



EFFICACY OF ORANGE PEEL MOUTHWASH AGAINST CANDIDA IN DIABETIC PATIENTS

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ARTICLE INFO

Article History:

Received 10th September, 2018

Received in revised form 2nd
October, 2018

Accepted 26th November, 2018

Published online 28th
December, 2018

Key words:

Chlorhexidine mouthwash, Orange peel
extract mouthwash, diabetes mellitus,
candidiasis

ABSTRACT

Background: Diabetes mellitus is an endocrine disorder which increases susceptibility of an individual towards oral candidiasis. Chlorhexidine (CHX) is considered as a choice of treatment to prevent oral candidiasis but the long term use of chlorhexidine results into adverse effects. So, citrus aurantium (bitter orange) has been proved to be effective against candidiasis in many in-vitro studies and has no known side-effects. So, a study was undertaken to evaluate the efficacy of orange peel extract mouthwash in comparison to 0.2% Chlorhexidine (CHX) mouth wash against oral candida albicans (CA) in type II diabetic patients.

Material and Method: 30 type-II diabetic patients are randomly divided into 2 groups of 15 patient search. Group 1- 0.2% chlorhexidine mouthwash and Group 2- Orange peel extract mouthwash. Swab test was done before and after the use of respective mouthwash in group 1 and group 2.

Results: CHX and Orange peel extract mouthwash were proved to be effective in decreasing the CA count, which is statistically significant ($p > 0.05$). When potency of both mouthwash were compared, there was no statistical significance noted. Hence, CHX is as effective as Orange Peel Extract mouthwash in decreasing CA colony count.

Conclusion: Orange peel extract mouthwash is found to be as effective as chlorhexidine mouthwash in reduction of CA count.

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INTRODUCTION

Diabetes Mellitus (DM) is an endocrine disorder which causes multiple organ dysfunction. DM is manifested in form of periodontitis, taste alterations and increases the prevalence of opportunistic infections like candidiasis in the oral cavity.¹ Topical ointments and systemic antifungal medications are used to treat oral candidiasis, but the long term use of these medications results in resistance to these drugs that may lead to higher recurrence of candidiasis.^{2,3} Since, prevention of oral candidiasis the main goal, chlorhexidine mouth was his prescribed, but in long haul, it causes adverse effects like discolouration of the teeth, restorative materials, dysgeusia and hypersensitivity reaction.^{4,5}

Citrus aurantium (bitter orange) is FDA approved drug which is used to treat stomachache, hypertension, Scurvy.⁶ A plant Citrus aurantium (bitter orange) of family Rutaceae is a natural product with no known side effects, proved to be efficient against candida albicans. The Citrus aurantium peel contains flavonoids, which have anti-fungal, anti-inflammatory and antibacterial properties and has proved to be effective against Candida albicans according to an in-vitro studies.^{6,7}

The aim of the study is to evaluate the efficiency of Orange Peel Mouthwash over chlorhexidine mouthwash on oral candida albicans in type II diabetic patients.

MATERIALS AND METHODS

Acase-control study was conducted on 30 type II diabetic patients who are divided into 2 groups of 15 each.

Inclusion Criteria

- Type II Diabetic patients

Exclusion Criteria

- Pregnant patients
- Smokers and alcoholics
- Patients with other systemic diseases.
- Subjects with hypersensitivity or allergy to the study medications
- Subjects with already established candidiasis in oral cavity.

METHODS

Prior to conducting the study, ethical clearance is obtained from the ethical board. An informed written consent is obtained from the patients who agreed to participate in the

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study. 30 type II diabetic patients who fulfilled the inclusion criteria are divided into 2 groups of 15 each.

Group 1 comprises of 0.2% chlorhexidine mouthwash (active ingredient-0.2% chlorhexidine gluconate solution) and Group 2 comprises of orange peel extract mouthwash (active ingredient-4% bitter orange extract v/v).

Case history is recorded and diabetes is confirmed by performing hematological investigations (RBS-Random Blood Sugar). Glycosated haemoglobin (HbA1c) is measured using fully automated H.P.L.C (High Performance Liquid Chromatography). Swab test is performed on all surfaces of the oral cavity (buccal mucosa, anterior and posterior teeth and dorsum of tongue) before and after the use of mouthwash, in both the groups. Group 1 patients are instructed to swish with 10 ml of 0.2% chlorhexidine mouthwash for 30 sec and Group 2 participants are instructed to swish with 10 ml of orange peel extract mouthwash for 30 sec and spit it. Twenty minutes after the use of respective mouthwashes, the swab test is performed in group 1 and group 2.

In sterilized Sabouraud's Dextrose agar (SDA), microbial culture was performed by autoclaving SDA at 121°C and at 15 lbs for 15 minutes. In a sterilized Laminar Air Flow chamber, approximately 20 ml of the prepared media was poured into sterile disposable petri plates and allowed to solidify. The collected (saliva) samples are then serially diluted to 10⁻⁵ using sterile water. Since the bacterial load of the sample is unknown, 100µl of the undiluted sample with 100 µl of 10⁻² and 10⁻⁵ dilutions are inoculated on the media by spread plate technique and incubated at 37°C for 48 hours. The creamy white coloured smooth and pasty appearance colonies on each plate are counted and tabulated.

