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SWISS DENTAL JOURNAL 124:
 133–138 (2014)
 Accepted for publication:
 27 March 2013

Knowledge of Halitosis Among Dentists and Dental Hygienists

A Comparison Between Switzerland,
 Germany, and France

KEYWORDS

halitosis,
 bad breath,
 tongue scraper

SUMMARY

Bad breath is a widespread condition that has been increasingly discussed among professionals and in the mass media in the last few years. In nine of ten cases, halitosis originates intraorally; hence it has become an important topic of study in the education and training of dentists and dental hygienists. However, the de facto knowledge of professionals has never been examined until today.

750 dentists and dental hygienists from Switzerland, Germany, and France were personally interviewed. Their knowledge of halitosis was assessed using a specifically designed questionnaire. In general, considerable differences were ascertained between the German-speaking countries and France, dentists and dental hygienists, and women and men. 27.5% of the French participants believed that the underlying cause of halitosis has a non-oral nature, whereas only 8% of the Swiss and German participants believed so ($p < 0.001$). In contrast to dental hygienists, dentists more often considered gastrointestinal

factors as a cause of halitosis ($p < 0.001$). Dental hygienists from Switzerland and Germany more frequently reported the use of tongue scrapers as a therapeutic method (97% and 97.3%) than did dentists of the same countries (87.3% and 89.3%). Among the French participants, only 52% mentioned the use of tongue scrapers to treat halitosis. 2.7% of French dental professionals had participated in a continuing education course about halitosis, which is much lower than the rate of attendance in Switzerland and Germany (46%). Additionally, interdisciplinary discrepancies were observed, as 65.3% of the dental hygienists frequented advanced training courses, which was twice as much as dentists. Therefore, there are clear differences between dentists in France and their colleagues from the German-speaking countries, but also between dental hygienists and dentists. Dental hygienists from Switzerland and Germany appear to be far ahead in terms of halitosis knowledge.

Introduction

Although the causes and treatment of halitosis were described in the literature early on (O'BRIEN ET AL. 1947), society and dentists have only become more broadly aware of them in the past decade (YANAGISAWA ET AL. 2006).

The word halitosis (Latin "halitus": breath, haze) can be defined as malodorous breath. In 80%–90% of persons affected by it, the cause is intraoral and is related to the bacterial decomposition of organic matter into primarily volatile sulfur compounds (TONZETICH 1978, DELANGHE ET AL. 1997, 1999, ROSENBERG & LEIB 1997, LOESCHE & KAZOR 2002). Because about 60% of all oral microorganisms are located on the surface of the tongue (DE BOEVER & LOESCHE 1995, YAEGAKI & SANADA 1992, DELANGHE ET AL. 1999), the tongue should be the focus of treatment in these cases (QUIRYNEN ET AL. 2002, QUIRYNEN ET AL. 2004, FILIPPI & MEYER 2004, FILIPPI & MÜLLER 2006). A clinical examination by a dentist is nevertheless indispensable in order to identify or exclude other possible intraoral causes, such as gingivitis, periodontitis, caries or insufficient/faulty prostheses. Extraoral causes of halitosis are chiefly found in the otorhinolaryngeal area, and are rarely of gastroenterological origin (DELANGHE ET AL. 1999, LAMBRECHT 2011, KISLIG ET AL. 2013).

The organoleptic measurement of halitosis is still considered the gold standard (NALÇACI & SÖNMEZ 2008), although this may be supplemented by the use of special devices. These can be especially helpful with patients suffering from psychologically-based halitosis (pseudohalitosis and halitophobia).

Over half of the references for halitosis listed in PubMed were published in the last ten years. Thus, the question arises of whether this development is reflected in the state of knowledge among those potentially treating the condition. To date, the present authors are not aware of any publications in the dental literature which address this question. Hence, the purpose of this study was to collect data on the state of knowledge on halitosis among dentists and dental hygienists in Switzerland and two of its neighboring countries, Germany and France.

