



Original Article

Assessment of Tongue Scraper and Using Baking Soda Mouth Wash in Reduction of Halitosis

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ABSTRACT

Bad breath, also known as halitosis, is a symptom in which a noticeably unpleasant breath odor is present. It can result in anxiety among those affected. It is also associated with depression and symptoms of obsessive compulsive disorder. **Objective:** To compare the effectiveness of tongue scraper and sodium bicarbonate (baking soda) mouthwash in reduction of halitosis. **Methods:** This comparative cross-sectional study was organized in undergraduate students of Paramedics Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro. Individuals aged 18 to 30 years of age were included by non-probability convenient sampling technique. Data were analysed by SPSS Version-26.0. **Results:** A total of 302 cases were comparatively studied. Males were in preponderance in both groups. Before treatment, 2.6% had slight odor, 33.8% had moderate odor, 28.5% had heavy odor, 23.85% had strong odor and 11.2% had intense odor in Group A, while 14.6% had slight odor, 19.9% had moderate odor, 25.8% had heavy odor, 21.8% had strong odor and 17.8% had intense odor in Group B (p=0.04). After treatment baking soda mouthwash showed more efficacious in terms of decrease the halitosis and its severity. In 21.2% halitosis was completely reduced and remaining most of the cases had mild and moderate halitosis compared to tongue scraper technique, while strong odor was completely reduced in both groups (p=0.001). **Conclusions:** Sodium bicarbonate (baking soda) mouthwash was observed to be the more effective in terms of decrease the halitosis and its severity compared to the tongue scraper technique among individuals presented with halitosis.

INTRODUCTION

Countless and different types of odors with complex substances are present in the human breath, these odors can create unpleasing conditions called Halitosis [1]. The general term used for the disagreeable odor is "Halitosis". It emerges from intraoral and extra oral sources. "Oral Malodor" precisely directs to the malodor emerging from the oral cavity [2]. A state of a person that suffers from bad breath is a condition which influences huge population. Bad breath emerging from the mouth is because of presence of Volatile Sulfide Compounds (VSCs) which are produced by metabolism of bacteria [3-5]. The prime source of halitosis is the dorso-posterior area of the

tongue. To be specific the tongue-coating consists of proteolytic bacteria that degenerates protein which in turn causes the building up of cysteine and methionine which are additionally converted into hydrogen sulfide and methyl mercaptan by certain species of bacteria [6-8]. The primary treatment of halitosis is scrapping of the tongue coating with the help of scrappers. Throughout the world different studies have been documented with high prevalence rates of halitosis among young, adult and elderly populations [9, 10]. Worldwide population has 20% to more than 50% of halitosis prevalence rate. Oral malodor causes important issues of social and mental

complications in relationships also [11, 12]. Experimental proof strongly proposes that around 80%–90% of unpleasant odors are caused by Volatile Sulphur Compounds (VSCs) caused by the degradation of organic elements by anaerobic bacteria which are present in the oral cavity. These anaerobic bacteria are also related in causing gingivitis/periodontitis and are usually present in the coating situated on the dorso-posterior surface of the tongue [13–16]. Halitosis is major cause of discomfort in individual's life and affects their day to day activity and social interactions; different methods and techniques have been conducted in researches regarding reduction of halitosis.

The rationale of this study is to observe the diminution of halitosis by introducing tongue scrapping method and sodium bicarbonate mouthwash in two groups.

METHODS

Comparative cross-sectional study was undertaken in graduating candidates of Paramedics Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro in length of six months duration by non probability convenient sampling approach. Ethical approval from the Institutional Ethical Review Committee of LUMHS Jamshoro was granted (Ref No: LUMHS/REC/-08) on dated (04/01/2021). Patients of either gender aged 18 to 30 years were included and patients with systemic diseases causing halitosis was excluded by taking brief history of the subjects, habit of smoking and betel nuts, pregnant women, periodontal diseases, no severe dental caries, subjects wearing orthodontic appliances, no current use of antibiotics and subjects with no history of antibiotics use for at least 3 weeks were excluded from the study. Sample size was calculated by sample calculation equation using the margin of error 5%, at confidence interval 95%, with 75% prevalence of halitosis [10]. Keeping all values together: $n = z^2 p \times q / e^2$ Taking 5% more subjects as non-responders, we get total sample size as: $n = 302$ (3–9%) of sodium bicarbonate product having a pH value of about 8.0 to 9.3 is used to make a stable mouthwash. Groups consisting of Blue #1, Red #4, Red#19 and Red #33 along with dye selection is done from 0.005% to 0.002%. With inclusion of 5% to 15% of ethanol or isopropanol. Herbal medicinal or mint flavor oil is used 0.05% to 0.4%. Member of group containing nonionic and anionic emulsifier is used to give flavor oil in concentration of 0.01% to 4.0% and balanced deionized water. The product is being composed by dissolving the sodium bicarbonate in deionized water, then by amalgamating the resulting solution with the existing constituents of ethanol or isopropanol. Filtration of sodium bicarbonate solution from 0.1–1.0 micron and it is filtered for about 12 hours soon after the process by which the resultant product had concentration of bacteria less than

