

PREVALENCE OF SELF-REPORTED HALITOSIS AND ASSOCIATED FACTORS IN ADOLESCENTS FROM SOUTHERN BRAZIL

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ABSTRACT

The aim of this study was to assess the prevalence of self-reported halitosis and associated factors in adolescents from Passo Fundo, Brazil. Additionally, we studied adolescents' concern with their own breath and whether anyone had ever told them that they had halitosis. A cross-sectional observational survey was conducted on 15- to 19-year old high school students from public and private schools in the city of Passo Fundo, Brazil. The random sample consisted of 736 adolescents from 20 schools. An interview with a structured questionnaire was administered. The prevalence of self-reported halitosis and associated factors was analyzed by either the chi-square test or Fisher's exact test. The prevalence of self-reported

halitosis was 39.67%. The mother's level of education was associated with the outcome. Gender and behavioral habits were not associated with self-reported halitosis. Halitosis reported by others presented a prevalence of 10.73% and was associated to male gender and oral hygiene habits. Individuals with less toothbrushing frequency and no use of dental floss were associated to halitosis reported by others. It was observed that 88.58% of the participants are concerned with halitosis. It is concluded that there is high prevalence of self-reported halitosis, which is associated with a socioeconomic pattern. Most adolescents report concern with their own breath.

Key words: Halitosis; adolescent; prevalence; associated factors.

PREVALÊNCIA DE HALITOSE AUTORREPORTADA E FATORES ASSOCIADOS EM ADOLESCENTES DO SUL DO BRASIL

RESUMO

O objetivo do presente estudo foi verificar a prevalência de halitose autorreportada e fatores associados em adolescentes de Passo Fundo, Brasil. Além disso, foram verificados a preocupação dos adolescentes com o seu próprio hálito e se eles já foram avisados por alguém sobre essa condição em qualquer momento de suas vidas. Esse estudo transversal envolveu estudantes do ensino médio, da rede pública e privada, com idades entre 15 e 19 anos, da cidade de Passo Fundo, Brasil. Uma amostra randômica de 736 adolescentes de 20 escolas foi utilizada. Um questionário estruturado foi aplicado. A prevalência de halitose autorreportada e fatores associados foram analisados por qui-quadrado ou teste exato de Fischer. A prevalência de halitose autorreportada foi de 39,67%. O nível educacional da mãe foi associado com esse desfecho. Gênero e hábitos comportamentais não estiveram associados com halitose

autorreportada. Apenas 10,37% dos adolescentes reportaram que outras pessoas indicaram a existência desse problema, sendo associada com o gênero masculino e com hábitos de higiene bucal. Os indivíduos que reportaram menor frequência de escovação dentária e ausência do uso de fio dental apresentaram associações com a advertência da halitose por outras pessoas. Foi observado que 88,58% dos participantes são preocupados com o próprio hálito. Concluiu-se que a halitose autorreportada apresenta alta prevalência e está associada com fatores socioeconômicos. Advertência sobre mau hálito por outras pessoas foi relatada apenas por uma minoria, sendo associada com o gênero masculino e hábitos de higiene bucal. A maioria dos adolescentes reportou preocupar-se com o próprio hálito.

Palavras chave: Halitose; adolescente; prevalência; fatores associados.

INTRODUCTION

Halitosis is a condition in which exhaled air is unpleasantly altered both for patients and for people with whom they relate¹. It affects millions of people around the world, although its prevalence varies, apparently triggered mainly by lack of oral hygiene and a disorderly lifestyle. It can cause social restrictions, interfere in quality of life, and may be an indicator of important systemic diseases. In most societies where

halitosis is prevalent, people seek solutions, usually due to the discomfort or embarrassment to which they are subjected². A lot of money is spent – often unsuccessfully – on breath fresheners¹.

One of the reasons for studying halitosis is its social impact as a result of patients feeling insecure in social, professional and family interactions. It may also influence quality of life and embarrass people relating to the individual with bad breath.

Therapeutic interventions in the health field are basically assessed through two types of outcomes. Surrogate outcomes are defined as a measurement of the disease process, and are usually therapy-centered, whereas true outcomes reflect unequivocal evidence of tangible benefit to patients, and are exclusively patient-centered. Surrogate outcomes are used assuming they represent true outcomes, either separately or together³.

For example, some studies assess halitosis only through the objective measurement of volatile sulfur compound (VSC) concentrations in the exhaled air. The results of these investigations have a completely different meaning from studies that determine the percentage of individuals who report having halitosis¹.

