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Self-Perception of Halitosis Among Students of Wrocław Medical University

Odczucie halitozy wśród studentów Akademii Medycznej we Wrocławiu

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Abstract

Background. Halitosis (bad breath) may result from bacteria colonizing the oral cavity, systemic diseases, caries, calculus, infections of the oral cavity or throat, tonsillitis, as well as insufficient oral hygiene.

Objectives. The aim of this study was to determine the frequency of self-assessed halitosis among students of Wrocław Medical University and its correlation with oral hygiene habits and accompanying systemic diseases.

Material and Methods. The questionnaire-based survey included 400 students (287 women and 113 men) of Wrocław Medical University. Statistic analysis was done using the χ^2 test.

Results. Among those questioned, 24% suffered from halitosis, 77% of whom experienced it every morning or more frequently. Sixty percent of the students suffering from halitosis also suffered from xerostomia, while among the rest of the students this was a problem in less than 27%. Fourteen percent learned of their own bad breath from a person of the opposite sex, while a dentist informed 3.5% of those questioned. It is significant that 96% (of dentistry students: 100%) smelled bad breath in others. It was not significant whether a person brushed their teeth once, twice, or three or more times a day ($p = 0.08$). Supplementary oral hygiene products such as mouthwash and dental floss were used more often by the dentistry students (83%) than by those of the other faculties (60%). Chewing gum and breath fresheners were used more often (90%) than such additional agents as mouthwash and floss (70%). Using additional agents (mouthwash and dental floss) decreased the frequency of subjective halitosis ($p = 0.00016$).

Conclusions. Using additional agents for oral hygiene rather than more frequent brushing decreases the self-assessed halitosis level. People prefer using chewing gum or breath fresheners (90%) to dental floss or mouthwash (70%). A large portion of those questioned suffered from both halitosis and xerostomia. Almost all of those questioned (96%) smelled bad breath from other people (*Adv Clin Exp Med 2007, 16, 4, 543–548*).

Key words: halitosis, oral hygiene, students.

Streszczenie

Wprowadzenie. Halitosis, czyli nieprzyjemny zapach z jamy ustnej, może wynikać z działania niektórych bakterii kolonizujących jamę ustną lub może być objawem chorób ogólnoustrojowych. Początkiem może być proces próchnicowy, obecność kamienia nazębnego, zakażenie jamy ustnej, gardła i migdałków, lecz przede wszystkim niewystarczająca higiena jamy ustnej.

Cel pracy. Ocena częstości występowania halitozy wśród studentów Akademii Medycznej we Wrocławiu oraz związku jej występowania z poziomem higieny jamy ustnej i współwystępującymi chorobami ogólnoustrojowymi.

Materiał i metody. Badaniem ankietowym objęto 400 studentów Akademii Medycznej we Wrocławiu. Wśród zbadanych było 287 kobiet i 113 mężczyzn. Analizę statystyczną wykonano za pomocą testu χ^2 .

Wyniki. U 24% badanych stwierdzono halitozę, w tym u 77% występuje codziennie rano bądź również w ciągu dnia. Wśród osób podających w ankiecie występowanie nieprzyjemnego zapachu z jamy ustnej prawie 60% podawało również częste występowanie suchości w jamie ustnej, podczas gdy u pozostałych badanych odsetek ten wynosi niespełna 27%. O własnym nieświeżym oddechu dowiedziało się od płci przeciwnej 14% ankietowanych, od stomatologa natomiast zaledwie 3,5%. Istotne jest, że 96% ankietowanych czuje przykrą woń z ust innych (przy czym wszyscy studenci stomatologii podają odczuwanie nieświeżego oddechu u innych). Nie stwierdzono istotnych różnic w występowaniu halitozy u osób czyszczących zęby 1–2 razy dziennie, a osób oczyszczających 3 razy dziennie i częściej ($p = 0,08$). Dodatkowych środków higieny jamy ustnej w postaci nici dentystycznych i płukanek najczęściej używają studenci stomatologii (83%), na pozostałych kierunkach studiów odsetek ten wynosi około 60%. Niemalże wszyscy natomiast (90%) używają miętowych gum do żucia i odświeżaczy do ust. Stwierdzono,

że stosowanie dodatkowych środków higieny jamy ustnej w przeciwieństwie do częstszego oczyszczania zębów szczoteczką zmniejsza częstość występowania halitozy ($p = 0,00016$).

