

A retrospective analysis of patients suffering from halitosis over a 17-year period

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Abstract

Halitosis is a socially avoided topic with an increasing worldwide prevalence. This study aimed to investigate the correlation between the different forms of halitosis and factors such as: gender, smoking, stress, and oral hygiene. We analysed data from patients registered at the Center of Salivary Diagnostics, Hyposalivation and Halitosis at the University Center for Dental Medicine Basel over a 17-year period, using both subjective and objective approaches to determine the presence of halitosis. The data was statistically analysed using chi-squared and Wilcoxon rank-sum tests. Although halitosis is of multifactorial origin, an oral cause was found in 3 out of 4 patients. Men showed higher values of volatile sulfur compounds (VSC) ($p = 0.002$) indicative of halitosis than women, while women displayed better oral hygiene ($p < 0.001$), yet were twice as likely to suffer from halitophobia than males. Patients with higher tongue coating scores ($p < 0.001$) and periodontitis ($p < 0.001$) had higher levels of VSC, contributing to bad breath, whereas patients with symptoms such as stress ($p = 0.81$) or smoking ($p = 0.28$) did not reveal significantly altered measurements. This study sheds light on the complex and multifactorial nature of halitosis over a long period of time. It further underlines the importance of individualized treatment strategies, given halitosis' multifactorial nature, in order to contribute to the patients' treatment needs.

Introduction

Halitosis, a medical condition characterized by noticeably unpleasant breath odor, derives its name from the Latin word "halitus," meaning "breath". Understanding the factors contributing to and influencing halitosis is grounded in various retrospective studies conducted with diverse demographic cohorts (AYO-YUSUF et al. 2011; DE JONGH et al. 2014; SETIA et al. 2014). It is worth noting that patients often seek the expertise of medical practitioners to address this malodor issue. Paradoxically, patients' perception of the severity of their condition frequently diverges from reality (PORTER & SCULLY 2006). Thus, accurate diagnosis and identification of the underlying causes are imperative to devise effective individualized treatment plans for patients seeking resolution.

Halitosis arises from the activities of microorganisms naturally inhabiting the oral cavity, which break down substances such as proteins, food particles, debris, saliva, and blood. These microorganisms generate volatile sulfur compounds (VSCs), the culprits behind the unpleasant oral malodor (TONZETICH 1977). Halitosis can be categorized into several types, including genuine halitosis (pathologic/physiologic) and psychogenic halitosis (halitophobia/pseudo halitosis). Pathologic halitosis can be further divided into intraoral and extraoral forms. Intraoral causes originate within the oral cavity, with key contributors being tongue coating, gingivitis, and periodontitis. Extraoral halitosis emanates from areas like the respiratory system, gastrointestinal tract, ear, nose, and throat (ENT), with conditions such as sinusitis and tonsillitis often being prominent ENT-related causes (DELANGHE et al. 1999; SCULLY & FELIX 2005). Physiological halitosis, often known as "morning breath," is typically transient and linked to nocturnal hyposalivation, commonly experienced upon waking but not considered a distinct form of halitosis (PORTER & SCULLY 2006). Pathological halitosis, whether intraoral or extraoral, results from microbial degradation (BOLLEN & BEIKLER 2012). Psychogenic halitosis encompasses individuals who mistakenly believe they have bad breath without objective evidence, with halitophobia patients persistently deluded about their condition and those with pseudo-halitosis acknowledging the absence of malodor, attributing their symptoms to self-induction (SCULLY & GREENMAN 2012).

Patients seek halitosis consultations for various reasons, either self-recognizing their condition or in response to complaints from others. Some raise concerns during routine dental check-ups, leading to referrals for specialized halitosis consultations when the underlying cause remains unclear. These consultations involve comprehensive

assessments by a team of experts and the development of personalized treatment plans aimed at effectively addressing and alleviating halitosis.

This study represents a retrospective follow-up analysis of halitosis patients registered at the Center of Salivary Diagnostics, Hyposalivation, and Halitosis at the University Center for Dental Medicine Basel over a 17-year period (2003-2020). Among the 1,052 patients who underwent examinations during this period, 937 were diagnosed with one of the aforementioned forms of halitosis. Prior research has primarily focused on shorter time frames, as demonstrated by the findings of ZÜRCHER & FILIPPI (2012) and FILIPPI & MULLER (2006).

