

# Prevalence of *Candida albicans* in patients using fixed orthodontic appliances after the use of peppermint

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## ABSTRACT

This study was conducted to evaluate the antifungal effect of peppermint extract as mouth rinse during orthodontic treatment.

Thirty patients (11 males and 19 females) who wear orthodontic appliances and instructed to use chlorhexidine as mouth rinse (8 patients); *Mentha piperita* extract (10 patients) or left to care of their teeth without any mouth rinse (12 patients); mean number of *Candida albicans* colonies recovered from anterior surface at three intervals (Time 0: Before wearing the appliance; time 1: After 7 days and time 2: After 1 month) was 48.8, 144.3, 158.9 for the control group; 132.9, 125.4, 147.9 for the peppermint group and 72, 105.8 and 130.8 for the chlorhexidine group.

The mean number of *Candida albicans* colonies from the posterior surface at the different intervals was 87.4, 136.8, 159.5; 121.3, 84, 34.6 and 78.5, 91.25, 91 for control, peppermint and chlorhexidine groups respectively. The use of the peppermint extract decreases the number of *Candida albicans* significantly at the posterior surfaces.

**Key Words:** Candidiasis, orthodontic appliances, peppermint extract.

Abdul-Rahman GhY, Al-Dewachi ZB, Al-Dawoody AD. Prevalence of *Candida albicans* in patients using fixed orthodontic appliances after the use of peppermint extract. *Al-Rafidain Dent J*. 2005; 5(1): 91-96.

**Received:**

5/1/2005

**Sent to Referees:**

11/1/2005

**Accepted for Publication:**

11/4/2005

## INTRODUCTION

The oral candidal infections of clinical significance include acute pseudomembranous candidosis (thrush), acute atrophic candidosis (antibiotic sore tongue), and angular cheilitis (perleche).<sup>(1)</sup>

The chronic atrophic candidosis or the denture induced stomatitis is the commonest form of oral candidosis and is present in 24-60% of denture wearers; it may also associated with orthodontic appliances and obturators.<sup>(2)</sup>

Both the prevalence of candidal carriage in the population and the distribution of *Candida* within the mouth of a carrier

appeared dependent on both local and general factors, in particular smoking habits, the wearing of prostheses, drugs and sex.<sup>(3,4)</sup>

The increase in number of *Candida* species after wearing the orthodontic appliance could be explained that the lowest surface tension values of polycarbonate and ceramic alumina materials used in adhesion of appliances increase the potential for microorganisms attachment on metallic brackets.<sup>(5,6)</sup>

The presence of the fixed orthodontic appliances in the oral cavity cause an increase in the number of microorganisms,

which may lead to plaque formation, gingivitis, thrush and acute atrophic candidiasis and the patients undergoing orthodontic treatment advised to careful brushing and using any type of mouth rinsers; e.g., chlorhexidine, phenol, thymol in alcohol (PTA) etc...

Large and increasing number of patients use medicinal herbs or seek the advice of their physician regarding their use, and most research on medicinal herbs is conducted in areas of the world where the use of medicinal herbs is main stream, particularly in Asia and Europe.<sup>(7)</sup>

Peppermint (*Mentha piperita*) is one of the aromatic plants found in Iraqi environment, containing high amount of volatile oils, menthol and gullotannic acid;<sup>(8)</sup> it had reported that these oils have an inhibitor effect on the growth of bacteria and yeast.<sup>(9)</sup> The antibacterial and antifungal effect of water extract from peppermint (*in vivo* and *in vitro*) was reported by other studies.<sup>(10, 11)</sup>

The periodontal problems after the placement of orthodontic bands, brackets and arch wires, are the result of irregularities on fixed orthodontic appliances.<sup>(12)</sup>

The chemical agents, like mouthwash, should be used adjunctively for orthodontic patients who have difficulty maintaining plaque control by mechanical mean alone. These patients should be reminded that the chemical agents are not substitutes for thorough brushing and interproximal cleaning. For most orthodontic patients these agents may be necessary for only short term periods to demonstrate how having the proper oral hygiene facts, and this would provide an intensive care for the patient to redirect their methods of oral hygiene.<sup>(13, 14)</sup>

The aim of this study is the evaluation of the watery extract of peppermint (*in vivo*) as mouth rinse during the orthodontic work to reduce the prevalence of *Candida albicans* in the oral cavity.