Materials and Methods

Using a 10-item questionnaire (Tab. I), 750 working dentists and dental hygienists from Switzerland, Germany, and France attending three dental and two dental hygiene conferences between November 2007 and April 2009 were personally interviewed. The conferences were all annual meetings of professional societies for dentistry and dental hygiene (SSO, ADF, DGZMK, DGDH, DDHV, Swiss Dental Hygienists). In France, only dentists were interviewed, since the profession of dental hygienist is not recognized. The questionnaire not only contained questions that the respondent could answer freely, but also some multiple-choice questions. Three groups of dentists and two of dental hygienists were formed, with 150 individuals

Tab. I Questionnaire

<input type="checkbox"/> Dentist	<input type="checkbox"/> Dental hygienist
In which country do you work?	
Gender?	<input type="checkbox"/> Female <input type="checkbox"/> Male
Where do you work?	<input type="checkbox"/> City <input type="checkbox"/> Country
How long have you been working in your profession?	
What percentage of Europeans have socially incompatible bad breath day and night?	
In your opinion, what is the most common cause of halitosis?	
In your opinion, which is the most suitable health-care specialist for treating halitosis?	<input type="checkbox"/> Psychologist <input type="checkbox"/> General Physician <input type="checkbox"/> Internist <input type="checkbox"/> Ear-nose-throat doctor <input type="checkbox"/> Dentist
In your practice, do you have the means to objectively diagnose halitosis?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, which?
Do you employ tongue scrapers when performing treatment?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, which?
Have you ever participated in a continuing education course on halitosis?	<input type="checkbox"/> Yes <input type="checkbox"/> No

per group (Tab. II). This number resulted from how many people it was possible to interview at one annual conference.

The answers were descriptively evaluated using cross-tabulation. The p-values were calculated using Pearson's Chi-square test. For all tests, the significance level was set at 0.05 (two-sided). All statistical calculations were performed with the statistical package R (The R Foundation for Statistical Computing, Version 2.9.2).

Results

The respondents

Table 2 shows the distribution of women and men in each profession for each country. Of those interviewed in Switzerland, 7 people (2.33%) reported having 39 to 59 years of professional work experience, 156 individuals (52%) reported 19–38 years, and 137 (45.7%) indicated a few months up to 18 years.

In Germany, these numbers were 6 (2%), 156 (52%), and

Tab. II Overview of respondents

	Switzerland		Germany		France		Σ
	Women	Men	Women	Men	Women	Men	
Dentists	39	111	41	109	59	91	450
Dental hygienists	147	3	150	0	p.n.r.	p.n.r.	300

(p.n.r. = profession not recognized)

138 (46%), resp., and in France 4 (2.6%), 88 (58.7%), and 58 (38.7%), resp.

Of those interviewed in Switzerland, 36.7% reported working in a rural area. In Germany and France, 26.3% and 20.7%, resp., reported doing so. Hence, most of the respondents worked in towns or cities.

Halitosis prevalence

In answering the question “What percentage of Europeans suffers from chronic bad breath?”, 26.4% of the Swiss respondents estimated 0 to 10%. In Germany and France, 28.4% and 25.3%, resp., did so. Thus, this estimation did not differ statistically significantly between countries ($p=0.841$).

22% ($n=28$) of the dental hygienists from Switzerland and 19.4% ($n=24$) of the dental hygienists from Germany estimated that 0 to 10% of Europeans suffered from chronic halitosis. Compared to the dentists interviewed, there were no significant differences between professions ($p=0.335$) (Fig. 1).

The number of respondents from the respective groups who estimated >10% of Europeans had chronic halitosis was too small to be able to detect statistical differences.

Causes

The most frequently named causes of halitosis were intraoral, e.g., poor oral hygiene, gingivitis, periodontitis marginalis, cal-

culus, and tongue coating (Switzerland 92%, $n=275$, Germany 92.3%, $n=276$, and France 72.5%, $n=103$). A statistically significant difference was found between the two German-speaking countries and France ($p<0.001$). Gastroenterological problems were much more frequently cited by the French (17.6%) than by the Swiss and the Germans (4.3% in both cases) as the cause of halitosis ($p<0.001$). Other causes, such as diet (2.1%), smoking (2.1%), and gastroesophageal reflux (3.5%) were also much more frequently mentioned as the main reason for bad breath by the French group than by the Swiss or German groups ($p<0.001$).

Comparing disciplines, 97.3% of the dental hygienists (Switzerland and Germany) and 86.7% and 87.3% of the Swiss and German dentists, resp., answered that the causes were intraoral ($p<0.001$). However, compared to dental hygienists, dentists answered with above-average frequency that the cause of halitosis was gastroenterological (8% of the dentists vs 0.7% of the dental hygienists) ($p<0.001$) (Fig. 2).

“In your opinion, which specialist is best qualified to treat halitosis patients?”

A clear majority of the Swiss and Germans (95.3%; $n=570$) answered that a dentist should be consulted in cases of halitosis. Only 78.9% ($n=116$) ($p<0.001$) of the French respondents gave this answer. In both Germany and Switzerland,

Fig. 1 Estimation of halitosis prevalence between 0% and 10% ($p=0.335$).