The aim of this investigation was to establish correlations between the various forms of halitosis and potential influencing factors, including gender, smoking, stress, and oral hygiene. Concurrently, the study aimed to highlight the enduring adverse psychological effects of this condition on patients' social interactions.

Materials and Methods

This retrospective study examined data from the Center of Salivary Diagnostics, Hyposalivation, and Halitosis at the University Center for Dental Medicine in Basel, spanning a 17-year period from February 2003 to September 2020. During this timeframe, 1,052 patients underwent examinations for halitosis, which were conducted by a team of seven trained dentists, each dentist handling consultations during specific time periods. Prior to the examination, patients were provided with a specialized medical questionnaire comprising 38 questions.

To objectively assess halitosis, the patient's breath was evaluated using three clinical mobile devices, specifically the Oral Chroma™, Halimeter® until 2018 and Halisens® afterwards. These objective measurements served to elucidate the origin of halitosis and differentiate between genuine and pseudo-halitosis. Simultaneously, they offered patients a quantitative perspective on their condition, enabling them to visualize its intensity through numerical and graphical representations.

Furthermore, a comprehensive clinical examination of the patient's oral cavity was conducted, encompassing an assessment of dental restorations, periodontal tissue, oral hygiene, oral mucosa, tongue, oropharynx, and salivary glands. The evaluation of oral hygiene was based on the presence of plaque or calculus on tooth surfaces, categorized as good, fair, or poor using the periodontal screening index (PSI). Tongue examination followed the Winkel tongue coating index (WTCl) procedure, dividing the posterior and anterior portions of the tongue into six sectors and assigning numerical grades (0, 1, 2) to assess coating thickness in each sector, with a maximum sum of 0 to 12 (BOLEPALLI et al. 2015; FILIPPI 2011). Consequently, individualized treatment plans were formulated for patients based on clinical diagnoses, distinguishing between intraoral and extraoral halitosis. Pseudo-halitosis was considered when no oral or extraoral findings were evident.

A subset of 10 questions from the halitosis questionnaire underwent further analysis, which also included patient self-perceptions of halitosis, past treatment recommendations from general medical practitioners and dentists, and observations made during initial halitosis consultations.

All patients attending the halitosis consultation sessions were included in the study, with the exception of fully edentulous patients, as this exclusion facilitated a more focused examination of halitosis in individuals with natural teeth. Including edentulous

patients could potentially introduce confounding factors related to halitosis, such as caries and periodontitis.

Due to the disruptions caused by the COVID-19 pandemic, the organoleptic assessment was compromised, prompting the adoption of an alternative method involving the filtration of exhaled air using a membrane filter, as proposed by RHYN et al. (2020). For statistical analysis, both objective assessments (quantification of VSC using clinical devices, PSI and WTCI) and subjective assessments (organoleptic measurements) collected from practitioners and patients via the medical questionnaire were employed. Various statistical methods were applied, including descriptive statistics such as frequency, proportion, median (interquartile range) for discrete and continuous parameters, and p -values derived from relevant significance tests like chi-squared and Wilcoxon rank-sum tests. In cases where VSC values were analyzed using regression models, 0 values were set to 1 prior to logarithmic transformation. A comparison of VSC values between different visits was conducted, resulting in the estimation of an odds ratio for the second versus the first visit, accompanied by a 95% confidence interval (CI) and a p -value (at a significance level of 0.05). Due to the exploratory nature of the study, no adjustment for multiple comparisons was performed. All statistical analyses were carried out using R version 3.5.1 (<http://www.R-project.org>).

Results

A total of 1,052 patients underwent a halitosis examination at the University Center for Dental Medicine, Basel during the time period from February 2003 until September 2020. In 74.3% ($n = 782$) of cases, patients were diagnosed with an oral cause, while 1.6% ($n = 17$) of patients displayed a possible diagnosis of an extraoral cause originating from the ENT or gastrointestinal area. The share of patients diagnosed with halitophobia or pseudo-halitosis amounted to 13.1% ($n = 138$), while the remaining 11% had no record of what type of diagnosis they adhered to.

