Comparison of the Effect of 2% Ginger Mouthwash and Nystatin Mouthwash on Denture Stomatitis

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ABSTRACT
Denture stomatitis is the chronic inflammation of mucus along with the presence and activity of Candida albicans. Ginger, which is a herb with antibacterial and antifungal proportion, has shown proven effects against Candida albicans. In this study the effects of ginger mouthwashes and nystatin mouthwashes on the treatment of denture stomatitis have been compared. This study was conducted in a doubled-blind clinical trial on 50 patients with denture stomatitis. Given consent, the patients were categorized into two groups and one group was given the ginger mouthwash and another one was given the nystatin mouthwash for two weeks. At the end of the first and second week the erythematous zone was examined and its type of denture stomatitis was specified. Furthermore, in the first session and the end of the treatment sample were taken from the palate with in order to carry out microbial culture and colony count. The data was analyzed by SPSS 21 and the results were compared with Chi-square test. During the two-week treatment, both treatments resulted in the recovery of denture stomatitis significantly. However, the mentioned treatments did not have any clinically significant differences. No significant difference in the reduction of the number of colonies was seen between the two groups. Moreover, the level of the patient's satisfaction with the two treatments was similar. Considering the similar effectiveness of ginger and nystatin in the treatment of denture stomatitis and also patients similar satisfaction with both mouthwashes, the ginger mouthwashes can be an alternative treatment for nystatin.

Keywords: ginger mouthwash, nystatin mouthwash, denture stomatitis.

INTRODUCTION
Denture stomatitis is the chronic inflammation of mucus to supporting the movable prostheses and it’s more common in the upper jaw (1, 2). Its etiology is multifactorial and can be caused by local or systematic factors such as microbial plaque, trauma of the denture, Candida albicans, allergy, smoking, various antibiotics, corticosteroids and anemia (2, 3). The most important pathogenic microorganism causing denture stomatitis is Candida albicans (4). Denture protects sloughed epithelial cells against the physical effects of saliva (5). When Candida turns into pathogen, the immune reaction starts and causes the inflammation of
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the palate and the occurrence of denture stomatitis (6). Due to the multifactorial etiology, control of candidiasis related to denture is complicated (3). The possibility of relapse after the treatment is high and there is no single treatment for all patients (7, 8, 9). If possible, the elimination of local factors has to be the first therapeutic aim of denture stomatitis and other opportunistic infections (5). In the treatment of denture stomatitis, antifungal drugs such as Polyenes (nystatin), derivatives of imidazole ( clotrimazole) and chlorhexidine are used (10). Polyenes drugs (nystatin) are usually considered as the first remedial option (5). There drugs have side effects despite being effective in the treatment of denture stomatitis (10). Therefore, it is crucial to find antifungal compounds with the fewest side effects (11).

Nowadays, vast researches have been carried out about the biological inhibitory effect of natural substances such as oils and plants extracts against fungal activities (12). According to the report of the world health organization, 80% of the world population use herbal drugs that are non expensive and available and also have fewer side effects (13). Ginger is vastly used as a spice in the world and is a herbal drug to cure a cold, rheumatism, toothache, asthma, heart attack, constipation, diabetes and postoperative nausea and vomiting (14). It has been demonstrated that the extract ginger has anti-inflammation, anti-fever, anti-pain, antioxidants, immune modulating and anti-nausea properties (15). In vitro studies have reported the anti candidal properties of ginger (16). Few studies have been conducted regarding its function in the treatment of denture stomatitis. The aim of the present study is to compare the antifungal effect of nystatin and the extract of ginger in the treatment of denture stomatitis.

MATERIAL AND METHODS
This study (that has been approved by the Ethics Committee of the Research Division of Babol University of Medical Sciences) is a double-blind trial on 50 patients having referred to the department of oral diseases of the dental university of Babol. The patients participated in the study after the condition had been confirmed by the specialist of oral diseases and their consent forms had been gotten. At the start of the study, the information concerning age, gender, the duration of use of denture, the use of denture while sleeping, the way and frequency of cleaning denture, the consumption of drugs that reduce saliva such as anti hypertension agents and anticholinergic drugs was recorded in the patient's files. The patients who had the history of the use of anti fungal drugs, antibiotics, corticosteroids during one month before the implementation of the study, and also those with immunodeficiency, Alzheimer's, the disorder of chewing muscles, inability to use a mouth wash, allergy to ginger, or nystatin-mouthwash and those having a diet full of ginger were excluded from the study. The patients were randomly categorized into two groups. Each patient was given a mouthwash with either ginger or nystatin in similar bottles (size, shape and color). The two groups were looked to gargle 5ml of 2%- ginger mouthwash or 1000 u/mg (60 drops in 5ml) suspension nystatin in their mouths for three minutes. Three times a- day and abstain from eating or drinking for 30 minutes. The drugs were given in bottles of similar shape, color and size to the patients. Neither the researcher nor the patient was aware of the nature of the drug. At the end of the first and second weeks after the use of the mouthwashes, the patient's palates were examined and recovery was registered as the change in size and type of denture stomatitis (the change of type (1) to type (2) or complete recovery). In the first session and also at the end of the second week (end of the treatment) a sample was taken from the palate by a sterile swab, cultured in BHI agar use of routine method. In order to examine the existence of candida in the palate directly, one of the swabs was pulled on a clean laboratory slide and as smear was prepared. From the sample, grown colonies of diagnostic tests on candida chromagar were cultured. In this medium. Different kinds of candida have different colors. Other diagnostic tests such as the generation of chlamydospore and germ tube were done for every single separated colony. The degree of patients’ satisfaction of using either of
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mouthwashes was recorded as very good, good, relatively and bad.