Both outcomes are meaningful to understanding the issue, but observation through VSC monitors is considered a surrogate outcome, while self-reported perception of halitosis is recognized as a true outcome. Epidemiological observation taking into consideration both types of outcomes provides important information and enables broader understanding of the issue¹.

Adolescence is the transition period between childhood and adulthood, and is characterized by various changes in biological, psychological and social development⁴. Adolescents are subject to several health-related manifestations, including halitosis, which exceeds the biological scope, affecting the social scope and potentially harming the physical and psychological health of affected individuals⁵. Moreover, presence of halitosis may indicate presence of important systemic diseases requiring urgent diagnosis and treatment.

Nevertheless, in Brazil there are few scientific papers on adolescents, and still fewer on adolescent halitosis, which is a highly overestimated and taboo subject. The aim of this study was to assess prevalence of self-reported halitosis and associated factors in adolescents from southern Brazil. Additionally, it assessed subjects' concern with their own breath and whether they had ever been told they had bad breath.

MATERIAL AND METHODS

Study design and location

In this cross-sectional observational study, we interviewed 15- to 19-year-old adolescents enrolled at public and private high schools in the city of

Passo Fundo, in 2012. Passo Fundo is located in the state of Rio Grande do Sul, southern Brazil. The city's population is about 190,000, according to the Brazilian Institute of Geography and Statistics. More than 95% of the population lives in the urban area with a poverty incidence of 27.91%, and a Gini Index of 0.41. In 2012, the city reported 7,558 students enrolled in regular high school education at 23 schools, divided into 16 public schools and 7 private schools, all in the urban area of the city. Of this total 6,256 students (82.78%) attended public schools and 1,302 (17.22%) attended private schools (Department of Education of the State of Rio Grande do Sul).

Ethical considerations

The Institutional Review Board of the University of Passo Fundo approved this study following authorization from the 7th Regional Office of Education to conduct it at public schools, and after formal approval by the principals of the private schools. All selected students presented the Informed Consent Form signed by parents or legal guardians, and those who were present on the day of the survey were interviewed. If a student was absent on the day of the survey, a second attempt was made to collect data. This study was fully conducted in accordance with the World Medical Association Declaration of Helsinki.

Sample

All 23 high schools in the city were visited by the study coordinator and invited to participate. Twenty schools accepted the invitation (n=20), and 30% of the students from each of them were invited to participate. Participants were selected randomly by draw from the lists of all students aged 15 to 19 years from each participating school, regardless of their school schedule.

The research team visited all classrooms that included selected students, to present the objectives of the study. After the explanation, the selected students received an Informed Consent Form to be signed by their parents or guardians. In case of absence, a later contact was made.

Interview

A structured questionnaire including demographic data, socioeconomic condition, general health behavior, health record, and oral health self-perception

was administered using a set of questions from the PCATool-SB Brazil adult version, validated in Brazil⁶, in addition to other questions on oral health at this age, such as oral hygiene habits and halitosis. The adolescents were interviewed between April and July 2012 by teams that included an interviewer and a recorder who had been previously trained by the study coordinator to ensure standard procedures. The training consisted of theoretical classes that included literature review on the subject, and reading and explanation of each question in the questionnaire. First, team members were trained, and secondly, high school students not selected to participate in the study were examined. The reproducibility of the interview was verified in 10% of the respondents chosen by draw, revealing an agreement rate of 98%.

Statistical analysis

The dependent variable was the prevalence of self-reported halitosis, which was ascertained by asking three questions: “Do you have bad breath?”, “Has anyone ever complained to you about your breath?” and “Are you concerned about your breath?”. The questions were answered on a Lickert scale response card with the answer choices “never”, “rarely”, “sometimes”, “often”, and “always”⁷. The answers were classified as “YES” for “sometimes”, “often”, and “always”; and as “NO” for “never” and “rarely”. The explanatory variables for halitosis in adolescents were divided into two groups (Fig. 1) - one group with sociodemographic factors, and another with behavioral, biological, and oral factors⁸.

Ethnicity/skin color was classified as white or non-white. The non-white group included adolescents who referred to themselves as black, yellow, brown or indigenous. Socioeconomic condition was assessed through two factors. The first was mother’s level of education, classified into three groups: (1) complete or incomplete higher education, (2) complete or

incomplete high school, and (3) complete elementary school at the most. The second factor was the type of school the adolescent attended, using public or private school as an income proxy, with students from public schools being considered to belong to lower income families.

Smoking was classified into three groups: (1) no history of smoking, (2) current smokers and (3) former smokers. Health condition was classified into two groups: (1) no health problem or unaware of health problem and (2) with a health problem that has lasted or will probably last more than one year. Toothbrushing frequency was classified into three groups: (1) more than three times a day, (2) three times a day, and (3) less than three times a day. Use of dental floss and orthodontic treatment were both dichotomized as yes or no.