## MATERIALS AND METHODS

### Mouthwash Preparation of the Peppermint Extract

The watery extract from the fresh peppermint leaves was prepared according to Abdul-Rahman<sup>(15)</sup> at the concentration of

1:10 ( $10^{-1}$ ); sterilized by autoclaving and stored in a refrigerator before use.

Each patient consumes about 350 to 400 ml of the extract during 7 days.

### Samples

The subjects for this study were selected from the patients attending the Department of Pedodontics, Orthodontics and Preventive Dentistry, College of Dentistry, Mosul University. Thirty patients or subjects were qualified on the basis of the following criteria:-

- Bracketing the upper anterior and posterior teeth (angulated roth technique) and banding on their molars.
- Patients with no evidence of any type of allergy; and no any systemic disease consider to influence the carriage of *Candida*.
- Evidence of gingivitis and no evidence of periodontitis.
- No anterior and/or posterior fillings.<sup>(16)</sup>

The selected patients were all instructed to brush only with Crest toothpaste with fluoride; once at the morning—after breakfast, and once at the evening before bedtime with a minimum time of 3 minutes to ensure thorough brushing. Also the patients who use peppermint or chlorhexidine were instructed not to take any liquid or food into the mouth for at least 30 minutes after using the mouthwash to avoid diminishing the effect of the mouthwash.

### Sample Collection

Swabs from the anterior and posterior surfaces from each patient were taken using sterile cotton swabs, three times during the orthodontic treatment. The first sample was taken before the fixed appliance wearing (time: 0); the second sample was taken after 7 days (time: 1) and lastly the third sample taken after 1 month (time: 2).

The three different swabs at each visit (1<sup>st</sup> day, 7<sup>th</sup> day and after 1 month) were transported in vials containing 4 ml of Brain Heart Infusion broth to the laboratory at the same day.

The orthodontic patients were divided into three groups:

**First group:** Twelve patients who were instructed to take care of their teeth and appliances without using any type of mouth rinses. This was the control group.

**Second group:** Ten patients who were instructed to use the peppermint aqueous extract (10%) as a mouth rinse for one week/twice daily (at the morning and at the evening) and it was the experimental group.

**Third group:** Eight patients who were instructed to use the chlorhexidine solution, Zak (Maleh Chemical Product MCP, Syria) 0.25% as a mouth rinse for one week/twice daily (at the morning and at the evening). This was the comparative group.

Zak mouth wash 0.12% used in this research as ½ oz of 0.25% chlorhexidine gluconate for 30 seconds twice a day (after breakfast and before bed time), instruction were given to the subject not to take any liquid or food into the mouth at least 30 minutes after using mouth wash to avoid sustantivity of chlorhexidine thereby diminishing the effect of the drug.<sup>(17)</sup>

**Culture**

Each swab was inoculated on the whole surface of a Sabaraud's dextrose agar (oxide) plates; incubated in an invert posi-

tion at 37 °C for 24–48 hours.<sup>(18)</sup> The number of colonies was counted for each plate manually; the calculation of the colony forming units per 1 ml (CFU/ml) was found.

**Statistical Analysis**

The number of *Candida albicans* colonies (i.e. the number of candidal cells carried by the patients) was analysed using the Complete Random Design –CRD– and Duncan's Multiple Range Test.

**RESULTS AND DISCUSSION**

This study deal with a number of patients who visit the Department of Pedodontics, Orthodontics and Preventive Dentistry, College of Dentistry at Mosul University, then these patient wear fixed appliances; the sex of the patients at the control, peppermint and chlorhexidine groups were distributed as in Table (1).

The ages of the patients in the three groups range between 14–30 years and the means of these age distributed among males and females as shown in Figure (1).

