

The Effect of Gargling with Aqueous Extract of Dandelion (Taraxacum officinale) on the Oral Hygiene Status of Patients Wearing Fixed Orthodontic Appliance: A Clinical Study

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ABSTRACT

Background: During the course of fixed orthodontic therapy, it is difficult to maintain high standard oral hygiene care by mechanical tooth cleaning only. Therefore, mouthwashes are commonly used as adjunct for mechanical tooth cleaning. Most of the mouthwashes are chemicals and have a wide range of side effects. Plant extracts have stood the test of time as safe inexpensive and available remedy for providing general health care. **Objective:** The present study attempted to evaluate the efficacy of gargling with aqueous extract of Dandelion (*Taraxacum officinale*) on the oral hygiene status of patients wearing fixed orthodontic appliances. **Methods:** Eleven male patients undergoing orthodontic treatment with fixed appliances were recruited in the study. All patients were given the same oral hygiene regimen during the study period. Clinical evaluation of OPI (orthodontic plaque index) and salivary streptococcus mutans count were recorded at the first activation visit (three weeks after placement of the orthodontic appliances) which considered the baseline visit and after one week of gargling with the extract. The data were statistically analyzed with SPSS (version 21) using Paired Samples t-test. **Result:** The results of the statistical analysis revealed that, there were highly significant reductions in both OPI and salivary streptococcus mutans count after one week gargling with aqueous extract of Dandelion (*Taraxacum officinale*). **Conclusion:** The present finding concluded that, aqueous extract of Dandelion (*Taraxacum officinale*) could be use as a promising ingredient in manufacturing mouthwashes and other dental supplies that contribute in maintaining good oral hygiene during the course of orthodontic treatment with fixed appliances.

KEYWORDS

dandelion (*Taraxacum officinale*), oral hygiene , fixed orthodontic appliance.

INTRODUCTION

It has long been demonstrated that fixed orthodontic appliance components create new retentive sites for plaque formation which preclude tooth brushing, reduce the self-cleansing effect of saliva which lead to increase the dental plaque accumulation as well as an increase in the level of oral microorganisms⁽¹⁾. This increase in dental plaque volume and number of bacteria and their by-products, lead to enamel demineralization, gingival inflammation and even systemic problems^(2,3).

Although dental plaque may harbor 200–300 bacterial species, mutans streptococci has been considered as important etiological factor for both dental and gingival diseases^(4,5). Moreover, dental plaque of patients wearing fixed appliances harbor more *Streptococcus mutans* than orthodontic patients without fixed appliances^(6,2). The presence of fixed orthodontic appliances precludes mechanical teeth cleaning and changes the oral flora. Failure in maintaining good oral hygiene during the course of orthodontic treatment adversely affects the treatment outcome. Therefore, mechanical tooth cleaning is not enough to control plaque accumulation during orthodontic treatment with fixed appliances. Hence, it is crucial to develop measures other than teeth brushing to control plaque accumulation during orthodontic treatment with fixed appliances^(7,8). One of these plaque preventive measures is mouthwash.

Many chemical mouthwashes have been sold in markets for controlling plaque accumulation and gingival inflammation. All these chemicals have side effects^(9,10). Therefore, using natural products from plants extract as mouthwash is a promising approach to overcome the side effects of chemical mouthwashes⁽¹¹⁾.

Extract derived from plants have long been used for curing different types of diseases. Plants represent natural products that inexpensive and easily collect from the nature. Furthermore, these natural products have no side effects as much as chemical drugs^(12,13).

Taraxacum Officinale, is flowering perennial plant grows anywhere in the world and commonly known as Dandelion⁽¹⁴⁾. Dandelion content is rich with minerals and vitamins like, sodium, magnesium, potassium, zinc, iron, phosphorus, and vitamin A, B, C, D and E. It used to make food salad and considers an excellent nutrient for honey bees⁽¹⁵⁾.

It has long been used to cure many medical health problems like depression, diabetes, urinary, digestive problems, and breast and uterus tumors⁽¹⁶⁻¹⁹⁾.

Abundant of research suggest the antimicrobial, anti-inflammatory and antiviral activity of Dandelion⁽²⁰⁻²⁵⁾.

Avast array of plant extracts like *Azadirachta Indica*, *Ocimum sanctum*, *Murraya koenigii* L., *Acacianilotica*, *Eucalyptus camaldulensis*, *Hibiscus sabdariffa*, *Mangifera indica*, *Psidium guajava*, *Rosa indica*, and *Aloe barbadensis*

Miller were used to kill microorganism that harmful for oral health ⁽²⁶⁾.

However, the effect of dandelion on the oral hygiene status has not yet been examined. Therefore, this study aimed to evaluate the efficacy of aqueous dandelion extract on oral hygiene status and the level of salivary *Streptococcus mutans* in patients wearing fixed orthodontic appliance.

MATERIALS AND METHODS

The scientific committee of research and development of the college of dentistry ALMustansiriyah University approved the study protocol. Eleven male patients aged range 19-23 needed orthodontic treatment with fixed appliances were recruited in the study. The inclusion criteria were healthy nonsmoker patients with no medications, full permanent dentition, no caries and no gingival inflammation. The participants were assigned informed consents that discuss the study protocol.

After placement of fixed orthodontic appliances, the NiTi Arch wires (12 inch) were inserted in all patients' appliances. At the first follow up appointment (after three weeks of appliance placement), the OPI scores were measured and salivary samples were collected from each patient for assessing baseline data of oral hygiene status and bacterial count before starting gargling with the extract. At this appointment the patients were instructed to follow oral hygiene regimen by using the same type of toothbrush and paste (Coalgate) which were gifted to all participants in the study. The participants were instructed to gargle with the (40 ml) of extract after teeth brushing for one minute, three times daily for a week.