Data were analyzed with the statistical package SPSS 18 (SPSS Inc., Chicago, United States). Associations between the dependent variable and independent variables were analyzed by chi-square test or Fisher’s exact test, and presented by frequency distribution. The significance level applied was 5%.

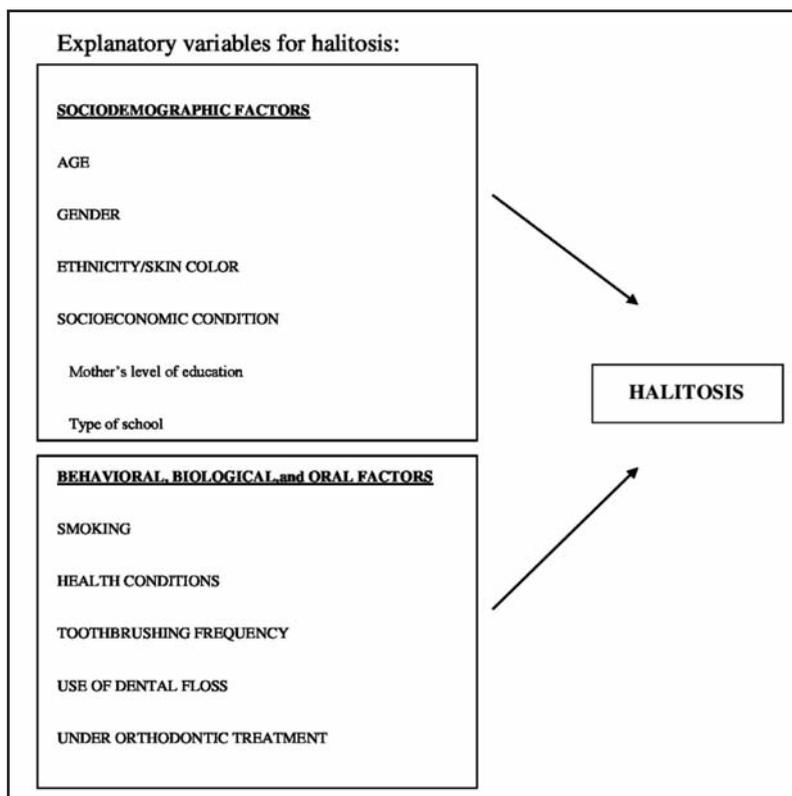


Fig. 1: The theoretical framework linked to the analysis of the present study.

RESULTS

This study addressed 20 schools in the city of Passo Fundo. Participant recruitment is illustrated in the flowchart in Fig. 2.

Results show that 15- to 19-year-old old students in the city of Passo Fundo are predominantly female. Most individuals in this sample are 15, 16 and 17 years old. Regarding sociodemographic characteristics, most individuals are white, study at public schools, and the mother's level of education is low. In relation to health habits, a small percentage of individuals (less than 6%) reported having smoked at some time, more than 85% brush their teeth at least 3 times a day, and about half report using dental floss. About 12% report having health problems (mostly respiratory conditions),

and about one third are under orthodontic treatment (Table 1).

Prevalence of self-reported halitosis was 39.67%. Table 2 shows the self-reported halitosis outcome and its association to potentially explanatory exposures. Gender had no statistically significant association to the outcome, although the result was close to reaching significance. Similarly, ethnicity and type of school were not associated to self-reported halitosis. The mother's level of education was associated to the outcome, considering that students whose mothers had less access to formal education presented higher prevalence of self-reported halitosis. Smoking, oral hygiene, health conditions and history of orthodontic treatment were not associated to self-reported halitosis.

Table 3 shows the results for "halitosis indicated by others". For this type of assessment, prevalence of halitosis was 10.73%. Halitosis indicated by others was associated to male gender and oral hygiene habits. Individuals with less toothbrushing frequency and no use of dental floss were associated to indication of halitosis by others. Concern with bad breath was assessed, showing that 88.58% of participants care about halitosis, but no statistically significant association with the explanatory variables was found. Non-white ethnicity presented a lower percentage of concern, almost reaching statistical significance (Table 4).