Gender comparison

Analysis of the male-to-female distribution revealed that men slightly outnumbered women. Men accounted for 47.9% ($n = 504$) and women 52% ($n = 547$) of those with halitosis. Males had 1.23 times higher VSC scores than females on average, as seen in Table II ($p = 0.002$). The opposite was true for the distribution of different types of halitosis; the relative proportion of “psychological vs. physiological causes” was twice as high in women than in men ($p < 0.001$). Women were more attentive to their oral hygiene than men. 74.3% of female patients showed good oral hygiene, compared to 59.5% of males. On the other hand, 1.6% of men showed poor oral hygiene, while 0.5% of women demonstrated such results ($p < 0.001$).

Pathology and smoking

The most commonly occurring pathology based on the patients’ diagnoses was periodontitis, occurring in 17.5% ($n = 191$) of the patients. This is defined by a measurable loss of the periodontium (loss of clinical attachment, bleeding on probing) seen clinically by existing gingival pockets (Joss et al. 1994). Gingivitis occurred in 21% ($n = 241$) of patients. Tonsillar manifestations (tonsillitis, chronic caseous tonsillitis, tonsillar stones, hyperplastic tonsils) are among the most common extraoral respiratory causes for halitosis shown in Table I. Several other clinical conditions were identified and are presented in Table I.

Eighty percent ($n = 846$) of patients who underwent consultations were non-smokers, whereas 16.2% ($n = 171$) of patients indicated that they were smokers ($p = 0.28$). No information was noted in 3.2 % ($n = 34$) of the evaluations.

Tongue coating and oral hygiene

The coating was measured on the surface of the tongue, using a scale from 0 (lowest value) to 12 (highest value). Patients with coating of 6 or higher recorded higher VSC scores than patients with coating scores between 0 and 5 as seen in Table II ($p < 0.001$). Of the 982, out of 1052, patients who underwent tongue examinations, 97.5% ($n = 957$) showed presence of biofilm. The examiners found that the oral hygiene in 62.3% ($n = 655$) of the patients was good. In addition, 17.9% ($n = 188$) of the patients had fair hygiene, and only 0.9% ($n = 9$) poor hygiene. For the remaining 199 patients, nothing was noted.

Impact of psychosocial interaction

In most cases, people became aware of their bad breath through another person (78.1%, $n = 822$). Of the 1,052 patients who underwent consultation, 82.5% ($n = 872$) reported suffering from bad breath on a daily basis. Regarding the impact of halitosis on their social lives, 73.6% ($n = 778$) of patients indicated that the condition had a negative impact on their social lives, varying in severity. The patients mentioned social withdrawal, insecurity, disordered sleep, difficulty conversing, or disrupted relationships with family and loved ones as consequences of such. Out of all the participants, 31.3% ($n = 331$) had been suffering from bad breath for over a decade, 50.6% ($n = 535$) noted a time span of more than a year, and 13.4% ($n = 142$) less than a year.

Stress

Patients were asked to self-assess their perceived stress. Most participants indicated their stress levels as being either “average” (46.8%, $n = 471$) or “high” (32.3%, $n = 325$) compared to the extremes “very high” (9.9%, $n = 100$) and “low” (11%, $n = 111$). In 45 cases, unclear or no answers were provided ($p = 0.81$).

Therapy visits

In 72.3% ($n = 760$) of cases, only a single visit was listed; 27.8% ($n = 292$) of the patients had multiple halitosis consultations. The measurements of VSCs between the first and second sessions are seen in Fig. 2. On average, the measured halitosis value was 1.78 times lower after the second consultation in comparison to the first ($p < 0.001$). The majority of patients had visited previous consultations to treat bad breath (63.7%, $n = 673$).

Discussion

Halitosis is a common health problem, ranking third among the reasons for seeking dental treatment after caries and periodontitis (RAYMAN & ALMAS 2008). The need for a halitosis consultation is reflected by the high number of patients who have had previous consultations about halitosis and are still seeking help to treat bad breath (63.7%). Out of all the patients registered in this study, 81.9% had been affected by halitosis for over a year, while about a third of the participants, indicated having been affected for more than 10 years. Nowadays, it still appears to be a critical topic that has not been accepted on social terms and therefore is self-conflicting to admit and, in return, to seek help to combat such a symptom.

