

Self-perceived halitosis among students of higher learning institutions in Rwanda

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Mumena C.H, Evode U, Muhumuza I, Sasi R, Mudhihiri M.H Placide B, Imelde I, Madjaliwa K. **Self-perceived halitosis among students of higher learning institutions in Rwanda. Tanz Dent J. 2015; 19(1):21-26**

Abstract

Aim: This study aimed to determine the prevalence of self-perceived halitosis (SPH), its effects and associated factors among students of higher learning institutions in Kigali, Rwanda. **Materials and methods:** A self-administered structured questionnaire was distributed to 354 students. Data was entered into excel sheet and analyzed using SPSS version 16.0. Chi-square test was performed and $p < 0.05$ was considered significant. **Results:** Out of 354 questionnaires distributed, only 329 were completely filled and used for analysis of which 48.6% were filled by females. The prevalence of perceived bad breath was 23.1%, and was similar in both sexes. About 23% reported that breath had interfered with their social life at school during the month of the study, while 13.1% and 19.7% respectively reported to have lost their friends at school and avoided other people from feeling that they had bad breath. Respondents who reported to have cavities in their teeth; gum bleeding; white or yellow deposits on their tongue; and dry mouth were more likely to report perceived bad breath than their counterparts ($\chi^2 = 18.21, p < 0.001$; $\chi^2 = 28.03, p < 0.001$; $\chi^2 = 28.19, p < 0.001$, $\chi^2 = 4.55, p < 0.033$ respectively). The oral habits that were associated with perceived bad breath were “not brushing teeth every day” ($\chi^2 = 5.51, p = 0.019$); “tobacco smoking” ($\chi^2 = 31.91, p = 0.001$); “drinking alcohol regularly” ($\chi^2 = 7.73, p = 0.005$); and “using chewing gum every day” ($\chi^2 = 28.03, p < 0.001$). **Conclusion:** A substantial proportion of students in institutions of high learning in Rwanda reported to have bad breath. Tooth cavities, gum bleeding, white or yellow deposits on tongue, infrequent tooth brushing; tobacco smoking and regular alcohol consumption were significantly associated with perceived bad breath.

Key word: Self-perceived halitosis, associated factors, social life, Students

Running Title: Self-perceived halitosis

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Introduction

Halitosis, bad breath or breath malodor all mean unpleasant breath odor that is objectionable to others (1). Halitosis is a universal medico-social problem reported worldwide to have a diverse prevalence in all age groups (2-5). Globally, the prevalence of halitosis has been reported to vary significantly (3-11). In East Africa, the prevalence of oral halitosis varies from 14% to 72% (6, 7). In the United States, it is reported that about 65 million Americans have suffered from halitosis at a certain time in their lives time (8). In Asian countries the prevalence of halitosis has been reported to range from 27.5% in China (9) to 39.6% in Japan (4). Self reported halitosis among Swiss army recruits was documented to be as high as 83% (3). In Brazil general population, persistent oral malodour was reported in 15% (10). There are conflicting reports on sex predilection of halitosis. Some researchers have shown that males were

more affected than females (10, 12), while others showed that females were more prone than males (1, 5, 11). Although many studies show that halitosis is a significant dental medical problem that needs attention, in Rwanda, epidemiological information of the problem is limited or has not been reported before.

Halitosis has multi-factorial etiology involving intra and extra oral causes. Intra oral causes account for more than 90% of reported oral malodors (12). Halitosis of oral origin in majority of cases has been associated with poor oral hygiene, dental caries, gingivitis, periodontitis, tongue coatings and dry mouth (12). In most of the cases tongue coatings have been shown to be the leading cause of halitosis (4, 12-14).

Halitosis has many impacts that range from poor self-esteem, discomfort, embarrassment, stigmatization, and sometimes may lead to separation or avoidance of relationships that negatively affect the entire social life of a person (2, 15). The diagnosis of halitosis remains to be a challenge in resource limited countries such as Rwanda. The objective diagnosis of halitosis involve use of equipment such as halimeters (Interscan Corp, Chatsworth, California) (8-9), Sensors for volatile substances and compounds (VSCs) that are incorporated into probes and paddles, which are placed directly on the tongue for measurement (Diamond Probe, Ann Arbor, Michigan) (8) gas chromatograph and organoleptic judges (1, 9). There is limited access to most diagnostic equipment, and the condition often does not present with pain unless it is caused by a painful pathological condition. In most of the circumstances diagnosis of halitosis is made after a person has gone through some negative consequences such as stigmatization, loss of friends and embarrassment. However self reported diagnosis remains to be one among the preliminary method to properly identify and manage the problem (1). Furthermore, self perceived halitosis (SPH) has been suspected to serve as a motivation for improved oral hygiene by its sufferers (6).