DISCUSSION

The aims of this study were to determine prevalence of self-reported halitosis and associated factors in adolescents from Passo Fundo, Brazil and to measure adolescents' concern with their own breath and whether they had ever been told they had bad breath. A cross-sectional observational study was carried out on high school students aged 15 to 19 years. The sample was similar to the percentage of students enrolled at public and

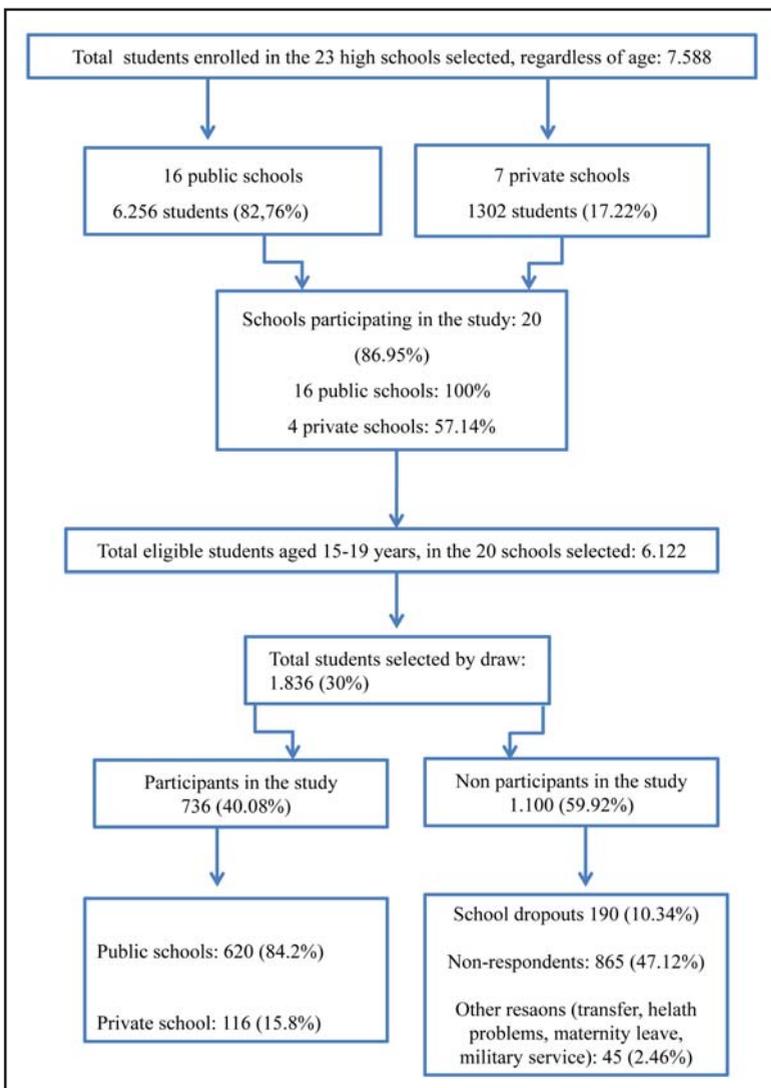


Fig. 2: Study flowchart.

Table 1. Description of the study sample.

		N	%
SOCIODEMOGRAPHIC FACTOR			
GENDER	MALE	323	43.9
	FEMALE	413	56.1
AGE	15	236	32.1
	16	251	34.1
	17	175	23.8
	18	58	7.9
	19	16	2.2
ETHNICITY	WHITE	511	69.4
	NON-WHITE	225	30.6
TYPE OF SCHOOL	PUBLIC	620	84.2
	PRIVATE	116	15.8
MOTHER'S LEVEL OF EDUCATION	Complete or incomplete higher education	164	22.3
	Complete or incomplete high school	265	36
	Finished up to elementary school	307	41.7
BEHAVIORAL, BIOLOGICAL, AND ORAL FACTORS			
SMOKING	SMOKER	17	2.3
	FORMER SMOKER	26	3.5
	NEVER SMOKED	693	94.2
TOOTHBRUSHING FREQUENCY	>3 times a day	186	25.3
	3 times a day	435	59.1
	<3 times a day	115	15.6
USE OF DENTAL FLOSS	YES	390	53
	NO	346	47
UNDER ORTHODONTIC TREATMENT	YES	241	32.7
	NO	495	67.3
HEALTH PROBLEMS	YES	91	12.4
	NO	646	87.6

private schools in the city and the percentage of explanatory variables obtained such as ethnicity and gender was similar to the city's population data (Fig. 2).

All 23 high schools in the city were invited to participate, of which 20 accepted. A simple random sample of adolescents was selected, with a total 30% of students from each school. Of the selected students, 40.08% accepted to participate. Other studies using similar methodology report higher⁹ or similar¹⁰ participation rates. Although according to

their age group, participants were close to being independent from their parents, the fact that legal restrictions required parents' signature on the consent form may account for the response rate.

