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

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ABSTRACT
Background: While fasting, the mouth does not work to eat and drink so that the salivary glands become less active so saliva production decreased and there was a change in eating time which is related to the mastication process that impact on changes in the degree of acidity (pH). Objectives: To determine the concentration of total protein and the degree of acidity (pH) of saliva when fasting and after breakfasting. Materials and Methods: The study was observational analytic design with longitudinal (follow up study) conducted in the Hj. Halima Dg. Sikati Dental Hospital in Kandea 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. To calculate the total protein of saliva concentration using Kyltecautoanalyzer and pH meter to measure the acidity of saliva. Data was analyzed was using SPSS version 17.0 (paired t-test, p <0.05). Results: The mean of total protein (%) while fasting by 0.135% ± 0.026 and the mean total protein (%) after breakfasting at 0.179% ± 0.035, while the average degree of acidity (pH) during fasting at 7.26 ± 0.24 and the average degree of acidity (pH) after breakfasting at 7.66 ± 0.23 with p-value (0.000). Conclusions: An increase in the total protein concentration and acidity (pH) after breakfasting.

INTRODUCTION
Ramadan 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, to have sexual relations, is the feature of this period. During Ramadan, Muslims fast every day from dawn to sunset.¹ In oral cavity there are diverse microbial colonies, where the differences in physical, chemical and mechanical in oral cavity which has an effect in controlling the spread of the colony and ecological system in normal micro flora. Dental caries and periodontal disease come from the complex relationship between diet and micro flora 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 Ramadan, 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 microflora in the mouth.2

Saliva is one of the most important protectors of body fluids in oral cavity. Saliva have 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 antibacterial, antifungal and antiviral. 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 largely composed of water (99.5%); also contains protein (0.3%) and inorganic, other substances (0.2%).4 Salivary proteins have five roles: (a) for microbial agglutination, (b) for the lysis of microbial membranes, (c) for antifungal and (d) antivirus, and (e) is used as an immune regulatory processes immune regulation 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 salivary components and 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.6

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

**MATERIALS AND METHODS**

Analytic observational study with a longitudinal design carried out in Hj. Halima Dg. Sikati Kandea Dental Hospital. The research was conducted in July 2015. The population in this study were 35 clinical students at the Dental Public Health Department of Hasanuddin University with the number of sampled saliva from 16 students who are fasting, which is not undergoing orthodontic treatment, which is not currently taking antibiotics, is not currently using a prosthesis, has no systemic disease and not smoking by using a sampling method is purposive sampling.

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

After break fasting samples were taken in the evening at 20:30 pm as 90 minutes after iftar. Subjects at rest with bowed head for taking saliva and placed into sterile plastic bottles up to half or less than about 5 ml, then measuring using a pH meter. The bottle were labeled using paper for identification. Saliva already accommodated in sterile plastic bottles, placed in the recessor, to prevent changes to the components saliva. Saliva removed from the refrigerator to the cooler box and sent to the BPTP Maros for total salivary protein measured using Kyltec auto analyzer on the next day.

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

**RESULTS**

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

<table>
<thead>
<tr>
<th>Substances</th>
<th>n</th>
<th>While fasting Mean ± SD</th>
<th>After breakfasting Mean ± SD</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total protein (%)</td>
<td>16</td>
<td>0.135 ± 0.026</td>
<td>0.179 ± 0.035</td>
<td>0.000*</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>7.26±0.24</td>
<td>7.66±0.23</td>
<td></td>
</tr>
</tbody>
</table>

*Paired t test, p <0.05; significant
(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 (%) at the time after break fasting at 0.179% with a standard deviation of 0.035, while the average degree of acidity (pH) of saliva at the time fasting at 7.26 with a standard deviation of 0.24 and a mean degree of acidity (pH) of saliva after break fasting 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 break fasting significantly.

DISCUSSION
The study was conducted at 11.00 pm during fasting may be due to the process of circadian rhythm who worked at that time. This is supported by studies of Karami-Nougurani stating that in order to avoid the possibility of confounding effects of circadian rhythms in salivary flow, so that the research carried out at 9:00 to 11:00. The circadian rhythm is a rhythm of the body that is "up" and "down" are regularly in the span of about 24 hours. This is also supported by Katie et al suggested that the concentration of the various components of the saliva 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 times which is the peak time salivary flow rate increases along with the circadian cycle. Chad suggests that the protein concentration in each individual differently based on the condition of stimulation and non-stimulation of saliva, and the differences were also influenced by the circadian rhythm and the impact of food consumption.

Sampling both was taken at the time 90 minutes after break fasting, possibly due to circumstances pH in the oral cavity has returned to a normal state. This is supported by research from Higham, he argued that, based on the graph or Stephan’s curve indicates 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 back to normal or resting state about 45 to 60 minutes after eating.

Results of research have shown an increase in protein concentration after breakfasting. There is an increased the concentration of protein, sodium, chloride, bicarbonate and calcium because of an increase in salivary flow. As said by Edgar 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. Dawes reported in his study that the average rate of unstimulated salivary flow 0.3-0.4 ml / min which if the salivary flow <0.1 ml / min prove any signs of hypo salivation. Shaila et al., suggested that in addition to the factors of salivary flow that can affect an increase in total protein in saliva, there are several other factors that can affect, such as the contribution of the salivary gland proteins and protein sulcus fluid.

At the time of fasting there is no intake of food or nutrients into the body for 12 hours, it may be affecting the low total protein concentration at the time of fasting. As in the study of Mahadevan etal 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.

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

CONFLICT OF INTEREST
The authors report no conflict of interest

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