes in the components of saliva. Saliva was sent to the BPTP Laboratory Maros to measure total protein using saliva Kyltec auto analyzer.

After breakfast, samples were taken again in the morning at 08:30 am, it was 90 minutes after feeding. Subjects were at rest with bowed head for taking saliva and stored into sterile plastic bottles up to half or less than about 5 ml, then measuring using a pH meter. The bottles were labeled for identification. Saliva was already stored in sterile plastic bottles and preserved in the refrigerator, to prevent changes to the components of saliva. Saliva was then removed from the refrigerator to the cooler box and sent to the BPTP Maros for measuring the total salivary protein using Kyltec auto analyzer on the next day.

All the data obtained were collected and then analyzed using SPSS 17.0

Results

Table 1 shows the average total protein (%) at the time of fasting at 0.135% with a standard deviation of 0.026 and mean total protein (%) after breakfast at 0.179% with a standard deviation of 0.035, while the average degree of acidity (pH) of saliva at the

time of fasting at 7.26 with a standard deviation of 0.24 and a mean degree of acidity (pH) of saliva after breakfast 7.66 with a standard deviation of 0.23 which shows the p value (0.000), which means that there is an increase in the total protein concentration and the degree of acidity (pH) of saliva after breakfast significantly.

Discussion

The study was conducted at 11.00 pm during fasting, may be due to the process of circadian rhythm that worked at that time. This is supported by studies of Karami-Nougurani,⁸ stating that in order to avoid the possibility of confounding effects of circadian rhythms in salivary flow the research was carried out at 9:00–11:00 pm. The circadian rhythm is a rhythm of the body that is “up” and “down” regularly in the span of about 24 hours. This is also supported by Katie et al.⁷ who suggested that the concentration of the various components of the saliva is characterized by their impact on the variation of salivary flow. The increase in salivary flow rate reaches a maximum peak in the late afternoon so that the collection of saliva one hour after meal time, which is the peak time when the salivary flow rate increases along with the circadian cycle. Chad.⁷ suggests that the protein concentration in each individual is different based on the condition of stimulation and non-stimulation of saliva and the difference is also influenced by the circadian rhythm and the impact of food consumption.

Both the samples were taken 90 minutes after breakfast, possibly due to circumstances of pH in the oral cavity has returned to a normal state. This is supported by research from Higham.¹⁰ he argues that based on the graph of Stephan's curve, a pH of 5.5 or less are indicating the occurrence of demineralization and pH levels will stay down or in a 'critical level' for approximately 20 minutes: pH completely returns back to normal or resting state about 45–60 minutes after eating.

The results of the research have shown an increase in protein concentration after breakfast. There is an increased concentration of protein, sodium, chloride, bicarbonate and calcium because of an increase in salivary flow. As said by Edgar.⁷ in his research that the rate of unstimulated salivary flow which increased from an average 0.3 ml/min up to 7 ml/min with stimulation. Dawes¹¹ reports in his study that the average rate of unstimulated salivary flow is 0.3–0.4 ml/min in which if the salivary flows <0.1 ml/min it proves signs of hypo salivation. Shaila et al.¹² suggest that in addition to the factors of salivary flow that can affect an increase

Table 1 Total protein concentration and acidity (pH) while fasting and after breakfast

Substances	N	While fasting	After breakfast	p*
		Mean ± SD	Mean ± SD	
Total protein (%)	16	0.135 ± 0.026	0.179 ± 0.035	0.000*
pH		7.26±0.24	7.66±0.23	

*Paired t-test: $p < 0.05$: significant

in total protein in saliva, there are several other factors that can affect, such as the contribution of the salivary gland proteins and protein of sulcus fluid.

At the time of fasting there is no intake of food or nutrients into the body for 12 hours, which may be affecting the low total protein concentration at the time of fasting. As in the study of Mahadevan et al.¹³ who suggests that changes and nutritional deficiencies can affect the salivary function. A moderate decline in the daily food intake can lead to decreased salivary proteins, whereas the severe caloric restriction tends to reduce the flow rate of saliva, cell number and composition of saliva.

Conclusion

These results indicate an increase in acidity (pH) of saliva after breakfast: it concurs with research conducted by Fumihiko Moriet et al.¹⁴ who suggests that the acidity of saliva increases after a while (after eating food). The consumption of food and the frequency of mastication increased during breakfast, which can affect the saliva. There are many studies on the effect of mastication of various foods due to the pH of saliva, the research concluded that there is an increasing degree of acidity (pH) due to the effect of saliva stimulation during mastication of food and taste simultaneously.¹⁵ From this study it can be concluded that an increase in total protein concentration after breakfast are significant.

Conflict of Interest

The authors report no conflict of interest.

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