Efforts were made to decrease any biases in the study, especially concerning the questionnaire. For this purpose, the research team was trained so that members would act similarly and to reduce any doubts that might arise while administering the questionnaire. Question comprehension was previously assessed among groups of adolescents.

Table 2. Frequency distribution of exposures regarding self-reported halitosis among adolescents 15 to 19 years old.

SELF-REPORTED HALITOSIS				
VARIABLE		YES – n (%)	NO – n (%)	p-value
SOCIODEMOGRAPHIC FACTORS				
GENDER	Male	117 (15.9%)	206 (27.9%)	0.053
	Female	175 (23.8%)	238 (32.4%)	
ETHNICITY	White	195 (26.5%)	316 (42.9%)	0.119
	Non-white	97 (13.2%)	128 (17.4%)	
TYPE OF SCHOOL	Public	252 (34.2%)	368 (50%)	0.12
	Private	40 (5.5%)	76 (10.3%)	
MOTHER'S LEVEL OF EDUCATION	Complete or incomplete higher education	51 (7%)	113 (15.3%)	0.005
	Complete or incomplete high school	100 (13.5%)	165 (22.4%)	
	Finished up to elementary school	141 (19.1%)	166 (22.5%)	
BEHAVIORAL, BIOLOGICAL, AND ORAL FACTORS				
SMOKING	Smoker	10 (1.4%)	7 (0.95%)	0.176
	Former smoker	8 (1.1%)	18 (2.44%)	
	Never smoked	274 (37.2%)	419 (57%)	
TOOTHBRUSHING FREQUENCY	>3 times a day	71 (9.6%)	115 (15.6%)	0.30
	3 times a day	168 (22.8%)	267 (36.2%)	
	< 3 times a day	53 (7.2%)	62 (8.4%)	
USE OF DENTAL FLOSS	YES	149 (20.2%)	241 (32.7%)	0.21
	NO	143 (19.4%)	203 (27.5%)	
UNDER ORTHODONTIC TREATMENT	Yes	92 (12.5%)	149 (20.2%)	0.30
	No	200 (27.1%)	295 (40%)	
HEALTH PROBLEMS	Yes	37 (5%)	54 (7.33%)	0.45
	No	250 (34%)	395 (53.6%)	

Self-assessment or self-perception of halitosis is a highly relevant outcome, since it involves the individual in the process and makes him/her understand the importance of the condition¹¹. Accordingly, it is safe to assume self-perception as a true patient-centered outcome, which is highly recommended in contemporary research in the health field³. However, organoleptic testing and self-perception both involve a subjective component, which may ultimately be questioned; therefore the additional use of an objective measurement to

assess breath, such as the volatile sulfur compounds monitor (halimeter), may be recommendable. Its main limitation is that it does not detect all of the odorivectors present in exhaled air, and indicates only quantitative – not qualitative – values. It only detects some of the components offensive to the human sense of smell, while self-assessment relates to the individual perception of the person affected by halitosis^{1,12}. Studies that assess halitosis exclusively through objective measurement of volatile compound concentration in exhaled air

Table 3. Frequency distribution of exposures regarding halitosis indicated by others among adolescents 15 to 19 years old.

HALITOSIS INDICATED BY OTHERS				
VARIABLE		YES	NO	p-value
SOCIODEMOGRAPHIC FACTOR				
GENDER	Male	48 (6.5%)	275 (37.3%)	0.001
	Female	31 (4.2%)	382 (52%)	
ETHNICITY	White	51 (7%)	460 (62.5%)	0.19
	Non-white	28 (3.8%)	197 (26.7%)	
TYPE OF SCHOOL	Public	63 (8.5%)	557 (75.6%)	0.15
	Private	16 (2.2%)	100 (13.5%)	
MOTHER'S LEVEL OF EDUCATION	Complete or incomplete higher education	18 (2.4%)	146 (20%)	0.36
	Complete or incomplete high school	23 (3.1%)	242 (33%)	
	Finished up to elementary school	38 (5.2%)	269 (36.5%)	
BEHAVIORAL, BIOLOGICAL, AND ORAL FACTORS				
SMOKING	Smoker	0 (0%)	17 (2.3%)	0.35
	Former smoker	3 (0.4%)	23 (3.1%)	
	Never smoked	76 (10.3%)	617 (84%)	
TOOTHBRUSHING FREQUENCY	>3 times a day	16 (2.2%)	170 (23%)	0.000
	3 times a day	35 (4.8%)	400 (54.3%)	
	< 3 times a day	28 (3.8%)	87 (12%)	
USE OF DENTAL FLOSS	YES	31 (4.2%)	359 (48.7%)	0.007
	NO	48 (6.5%)	298 (40.4%)	
UNDER ORTHODONTIC TREATMENT	Yes	24 (3.2%)	217 (29.5%)	0.36
	No	55 (7.5%)	440 (60%)	
HEALTH PROBLEMS	Yes	11 (1.5%)	80 (11%)	0.40
	No	68 (9.25)	577 (78.4%)	

provide results which have a completely different meaning from those of studies that verify the percentage of individuals who report having halitosis^{1,11}.