Wnioski. Stosowanie dodatkowych środków higieny jamy ustnej, w przeciwieństwie do częstszego oczyszczania zębów szczoteczką, zmniejsza częstość występowania halitozy. Większy jest odsetek osób używających gum do żucia i odświeżaczy do ust (90%) niż osób używających nici dentystycznych i płynów do płukania jamy ustnej (70%). Duży jest odsetek osób, u których występowanie halitozy wiąże się również z występowaniem suchości w jamie ustnej. Prawie wszyscy ankietowani (96%) spotykają się z nieprzyjemnym zapachem z ust u innych osób (*Adv Clin Exp Med* 2007, 16, 4, 543–548).

Słowa kluczowe: halitoza, higiena jamy ustnej, studenci.

Halitosis is a common problem, occurring in about one fourth of the population. Bad breath may be a result of a specific spectrum of bacteria, lack of or poor hygiene, or by some somatic diseases. The pathogens are usually Gram-negative anaerobic microflora that live in places inaccessible to oxygen [1]. The most common bacteria responsible for bad breath are *Porphyromonas gingivalis*, *Prevotella intermedia*, *Fusobacterium nucleatum*, *Treponema denticola*, and *Tannerella forsythensis* [2, 3].

Some authors claim that halitosis is synonymous to *fetor ex ore* [2,4]. Others distinguish the two, stating that *fetor ex ore* is caused by local factors, such as periodontal diseases, caries, lack of or poor oral hygiene, laryngological diseases, or the use of drugs, while halitosis is a condition of exhaling fetid substances coming from deeper parts of the human body as a result of an internal disease, e.g. bronchitis, gastric or kidney diseases. It can also be part of a neoplastic process [5, 6].

Halitosis may be divided into three groups: 1) real halitosis, which is bad, unacceptable, intense breath, 2) pseudohalitosis, which is bad breath not smelled by others but by the person claiming to suffer from bad breath, and 3) haliphobia, in which after curing halitosis, the patient still thinks he suffers from it. Real halitosis may also be divided into two groups: physiological halitosis, caused by debris and putrefaction, and pathological halitosis, which originates in the oral cavity or from deeper regions of the body as a result of some somatic disease [7].

Although halitosis is said to occur in approximately one fourth of the population, its true prevalence is not really known and may be from 15 to 50% of people [1, 4, 8]. As it is such a common problem, halitosis has a great influence on the psychological aspects of life, especially for those who suffer from it. Bad breath is the third most frequent reason for visiting the dentist, after caries and periodontal disease [2]. Those who suffer from bad breath also seek help from general practitioners and gastroenterologists. People often try to cover their bad breath by brushing their teeth more frequently or using some additional agents such as

mouthwash (especially those with 0.2% aqueous chlorhexidine gluconate) or dental floss. Only by reducing oral flora are we able to decrease the level of bad breath [6, 8].

The aim of this study was to determine the frequency of halitosis among students of Wrocław Medical University and its correlation with some oral hygiene habits, i.e. the frequency of brushing teeth, the use of additional oral hygiene products, bad habits such as drinking sweet fizzy drinks, cigarette smoking, and accompanying systemic diseases. It concerned how often people smelled bad breath from other people's mouths and if they were aware of their own halitosis.

Material and Methods

The anonymous questionnaire-based survey included 400 students, 100 from each faculty, i.e. medicine, dentistry, pharmacy, and public health. There were 287 women and 113 men. All of the responders were between 19 and 28 years of age. The questionnaire contained 16 questions about halitosis, oral hygiene habits (the frequency of brushing teeth and using additional agents), somatic diseases, and bad habits, such as drinking sweetened drinks and smoking cigarettes (Table 1). The questionnaire was developed by reviewing the literature on the subject. The study was conducted in the winter (January to February) of 2006. The results were collated for each faculty separately and added together so that differences among the students of each faculty could be easily noted. Statistical analysis was done using the χ^2 test.