Plant collection and Preparation of the Gargle

Dandelion (*Taraxacum officinale*) plant was collected from public garden in Bagdad city. Plant identification was performed at the Department of Biology, College of Science, ALMustansiriyah University.

The leave and root of the fresh plant were purified and cleaned with distilled water then left to dry in shade at room temperature. The dried plant was grinded into fine powder.

For gargle preparation the extracted powder was dissolved in sterile water, filtered, and kept in dark place at 4 °C until gargle preparation. One Liter of 1 mg/ml concentration was poured in a bottle and dispensed to each participant.

Oral hygiene and bacterial assessment

Orthodontic Plaque Index which developed by Beberhold et al., ⁽²⁷⁾ was used to assess the oral

hygiene status before and after one week gargling with Dandelion (*Taraxacum officinale*) extract.

The antibacterial effect of gargling with extract was assessed by counting the number of colony-forming units (CFU) of *Streptococcus mutans* in saliva.

Site-specific modified Stripmutans® technique (Orion Diagnostica, Finland) recommended by Wallman and Krasse, ⁽²⁸⁾ was used for evaluating mutans streptococci colonies. Paraffin pellets and round-tipped strip from the kit were used for collecting salivary sample. The patient were instructed to chew a paraffin pellet for 1 minute, swallow any excess saliva and then put the rough surface of the round-tipped strip against the patient's tongue to collect the remaining saliva. Then the collecting sample removed gently from the patient mouth. Selective culture vial was used to incubate the salivary sample at 37° C for 48 hours in a liquid medium. After that the colony-forming units (CFU) of *Streptococcus mutans* in a culture media were counted.

One week after gargling with the extract, the OPI scores and salivary mutans streptococci coloni for each patient were calculated to assess the effect of gargling on these parameters. Data were presented as OPI scores and coloni forming unit and statistically analyzed with SPSS (version 21) using student paired t-test.

RESULT

All eleven sample patients were successfully participated in the study without any drop out. The participant not suffer from any adverse effect accompany the gargling.

Mean scores of OPI and streptococcus mutans colony's count were recorded at baseline time and after one week of gargling with the extract.

The Paired Samples Statistics with their significant level of both OPI and streptococcus mutans colony's count were shown in Table 1 and 2 respectively.

Regarding both OPI scores there were highly significant differences ($P = <0.001$) between the readings at baseline time and after one week of gargling with the extract. On the other hand there was highly significant ($P = <0.001$) reduction in streptococcus mutans colony's count after one week of gargling.

Table 1
Paired Samples Statistics of OPI scores before and after gargling

<i>Time of reading</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>P</i>
Baseline reading	2.18	.87	<0.001
After one week of gargling	.73	.47	

N=11

Table 2
Paired Samples Statistics of the number of Streptococcus mutans colony before and after gargling

<i>Time of reading</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>P</i>
Baseline reading	4.36	1.36	<0.001
After one week of gargling	2.55	1.13	

N=11

DISCUSSION

After placement of fixed orthodontic appliances, maintaining good oral hygiene being a challenge. Preventive methods like mechanical tooth brushing, fluoride application and avoiding cariogenic food and drinking are insufficient for controlling plaque accumulation and subsequent bacterial colonization^(29,30) (Jenatschke et al., 2001; Derks et al., 2007). Therefore, it is crucial for orthodontists to develop measures in addition to mechanical tooth cleaning to prevent the accumulation of dental plaque and decrease the level of oral mutans streptococci.

The present study was carried out to assess the efficacy of gargling with aqueous extract of Dandelion (*Taraxacum Officinale*) plant on the oral hygiene status and salivary mutans streptococcus count during orthodontic therapy with fixed appliances. In an attempt to incorporate this plant in the composition of mouthwash and other adjunct materials which could prevent plaque accumulation and subsequent dental and gingival diseases.

The selected sample was only male to exclude any hormonal effect on the oral hygiene status⁽³¹⁾.

Orthodontic Plaque Index (OPI) recommended by Beberhold et al.⁽²⁷⁾ was used for detecting plaque and gingival status, as it is easy, reliable and more precise method for evaluating the oral hygiene of patients wearing fixed orthodontic appliances.

Chair-side kit for detecting mutans streptococci colony's counts was used because it is easy, reliable, less time consuming and less costly microbial examination method.

After one week gargling with aqueous extract of Dandelion (*Taraxacum Officinale*), both OPI

(Orthodontic Plaque Index) scores and salivary mutans streptococci colony's count were significantly reduced. This in agreement with the result of Kenny et al.⁽²⁴⁾ who demonstrated the antibacterial activity of Dandelion.

In the present study the improvement in the oral hygiene status and reduction in the number of Streptococcus mutans colonies in saliva may be explained by the anti Streptococcus mutans activity of the polyphenol content of Dandelion this is according to Chu et al.; Smullen et al. and Han et al.^(32,33,23).

Other suggestion regarding antibacterial activity of Dandelion is the presence of potassium according to Clare et al.⁽¹⁷⁾ who suggested that the Dandelion is a source of potassium that inhibits bacterial growth by inhibiting moisture⁽³⁴⁾ (Alibasaya et al., 2018).

CONCLUSION

Gargling with aqueous extract of Dandelion (*Taraxacum Officinale*) has antiplaque, antigingival and antistreptococcus mutans effect. Therefore, Dandelion extract could be used as an active ingredient for manufacturing different dental supplies for maintaining good oral hygiene as adjunct to mechanical plaque control.

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