Both study methods make important contributions to understanding the issue, but observation using VSC monitors is considered a surrogate endpoint, while self-perceived halitosis is recognized as a true outcome. Epidemiological studies with true outcomes provide insight into the real impacts of halitosis. The perception and impact of oral health

status on quality of life have only recently become a matter of concern to the academic community, and several authors currently endorse patient-based results. In addition to gathering substantial information, studies aim to measure the impact of oral health disorders on the patient's quality of life^{1,12}.

This standpoint is important with relation to the concept of health not only as the absence of disease, but also as quality of life, and the concept of healthcare as not merely extending life and

Table 4. Frequency distribution of exposures regarding concern with bad breath among adolescents 15 to 19 years old.

CONCERN WITH BAD BREATH				
VARIABLE		YES	NO	p-value
SOCIODEMOGRAPHIC FACTORS				
GENDER	Male	285 (38.7%)	38 (5.1%)	0.44
	Female	367 (50%)	46 (6.2%)	
ETHNICITY	White	446 (60.5%)	65 (8.8%)	0.057
	Non-white	206 (28%)	19 (2.6%)	
TYPE OF SCHOOL	Public	553 (75%)	67 (9.1%)	0.15
	Private	99 (13.4%)	17 (2.3%)	
MOTHER'S LEVEL OF EDUCATION	Complete or incomplete higher education	140 (19%)	24 (3.2%)	0.13
	Complete or incomplete high school	232 (31.5%)	33 (4.5%)	
	Finished up to elementary school	280 (38%)	27 (3.6%)	
BEHAVIORAL, BIOLOGICAL, AND ORAL FACTORS				
SMOKING	Smoker	16 (2.2%)	1 (0.13%)	0.13
	Former smoker	20 (2.7%)	6 (0.8%)	
	Never smoked	616 (83.6%)	77 (10.5%)	
TOOTHBRUSHING FREQUENCY	>3times a day	165 (22.4%)	21 (2.8%)	0.83
	3 times a day	387 (52.5%)	48 (6.5%)	
	< 3 times a day	100 (13.5%)	15 (2%)	
USE OF DENTAL FLOSS	YES	344 (47%)	46 (6.2%)	0.41
	NO	308 (42%)	38 (5.1%)	
UNDER ORTHODONTIC TREATMENT	Yes	214 (29%)	27 (3.6%)	0.50
	No	438 (59.5%)	57 (7.7%)	
HEALTH PROBLEMS	Yes	83 (11.2%)	8 (1%)	0.24
	No	559 (76%)	76 (10.3%)	

eliminating diseases, but rather, doing so while maintaining the best possible quality¹³.

This study showed high prevalence of self-reported halitosis (39.7%), regardless of gender. This agrees with other studies on halitosis conducted with similar methodology on adults. In the United States, (1996) prevalence of self-reported halitosis was 31%¹⁴; in France (1998) it was 32% among 4815 individuals aged 15 years or older¹⁵; in Switzerland (2009) it was 32% among 419 adults aged 18 to 94 years¹⁶. Another Swiss study (2009) on 626 army

recruits aged 18 to 25 years found 21.4% prevalence of self-reported halitosis¹⁷. In Japan (2010) a similar study on 474 university students found 42% prevalence of self-reported halitosis¹⁸. Our study found similar results in Brazil, revealing halitosis as a condition having high impact.

Our study found a statistically significant association between self-reported halitosis and having a mother with a lower level of education, with 19.1% of the respondents having mothers whose educational level was not higher than elementary school and reporting

halitosis. The same has been reported in studies showing that socioeconomic conditions, such as mother's level of education, are strongly associated to poorer oral health conditions^{19,20}. Adolescents with poorer oral health conditions, including higher prevalence of cavities and periodontal diseases can be expected to have higher prevalence of bad breath. Although the difference was not statistically significant, 34.2% of the respondents answered "yes" to self-reported halitosis and attend public schools, while 5.5% answered "yes" and attend private schools.

Behavioral, biological, and oral factors are not statistically associated to self-reported halitosis. Fifty-nine percent of the respondents brushed their teeth three times a day, which is the most common toothbrushing frequency reported in the literature^{21,22}. This may account for the absence of association observed in this topic. It has also been suggested that the epidemiological situation of oral health in adolescents may not be directly related to the oral hygiene habits reported.