During literature search through Google scholar, and online libraries such as AJOL, Wiley and HINARI, using key words, halitosis, Rwanda, the authors' didn't come across any document that reported the epidemiology of halitosis in Rwanda based on any diagnostic approach. Lack of documented articles on oral halitosis and its associated factors motivated the researchers to explore the situation starting with Rwandan students. This study aimed to assess the self-perceived halitosis (SPH) and its associated factors.

Materials and methods

A questionnaire based cross-section study was carried out in two higher learning institutions, Kigali Institute of Education (KIE) and School of Finance and Banking (SFB). A total of 354 students were conveniently sampled. Structured self-administered questionnaires were physically distributed to sampled students at their institutions during their break time, at their recreational places. Before giving the questionnaire, the participants were informed of the objectives and were requested to participate in the study. Those who agreed to participate in the study were requested to sign a consent form.

The participants were then requested to semi-fold their palm and exhale through the mouth over the palms and inhale immediately through the nose the exhaled air to detect bad smell. Participants were

then requested to record in the questionnaire if they felt bad smell or not. The questionnaire used in the current study was adopted from that of Almas et al (12) and modified to suit Rwandan situation.

The questionnaire consisted of questions on aspects of halitosis and associated factors. Questions inquired on whether the participants knew halitosis; whether they have ever been treated of halitosis, and whether they have ever lost friends, or avoided meeting/talking to friends due to problem of halitosis. The questionnaire also explored factors that have been associated with halitosis. These included oral hygiene practices: - tooth brushing; tooth picking, and use of mouth washes. Other factors explored included use of chewing gums; smoking status and alcohol consumption. History of oral diseases and conditions that have been related with halitosis were also enquired: presence of white/yellow coating of the tongue; presence of tooth cavities and bleeding gums. The data were coded and entered into computer, then analyzed using Statistical Package for Social Sciences (SPSS) version 16.0. All questionnaires with incomplete information were excluded from data analysis. Data were analyzed using frequency distributions tables. Chi-square test was used where necessary to test any significant associations between reported perceived halitosis and the independent variables studied. Significant level was set at $p \leq 0.05$.

Results

A total of 354 students filled in the questionnaires and returned them to the researchers the same day. Only 329 questionnaires were completely filled and were used for analysis. Age of the study subjects ranged from 19 -28 years, with mean age of 23.5 years. Out of 329 study participants, 48.6% (n=160) were females.

The prevalence of self-perceived halitosis (SPH) was 23.1% (n=76). The prevalence was similar across age-groups ($\chi^2=0.063$; $p= 0.802$) and between males and females ($\chi^2=0.126$; $p= 0.723$), (Table 1).

The relationships between perceived bad breath and its consequences are summarized in Table 2. Twenty six percent of students (26.4%) reported to have been treated of bad breath during their lifetime. About 23% reported that breath had interfered with their social life at school during the month of the study, while 13.1% and 19.7% respectively reported to have lost their friends at school and avoided other people from feeling that they had bad breath. Proportionately more students who reported to have "been treated of bad breath" (41.4%); those who reported to "have experienced social life interference due to bad breath" (48.0%);

and those who reported to “have lost friends at school because of bad breath” (51.2%); and those who reported to “avoid other people from feeling that they had bad breath” (60.0%); perceived to have bad breath compared to their counterparts who respectively reported not to have been treated

of bad breath (15.7%); no social interference (15.7%); not lost friends (14.9%); and not avoiding people (14.0%) ($\chi^2=22.25$; $p< 0.006$; $\chi^2= 33.91$; $p< 0.000$ $\chi^2= 39.45$; $p< 0.000$; and $\chi^2= 62.09$; $p< 0.000$ respectively).

Table 1: Prevalence of perceived bad breath by sex and age

Demographic characteristics	Perceived bad breath n (%)		Total	χ^2 -test	p-value
	Yes	No			
Sex					
• Male	40 (23.7)	129 (76.3)	169	0.063	0.802
• Female	36 (22.5)	124 (77.5)	160		
Age-groups					
• 19-23	40 (22.3)	139 (77.7)	179	0.126	0.723
• 24-28	36 (24.0)	114 (76.0)	150		
• Total	76 (23.1)	253 (76.9)	329		

Table 3 summarizes the distribution of respondents by responses to specific questions related to oral diseases and perceived bad breath. Respondents who reported to have cavities in their teeth (37.4%); having experienced gum bleeding (41.6%); and having white or yellow deposits on their tongue (43.7%); and having experienced dry mouth (31.7%) were more likely to report perceived bad breath than their counterparts who reported no cavities (16.2%), no gum bleeding (14.9%); and no tongue coating (15.7%); and no

dry mouth (20.2%) ($\chi^2= 18.21$, $p< 0.000$; $\chi^2= 28.03$, $p< 0.000$; $\chi^2= 28.19$, $p< 0.000$, $\chi^2= 4.55$, $p< 0.033$ respectively).