SD = Swiss dentists
SDH = Swiss dental hygienists
GD = German dentists
GDH = German dental hygienists
FD = French dentists

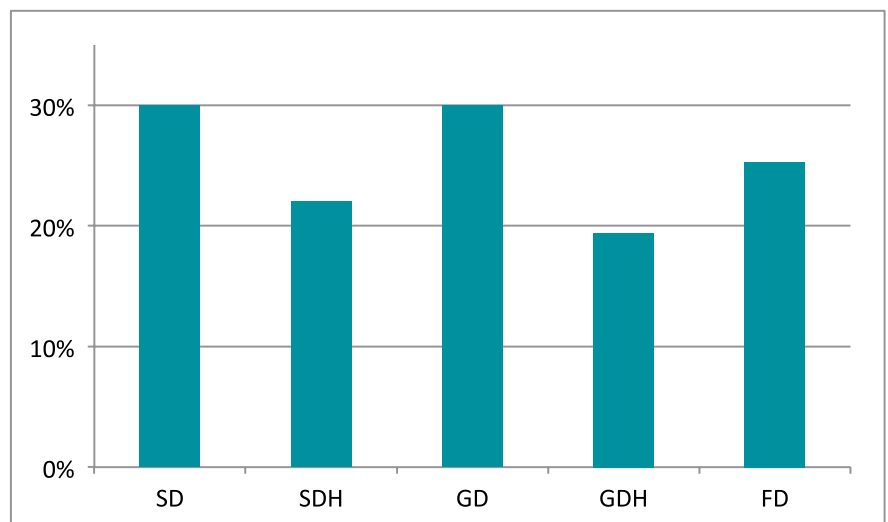
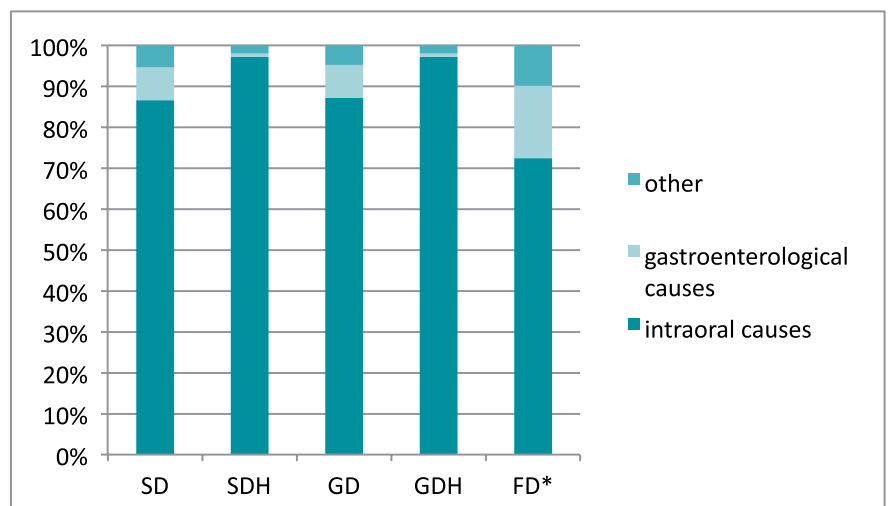


Fig. 2 Distribution of halitosis causes in percent as reported by dentists and dental hygienists from Switzerland, Germany, and France (free choice of answers) ($*p<0.001$).

SD = Swiss dentists
SDH = Swiss dental hygienists
GD = German dentists
GDH = German dental hygienists
FD = French dentists



3.7% (n=11) and in France 17.7% (n=26) replied that a general practitioner (physician) or an internist would be best ($p<0.001$). Otorhinolaryngologists followed with 1% (n=3) each in Switzerland and Germany and 3.4% (n=5) in France ($p<0.001$). None of those interviewed answered that a psychologist should be seen.

97.3% (n=145) of the dental hygienists from Switzerland and Germany replied that halitosis patients would receive the most appropriate treatment from a dentist. 93.3% (n=140) of the dentists in both countries also thought so ($p<0.001$).

Objective diagnosability in private practice

13% (n=39) of those interviewed in Switzerland, 14% (n=42) of those in Germany and 4% (n=6) of those in France indicated that it is possible to objectively diagnose halitosis. The diagnostic methods most frequently mentioned in Switzerland (n=27) and Germany (n=28) were those based on olfaction. In France, these methods were not mentioned at all. Intraoral findings were considered the method of choice by three respondents in France, four in Switzerland, and six in Germany ($p<0.001$). The halimeter was mentioned by three of those interviewed in Switzerland, five in Germany and one in France. Taking a smear and performing anamnesis were also considered objective methods in Switzerland and Germany. Saliva tests (n=2) were only mentioned in France ($p<0.001$). Because the groups were too small, a differential evaluation between the professions was not conducted.