With regard to smoking, 37.2% of the students reported halitosis and having never smoked. Surprisingly, no association was found in this study between halitosis and smoking, even though it is known that the smell of cigarette may be mistaken for halitosis and exposure to smoking causes deterioration in oral health conditions, especially periodontally, which is related to halitosis.

Another important finding is that 34% of this sample reports suffering from halitosis with no presence of systemic diseases. This supports other studies that showed halitosis mainly as a condition with oral etiology²³.

Subjects with poorer oral health status and behaviors could be expected to be more likely to have halitosis, as would those under orthodontic treatment as a result of the difficulty in performing oral hygiene. However, there was no statistically significant association between these factors in this study. The fact that not much literature is available about halitosis in adolescence makes it difficult to compare data for these topics.

A less frequent approach to measuring halitosis is through third party reporting. This method was used in a study on a population of elderly people in the United States, which found prevalence of 24%¹⁴. In contrast, our study found that 10.7% of the sample had been told they had bad breath at some time in

their lives. This difference may be explained by the age difference or even by cultural differences between populations.

Our study found a statistically significant association between halitosis and toothbrushing frequency, as well as between halitosis and use of dental floss. Of the respondents, 6.5% were male and reported halitosis indicated by others, presenting a statistically significant association. Of the respondents who reported having been told they had bad breath, 4.8% claimed they brushed their teeth three times a day, and 4.2% said they used dental floss. Thus, a relation between supposedly more adequate oral hygiene habits and lower impact of halitosis is clearly seen.

The discrepancy between self-reported halitosis and halitosis indicated by others can be accounted for by the fact that the former reflects self-perception while the latter requires someone else to be willing to point out the presence of halitosis. Other studies also reflect this discrepancy^{14,23}.

Our study also investigated whether adolescents are concerned with their own breath, finding that 88.7% are. This concern was independent of gender, ethnicity, type of school, mother's level of education, toothbrushing frequency, use of dental floss, orthodontic treatment, or other associated factors, without statistically significant association between the level of concern with halitosis and the explanatory variables. People of all ages, including adolescents, have long been concerned about halitosis. This is reflected by the considerable increase in the sale of mouthwashes, as shown by a study conducted in Brazil,²⁴ and massive advertising campaigns for breath fresheners²⁵.

Halitosis is a health condition with high prevalence^{1,2,14,17}, which may be present from childhood to old age, thus including adolescence. Halitosis has high social impact, affecting family, social, and professional life, and may have an impact on quality of life. A recent study on adolescents showed that those with self-reported halitosis had lower scores of quality of life measured by the OHIP-14²⁶. Halitosis may thus be inferred to have an impact on public health. Despite the importance of halitosis as a highly prevalent condition, there are few studies involving adolescents, and few studies in general, since halitosis has historically been treated as an issue of lesser importance in dentistry^{1,12,25}.

The results of this study should be interpreted in light of the methodological understanding of its

capacity to generate evidence. Because it is a cross-sectional study, causality may not be inferred. However, the observation of associated factors provides information on risk indicators, which are essential for establishing preventive strategies, early diagnosis and prompt treatment.

Considering the methodological characteristics and limitations, the results of the present study allow us to conclude that:

- Self-reported halitosis is a prevalent condition in about 40% of adolescents.

- Halitosis reported by others was observed in about 10% of adolescents.

- Almost 90% of adolescents reported concern with their own breath.

- Mother's low level of education was associated to self-reported halitosis.

- Males were more likely to have halitosis reported by others.

- Toothbrushing frequency and the use of dental floss are potential protective factors.

