

Comparison the efficacy of herbal mouthwash with chlorhexidine on gingival index of intubated patients in Intensive Care Unit

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Abstract

Background:

Intubated patients in Intensive Care Unit (ICU) are not able to take care of their mouth health, so they are at risk of bacterial colonization and dental plaques formation that can lead to systemic diseases such as pneumonia and gingivitis.

Aims:

In randomized, double-blind clinical study, the efficacy of natural herbal mouthwash containing *Salvadora persica* ethanol extract and *Aloe vera* gel was compared with chlorhexidine on gingival index (GI) of intubated patients in ICU.

Materials and Methods:

Seventy-six intubated patients (18–64 years old with mean age 40.35 ± 13.2) in ICU were admitted to this study. The patients were randomly divided into two groups: (1) Herbal mouthwash and (2) chlorhexidine solution. Before the intervention, the GIs was measured by modified GI device into two groups. The mouth was rinsed by mouthwashes every 2–3 h for 4 days. 2 h after the last intervention, GIs were determined.

Results:

Along with mechanical methods, herbal mouthwash in reducing GI was statistically significant than that of chlorhexidine ($P < 0.05$).

Conclusion:

The results of this study introduce a new botanical extract mouthwash with dominant healing effects on GI (1.5 ± 0.6) higher than that of synthetic mouthwash, chlorhexidine (2.31 ± 0.73).

Key words: *Aloe vera* gel, chlorhexidine, gingival diseases, Intensive Care Units, mouthwashes, patients

INTRODUCTION

Oral health is considered as one of the most important issues that affect on the general health of the Intensive Care Units (ICUs) admitted patients.[1] Omitting tooth brushing from dental hygiene program will cause the formation of dental plaque and consequently gingivitis.[2,3] In fact, poor oral health has been incremented as the primary cause of gingivitis.[4] Dental plaques alone can be the major cause of initiation and progression of periodontal diseases.[5,6,7] The direct correlation between dental plaques and severity of gingival inflammation or gingivitis was demonstrated.[8] Untreated gingivitis will exposed the infected patients to infection and periodontitis.[9] Untreated periodontitis is also considered as a risk factor for systemic disorders specifically bacterial pneumonia and cardiovascular diseases.[10,11,12] However, gingivitis and its related complications are readily preventable through controlling dental plaques and provision of oral and dental hygiene procedures.[13] Intubated patients in ICU are not able to take care of their mouth health, so they are at risk of bacterial colonization and dental plaques formation that can lead to systemic diseases such as pneumonia and gingivitis.[10,11,12]

Interventions for removing the dental plaques in intubated patients in ICUs include mechanical approaches and pharmaceutical approaches.[14] One of the most effective methods of controlling dental plaque is the use of mouth rinses.[15] Chlorhexidine is considered as the gold treatment for controlling the dental plaque and gingivitis due to its efficacy against different kinds of bacteria, fungi, and viruses and so far, no microbial resistance has been reported for it.[16,17] Although chlorhexidine has been introduced as the most effective anti-plaque agent,[16,17,18] but there is no sufficient evidence in regard to its efficacy and safety.[14] Some adverse effects include changing in color teeth and mucosa, mucosal desquamation, salivary stones creation, irritation, dryness of mouth, and side systemic effects as the result of swallowing were reported.[19,20] Therefore, finding the new alternative mouthwash with undesired side effects is mandatory. The World Health Organization (WHO) has recommended on finding the new natural sources such as the herbal extracts for overcoming on side effects of chemical agents.[21]

Salvadora persica is traditionally used for oral and dental health, and it was recommended by WHO for oral hygienic procedures.[22] The antibacterial activity of *S. persica* on cariogenic oral bacteria was confirmed.[22,23,24,25,26] Other pharmacological effects such as anti-inflammatory,[27] antioxidant,[28] antiulcer,[29,30] and sedative effects[31] were confirmed.

Aloe vera gel is the clear, jelly-like substance found in the inner part of the aloe leaf with anti-inflammatory,[32] antimicrobial,[33,34,35] antiulcer effects.[36]

Therefore, the aim of this investigation was to evaluate the efficacy of oral botanical extract mouth rinse containing *S. persica* ethanol extract (Miswak) and *A. vera* (*Aloe*) gel on gingival index (GI) of intubated patients of ICU and its efficacy was compared to chlorhexidine as current treatment.