In the study, several factors, both physiological and psychological, were carefully examined. These factors include gender, smoking habits, social interactions, stress levels, tongue coating, periodontitis, and tonsillar manifestations. It was explored if these factors could contribute to the development and exacerbation of halitosis.

Gender

In this study, women were found to be generally more attentive to oral hygiene than men. In accordance with our findings, a study by ALMAS ET AL. (2003) examined the undergraduate students from King Saud University's College of Dentistry. The research denoted that 99% ($n = 216$) of women, in comparison to 81% ($n = 213$) of male students, were brushing their teeth, indicating a higher awareness of oral hygiene practices in females. Furthermore, women demonstrated higher stress and fear of developing halitosis, thereby, explaining why twice as many women suffer from pseudo-halitosis as men. Even though women seemed more self-conscious about having halitosis, the VSC values were higher in men than in women. This is also shown by a review from LIPSKY ET AL. (2021) that discusses gender differences in oral health and diseases. The article states that women have greater oral health competence and behaviors compared to men.

Smoking

Only 16.2% of the investigated patients smoked. The results of the present study in this regard are similar to those of other halitosis studies, indicating that smoking has no direct correlation with an increase in VSC measurements (FILIPPI & MULLER 2006; SODER

ET AL. 2000). However, there are studies describing the opposite. SETIA (2014) described a correlation amongst undergraduate students with halitosis and smoking ($n=8/10$, $p=0.026$). AL-ANSARI et al. (2006) reported an association with self-perceived halitosis and smoking in Kuwaiti patients ($n=107/289$, $p<0.001$). In conclusion, the results of this study suggest that smoking does not have a direct correlation with an increase in VSC measurements, which is consistent with other halitosis studies. However, there are some studies that report a correlation between smoking and halitosis, highlighting the need for further investigation. As smoking is a known risk factor for many oral health problems, it is important for individuals who smoke to be aware of the potential impact on their oral health and to maintain good oral hygiene practices. Future research could explore the relationship between smoking and halitosis in greater detail to better understand the potential impact of smoking on oral malodor.

Social interactions and stress

According to AZODO & OGBEBOR (2019), interpersonal relationships and social interactions can be challenging for individuals with halitosis. In a survey that did not differentiate between gender, 73.6% of participants ($n=778$) reported that bad breath had negatively impacted their day-to-day interactions. In a study by FILIPPI & MULLER (2006), 71.4% ($n=103$) of patients with real halitosis and 83.3% ($n=120$) with psychologically induced halitosis reported a negative influence on their social lives. ZÜRCHER & FILIPPI (2012) found that 83.4% ($n=376$) of patients experienced severe impairment to their social life due to halitosis, and 72.7% ($n=328$) were aware of their bad breath based on the reactions of those around them. In this study, 78.1% ($n=822$) became aware of their bad breath through a third party. These figures highlight the negative impact of halitosis on both social interactions and relationships.

During halitosis consultations, stress was frequently discussed as a possible factor, but it was found to have no impact on the VSC values ($p=0.81$). This finding aligns with a previous study by FILIPPI & MULLER (2006) which also found no correlation between stress and successful reduction of halitosis ($n=141$, $p=0.789$). However, a cross-sectional study conducted by VALI ET AL. (2015) demonstrated that high stress levels were a risk factor for subjective halitosis in a sample of 1046 participants (66.2%).

Tongue coating and periodontitis

Tongue coating is a common factor among individuals with oral malodour (CHOI ET AL. 2021). The coating of the tongue is composed of blood components, nutrients, large amounts of desquamated epithelial cells, and bacteria, thereby promoting the proteolytic and putrefactive capacities of these deteriorating products to produce VSC (MORITA & WANG 2001). This study suggests that increased VSCs correlate with the tongue's dorsum coating and oral malodour.

Out of the patients attending the consultation, a subset (12.5%, n=131) had previously performed self-treatment by using a tongue cleaner or scraper to remove the biofilm from their tongue. This percentage indicates that more instructions and awareness must be conveyed to the public regarding the patient's oral health routine.