Table (1): Sex distribution of the patients within groups

Treatment	Males		Females		Total	
	No.	%	No.	%	No.	%
<b>Control Group</b>	2	16.67	10	83.33	12	100
<b>Peppermint</b>	6	60.00	4	40.00	10	100
<b>Chlorhexidine</b>	3	37.50	5	62.50	8	100
<b>Total</b>	11	36.67	19	63.33	30	100

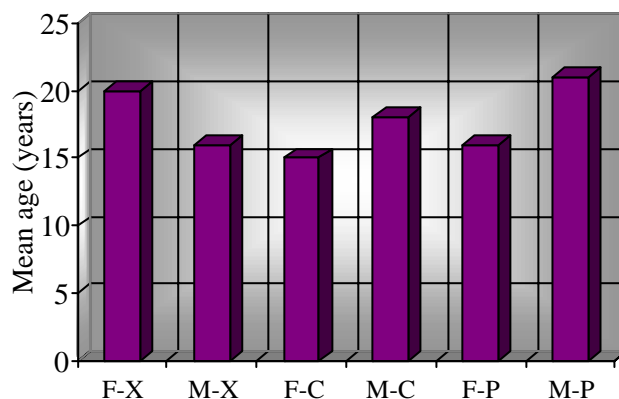


Figure (1): Age distribution of patients

P: Peppermint; C: Control; X: Chlorhexidine; F: Female; M: Male

*Candida albicans* was recovered from swabs collected from both posterior and anterior oral sites among the orthodontic appliance wearers; the mean number of colonies was shown in Table (2).

Statistically; there were no significant differences between the mean number of

colonies when the different mouth rinses used, or between the anterior and posterior regions for each group also; the only significant difference found was in the number of colonies recovered at the posterior region when the peppermint extract used as mouth rinse (mean no. = 34.6).

Table (2): Analysis of variance and Duncan's Multiple Range Test for the number of *Candida albicans* colonies recovered from different surfaces at different intervals

Between Groups	df	SS	MS	F-value
Posterior Time 0	2	9731.65	4865.825	0.26
Posterior Time 1	2	17954.7	8977.35	0.66
Posterior Time 2	2	86017.65	43008.825	0.36
Anterior Time 0	2	39876.4	19938.2	0.79
Anterior Time 1	2	7183.425	3591.7125	0.13
Anterior Time 2	2	3897.675	1948.8375	0.07

df: Degree of freedom, SS: Sum of squares, MS: Mean squares

Groups (Treatment)	Mean Colony Count*					
	Posterior Time 0	Posterior Time 1	Posterior Time 2	Anterior Time 0	Anterior Time 1	Anterior Time 2
Control	87.42 <sup>A</sup>	136.83 <sup>A</sup>	159.58 <sup>A</sup>	48.83 <sup>A</sup>	144.33 <sup>A</sup>	158.90 <sup>A</sup>
Peppermint Aqueous 10%	121.30 <sup>A</sup>	84.00 <sup>A</sup>	34.60 <sup>B</sup>	132.90 <sup>A</sup>	125.4 <sup>A</sup>	143.40 <sup>A</sup>
Chlorhexidine Mouthrinse (Zak) 0.25%	78.50 <sup>A</sup>	91.25 <sup>A</sup>	91.00 <sup>AB</sup>	72.00 <sup>A</sup>	105.88 <sup>A</sup>	130.88 <sup>A</sup>

\* Means with different letters were significantly different at  $p < 0.05$ .

The results show an increase in the number of *Candida albicans* or both anterior and posterior surfaces among the patients at the control group (Figures 2 and 3) and a significant decrease in the number of

*Candida albicans* colonies among patients who use the peppermint extract as mouth rinse especially at the posterior region at the time 2 (Figure 3).

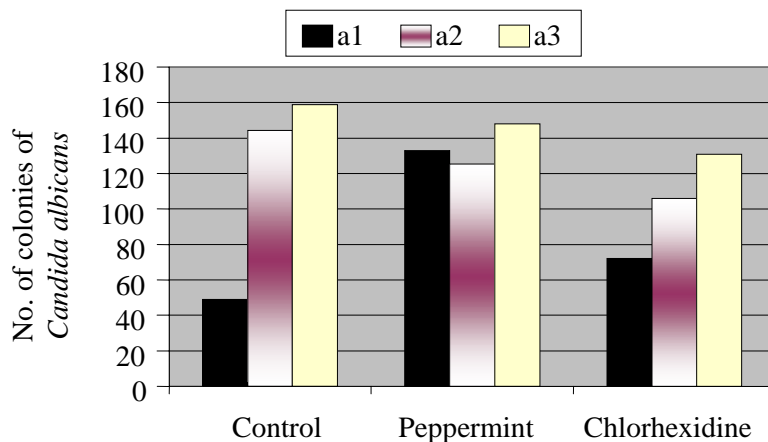


Figure (2): Number of *Candida albicans* colonies recovered from the anterior region

a<sub>1</sub>: Anterior region, time 0; a<sub>2</sub>: Anterior region, time 1; a<sub>3</sub>: Anterior region, time 2