Results

Twenty-four percent of the responders reported they suffered from halitosis (Fig. 1). Statistically, men suffered from it more often than women (29 vs. 19%, respectively). Of the group with halitosis, 77% experienced their own bad breath every morning or more frequently. People usually learned about their own bad breath from

Table 1. Questionnaire on self-perception of halitosis for students of the Medical University**Tabela 1.** Ankieta dotycząca halitozy u studentów Akademii Medycznej

1. Sex	<input type="checkbox"/> male	<input type="checkbox"/> female	Age
2. Faculty:	<input type="checkbox"/> Medical		
	<input type="checkbox"/> Dental		
	<input type="checkbox"/> Pharmacy		
	<input type="checkbox"/> Public Health		
3. Do you smell bad breath from yourself?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
If yes, how often?			
If yes, at what time of the day?			
4. Did anyone tell you that they smelled bad breath from you?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
If yes, who:	<input type="checkbox"/> someone of the opposite sex		
	<input type="checkbox"/> a dentist		
5. Do you smell bad breath from others?	<input type="checkbox"/> yes	<input type="checkbox"/> no	
6. How often do you brush your teeth?			
7. How often do you visit your dentist?			
8. Do you use dental floss or interdental brushes?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
9. Do you use mouthwash?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
10. Do you use dental fresheners in spray form?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
11. Do you use chewing gum or mint candies?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
12. Do you use other oral hygiene products?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
13. Do you suffer from or cure any somatic disease?			
a) a periodontal disease	<input type="checkbox"/> Yes	– what kind?	<input type="checkbox"/> No
b) disease of the digestive system	<input type="checkbox"/> Yes	– what kind?	<input type="checkbox"/> No
c) disease of the respiratory system	<input type="checkbox"/> Yes	– what kind?	<input type="checkbox"/> No
d) disease of the vascular system	<input type="checkbox"/> Yes	– what kind?	<input type="checkbox"/> No
e) other disease?	<input type="checkbox"/> Yes	– what kind?	<input type="checkbox"/> No
14. Do you suffer from xerostomia (oral dryness)?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
If yes – how often?			
15. How often do you drink sweetened fizzy drinks?	<input type="checkbox"/> never	<input type="checkbox"/> 1–3 cans per week	<input type="checkbox"/> 3–5 cans per week
			<input type="checkbox"/> more
16. Do you smoke cigarettes?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	

a member of the opposite sex (14%), while a dentist informed them of an unpleasant scent in only 3.5% of those questioned. It is significant that 96% of the students (of dentistry students: 100%) smelled bad breath from others. Sixty percent of the students suffering from halitosis also suffered from xerostomia, while among the rest of students this was a problem in less than 27% (Fig. 2).

Some oral hygiene habits influenced the level of halitosis. It was not statistically significant whether a person brushed their teeth once, twice, or three or more times a day ($p = 0.08$). It was found, though, that using additional agents decreased the frequency of subjective halitosis significantly ($p = 0.00016$). Supplementary oral hygiene products such as mouthwash and dental floss were used much more often by the students of dentistry (83%) than by those of the other fac-

ulties (average: 60%, with the lowest level at the faculty of medicine) (Fig. 3). Chewing gum and breath fresheners were used by almost all of those questioned (90%). The students preferred fresheners to other additional agents such as mouthwash and dental floss (70%).

There was no influence of drinking sweetened fizzy canned drinks on halitosis. About 50% of those questioned drank such drinks at least once a week (49% in the group with halitosis and 54.5% in the group without). Only 2 people of the 35 smokers questioned (5.7%) claimed they did not smell their own bad breath at all.