Use of tongue scrapers

In both Switzerland and Germany, a high percentage of those interviewed reported using a tongue scraper in the treatment of halitosis (92.3% and 93.3%, resp.). In France, only 52% did so ($p<0.001$). 97.3% of the dental hygienists from Switzerland and Germany replied that they employed a tongue scraper in treat-

ing halitosis. Among the dentists, this value was 87.3% in Switzerland and 89.3% in Germany. It is notable that 12.7% (n=19) of Swiss dentists reported more frequently not using a tongue scraper to treat halitosis compared to Swiss dental hygienists ($p<0.001$) (Fig. 3).

Participation in continuing education courses on halitosis

Close to half of those interviewed in Switzerland and Germany (47% and 45.3%, resp.) indicated having participated in a continuing education course on halitosis. A dramatically lower percentage of respondents in France had done so (2.7%, $p<0.001$). Among the dental hygienists from Switzerland and Germany, 65.3% from both countries had attended halitosis courses, while of the dentists from these countries, only 28.7% (Switzerland) and 25.3% (Germany) had done so ($p<0.001$) (Fig. 4).

Discussion

Epidemiological studies show that about every fourth adult in Switzerland, Poland, and France suffers from halitosis at certain times of day. Approximately 6 of 100 people additionally suffer from socially incompatible bad breath (FILIPPI 2009). Earlier studies report halitosis prevalences of 30% to 60% (MENNINGAUD ET AL. 1999, YAEGAKI & COIL 2000). A more recent study demonstrates that for one-third of the Bern (Switzerland) population, halitosis is an oral health problem (BORNSTEIN ET AL. 2009). This appears to be relatively well-known, and is reflected in the results of the present study, in which over half of all those interviewed estimated an 11% to 50% prevalence of socially incompatible halitosis. However, prevalence data must be viewed with caution, since they chiefly originate from self-reported surveys.

Halitosis is caused by multiple factors. A distinction is made between genuine and psychologically-based halitosis (YAEGAKI &



Fig. 3 Percentage of interviewed dentists and dental hygienists using tongue scrapers in treating halitosis (* $p<0.001$).

SD = Swiss dentists
SDH = Swiss dental hygienists
GD = German dentists
GDH = German dental hygienists
FD = French dentists

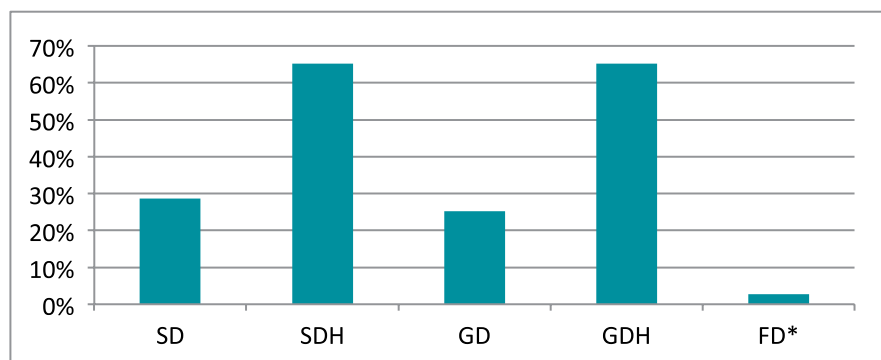


Fig. 4 Percentage of interviewed dentists and dental hygienists participating in continuing education on halitosis (* $p<0.001$).

SD = Swiss dentists
SDH = Swiss dental hygienists
GD = German dentists
GDH = German dental hygienists
FD = French dentists

COIL 2000). Genuine halitosis is subdivided into physiological and pathological halitosis. Physiological halitosis is temporary and is caused by the body's normal metabolic functions, such as hunger or reduced salivation during sleep. Pathological halitosis can have intra- and extraoral causes. In 80%–90% of the cases, the cause of halitosis can be found intraorally (ROSENBERG 1994, MIYAZAKI ET AL. 1995, LOESCHE & DE BOEVER 1995, DELANGHE ET AL. 1997, 1999, TANGERMAN & WINKEL 2007), in ca. 5% of the cases the cause is extraoral, and in 5%–25% of the cases, halitosis is psychologically based (QUIRYNEN ET AL. 2009). In only about 1% of all cases is halitosis caused by gastroenterological factors (DELANGHE ET AL. 1999, LAMBRECHT 2011, KISLIG ET AL. 2013).