MATERIALS AND METHODS

Participant

A randomized, double-blind controlled clinical trial was conducted on 76 patients under mechanical ventilation of three ICUs of Teaching Hospital, Yazd, Iran, from May to September 2014. The patients were randomly divided into two groups. The dentist measured the gingival health index of the patients before and after the intervention. The clinical design was approved by the University Committee of Ethics, and all private data of patients remained confidential. All participants provided written informed consent. This clinical study was also registered in the Iranian Clinical Trial Center under the code number 2014062418212N1. Participants with the following criteria were included all intubated patients (18–65 years old with mean age 40.35 ± 13.2) with normal teeth that had hospitalization time in ICU <24 h, participants with the following criteria were excluded hospitalized in other wards before wheeling into ICU, pregnancy, sensitivity, or anaphylaxis to herbal preparation and chlorhexidine, transfer the patient from the ICU for any reason or death before completion the study, dissatisfaction of patient's attendants, observation any damage or injury in patient's airway as a result of intratracheal intubation, or any other

physical factors.

Mouthwashes

Chlorhexidine mouthwashes (0.2%) were purchased from Shahredarou company and were poured in the bottles such as the other group. Herbal solution was prepared at the formulation Unit of Medicinal Plant, Research Center of BarijEssence, Kashan, Iran. Each milliliter of product was containing 10 mg *S. persica* dried ethanol extract and 940 mg *A. vera* gel. Microbial limit test passed the criteria for oral liquid pharmaceutical products.

Study design

All demographic data, disease and smoking histories, cause of hospitalization, all of the medications of all intubated patients were recorded in the checklists. The GI was measured and recorded in both groups before intervention by modified GI device[37] (baseline GI). Before oral care surveillance, to ensure the suitability of obstructive pressure of the cuff, its pressure was calibrated using a special manometer (20–25 mm Hg). Then, all oral areas including the internal and external dental surfaces with rotatory movements, and gums and tongue with protrusive movements were brushed with Butler soft toothbrush (USA). Using a special syringe, each part of the mouth was irrigated with the mouthwash before and after brushing for 30 s.[38] If the patients had airway in place, it was removed, cleaned, and relocated again in place. The same method, time, and frequency of rinsing were used for both groups. Oral irrigations and secretion suction were performed for all patients every 2–3 h using the Nursing Support Services and ward's routines, respectively. The mouthwashes were used for 4 days. 2 h after the last treatment, the GI was measured again using the same method [Figure 1].

Statistical analysis

All data were analyzed by SPSS version 16 (SPSS Inc., Chicago, IL, USA). Chi-square was used to examine the differences between the two groups regarding qualitative variables as gender, smoking history, and type of disease. Paired and independent *t*-tests were used to examine the differences between the two groups regarding quantitative variables such as breathing rate, number of teeth, systolic pressure, diastolic pressure, and pulse rate which had a normal distribution based on the Kolmogorov–Smirnov test. Mann–Whitney test was used to examine the differences between the two groups regarding quantitative variables such as temperature, number of medications, and number of antibiotics which proved to be normally distributed based on the Kolmogorov–Smirnov test.

RESULTS

Seventy-six intubated patients were completed the study. Some patients were excluded from the study due to extubation ($n = 13$), death ($n = 3$), leaving the ICU before the completion of the study ($n = 2$). All of the demographic data were presented in [Table 1](#).

Comparison of the two groups with respect to demographic conditions showed no significant difference between the two groups at the baseline. Furthermore, the subjects in both groups were the same for age, gender, smoking, dental number, cause of disease, antibiotic number, drug number, systolic blood pressure, diastolic blood pressure, heart rate, and temperature of the body ($P > 0.05$). There was a difference between breathing rate that was not clinically important.

The results of the present study demonstrated that the use of chlorhexidine rinse and herbal extract mouthwash along with mechanical methods both reduced the GI in intubated patients, but this reduction in GI was more considerable in the herbal mouthwash group, and their differences were statistically significant ($P < 0.05$) [[Table 2](#)].