Only 6 of the 400 students stated that they suffered from somatic diseases, these being chronic maxillary sinusitis, asthma, reflux disease, diabetes, hypertension, and Gilbert's syndrome.

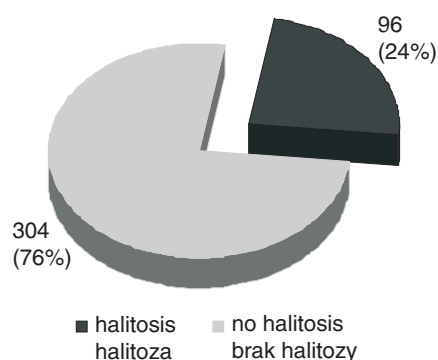


Fig. 1. Presence of halitosis

Ryc. 1. Obecność halitozy

Among them, only the person with Gilbert's syndrome claimed she did not suffer from halitosis.

Discussion

This study on students of Wrocław Medical University found a level of people suffering from halitosis (24%) close to the reported average of approximately one fourth of the population. Among these students, men suffered from halitosis more frequently than women. Almas et al. investigated the self-perception of halitosis among 481 students of a dental faculty and obtained similar results. In the present study the level of bad breath in men was 29% and in women 19%, while in Almas' study these percentages were 44 for male and 32 for female dental students. Both the age range (19–24 in Almas' study, 19–28 in the present one) and the education level (medical students) in the two investigated groups were similar. The differences between the students from Poland and those from Saudi Arabia may be a result of cultural and regional differences or may be influenced by the differences in climate and ambient temperature, considering that the present study was conducted during the winter [9].

The students of the present study complained on their own bad breath especially in the morning, which supports the thesis that halitosis appears mostly just after sleep, when the flow of saliva is reduced [8, 10].

Views on the self-perception of bad breath are diverse. Some researchers claim we are good judges of the degree of our own bad breath [8], while others say we are unable to smell it [10]. The students of the present study learned about their own bad breath from people of the opposite sex (14%), while a dentist informed them of it in only 3.5% of those questioned (in other studies this percentage was even lower, e.g. less than 1.5% of those questioned being informed by a dentist [9]),

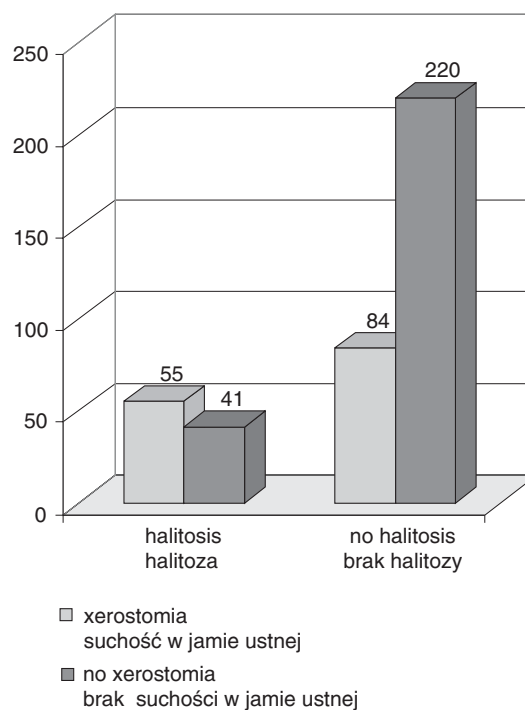


Fig. 2. Halitosis and xerostomia

Ryc. 2. Halitoza a xerostomia

while it should be a dentist who informs us of such problems [10]. It is significant that 96% of the students had noted bad breath in other people at least once (among dentistry students: 100%), which shows how good we are in judging other people's bad breath and that it may have an effect on our relations with other people and social life [2].