Part of the halitosis consultation encompassed a professional cleaning of the tongue with a TS1 suction device. Furthermore, it was recommended to clean the tongue two to three times a day with a tongue cleaner and toothpaste containing zinc fluoride. Tongue coating and periodontitis were found to correlate with higher VSC measurements ($p < 0.003$). In the present study, the amount of biofilm was on average three times higher in periodontitis patients than in healthy participants without the presence of gingival inflammation, as seen in Fig. 1. These results were further highlighted in an earlier study presented by YAEGAKI & SANADA (1992), who found patients with periodontal pockets ($>4\text{mm}$ probing depth) had 8 times higher VSC measurements ($n=17, n=14$; $4.64\text{ng}/10\text{ml}$ vs $0.58\text{ng}/10\text{ml}$; $p < 0.01$) and four times greater VSC production by the tongue coating than those of control subjects ($<4\text{mm}$ probing depth) ($n=17, n=6$; $18.6\text{ng}/10\text{ml}$ vs $4.3\text{ng}/10\text{ml}$). In a study from ORTIZ & FILIPPI (2021) biofilm found in the oral cavity was found to be attributed to halitosis, further underlining the correlation between oral biofilm and halitosis.

Tonsillar manifestations

Patients with tonsillar manifestations (including tonsillitis, chronic caseous tonsillitis, tonsillar stones and hyperplastic tonsils) were found to have higher tongue coating ($p=0.003$) and VSC measurements ($p < 0.001$) in comparison to healthy individuals. Tonsillar manifestations are generated by increased mucus and biofilm formation, which increase the accumulation of bacteria and ultimately promote inflammation as well as foul-smelling compounds (YELLAMMA BAI & VINOD KUMAR 2015). Studies, such as the one

conducted by FERGUSON ET AL. (2014), highlight the correlation between chronic caseous tonsillitis and tonsil stones and increased VSC concentrations in exhaled air due to potential minimal inflammation or anaerobic bacterial colonization.

Nonetheless, the paper highlights the challenge of accurately determining whether high levels of VSC originate from the tonsils or the oral cavity. This difficulty arises from the qualitative nature of diagnosing halitosis, where the gold standard for determining its presence in a clinical setting is through organoleptic measurements (BRUNNER ET AL. 2010).

Limitations

This retrospective study reviews the data collection from the medical records of the patients who underwent a halitosis consultation at the University Center for Dental Medicine, Basel during the years 2003-2020. The strength of the study lies in its extensive duration of 17 years and the inclusion of a large group of patients.

However, certain limitations affect the study's methodology and subsequent outcomes. Variability in patient responses, with some questions remaining unanswered, introduces potential interpretation challenges and biases in assessing the correlations among the results. Moreover, the study heavily relies on subjective self-perceptions reported by patients and practitioners, which are inherently susceptible to bias. Nonetheless, a well-designed halitosis questionnaire with a large sample size may provide valuable information on which factors are significant and should be further studied. It should be noted that the study's findings may have been influenced by the impact of the pandemic.

Conclusions

Halitosis is a multifactorial condition that arises from a combination of various factors. In this study, variables such as gender, periodontitis, gingivitis and increased tongue coating have led to increased VSC measurements. No correlation to halitosis was found among smoking and stress. Nevertheless, the findings underscore the significance of guiding patients towards improving their dental care techniques to reduce the bacterial load within the mouth, leading to the elimination of bad breath. Improving oral hygiene, informing the patients about the results found during the halitosis consultation, discussing with them the causes of halitosis and treatment options, and making timely referrals when needed are steps to a successful treatment of halitosis. It is crucial to identify the causes of halitosis to determine the appropriate treatment so that dental

clinicians can manage patients successfully and therefore contribute to the amelioration of their mental health and interpersonal interactions. By thoroughly exploring these factors, we aim to gain a comprehensive understanding of their potential implications for the development and aggravation of halitosis. Through this analysis, we can identify significant correlations and draw meaningful insights, contributing to a more comprehensive approach to managing and addressing halitosis-related concerns.