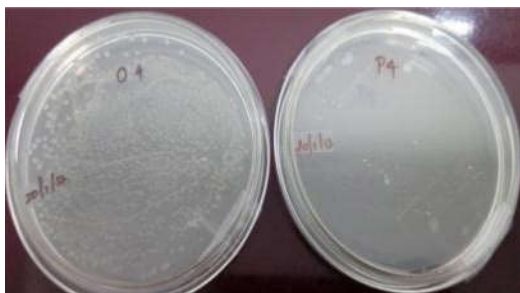


Figure 1 shows the microbial culture before & after the use of orange peel extract mouthwash



Figure 2 shows the microbial culture before & after the use of Chlorhexidine mouthwash

RESULTS

Results are calculated using Kruskal Wallis ANOVA and Spss version 22.0.

The mean age of the patients in GROUP 1 is 40.8±11.5 and GROUP 2 is 48.2±6.4. Distribution of the number of colony forming unit (cfu) of candida albicans at baseline and post intervention period in Group 1 and 2 showed statistical

significance, as there was decrease in the number of colony forming unit (cfu) in both the groups before and after the use of mouthwashes (Table 1).

Table 1 Distribution of the number of cfu of candida albicans at baseline and post intervention period

Baseline	Group 1 Mean±SD	GROUP 2 Mean±SD
Post intervention	147.13±221.5	52.2000±9.31
t value	67.86±140.4	8.7800±2.56
p value	2.7	188.80±78.71
	0.01*	0.01*

p value significant at 0.05

Comparison of mean candida colony forming unit following the use of chlorhexidine mouthwash and orange peel extract mouthwash between group 1 & 2 respectively shows no statistical difference, proving orange peel extract mouthwash to be equally effective when compared to chlorhexidine group (Table 2).

Table 2 Comparison of mean candida (post) between group 1 & 2

	Mean difference(pre-post)	t	P
Group 1	128.45	0.981	0.37
Group 2	80.32		

p value significant at 0.05

The above table indicates that both the mouth washes (group I & II) are effective in decreasing the microorganism count individually.

The table 2 depicts no statistical significant difference between the mean reductions of the colony count of candida albicans, when both the groups were compared.

DISCUSSION

Poor glycemic control in diabetic patients increases the prevalence of oral candidal infection. It is reported that commensal candida is harbored in the oral cavity in 40–60% of healthy adults, but the count significantly increases in the diabetic patients.¹

According to a study conducted by Aoun G. *et al* in 2015, 0.12% chlorhexidine digluconate has been proved to be effective in eliminating candida albicans colonizing in dentures⁸. Shino *et al* conducted a study to evaluate the antimicrobial activity of 0.2% Chlorhexidine, Coconut Oil, Probiotics, when compared with Ketoconazole in effect on Candida albicans in Children with early childhood caries and concluded that chlorhexidine is as potent as ketoconazole.⁹ Saipavithra *et al* conducted a study to evaluate the antimicrobial activity of chlorhexidine and iodine against CA in denture base and CHX was proved to be effective.¹⁰

The long term use of CHX results in side effects like discolouration of the teeth, restorative materials, dysgeusia and hypersensitivity reaction.^{4, 5} Hence, the study was undertaken to evaluate the efficacy of orange peel extract mouthwash which proved to be effective in eliminating the CA in diabetic patient. Nazhvani *et al* conducted a study to determine the prevalence of candida colonization in oral cavity in liver transplant patients and concluded that susceptibility tests of the

Candida species to 0.2% chlorhexidine is more at the exposure time of 60 seconds,¹¹ which was in accordance to our study, in which a swab test was conducted within 20 minutes of rinsing the mouth with chlorhexidine mouthwash.

According to a study conducted by Trabelsi D, the Chemical constituents present in orange peel extract like Limonene, Linalool, α -Terpineol has retention time of 3-14 minutes after application. So in our study, the swab was collected 20 minutes after the rinse with orange peel extract mouthwash which proved to be equally effective as chlorhexidine in reducing CA colony count in oral cavity¹².

CONCLUSION

DM increases the susceptibility of an individual towards oral candidiasis. Chlorhexidine is treatment of choice to prevent oral candidiasis in an individual, but the long-term use of CHX results in side-effects. So, a study was undertaken to evaluate the efficacy of orange peel extract mouthwash which has no known side effects. Orange peel extract mouthwash proved to be equally effective as Chlorhexidine. Orange peel extract mouth wash is a promising agent in preventing the incidence of oral candidiasis in diabetic patients.

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How to cite this article:

Anuradha Pai (2018) ' Efficacy of Orange Peel Mouthwash Against Candida in Diabetic Patients', *International Journal of Current Medical And Pharmaceutical Research*, 04(12), pp. 3915-3917.