Some oral hygiene habits influenced the level of halitosis. Dental plaque and bacteria colonizing the oral cavity are named as reasons for bad breath [11, 12], and they are the reasons in 85% of those suffering from halitosis [10]. Other causes of bad breath are dry mouth, systemic disorders, upper and lower respiratory tract infection, medications, and gastric content [10, 11]. Proper oral hygiene may decrease or cure halitosis [1, 8, 12]. Cleaning the tongue with special brushes also decreases the level of the coating and of bacteria on its dorsum, thus reducing bad breath [13–15]. The present study found that it was not statistically significant whether a person brushed their teeth once, twice, or three or more times a day ($p = 0.08$). It was shown, though, that using additional agents decreases the frequency of halitosis significantly ($p = 0.00016$). Brushing teeth eliminates bacteria only from some easily accessible parts of the oral cavity, while it is important to clean all surfaces that may provide a good environment for the multiplication of bacteria [13–15]. Some people (in one study, 26% of females and 12% of males [9]) use additional agents as a way of self-treatment of bad breath. The

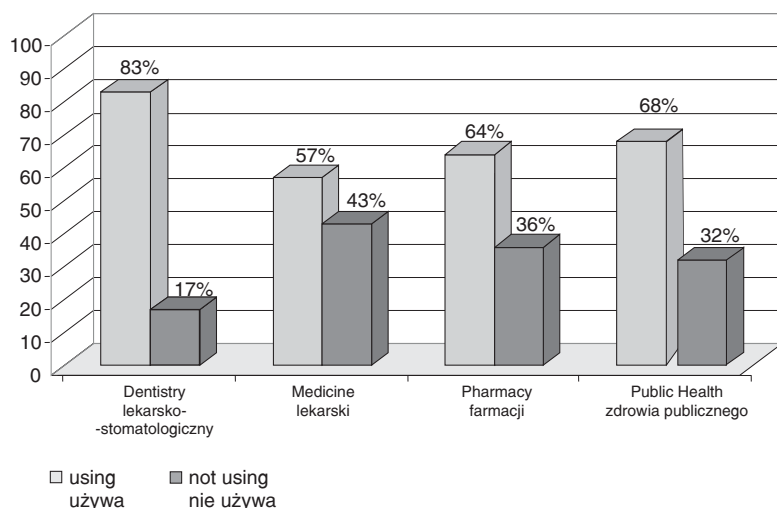


Fig. 3. The use of additional agents in the different academic faculties

Ryc. 3. Użycie dodatkowych środków higieny przez studentów z różnych wydziałów

present study found that such agents as mouthwash and dental floss were used much more often by dentistry students (83%) than by the students of the other faculties (average: 60%, with the lowest level in the medical faculty). Additional products were used by the students more frequently than the average for the general population [9]. Chewing gum and breath fresheners were used almost by all of the students questioned (90%). These reduce microorganisms in the mouth and help to eliminate or reduce bad breath quickly [8]. The best and most-known substances for curing or reducing halitosis seem to be seed oils and chlorhexidine, which are usually ingredients of mouthwashes, tooth pastes, and the like [15]. These medications are effective only when the odor originates in the oral cavity and is not connected to any somatic disease [16]. Dental and otolaryngological diseases are thought to be responsible for 87% of the cases of halitosis. The rest are caused by somatic diseases, including gastroenterological, pulmonological, and nephrological diseases. In 5% of cases the factor causing bad breath is unknown [17]. This may also support the thesis that halitosis can often be reduced or even cured by using additional oral hygiene agents, as the present study showed.

There was no influence of drinking sweet fizzy canned drinks on the occurrence of halitosis noted in this study, although there are some reports on it in the literature [3]. About 50% of the questioned students drank such drinks at least once a week (49% in the group with halitosis and 54.5% in the group without).

To measure the actual level of halitosis, a halitometer is used. This measures the level of volatile sulfur compounds in expired air and helps to verify the symptoms of oral malodor [17]. Even though such a professional tester is available, self-perception of bad breath remains the main diagnostic indicator of halitosis [8]. This may be a result of the low number of halitometers in dental clinics and practices.