There was no significant between the means of GI of intubated patients in herbal mouthwash (3.3 ± 0.63) and chlorhexidine (3.2 ± 0.71) groups at the baseline of the study ($P = 0.4$).

Administration of both mouthwashes decreased the GI to 2.31 ± 0.73 and 1.5 ± 0.6 in the patients that were treated with chlorhexidine and herbal extract mouthwash, respectively. The results were shown; the herbal

extract mouthwash was superior to chlorhexidine as the current treatment in reducing the GI of intubated patients in ICUs.

DISCUSSION

The results of our study exhibited the high GI for patients that were admitted to ICUs, and high GIs were not suitable for intubated hospitalized patients due to causing the systemic disorders specifically bacterial pneumonia and cardiovascular diseases.[10,11,12] Therefore, gingival disorders as silent epidemic[7] are most commonly chronic bacterial infection that affects on 60–90% of school children and nearly 100% of adults.[39,40] Furthermore, hospitalization has negative effects on oral health conditions of hospitalized patients and accelerates the accumulation of dental plaque that is associated with the destruction of mucosal membranes and increases the rate of gingivitis.[41] In addition, because the oral cares of hospitalized patients are not the right priority of nurses,[41] However, in these patients, oral problems are rapidly intensified and increased the nosocomial infections.[42,43] Therefore, oral health surveillance is one of the prominent topics of the ICU which should be performed by nurses to prevent the onset of infection.

The results of our study exhibited the prominent potency of mouthwash containing *S. persica* ethanol extract and *A. vera* gel than that of chlorhexidine in intubated hospitalized patients of ICUs.

Chlorhexidine (0.2%) as the gold standard for oral health care has been accepted.[44] Although, there are some studies that confirmed the beneficial effects of *S. persica* extracts[23,24,26] and *A. vera* gel[33,44] on oral cariogenic bacteria *in vitro* and *in vivo* conditions, separately, but our literatures survey did not show any research on the efficacy of a combination of *S. persica* and *A. vera* on GI of patients hospitalized in ICUs. In other study showed that mouthwash containing *S. persica* alone improves the GI as same as chlorhexidine.[45] The effectiveness of *A. vera* gel mouthwashes and chlorhexidine on improving GI have been demonstrated the same.[44,46]

Indeed, the higher efficacy of this natural mouthwash than that of chlorhexidine is related to the synergistic effects of *S. persica* and *A. vera* gel extracts against oral cariogenic bacteria that finally improve the GI of hospitalized patients.

Other biological activities of extracts including the anti-inflammatory effects,[27,32,35] antiulcer potency, [22,29,35] and sedative activities[31] of *S. persica* and *A. vera* and their synergic effects improve the status of oral health.

A. vera gel administration due to its efficacy in improvement of periodontal condition, nature's soothing healer property on gingiva has been recommended as a local drug delivery system in periodontal pockets.[47]

CONCLUSION

Therefore, the combination of *S. persica* ethanol extract and *A. vera* gel extract in mouthwash formula acts better than chlorhexidine in reducing the GI of intubated hospitalized patients in ICUs. Improvement in GI of hospitalized patients is one of the most important factors which can protect the patients from pathogenic microorganisms and therefore, prevent the spread of pulmonary and nosocomial pathogens in hospital and in the lungs and blood of patients.

Other larger clinical studies are required for evaluating the efficacy and safety of *S. persica* and *A. vera* mouthwash.

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Conflicts of interest

There are no conflicts of interest.