The oral habits that were associated with perceived bad breath were “not brushing teeth every day” ($\chi^2= 5.51$, $p= 0.019$); “tobacco smoking” ($\chi^2= 31.91$, $p= 0.000$); “drinking alcohol regularly” ($\chi^2= 7.73$, $p= 0.005$); and “using chewing gum every day” ($\chi^2 = 28.03$, $p< 000$) (Table 4).

Table 2: Distribution of respondents by responses to specific questions related to consequences of bad breath and current perceived bad breath

Specific question related to perceived bad breath	Perceived bad breath [#]		Total*	χ^2 -test	p-value
	Yes	No			
Have you ever been treated of bad breath?					
Yes	36 (41.4)	51 (58.6)	87(26.4)	22.25	0.006
No	40 (15.7)	202 (83.5)	242 (73.6)		
Total	76 (23.1)	253 (76.9)	329		
During this month, have your breath interfered with your social life at school?					
Yes	36 (48.0)	39 (58.0)	75 (22.8)	33.91	0.000
No	40 (15.7)	214 (84.3)	254 (77.2)		
Have you ever lost friends at school because of bad breath?					
Yes	22 (51.2)	21 (48.8)	43 (13.1)	39.45	0.000
No	37 (14.9)	212 (85.1)	249 (75.7)		
I don't know	17 (45.9)	20 (54.1)	37 (11.2)		
Do you ever stay alone to avoid other people from feeling that you have bad breath?					
Yes	39 (60.0)	26 (40.0)	65 (19.7)	62.09	0.000
No	37 (14.0)	227 (86.0)	264 (80.3)		

= Row percentages; * = Column percentages

Discussion

This study aimed to assess prevalence of self-perceived halitosis, its effects to social life, and associated factors, among the students of higher learning institutions in Kigali city.

The prevalence of self-perceived halitosis reported in the current study (23.1%) indicates that bad breath is a problem among students of higher learning institutions in Kigali city. This prevalence is similar to that reported by Al-Ansari and colleagues among Kuwait dental patients (16). On the other hand, the prevalence in the current findings is lower than that reported in India among

dental students (25-48%) (15) and lower than that reported by Youngnak-Piboonratanakit among Thai dental patients (61.1%) (18) and higher than those reported in Lagos among students in tertiary institutions (2%-22%) (19). In their review article, Cortelli and colleagues (14) pointed out that globally the prevalence of halitosis ranged from 22% to 50%. The current findings are within the reviewed range. These differences might be due to different status in oral health, dietary and oral health care habits. Methodological differences may also count for the differences observed.

Table 3: Distribution of respondents by responses to specific questions related to oral diseases, and perceived bad breath

Specific question related to oral diseases	Perceived bad breath [#]		Total*	χ^2 -test	p-value
	Yes	No			
Do you have cavities in your teeth?					
Yes	40 (37.4)	67 (62.6)	107 (32.5)	18.210	0.000
No	36 (16.2)	186 (83.8)	222 (67.5)		
Do you experience bleeding from your gums when brushing your teeth?					
Yes	42 (41.6)	59 (58.4)	101 (30.7)	28.030	0.000
No	34 (14.9)	194 (85.1)	228 (69.3)		
Is your tongue coated with white or yellow deposits?					
Yes	38 (43.7)	49 (56.3)	87 (26.4)	28.194	0.000
No	38 (15.7)	204 (84.3)	242 (73.6)		
Do you experience dry mouth?					
Yes	26 (31.7)	56 (68.3)	82 (24.9)	4.555	0.033
No	50 (20.2)	197 (79.8)	247 (75.1)		

= Row percentages; * = Column percentages

In the current study, sex variation in self-perceived halitosis was not found; males and females were almost equally affected. The finding of the current study are similar to those reported by Youngnak-Piboonratanakit among Thai dental patients (18), differ from those reported among dental students in India (15) and the dental student in India (19), where significantly more females (49.0%) reported self-perceived halitosis compared to males (25.0%). The studies conducted in adults revealed sex variations in Tanzania (11) by Mugonzibwa and Khamis and in Italy (5) by Settineri with colleagues. Sex may not be a significant factor in young adults in higher learning institutions.