There are some reports on the influence of tongue piercing on the occurrence of halitosis. Bad breath is found to occur together with tooth fractures, glossitis, and abscesses, some of the complications of tongue piercing [18]. As piercing becomes more and more popular, it may become a serious problem in the future. Only two of the students in the present study wore metallic decorations in their mouths; one of them wrote in the questionnaire that she experienced her own unrelenting bad breath just after she had had her tongue pierced.

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References

- [1] Chitavii N, Mdzeluri T, Dzagnidze G, Chonishvii Kh, Kurashvii N: Unpleasant smell from mouth – halitosis. Georgian Med News 2006, 141, 26–29.
- [2] John M, Vandana KL: Detection and measurement of oral malodor in periodontitis patients. Indian J Dent Res 2006, 17, 2–6.
- [3] Lee PPC, Mak WY, Newsome P: The aetiology and treatment of oral halitosis: an update. Hong Kong Med J 2004 10, 414–418.

- [4] **van Nieuw Amerongen A, Veerman EC, Abraham-Inpijn L, van Steenberg TJ, van Winkelhoff AJ:** Halitosis (*fetor ex ore*). A review. *Ned Rijdschr Tandheelkd* 1994, 101, 10–14.
- [5] **Herold G:** Gastroenterologia – przykry zapach z ust. *Medycyna wewnętrzna, repetytorium dla studentów medycyny i lekarzy*. Wydawnictwo Lekarskie PZWL, Warszawa 2003, 448.
- [6] **Beers MH, Berkow R, Bogin RM, Fletcher AJ, Bondy PK, Dilts PV Jr, Drossman DA, Faling LJ, Frenkel EP, Gabbard GO, Hoeckelman RA, Mandell GL, Plum F, Rossi GV, Tancer PH:** Badanie jamy ustnej. W: *The Merck Manual. Podręcznik diagnostyki i terapii*. Wydawnictwo Urban & Partner, Wrocław 2001, 881.
- [7] **Kepa-Prokopienko J, Iwanicka-Grzegorek E, Michalik E:** Halitosis – etiology, classification and epidemiology on the basis of current literature. *Nowa Stom* 2005, 31, 41–44.
- [8] **Scully C, Porter S, Greenman J:** What to do about halitosis. *BMJ* 1994, 308, 217–218.
- [9] **Almas K, Al-Hawish A, Al-Khamis W:** Oral hygiene practices, smoking habits, and self-perceived oral malodor among dental students. *J Contemp Dent Pract* 2003, 4, 77–90.
- [10] **Rosenberg M:** Clinical assessment of bad breath: Current Concepts. *JADA* 1996, 127, 472–482.
- [11] **Feller L, Blignaut E:** Halitosis: a review. *SADJ* 2005, 60, 17–19.
- [12] **Bruzewicz-Miklaszewska B, Urbanowicz I, Owczarek H:** Microbiological aspects of halitosis. *Dent Med Probl* 2003, 40, 117–120.
- [13] **Kaczmarek U, Przywitowska I, Ziętek M, Sultan E, Malicka B, Pregiel B:** Clinical efficiency of new manual toothbrush on removal of dental plaque and tongue coating. *Dent Med Probl* 2006, 43, 548–555.
- [14] **Christensen GJ:** Why clean your tongue? *JADA* 1998, 129, 1605–1607.
- [15] **Kowalczyk A, Tuberoso C, Bruzewicz-Miklaszewska B, Cisowski W:** Possible applications of some commercial seed oils in the treatment of stomatitis protetica and halitosis. *Herba Polonica* 2005, 51, 44–49.
- [16] **Quirynen M:** Management of oral malodour. *J Clin Periodontol* 2003, 30, 17–18.
- [17] **Kozłowski Z, Bruzewicz-Miklaszewska B, Konopka T, Drulis-Kawa Z, Lewczyk E:** Using a halitometer to verify the symptoms of halitosis. *Adv Clin Exp Med* 2007, 16, 411–416.
- [18] **Shinohara HK, Horikawa FK, Ruiz MM, Shinohara MT:** Tongue piercing: case report of a local complication. *J Contemp Dent Pract* 2007, 8, 83–89.

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