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Figures and Tables

Figure 1

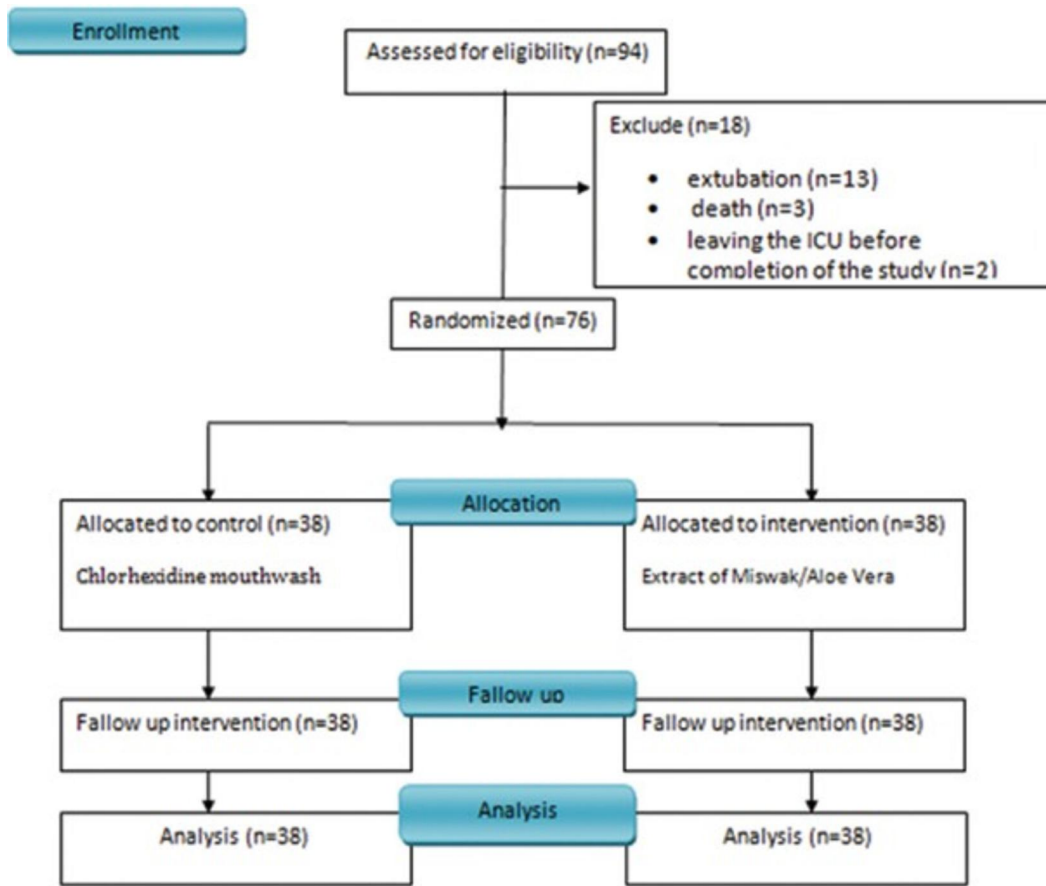


Diagram of clinical trial

Table 1

Demographic conditions	n (%)		P*
	Chlorhexidine	Herbal mouthwash	
Sex			
Male	20 (52.6)	21 (55.3)	0.8
Female	18 (47.4)	18 (47.4)	
Smoking history			
Yes	23 (60.5)	22 (57.9)	0.8
No	15 (39.5)	16 (42.1)	
Disease history			
Respiratory	8 (21.1)	7 (18.4)	0.6
Cardiovascular	6 (15.8)	7 (18.4)	
Necrotic	11 (28.9)	11 (28.9)	
Digestive	6 (15.8)	7 (18.4)	
Cancer	7 (18.4)	6 (15.8)	
Mean±SD			
Age	40.05±13.5	40.65±13.02	0.8
Teeth number	21.28±3	20.92±3.56	0.6
Medications number	6.4±0.8	1.7±0.8	0.5
Antibiotic number	1.7±1.1	6.4±1.1	0.9
Systolic pressure	125.9±11.5	125.1±10.3	0.7
Diastolic pressure	81±11.7	78.8±11.1	0.4
Heartbeat number	87.1±20.6	89.1±17.1	0.6
Respiratory number	12.2±2.1	11.1±2	0.02
Temperature of body	37.4±0.48	37.5±0.32	0.18

*Significant at the level of 0.05. SD – Standard deviation

Demographic data of intubated patients of this study

Table 2

Group	GI		P*
	Herbal mouthwash	Chlorhexidine	
During hospitalization	3.3±0.63	3.2±0.71	0.4
After intervention	1.5±0.6	2.31±0.73	0.000

*Significant at the level of 0.05. GI – Gingival index

Gingival index for intubated patients before and after rinsing of mouthwashes

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