10counts/mol [3]. After approval of from institutional Ethical Review Committee, the data were collected from the undergraduate paramedic students of LUMHS Jamshoro and it was obtained via the subjects' informed permission. The study subjects underwent a clinical examination and were divided into two: Group A and B randomly with 151 participants in each group respectively. In group at each participant was provided with tongue scrapper. In Group B each participant was provided with baking soda herbal mouthwash. Instructions and usage of how to use mouthwash and tongue scrapper were advised and explained to them in detail. Breath Alert was used to check the participant's level of halitosis before introduction of the respective methods and the values were noted and were checked after implementation of these methods in a time period of 3 months and values were noted and comparison was done between the two groups to see which group is more effective. Participants were restricted from consuming of strong odor foods, like onions, eggs, garlicks, gingers, cabbages. The Breath Alert is specially designed instrument which is used for the detection of halitosis and it works by measuring hydrogen sulfide and methyl mercaptans commonly known as Volatile Sulfur Compounds (VSCs). Data were analysed by SPSS Version–26.0. Variables such as age were compared in mean and standard deviation. Other variables like gender, treatment group, malodor, use of mouthwash, treatment taken were computed as frequency and percentages. The independent t-test was applied between treatment groups to check the statistical significance.

RESULTS

A total of 302 cases were comparatively studied, in terms of treatment of the halitosis. Average age of the patients of Group A was 23.01 ± 1.69 years and average of Group B was 24.07 ± 5.95 years, findings of the average were statistically non-significant ($p = 0.06$).

Table 1 shows males were in majority in both groups as 66.2% in Group A and 57.6% were in Group B ($p = 0.088$). Before treatment odor severity was statistically insignificant in both groups ($p = 0.04$). After treatment baking soda mouthwash showed more efficacious in terms of decrease, the halitosis and its severity. In 21.2% halitosis was completely reduced and remaining most of the cases had mild and moderate halitosis compared to tongue scraper technique, while intense odor was completely reduced in both groups ($p = 0.01$). After treatment the average score of halitosis was decreased in both groups, while it was more decreased in baking soda mouthwash group compared to the tongue scraper technique group ($p = 0.001$).

Table 1: Average Age and Gender Wise Comparison in Groups

Variable	Group A (n=151)	Group B (n=151)	p-value
Age			
Mean ± SD	23.019 ± 1.698	24.072 ± 5.955	0.06
Gender			
Male	100 (66.2%)	87 (57.6%)	0.088
Female	51 (33.8%)	64 (42.4%)	

In the table 2, the participants were feeling bad breath as 13.9% in Group A and 9.3% in Group B during morning, 11.3% in Group A and 6.6% in Group B during hunger and 63.6% cases of Group A and 73.5% cases of Group B were feeling bad breath after walking up, while remaining few cases of both groups were feeling it all day and when thirsty (p = 0.02). Table 2 is showing that, out of all 25.8% cases of Group A and 23.8% cases of Group B used mouth wash (p = 0.68).

Table 2: Frequency of Mouthwash and Malodor in Groups

Variables		Group A N (%)	Group B N (%)	Total N (%)	p-value
Do you use mouthwash?	Yes	39 (25.8%)	36 (23.8%)	75 (24.8%)	0.68
	No	112 (74.2%)	115 (76.2%)	227 (75.2%)	
When do you feel Oral malodor mostly?	All day	2 (1.3%)	2 (1.3%)	4 (1.3%)	0.02
	Morning	21 (13.9%)	14 (9.3%)	35 (11.6%)	
	While talking to other people	3 (2.0%)	4 (2.6%)	7 (2.3%)	
	When thirsty	12 (7.9%)	4 (2.6%)	16 (5.3%)	
	When hungry	17 (11.3%)	10 (6.6%)	27 (8.9%)	
	Just after waking up	96 (63.6%)	111 (73.5%)	207 (68.5%)	
	Never	0 (0.0%)	6 (4.0%)	6 (2.0%)	

According to the severity of the halitosis before treatment, 2.6% had slight odor, 33.8% had moderate odor, 28.5% had heavy odor, 23.85 had strong odor and 11.2% had intense odor in Group A, while 14.6% had slight odor, 19.9% had moderate odor, 25.8% had heavy odor, 21.8% had strong odor and 17.8% had intense odor in Group B (p = 0.04). After treatment baking soda mouthwash showed more efficacious in terms of decrease the halitosis and its severity. In 21.2% halitosis was completely reduced and remaining most of the cases had mild and moderate halitosis compared to tongue scraper technique, while intense odor was completely reduced in both groups (p = 0.001).