Extended abstracts

Einleitung:

Halitosis, ein oft soziales Tabuthema, beeinträchtigt viele Menschen, oft mit psychologischen Folgen wie Angst und Depression. Es entsteht hauptsächlich durch gramnegative, anaerobe orale Bakterien, die flüchtige Schwefelverbindungen (VSCs) produzieren. Es existieren unterschiedliche Arten von Halitosis, einschliesslich pathologischer, physiologischer und psychogener Formen, die jeweils unterschiedliche Ursachen haben. Die vorliegende Studie ist eine retrospektive Analyse von 17 Jahren Patientendaten aus dem Zentrum für Speicheldiagnostik, Mundtrockenheit und Mundgeruch des Universitären Zentrums für Zahnmedizin Basel. Untersucht wurde die Korrelation zwischen den verschiedenen Formen von Halitosis und den möglichen Einflussfaktoren wie Geschlecht, Rauchen, Stress und Mundhygiene. Zudem wird die negative Auswirkung dieser Symptomatik auf die sozialen Interaktionen der Patienten über einen längeren Zeitraum hinweg beleuchtet.

Material und Methoden:

Insgesamt wurden Daten von 1052 Patienten mit Halitosis analysiert. Die Behandlungen umfassten eine detaillierte Untersuchung, bei der Patienten gebeten wurden, im Vorfeld bestimmte Produkte zu vermeiden. Subjektive und objektive Befunderhebung, einschliesslich Fragebögen und dem Einsatz von Geräten wie Halimeter oder Halisens und Oral Chroma zur Messung flüchtiger Schwefelverbindungen, wurden durchgeführt. Zusätzlich wurde eine klinische Untersuchung der oralen und pharyngealen Strukturen vorgenommen. Auf Grundlage der Diagnose wurde ein individueller Behandlungsplan erstellt, der mögliche Anweisungen zur Verbesserung der Mundhygiene oder Empfehlungen zur Behandlung zugrunde liegender Faktoren enthielt. Zur Auswertung der gesammelten Daten wurden verschiedene statistische Methoden angewendet. Die Studie wurde während der Covid-19-Pandemie abgeschlossen, weil diese die methodischen Ansätze beeinflusste.

Resultate:

Zwischen Februar 2003 und September 2020 konnten Daten von 1052 Patienten erhoben werden. Die meisten Fälle von Halitosis (74,3%) wurden auf orale Ursachen zurückgeführt, während 13,1% als Halitophobie oder Pseudohalitosis diagnostiziert wurden. Männer hatten durchschnittlich höhere VSC-Werte als Frauen. Die häufigste

Pathologie war die Parodontitis marginalis; 80% der Patienten waren Nichtraucher. Patienten bewerteten ihren Stresslevel meist als "durchschnittlich" oder "hoch". Ein Zungenbelag-Score von 6 oder höher korrelierte mit höheren VSC-Werten. Die meisten Patienten wurden auf ihren schlechten Atem durch andere aufmerksam gemacht und berichteten, dass Halitosis negative Auswirkungen auf ihr Sozialleben hatte.

Diskussion:

Halitosis ist ein weit verbreitetes Gesundheitsproblem, das durch verschiedene Faktoren beeinflusst wird, darunter Geschlecht, Parodontitis, Zungenbelag. Insgesamt wurde keine direkte Korrelation zwischen Rauchen, Stress und Halitosis festgestellt. Frauen zeigten eine höhere Mundhygiene-Aufmerksamkeit als Männer, obwohl Männer höhere VSC-Werte hatten. Halitosis kann soziale Interaktionen und Beziehungen erheblich beeinflussen, wobei 78,1% der Befragten durch Dritte auf ihren Mundgeruch aufmerksam gemacht wurden. Tonsilläre Manifestationen und Zungenbelag korrelierten ebenfalls mit erhöhten VSC-Werten. Die Studie unterstreicht die Wichtigkeit, Patienten zu besserer Mundhygiene anzuleiten und sie über Ursachen und Behandlungsmöglichkeiten aufzuklären, um Halitosis erfolgreich zu behandeln.

Introduction:

L'halitose, sujet social souvent évité, affecte beaucoup de personnes, avec des conséquences psychologiques telles que l'anxiété et la dépression. Principalement due à la décomposition de bactéries orales anaérobies, elle produit des composés soufrés volatils (CSV). Cette étude rétrospective de 17 ans de l'Université de Bâle examine la corrélation entre les diverses formes d'halitose et des facteurs présumés tels que le sexe, le tabagisme, le stress et l'hygiène buccale.

