

Research Report

The efficacy of honey solution as plaque reducing agent

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ABSTRACT

Background: Periodontal care is an important step of periodontal health management. Some chemically active substances have been studied as an adjunct to mechanical plaque control. Honey is a traditional topical treatment for infected wounds and have inhibitory effect to around 60 species of bacteria including aerobes and anaerobes, gram-positives and gram-negatives.

Purpose: To compare the efficacy of 5% and 25% honey solution and aquadest as mouth-rinses to control dental plaque during 4 days period. **Method:** After a thorough prophylaxis, during 4 days period of no oral hygiene all subjects were rinsed with 10 ml mouth-rinse they received 3 times a day after meal. Group I rinse with 5% honey solution, group II with 25%, and group III with aquadest as control. **Results:** There were significant increases of plaque index within each group, but no differences between all three groups in every experimental day. The fact that the probability value from day 1 (0.766) were gradually decreased to day 4 (0.076).

Conclusion: Anti-microbial properties of honey solution as mouth-rinse did not show any inhibition effect on plaque formation until day 4.

Key words: Periodontal care, plaque control, honey solution, mouth-rinse

ABSTRAK

Latar Belakang: Menjaga kesehatan periodontal merupakan tahap penting dalam pemeliharaan kesehatan periodontal. Beberapa substansi kimiawi aktif telah diteliti untuk membantu dalam kontrol plak gigi secara mekanik. Madu merupakan obat tradisional untuk luka terinfeksi dan dinyatakan mempunyai pengaruh menghambat sekitar 60 spesies termasuk bakteri aerob dan anaerob gram positif dan gram negatif. **Tujuan:** Membandingkan manfaat larutan madu 5% dan 25% terhadap akuades sebagai obat kumur untuk mengontrol pembentukan plak gigi selama 4 hari penelitian. **Metode:** Setelah tindakan profilaksis pembersihan sempurna, semua subjek penelitian dipersilahkan berkumur dengan 10 ml larutan yang telah diterima, 3 kali sehari setelah makan. Kelompok 1 berkumur dengan larutan madu 5%, kelompok 2 dengan 25%, dan kelompok 3 dengan akuades sebagai kontrol. **Hasil:** Didapatkan peningkatan bermakna indeks plak dalam setiap kelompok penelitian, tetapi tidak berbeda antara ketiga kelompok pada setiap hari dalam waktu penelitian. Namun ditemukan nilai p sejak hari 1 (0,766) menurun secara bertahap ke hari ke 4 (0,076). **Kesimpulan:** Sifat antimikroba larutan madu sebagai obat kumur belum menunjukkan pengaruh bermanfaat untuk menghambat pembentukan plak gigi hingga hari ke 4 penelitian.

Kata kunci: Penjagaan kesehatan periodontal, kontrol plak gigi, larutan madu, obat kumur

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INTRODUCTION

Many studies from developed countries estimated that over 90% of the general population have some form

of periodontal diseases.¹ Epidemiologic study revealed a peculiarly high correlation between supragingival plaque levels and chronic gingivitis, and clinical research led to the proof that plaque was the primary etiologic factor in

gingival inflammation.² It has been reported that dental plaque is a biofilm containing approximately 500–700 different microbial species^{3,4} which capable of colonizing the oral cavity.⁵ This biofilm adheres to the tooth surfaces in close vicinity to the periodontal tissue, and to the root surfaces in the subgingival micro-environment.⁶ The aim of controlling dental plaque is to prevent biofilm-associated diseases like caries and periodontitis.⁷

The subgingival position of biofilm lies in the specific defense strategies that biofilm has evolved to overcome both the natural and the standard antibacterial defensive mechanism. These strategies compromise the efficacy of treatment regimes.⁶ While the tongue and oral mucosa serve as reservoirs of pathogenic bacteria which are able to relocate and colonize on the teeth and in sulci.⁸ Once exposed to a bacterial stimulus, the gingival epithelial cells can elicit a wide array of responses including cytokines and chemokines that recruit inflammatory and immune cells.⁵ An antiseptic mouth-rinse produces an antimicrobial effect throughout the entire mouth, including areas easily missed during tooth-brushing and interdental cleaning.⁸