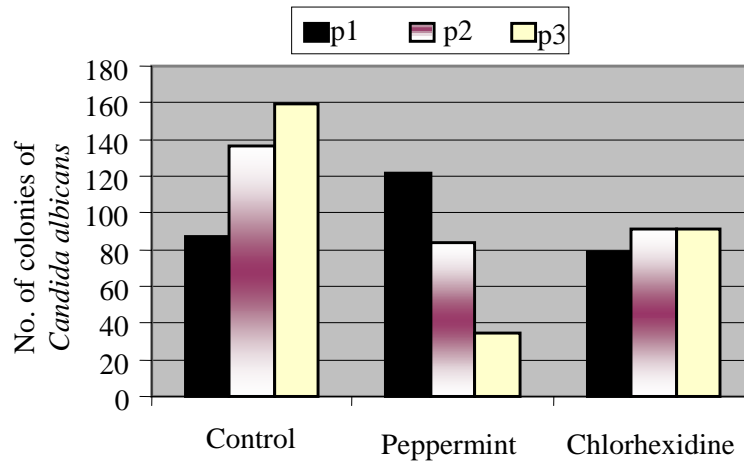


Figure (3): Number of *Candida albicans* colonies recovered from the posterior region

p<sub>1</sub>: Posterior region, time 0; p<sub>2</sub>: Posterior region, time 1; p<sub>3</sub>: Posterior region, time 2

Figure (4) shows a comparison between the number of yeast cells from both anterior and posterior sides for the three groups and reveal that peppermint extract

and chlorhexidine have the same effect with very special decrease at the posterior segment when the patients use peppermint extract.

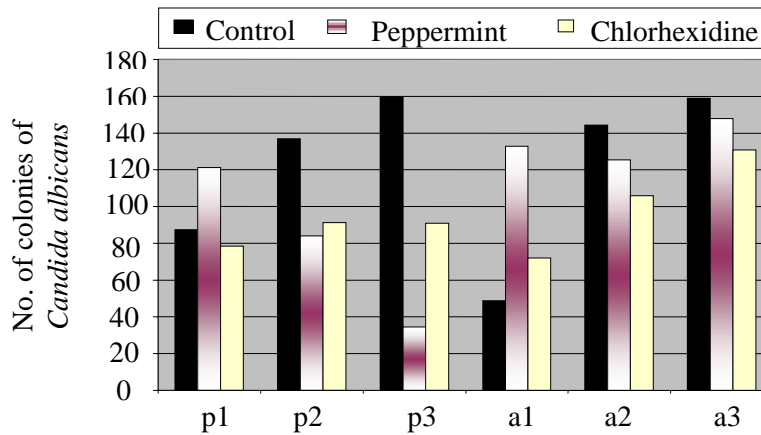


Figure (4): Comparison of the number of *Candida albicans* colonies from anterior and posterior region

a<sub>1</sub>: Anterior region, time 0; a<sub>2</sub>: Anterior region, time 1; a<sub>3</sub>: Anterior region, time 2  
 p<sub>1</sub>: Posterior region, time 0; p<sub>2</sub>: Posterior region, time 1; p<sub>3</sub>: Posterior region, time 2

The site prevalence and intra-oral density of candidal organisms may be increased by local factors including prosthesis. However, the prevalence of candidal recovery at some sites and candidal densities at all sites were significantly increase in both fixed and removable appliance wearers.<sup>(19, 20)</sup>

## CONCLUSION

This study evaluate the antifungal effect of *Mentha piperita* watery extract which was well known in Iraqi folk medicine, and the result revealed that the extract had an equal effect to chlorhexidine gluconate mouth rinse which was the famous one instructed by dentist as antimicrobial and also

antifungal mouth rinse. However, the extract was safer, cheaper and easier to be used by patients as well as its nice taste and odor. We advise to use it as mouth rinse twice daily for a week, after wearing the orthodontic appliance in addition to good care and brushing ...etc.

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