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REFERENCES

- Rösing CK, Loesche W. Halitosis: an overview of epidemiology, etiology and clinical management. *Braz Oral Res* 2011; 25: 466-471.
- Eldarrat, AH. Influence of oral health and lifestyle on oral malodour. *Int Dent J* 2011; 61: 47-51.
- Hujoel PP. Endpoints in periodontal trials: the need for an evidence-based research approach. *Periodontol 2000* 2004; 36:196-204.
- Armfield JM, Mejia GC, Jamieson LM. Socioeconomic and psychosocial correlates of oral health. *Int Dent J* 2013; 63: 202-209.
- Seemann R, Conceicao MD, Filippi A Greenman J, Lenton P, Nachnani S, Quirynen M, Roldan S, et al. Halitosis management by the general dental practitioner—results of an international consensus workshop. *J Breath Res* 2014; 8: 017101doi: 10.1088/1752-7155/8/1/017101
- Fontanive LT. Adaptação do instrumento Primary Care Assessment Tool – Brasil versão usuários dirigido à saúde bucal. [Master Dissertation] Porto Alegre: Faculdade de Medicina, Universidade Federal do Rio Grande do Sul, 2011. URL: <http://hdl.handle.net/10183/53155>
- Vagias W. Likert-type scale response anchors. Clemson: Clemson University [cited 2016 May 20]. URL: <https://www.clemson.edu/centers-institutes/tourism/documents/sample-scales.pdf>.
- Corraini P, Baelum V, Pannuti CM, Pustiglioni AN, Romito GA, Pustiglioni FE. Tooth loss prevalence and risk indicators in an isolated population of Brazil. *Acta Odontol Scand* 2009; 67:297-303.
- Park YD, Patton LL, Kim HY. Clustering of oral and General health risk Behaviors in Korean adolescents: A national representative sample. *J Adolesc Health* 2010; 47: 277-281.
- Brennan DS, Spencer AJ, Roberts-Thomson KF. Tooth loss, chewing ability and quality of life. *Qual Life Res* 2008; 17: 227-235.
- Eli I, Baht R, Koriati H, Rosenberg M. Self-perception of breath odor. *J Am Dent Assoc* 2001; 132: 621-626.
- Loesche WJ, Kazor C. Microbiology and treatment of halitosis. *Periodontol 2000* 2002; 28: 256-279.
- Guyatt GD, Cook DJ. Health status, quality of life and the individual. *JAMA* 1994; 272: 630-631.
- Loesche WJ, Grossmann N, Dominguez L, Schork MA. Oral malodour in the elderly. In: van Steenberghe D, Rosenberg M. *Bad breath: a multidisciplinary approach*. Leuven, Belgium: Leuven University Press, 1996: 181-194.
- Frexinos, J, Denis P, Allemand H, Allouche S, Los F, Bonnelye G. Descriptive study of digestive functional symptoms in the French general population. *Gastroenterol Clin Biol* 1998; 22: 785-791.
- Bornstein MM, Kislig K, Hoti BB, Seemann R, Lussi A. Prevalence of halitosis in the population of the city of Bern, Switzerland: a study comparing self-reported and clinical data. *Eur J Oral Sci* 2009; 117: 261-267.
- Bornstein MM, Stocker BL, Seemann R, Bürgin WB, Lussi A. Prevalence of halitosis in young male adults: A study in Swiss army recruits comparing self-reported and clinical data. *J Periodontol* 2009; 80: 24-31.
- Yokoyama S, Ohnuki M, Shinada K, Ueno M, Wright FA, Kawaguchi Y. Oral malodor and related factors in Japanese senior high school students. *J Sch Health* 2010; 80: 346-352.
- Perera I, Ekanayake L. Social gradient in dental caries among adolescents in Sri Lanka. *Caries Res* 2008; 42: 105-111.
- Mendes LGA, Biazevic MGH, Michel-Crosato E, Mendes MOA. Dental caries and associated factors among Brazilian adolescents: a longitudinal study. *Braz J Oral Sci* 2008; 7: 1614-1619.
- Colussi PR, Haas AN, Oppermann RV, Rösing CK. Factors associated with changes in self-reported dentifrice consumption in a Brazilian group from 1996 and 2009. *Braz Dent J* 2012; 23: 737-745.

22. Freddo SL, Aerts DR, Abegg C, Davoglio R, Vieira PC, Monteiro L. Oral hygiene habits and use of dental services among teenage students in a city in Southern Brazil. *Cad Saude Publica* 2008; 24:1991-2000.
23. Delanghe G, Ghyselen J, Feenstra L, van Steenberghe D. Experiences of a Belgian multidisciplinary breath odour clinic. *Acta Otorhinolaryngol Belg* 1997; 51: 43-48.
24. Montenegro MM, Flores MF, Colussi PR, Oppermann RV, Haas AN, Rösing CK. Factors associated with self-reported use of mouthwashes in southern Brazil in 1996 and 2009. *Int J Dent Hyg* 2014; 12: 103-107.
25. Zalewska A, Zantonski M, Jablonka-Strom A, Paradowska A, Kawala B, Litwin A. Halitosis – a common medical and social problem. A review on pathology, diagnosis and treatment. *Acta Gastroenterol Belg* 2012; 75: 300-309.
26. Broughton JR, TehMaipi J, Person M, Randall A, Thomson WM. Self-reported oral health and dental service-use of rangatahi within the rohe of Tainui. *N Z Dent J* 2012; 108: 90-94.