The fact that about a quarter of respondents reported to have been treated of bad breath and a similar proportion reporting that during the month of study, bad breath have affected their social life indicates that bad breath is a bother among students of higher learning institutions in Kigali city. Among students of higher learning institutions in Lagos however, about 50% of students reported to have consulted a health professional or other

persons for the problem of halitosis (19). In their recent review, Akaji et al 2014 emphasized the importance of controlling bad breath because it has serious impact on social life of those affected by the condition (20). In their study on attitudes towards individuals with halitosis among the Dutch general population, de Jongh et al 2014, documented that halitosis or bad breath was reported to be a strong 'downer' when meeting a person for the first time (21). This indicates that bad breath greatly lowers one's respect among the people he/she encounters. In their article on halitosis and its psychological impact Nardi and colleagues (21) concluded that bad breath represents a problematic element for the individual and his/her relational life. And that smelly emanation comes into conflict with the wish to attract, to please, and or to seduce. In his retrospective qualitative study of 55 clinical records of the Breath Odour Clinic in Thunder Bay Ontario Canada, MacKeown (2003) analyzed the breath odour and psychological history documentation that had been collected during the consultation and interview process. The main

findings did indicate that once a bad breath problem is experienced, or thought to exist, an individual's self-confidence, self and body image is eroded. This leads to insecurity in social situations (22).

The factors that were shown to be associated with bad breath in the current study were reports on presence of cavities in teeth, experiences of gum bleeding; tongue being coated with white and or yellow deposits; smoking and alcohol use. Open

cavities in the teeth, bleeding gums and a tongue covered with white or yellow coating are unquestionable sources of bad smell because they lead to production of volatile compounds that cause smell. Particularly, tooth cavities and bleeding gums represent a decomposing tissue that produces bad smell. In addition, tooth cavities and unclean tongue act as a retentive site for food remains that also decompose to produce bad smell.

Table 4: Distribution of respondents by responses to specific questions related to oral habits

Specific questions oral habits	Perceived bad breath [#]		Total*	χ ² -test	p-value
	Yes	No			
Do you brush your teeth every day?					
Yes	59 (20.9)	223 (79.1)	282 (85.7)	5.506	0.019
No	17 (36.2)	30 (63.8)	47 (14.3)		
Do you use toothpick regularly?					
Yes	19 (27.5)	50 (72.5)	69 (21.0)	0.967	0.325
No	57 (21.9)	203 (78.1)	260 (79.0)		
Do you use mouth wash regularly?					
Yes	19 (17.0)	93 (83.0)	112 (34.0)	3.599	0.0578
No	57 (26.3)	160 (73.7)	217 (66.0)		
Do you smoke?					
Yes	21 (61.8)	13 (38.2)	34 (10.3)	31.911	0.000
No	55 (18.6)	240 (81.4)	295 (89.7)		
Do you take alcohol regularly?					
Yes	18 (39.1)	28 (60.9)	46 (14.0)	7.736	0.005
No	58 (20.5)	225 (79.5)	283 (86.0)		
Do you use chew gum every day?					
Yes	42 (41.6)	59 (58.4)	101 (30.7)	28.030	0.000
No	34 (14.9)	194 (85.1)	228 (69.3)		

= Row percentages; * = Column percentages

The oral habits that were associated with perceived bad breath were “not brushing teeth every day” “tobacco smoking” “drinking alcohol regularly” and “using chewing gum every day. This could be explained by the fact that sporadic tooth brushing is likely to be associated with bleeding gums that is a sign of decomposing tissue. On the other hand, tobacco smokers may have real smell due to the smoke that contains volatile compounds that remain attached to oral tissues which may lead to bad smell. Whereas, alcohol drinkers may tend not to brush regularly, thus leading to bad smell, although it is possible that they might have felt the alcohol smell.

The current findings on factors associated with self-perceived bad breath compare well with the findings reported among dental patients in Kuwait (23) and Thailand (24); and among students of higher learning institutions in Lagos, and India (19); and among Korean adolescents (16). Tongue coating and bleeding when brushing teeth were

significantly associated with self-perceived oral malodor among Thai dental patients (24). Presence of carious teeth and bleeding gums were significantly associated with self-perceived bad breath among dental students in India (19). Use of the toothbrush less than once daily and history of tobacco smoking were the factors significantly associated with self-perceived halitosis among Kuwait patients (23) and Among Korean adolescents (16).

Conclusion

A substantial proportion of students in high learning institutions in Rwanda reported to have bad breath. Tooth cavities, gum bleeding, white or yellow deposits on tongue, infrequent tooth brushing; tobacco smoking and regular alcohol consumption were significantly associated with perceived bad breath. There is a need to address the root causes of bad breath among students of higher learning institutions in Kigali to improve their self-esteem.

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