Table 3: Pre-Treatment and Post-Treatment Severity of Halitosis in Groups

Variables	Study Groups		Total N (%)	p-value
	Group A N (%)	Group B N (%)		
Before Treatment	Slight Odor	4 (2.6%)	22 (14.6%)	0.04
	Moderate Odor	51 (33.8%)	30 (19.9%)	
	Heavy Odor	43 (28.5%)	39 (25.8%)	
	Strong Odor	36 (23.8%)	33 (21.8%)	

After Treatment	No Odor	5 (3.3%)	32 (21.2%)	37 (12.3%)	0.001
	Slight Odor	48 (31.8%)	72 (47.7%)	120 (39.7%)	
	Moderate Odor	60 (39.7%)	35 (23.2%)	95 (31.5%)	
	Heavy Odor	31 (20.5%)	10 (6.6%)	41 (13.6%)	
	Strong Odor	7 (4.6%)	2 (1.3%)	9 (3.0%)	

Before treatment halitosis average score 3.08 ± 1.09 in Group A and 3.05 ± 1.40 was in Group B, without significant difference (p = 0.85). After treatment the average score of halitosis was decreased in both groups, while it was more decreased in baking soda mouthwash group compared to the tongue scraper technique group (p = 0.001) as indicated in Table 4.

Table 4: Comparison of Pre-Treatment Halitosis Average Scores In Both Groups

Variable	N	Mean ± SD	p-value
Pre Treatment			
Group A	151	3.08 ± 1.09	0.06
Group B	151	3.05 ± 1.40	
Post Treatment			
Group A	151	1.91 ± 0.91	0.001
Group B	151	1.19 ± 0.89	

(t - Value 0.18)

DISCUSSION

Halitosis is the most prevalent reason for a patient to be sent to a dentist. It is a serious multifaceted health problem that negatively impacts a person's social and psychological well-being. If the aetiology can be accurately identified by a thorough clinical examination, it can be treated. The average age of the patients of Group A was 23.019 ± 1.69 years and average of Group B was 24.07 ± 5.95 years, and males were in majority in both groups 66.2% in Group A and 57.6% were in Group B. Consistently Choi et al., reported that the average age of the halitosis cases was 23.9 ± 5.4 years and males were in majority 37 while females 19 out of all [17]. In this study after treatment baking soda mouthwash showed more efficacy in terms of decreasing the halitosis and its severity. In 21.2% subjects halitosis was completely reduced while remaining subjects suffered from mild to moderate halitosis compared to tongue scraper technique; the intense malodor was completely reduced in both groups (p = 0.001). On other hand, the study of Wu et al., reported that the instructions to quit smoking and use of baking soda dentifrices are recommended [18]. There is dearth of literature on such comparison. Tongue coating turned out to be the primary source of foul breath in a study on the effectiveness of tongue cleaning to prevent bad breath; as a result, tongue coating must be taken care of. The time span of an effect from a tongue scraper is less than that of a tongue brush since it is limited to removing the biofilm's top layer. Additionally, using a tongue scraper too vigorously might cause damage to the tongue. In another study by Kim et al., reported that the sodium

bicarbonate known as baking soda. Sodium bicarbonate has generally been used both inside and outside the country [19]. Because sodium bicarbonate is soft and has a low abrasiveness, it is thought to be less potentially damaging to enamel and dentin. In a clinical study it was demonstrated that the plaque controlling effect of dentifrice containing sodium bicarbonate was higher than the control dentifrice without sodium bicarbonate. Also, since sodium bicarbonate is a natural buffer, it helps maintain the mouth's natural pH level as it neutralizes food acids, even after brushing. Because of the well-known effects of sodium bicarbonate, dentifrice containing sodium bicarbonate is recommended by dentists to control oral malodor. In another study it is stated that the baking soda dentifrices have been shown to achieve a significant odor-reducing benefit for time periods up to 3 h [20]. The mechanisms by which baking soda inhibits oral malodor are related to its bactericidal effects.

CONCLUSIONS

Sodium bicarbonate (baking soda) mouthwash was observed to be the more effective in terms of decrease the halitosis and its severity compared to the tongue scraper technique among individuals presenting with halitosis. By using the sodium bicarbonate mouthwash the individuals can live in better quality of life after decreasing halitosis.

Authors Contribution

Conceptualization: PT

Methodology: SPR

Formal analysis: NT, KNM

Writing, review and editing: JU, RK, PT, SPR

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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