The Effect of Mouth washing with *Moringa Olivera* to acidity saliva level of Diabetes Mellitus Patients

Authors
Mugi Hartoyo[1], S. Eko Ch. Purnomo[2], Budiyati[3], Kurniati Puji Lestari[4], Sawab[5]
[1,2,3,4,5]Ministry of Health Polytechnic Semarang
Jl. Tirta Agung Pedalangan, Banyumanik, 50239 Semarang, Indonesia
* Corresponding Author
Mugi Hartoyo
Email: *hartoyo.mugi@yahoo.com*

Abstract
Introduction: *Salivary pH or acidity level changes have detrimental effects on the teeth and oral mucosa which will lead to complications of the periodontal disease. Water decoction of the leaves of Moringa Olivera contains flavonoids that act as an anti-inflammatory.*
Objective: *This study aims to determine the effect of Moringa leaves mouthwash against salivary pH of patients with Diabetes Mellitus.*
Methods: *This study design is a quasi-experimental, pretest-posttest with the control group by measuring the pH of saliva before and after rinsing with a decoction of the leaves of 50%, 100%, Moringa Olivera and the boiled water. Respondents were patients with diabetes mellitus type 1 and two at hospitals and health centers in Semarang as many as 90 respondents specified by purposive sampling technique divided into three groups.*
Result: *The results showed no effect of gargling decoction of the leaves of 50%, 100% Moringa, and the boiled water on the pH saliva of DM patients.*
Conclusion: *Moringa leaf herb cannot be used as a drop of mouthwash to raise the pH of patients' saliva with Diabetes Mellitus.*
Keywords: *Moringa leaf decoction, pH of saliva, Diabetes Mellitus.*

Introduction

Salivary pH of diabetic patients is lower compared with healthy people with an average of 6.96 ± 0.71 (Eslami, et.al 2015). Decreased salivary pH of diabetic patients can also be caused by the increased concentrations of glucose in saliva that helps bacteria to grow. The process of carbohydrate breakdown of food by bacteria in the oral cavity also increases the acidity of the oral cavity (Ismi'anifatun, et.al 2011). Decreased salivary pH in the diabetic patient will cause some changes in the mouth like a dirty tongue, broken and volatile teeth, gingivitis with bleeding, candidiasis, and increased risk of caries (Sreebny, 2000). These complications should receive serious attention from nurses.

In addition to brushing and flossing, it is also advisable to use an antimicrobial mouth rinse to control gingivitis (American Dental Association, 2002). Mouthwash fluids on the market vary

considerably both in ingredients and tastes. This research will use a liquid rinse which uses the essential components of the herbs that grow in Indonesia, namely *Moringa oleivera*. *Moringa* plant is known as the "miracle tree" or "tree for life" and has become part of everyday life as vegetable ingredients, and raw materials medicine. One of the significant benefits of *Moringa* leaf is an anti-inflammatory and support the body's healthy blood sugar levels. The ethanol extract of *Moringa* leaves has hypoglycemic effects that has the effect of decreasing blood sugar levels (Yusup, 2010).

Moringa is a native plant of sub-Himalayas in India, Pakistan, Bangladesh, and Afghanistan. Some countries use it as a traditional medicine and industrial use. In Indonesia, *Moringa* leaves are often used as a vegetable. *Moringa* leaves contain a unique compound called isothiocyanate which has the ability as a chemopreventive agent or anti-cancer. In the other study, *Moringa* leaf tea is used as an additional use of natural flavorings cinnamon and cloves (Bose, 2007). As such, we were interested in tracing the possibility of using this plant as a mixture of mouthwash and observe the effect to the diabetes mellitus patients.

Materials and Methods

This study is a quasi-experimental with control group design. The measurement of the pH of saliva was conducted before and after rinsing with a decoction of the leaves of *Moringa* and boiled water in each group of diabetic patients in hospitals and health centers in Semarang, Central Java, Indonesia. The population was all patients with DM 1 and two who underwent health services in health centers and hospitals. The sample was determined by purposive sampling technique. The study involved 90 respondents divided into three groups. The first team was given gargle with a decoction of the leaves of *Moringa* 100%, the second group was given gargle with a decoction of the leaves of *Moringa* 50%, and the third team was a control group given gargle with water / fresh water. Materials used in

the study was the examination of saliva as material, and *Moringa* leaves infuse concentration of 50% and 100%, as well as boiled water.

The study begins by conducting laboratory tests on flavonoid content of *Moringa* leaves in the laboratory. Data retrieval study conducted by researchers and assisted by four students. Respondents were given infuses of 50% *Moringa* leaf mouthwash on the first day, the second day got mouthwash infuses of 100%, *Moringa* leaf and the third day got boiled water gargle.

Results & Discussion

Table .1 Characteristics of respondents by age

	N	Min	Max	Sum	Mean	SD
Age	8.0337	28	69	5105	56.72	90

Table 1 shows that out of 90 respondents, the youngest age is 28 years old, the oldest age is 69 year, with an average age of 56.7 years old.

Table 2: The frequency distribution of respondents by gender

Gender	f	Percentage (%)
Male	32	35.6
Female	58	64.4
Total	90	100

Table 2 shows that female respondents are 58 (64.4%), and men are 32 (35.6%).

Table 3 The frequency distribution of respondents by type of Diabetes Mellitus

Type DM	f	Percentage (%)
DM 1	41	45.6
DM2	49	54.4
Total	90	100

Table 3 shows that the suffering from type 2 diabetes is 49 (54.4%) of the respondents, and respondents with type 1 diabetes are 41 (45.6%) persons.