Chemically active substances can be a valuable aid to mechanical plaque removal if manual measures are not performed long enough or on a regular daily basis.⁷ For many years, many studies has been done about chemical agents to remove plaque. Many vehicles for the delivery of these agents² for example as mouthwashes as of value in reducing bacterial plaque and gingivitis and are useful adjuncts to mechanical methods of plaque removal.⁹

Honey has been used as a medicine since ancient times in many cultures. The popular literature on health and self-treatment of ailments gives the impression that honey can be taken to cure almost anything. Since the last century it has been known that many ailments are the result of infection by microorganisms.¹⁰ There are many reports of honey having bactericidal as well as bacteriostatic activity against a broad spectrum of bacteria, and antifungal activity.^{10,11} The purpose of this study was to compare the efficacy of 5% and 25% honey solution and aquadest as mouth rinses to control dental plaque during 4 experimental days. If honey is proved beneficial to inhibit plaque formation, we can suggest patients to use it as it is cheap and easy to make at home.

MATERIAL AND METHOD

The volunteers were 44 healthy dental students from the University of Indonesia, ranging from 18 to 22 years old. The reasons for this study were explained and consent forms signed by all participants. All participants were randomly taken as sample and distributed into three groups. Group I (N=20) rinsed with the 5% honey solution, group II (N=20) with the 25% honey solution, and group III (N=20) with aquadest (placebo).

The 5% honey solution was made by 5 ml honey diluted in 95 ml aquadest, and the 25% honey solution was made by 25 ml honey which is diluted in 75 ml aquadest. The honey was produced from the nectar of the flowers of Randu tree (*Ceiba petandra*), to be bought from Pusat Perlebahan Nasional (PUSBAHNAS), desa Ciomas, Parung Panjang Bogor, west Java. Because of the double-blind design, all solutions were kept in the same kind, size and colour of bottle.

In the pretreatment phase, the individuals were subjected to a thorough prophylaxis. At day 0, they were asked to refrain from all oral hygiene measures for a period of 4 days, during which they rinsed three times daily for 30 seconds with 10 ml of one of the mouth rinses. At the end of the investigation period, all participants were again subjected to a thorough prophylaxis.

RESULTS

The differences of mean data between and within study groups in every investigation day were shown in Table 2. There were significant differences within every group ($p < 0.000$) but no differences between groups in every investigation days.

DISCUSSION

It is well-known fact that plaque is formed immediately after meticulous tooth brushing. By the end of 24 hours the plaque is well on its way towards maturation and

Table 1. Demographic data of the volunteers

	Group						Total
	I		II		III		
Gender & age range	F 12	19-22	F 15	18-22	F 10	18-22	37
	M 4	19-22	M 1	19	M 2	18-22	7
Total	16		16		12		44

Group I : Rinse with 5% honey

II : Rinse with 25% honey

III : Rinse with aquadest

Table 2. Plaque score rate within and between the study groups

Day	Group			P
	I	II	III	
1	38.38	42.88	41.67	0.766
2	69.69	65.75	72.33	0.712
3	84.19	91.44	91.08	0.510
4	103.38	111.38	116.33	0.076
p	0.000	0.000	0.000	

Group I : Rinse with 5% honey

II : Rinse with 25% honey

III : Rinse with aquadest

hence starts its deleterious effects on the gingival.¹² More severe disease will be progressed because of the anatomy of posterior teeth that impedes accessibility for individual oral hygiene, and offer less favorably to tooth brushing.¹³ It is also widely recognized that specific microorganisms in sub-gingival micro-flora are determinant agents for periodontitis.¹⁴

Periodontal maintenance or supportive periodontal therapy is a key part of periodontal treatment. The goals of periodontal maintenance include prevention or minimization of disease recurrence, prevention or reduction of tooth loss, and diagnostic and treatment of recurrent disease and or other oral diseases in a timely basis. This therapy must be scheduled at regular intervals, usually ranging from 2 to 6 months, depending on the clinical needs of the individual patient continuing for the life of the dentition.¹⁵

Periodontal care at each recall visit comprises three parts. The first part is concerned with examination and evaluation of the patient's current oral health. The second part includes the necessary maintenance treatment and oral hygiene reinforcement. Because the amount of supra-gingival plaque affects the number of sub-gingival anaerobic organisms, and incomplete sub-gingival plaque eradication usually caused the recurrence of periodontal disease¹⁶, it is needed to use chemically active substances as a valuable aid to mechanical plaque removal.