The results of this survey show that in Germany and Switzerland, knowledge of halitosis among both professional groups is up to date. This is not the case in France: almost 20% of those interviewed see gastroenterological problems as the most frequent cause of halitosis. In addition, other factors such as stress or medications were mentioned as being most commonly responsible for bad breath. It is thus not surprising that the opinions on causes correlate with the first choice of professional help: nearly all of those interviewed in Switzerland and Germany considered dentists as being the most suitable health-care specialist for treating halitosis, but in France, a remarkable number of respondents chose physicians or internists.

To diagnose halitosis, taking the medical history and intraoral findings as well as analyzing exhaled breath are essential. Organoleptic measurement is considered the gold standard (NALÇACI & SÖNMEZ 2008, NACHNANI 2011). It is a simple method which delivers reproducible results when performed by experienced examiners. Various scales exist which the operator can use to assign a score to halitosis (YAEGAKI & COIL 2000). In addition to organoleptic measurement, instruments such as gas chromatographs or sulfide monitors can be helpful. Thus, the present survey also evaluated the availability of such equipment, finding that only a very small proportion of those interviewed had access to an instrument for measuring halitosis (3 persons from Switzerland, 5 from Germany and 1 from France had use of a halimeter). Only 55 individuals – half from Switzerland and half from Germany – considered organoleptic measurement to be an objective means of measuring bad breath. Overall, it is apparent that professional halitosis measurement instruments have not yet become established in general dental practice. It is suggested that acquisition costs play a role.

As mentioned above, the cause of halitosis is usually intraoral (TONZETICH 1978, DELANGHE ET AL. 1997, ROSENBERG & LEIB 1997, LOESCHE & KAZOR 2002, SEEMANN ET AL. 2006, FILIPPI 2011, ZÜRCHER & FILIPPI 2012), resulting from the bacterial degradation of organic material into volatile sulfur compounds. Approximately 60% of all oral microorganisms are located on the surface of the

tongue (YAEGAKI & SANADA 1992, DE BOEVER & LOESCHE 1995, BOSY 1997). Hence, any therapeutic approach to oral hygiene must include tongue cleaning (SEEMANN ET AL. 2001, QUIRYNEN ET AL. 2009, VAN DER SLEEN ET AL. 2010), and in fact, nine out of ten respondents from Switzerland and Germany do employ tongue scrapers as an integral part of their treatment concept. In contrast, only half of the French respondents reported employing tongue cleaning, which is in keeping with the lower percentage (72.5%) of mentioning intraoral factors as the main cause of halitosis.

In summary, the state of knowledge on halitosis differs markedly between countries (Switzerland and Germany vs France) and between dental hygienists and dentists. Thus, it is justifiable to maintain or promote the topic of halitosis as part of the training and continuing education of dentists and dental hygienists.

Résumé

La mauvaise haleine est un problème très répandu, qui a été spécialement thématiqué ces dernières années par les chirurgiens dentistes et les médias. Dans 9 cas sur 10, la cause de l'halitose est intraorale et c'est pourquoi il n'est pas surprenant que l'halitose soit thématisée dans la formation des dentistes et hygiénistes. Jusqu'à aujourd'hui, le savoir des spécialistes n'avait encore jamais été vérifié.

750 dentistes et hygiénistes de Suisse, d'Allemagne et de France ont été interrogés pour objectif de vérifier leur savoir sur l'halitose.

Cela a montré de claires différences entre les pays germanophones et la France, ainsi qu'entre les dentistes et hygiénistes, hommes et femmes. 27,5% des personnes interrogées de France sous-entendent que l'halitose est due à une cause extraorale, alors que seuls 8% le font en Suisse et en Allemagne ($p < 0.001$). Les dentistes ont plus souvent déclaré un problème gastroentérologique comme cause d'une halitose que les hygiénistes ($p < 0.001$). L'utilisation des gratte-langue dans la thérapie en Suisse et en Allemagne a clairement été plus souvent signalée par les hygiénistes (97% et 97,3%) que par les dentistes (87,3% et 89,3%). Chez les personnes consultées en France, elles n'étaient que 52% ($p < 0.001$) à le faire. La participation à un cours consacré à l'halitose en France était avec 2,7% bien plus petite qu'en Suisse et en Allemagne avec 46% ($p < 0.001$). Les hygiénistes ont déclaré deux fois plus avoir participé à un cours (65,3%) que les dentistes ($p < 0.001$).

Les résultats montrent clairement des différences entre les traitants de France et leurs collègues des pays germanophones, ainsi qu'entre dentistes et hygiénistes. Les hygiénistes de Suisse et d'Allemagne semblent être plus avancés au sujet de l'halitose que les dentistes.

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