Table 4 The frequency distribution of respondents by the pH of saliva

	N	Min	Max	Sum	Mean	SD
salivary pH before gargle	90	5		7526	5.84	0.5789
pH of saliva after gargle	90	5		7537	5.96	0.5073

Table 4 shows that the average saliva pH of DM patients before being given a mouthwash intervention is increased slightly to 5.84 average of 5.96 on the pH of saliva after being given the mouthwash.

Table 5 Analysis of differences in the pH of saliva before and after gargle with a decoction of 50%, 100% Moringa leaves

Intervention	n	Mean Rank	Sum of Ranks	Z	p-value
pH of saliva after gargle decoction of *Moringa* 50% - pH of saliva before gargle decoction of *Moringa* 50%	30	3.00	15.00	-2.236	0.025
pH of saliva after gargle decoction of *Moringa* 100% - pH of saliva before gargle decoction of *Moringa* 100%	30	3.50	21.00	-2.449	0.014
pH of saliva after boiled water gargle - the pH of saliva before boiled water rinses	30	0.00	0.00	0.000	1.000

Table 5 shows the results salivary pH difference test by using Wilcoxon test. There is no difference in the pH of saliva before, and after rinsing with 50%, 100% *Moringa leaf* and the boiled water prove with each having a value respectively = 0.025; 0.014; and = 1.000 (p> 0.05).

Table. 6 Variant homogeneity test of the pH saliva after rinsing

Levene Statistic	DF1	DF2	Sig.
.613	(2).	87	.493

Table 7 Significant ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.600	2	.300	1.170	.315
Within Groups	22,300	87	.256		
Total	22,900	89			

Based on table 6 it can be seen that the significance tests homogeneity of variances indicates the number 0.613 (p> 0.05). Since p>

0.05, it can be concluded that there are two groups with different variants.

In table 7 the results of ANOVA showed the significant value of 0.315 (p> 0.05). Since the value of *p* is more significant than 0.05, it can be concluded that there are no significant differences in salivary pH in the treatment group and the control group.

Out of 90 respondents, the youngest age is 28 years old and the oldest 69 years with an average age of 56.7 years old. This is in line with the previous research that the majority of respondents with diabetes mellitus are at an age range of 51-60 year (Fox & Kilvert, 2010). The blood sugar tends to increase progressively over the age of 50 years, especially in people who are not active or sedentary and overweight or overweight (Atun, 2010). From these studies, we can conclude that at the age of 50 years are at risk of suffering from diabetes as a result of the decline in organ function that triggers an increase in blood sugar. By sex, the majority of respondents were women (64.4%), and men were (35.6%).

Within this setting, women are more likely to suffer diabetes due to an increase in blood sugar as a result of hormonal processes.

Of the 90 respondents, 49 people (54.4%) had type 2 diabetes, and respondents with type 1 diabetes were 41 (45.6%) persons.

It is known that the prevalence of type 2 diabetes more than DM type 1 Diabetes Mellitus Type 2 diabetes is the most frequent type of case, cover 85% of diabetic patients. This condition is characterized by insulin resistance with relative insulin deficiency. This disease is increasing rapidly due to lifestyle factors/diet and is often found in middle-aged and older adults, caused mainly by a resistance to insulin action in peripheral tissues.

The results showed that the average pH of the saliva of patients with preexisting diabetes given mouthwash intervention was 5.84 (acid) increased slightly to 5.96 (acid) at an average pH of saliva after being given the mouthwash, with each having a minimum value of pH 5 and a maximum

value of 7. Diabetes mellitus is one of the predisposing factors that influence the occurrence of caries due to uncontrolled blood glucose levels that lead to high levels of glucose in saliva. Diabetic patients will experience acidity on the pH of saliva for interrupting the flow of saliva and cause reduced oxygen supply to the mouth so that the anaerobic bacteria easy to breed. If the mouth salivary secretion is decreased, then the buffer in saliva is also reduced so that the mouth undergo acidic conditions (Respati, &Iwanda, 2006). From these studies, it can be concluded that in diabetic patients would endure saliva acidic conditions due to an interruption in the flow of saliva resulting in the decreased buffer system, and a dry mouth.

The results also showed no difference in the pH of saliva before and after rinsing with a decoction of the leaves of 50%, 100%, *Moringa* and the boiled water. In this study, clean using a decoction of the leaves of 50%, and 100% *Moringa* cannot increase the pH of saliva in diabetic patients although in *Moringa* leaves contain flavonoids that function as an anti-inflammatory that can prevent inflammation in the oral cavity and contains potassium which controls sugar levels blood. If the pH of saliva increases, it will reduce the risk of complications in the mouth due to the acidic pH. When the pH of acidic saliva increases *streptococcus mutans* bacteria will colonize and cause complications such as oral candidiasis, xerostomia and dental caries (Suryono, et.al, 2006). Though the previous studies have shown consuming *Moringa* leaves can lower blood sugar levels (Bose, 2007), the results of this study showed that gargling using Moringa leaf decoction cannot increase the pH of saliva patients with diabetes,

One way ANOVA test results showed that the homogeneity of variances test significance of 0.613 (p> 0.05), meaning that there are at least two groups that have the variant were no different. This indicates that there is no difference between the three groups of respondents.

In this study, it can be concluded that there is no difference between the group's salivary pH mouth wash given *Moringa* leaf with the team assigned gargle with boiled water.

Conclusions

Though *Moringa* leaf is a kind of a beneficial traditional medicine in Indonesia proved effectively to cure some common disease, but no effect of *Moringa* leaf decoction gargle with or boiled water against salivary pH of Diabetes Mellitus patients.

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