There are numerous studies about the effect of anti-microbial agents on oral micro-organisms.⁷ Three known systems are responsible for the major anti-microbial activity found in honey. These are the acidity, the osmotic pressure, and the presence of inhibine.^{10,17} Several chemicals with antibacterial activity have been identified in honey by various researchers, e.g. pinocembrine, terpenes, benzyl alcohol etc. However, the quantities of these phyto-chemical factors present were far too low to account for any significant amount of activity.¹⁰

The most anti-microbial activity of honey is its inhibine number. The inhibine number of honey is the degree of dilution to which a honey will retain its antibacterial activity. The inhibine number is presented as hydrogen peroxide. The number rises only when the honey is diluted. On dilution of honey, the activity increases by a factor of

2.500–50.000; thus giving a "slow release" antiseptic as a level which is antibacterial but not tissue-damaging.¹⁰

In this experiment, two concentrations were used, 5% and 25%. Indriani *et al.*¹⁷ in their study used 5% and 25% honey solution. They stated that in 5% solution the inhibine value was higher than that in 25%, because the inhibine number is formed by enzymatic effect of glucose oxidase in honey itself when it is referred from glucosa to gluconic acid. In higher concentration, much more inhibine will be formed; therefore this experiment only used the 5% and 25% to find how honey dilution works against the plaque bacteria of some Indonesian oral hygiene condition. The inhibine number depends on its dilution to which still have its antibacterial activity.¹⁰ H₂O₂ is an active germicide, and the effervescence of oxygen affords a mechanical debridement for healing of infected post surgical wounds.¹⁷

The O_n that is released from H₂O₂ can inhibit the anaerob bacteria in the plaque.¹⁸ It is also well known that anaerob bacteria for example *Porphyromonas gingivalis*, *Tannerella forsythensis*, *Treponema denticola* as well as *Aggregatibacter actinomycetemcomitans* could be found even in not deep periodontal pocket and between papillae of dorsal part of the tongue.¹⁹ Molan¹⁸ wrote on how the method of honey antibacterial activity works is O_n oxidizing the protein of bacteria by inactivating bacterial enzymes (catalase, peroxidase, superoxide dismutase) as ametabolic product.

In this study, there were significant increases of plaque index from day 1 to day 4 within every groups. But there were no differences of plaque index in every experiment days between study groups. The probability of its differences was decreased from 0.766 in day 1 until 0.076 in day 4. Significant differences can be found in day 5 or day 6 or more. But the fact that 4 days period of investigation is not enough to show the efficacy of honey solution as a good rinsing agent to inhibit plaque formation in periodontal care.

Plaque index in day 1 of group I (38.38) is lower than group II (42.88) or group III (41.67). The same results also found in day 3 (84.19; 91.44; 91.08) and day 4 (103.38; 111.38; 116.33). These results showed that rinsing with honey solution has more inhibiting effect of plaque formation than with aquadest only, and more water in dilution (honey 5%) raised the anti-microbial activity than less water (honey 25%). This phenomenon showed its inhibine effect as stated by Molan^{10,11} and Indriani *et al.*¹⁷

From the results of this study it can be concluded that honey solution as mouth rinse did not show any plaque reducing effect on biofilm until day 4 investigation. Further research in longer time to prove antibacterial effect is needed. It is hoped this honey as mouth rinse is sufficient to reduce plaque formation. If it is proved, it should be suggested that someone gargling with honey solution then with water only as periodontal care to control supra-gingival plaque.

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