RESULTS
50 patients with the gender distribution of 44% males (22 men) and 56% females (28 women) participated in the study. This study was a randomized double-blind clinical trial. The mean age of patients was 66±10. The duration of denture use was 176.64±36 months. 44% of the patients used denture while sleeping. The consumption of anti hypertension drug or anticholinergic drug in the treatment group and the control group was 40% (10 cases) and 44% (11 cases) no significant difference was seen between two groups. 60% (30 cases) cleaned their dentures with water, 26% (13 cases) with a toothbrush and toothpaste, 12% (6 cases) with a toothbrush and salt and 2% (1 case) with a toothbrush and detergent. The average of the frequency of cleaning denture was 1.55 ± 0.75. no significant difference was seen between the groups. (p>0.05)At the end of the first week of the treatment the change in the type of denture stomatitis in the nystatin group and the ginger group was 92% (23 people) and 88% (22 people) respectively. The difference between the two groups was not significant. (p> 0.05)At the end of the two-week treatment, the complete recovery in the nystatin group and ginger group was 84% (21 people) and 76% (19 people) respectively. There was no significant difference between the two groups. (p > 0.05).In the examination of the colonies gotten from culture and with the help of the generation of and germ tube, it was figured out that in the two groups, 66% of the people had candida albicans 24% had candida Krusei and 4% had candida tropicalis. In terms of the distribution of candida, there was no significant difference between the two groups (p>0.05). Before the start of the treatment, the number of colonies in the ginger group and nystatin group was 23.35±10.58 and 53.94±44.28. no significant difference was observed. (p> 0.05)In the second culture, the number of colonies in the ginger group and nystatin group was 13±7.3 and 10.17±6.64 respectively. There was a reduction in the number of colonies in both groups, but it was not significant (p>0.05), there was not a significant difference in the reduction of the number of colonies between nystatin and ginger either (p>0.05).Of 25 patients who used nystatin mouthwash in 36% (9 cases) described it as relatively good, very good 32% (8 cases), good 20% (5 cases) and bad 12% (3 cases).In the ginger group 40% (10 cases) accepted it relatively good, 28% (7 cases) very good, 28% (7 cases) and 4% (1 case) bad. No significant difference in the satisfaction level was seen between the two groups (p>0.05). in both groups most patients deemed the taste of the drug satisfactory (figure 1).

Figure 1: Patients’ satisfaction with both treatments
The side effects reported by the patients included the bad taste 12% (3 cases), diarrhea 4% (1 case) in the nystatin group. In ginger group, the side effects were bad taste and oral irritation reported by 4% (1 case) and 4% (1 cases) of patients, respectively. All side effects reported by the cases were tolerable and none of them resulted in not using the mouthwashes or abandoning the study. The data of the study were gathered and analyzed by SPSS 21 and chi-square test was used to compare two groups. The results of the test revealed that the effect of both mouthwashes was similar in terms of treatment and the Patients’ satisfaction and there was no significant difference in their efficacy (p>0.05 for all items).

DISCUSSION
Denture stomatitis is the most common form of chronic candidiasis of the mouth (6). Infectious factors including of candida spp, especially candida albicans, are the main reasons of denture stomatitis. The local and systemic prescription of antifungal drugs, especially nystatin and fluconazole is the common treatment of denture stomatitis. Toxicity and resistance to use of antifungal medication is a complex problem (18). Natural products have shown antibacterial and antifungal activity and also anti-inflammatory effects and have been proven to be able to replace chemical substances with fewer side effects. The extracts of many plants have been traditionally used as antifungal agent against candida albicans, their role in the treatment of candidiasis with denture stomatitis can have crucial importance (19). Among medicinal plants, ginger and its extract has usages due to its antibacterial and antifungal properties (18). The effect of the extract of ginger on candida albicans in vitro (15) and the treatment of vaginal candidiasis has been proven (20). Nystatin is effective in the reduction of colonization the growth and division of fungal cells (21). This drug does its antifungal action through the negative effect on the production of ergosterol which is critical for the yeast’s cell membrane integrity (5). However, nystatin has undesirable side effects such as bad taste and digestive problems like nausea and diarrhea that may reduce the patient’s cooperation (6). Ginger has gastroprotective and antiemetic effects (22). And does not accompany with side effects of other antifungal agents such as nystatin (23). The results of the current study have demonstrated that both the ginger mouthwash and the nystatin mouthwash have clinically similar effects in the treatment of denture stomatitis. No significant difference in the treatment was observed in the laboratory result. Eslami et al. reached the same finding in a similar study. Bakhshi et al. examined the effects of nystatin and the extract of garlic as an effective herbal factor in the treatment of denture stomatitis and showed that the extract of garlic is effective for this treatment (6). Atai Z, in a in-vitro study, demonstrated that ginger has significant antifungal properties but its inhibitory effects against candida albicans are fewer than nystatin (24), in the current study a significant difference between two groups was not seen. Supreetha, also in an in-vitro study showed that ginger has significant antifungal effects against candida (25). Giriraju examined the effect of 10%- ginger against the three common oral microorganism include of candida albicans, streptococcus mutans and enterococcus faecalis in the laboratory and showed ginger has activity against candida that was similar to the other in-vitro studies and the present study. All the aforementioned studies have highlighted the antifungal effects of ginger.

CONCLUSION
Considering the positive effects of the ginger mouthwash on the treatment of the erythematous areas resulting from denture stomatitis and lack of side effects and also the patients similar satisfaction with the both mouthwashes in this study, the ginger mouthwash can be an alternative treatment of nystatin

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