Matériel et méthodes:

Dans cette étude de 17 ans, 1052 patients atteints d'halitose ont été examinés à la clinique dentaire universitaire de Bâle. Les traitements ont inclus un examen détaillé, des analyses subjectives et objectives, un examen clinique de la bouche, et l'établissement d'un plan de traitement individuel. L'étude a été réalisée pendant la pandémie de Covid-19.

Résultats:

De février 2003 à septembre 2020, 1 052 patients ont participé à une enquête sur l'halitose à l'Université de Bâle. La plupart des cas étaient attribués à des causes orales, avec un taux de CSV plus élevé chez les hommes. La majorité des patients étaient non-fumeurs, avec un niveau de stress moyen à élevé. Un revêtement de la langue de 6 ou plus corrélait avec des valeurs de CSV plus élevées.

Discussion:

L'halitose est un problème de santé influencé par divers facteurs, y compris le sexe, la gingivite, et la parodontite. Aucun lien direct n'a été établi entre le tabagisme, le stress et l'halitose. Les hommes présentaient des niveaux plus élevés de CSV, malgré une plus grande attention à l'hygiène buccale chez les femmes. L'halitose peut affecter significativement les interactions sociales, avec 78,1% des patients alertés de leur mauvaise haleine par d'autres. L'étude souligne l'importance d'améliorer l'hygiène buccale pour traiter efficacement l'halitose.

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Captions

Fig 1 The result from patients with periodontitis and tonsilitis compared to healthy individuals measured according to the Winkel tongue coating index. The median score values were as follows: periodontitis patients 5 (IQR=1;9), patients with tonsillar manifestations 6 (IQR =1;9), healthy 1 (IQR=1;9).

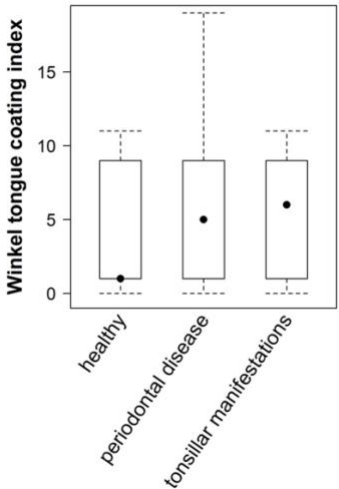
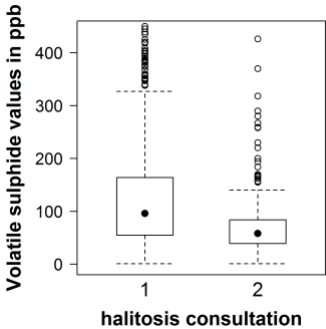


Fig 2 Distribution of the VSC measurements (ppb) in the first and second halitosis consultation. Showing a higher median VSC value for the first: 96 ppb (IQR=55;164), than for the second session: 58 ppb (IQR=39; 83.5) $p<0.001$.



Tables

Table I Prevalence of concomitant oral conditions in a clinical population; n=1052

Clinical concomitant conditions	N (%)
none	318 (30.23)
gingivitis	242 (21)
periodontitis	191 (17.47)
ectopic sebaceous glands	100 (9.5)
tonsillar manifestation (tonsillitis, chronic caseous tonsillitis, tonsillar stones, hyperplastic tonsils)	76 (5.39)
partially impacted wisdom teeth/pericoronitis	61 (5.3)
atypical morphological features of the tongue (lingua villosa, nigra, geographica)	31 (2.7)
insufficient restorations or caries	30 (2.6)

n= 1052

Table II A comparative analysis of the sum of volatile sulfur compounds (VSC) levels between the different factors of oral health condition, tongue coating, smoking and sex. P values were derived from Kruskal-Wallis or Wilcoxon rank tests.

Variable	VSC median (IQR)		P value
		ppb	
Condition			<0.001
Healthy	86	(52.2; 129.5)	
Periodontal Disease	134	(83; 220.5)	
Tonsillar Manifestation	110	(61; 200)	
Tongue coating			<0.001
<5	77	(48; 124)	
>5	126	(76; 218.2)	
Smoking status			0.28
Non-smoker	98	(56;164)	
Smoker	90	(51.2;163.5)	
Sex			0.002
Male	101	(61;176)	
Female	87	(50;157)	

Ppb: Parts per billion