Letter to Editor

The Most Promising Alternative to Mercury-containing Dental Restorations

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Dear Editor;

The European Union Environmental Commission report and the United Nation Minamata Convention have legislated for phasing-out of mercury-containing dental materials use (dental amalgams) by 2030.[1, 2] Several Scandinavian countries have already banned the use of dental amalgams, and this ban is expected to grow to other countries worldwide.[2, 3] This creates a market gap for materials which can be used as an alternative to dental amalgams.[4] Varieties of mercury-free dental materials have been clinically approved as posterior restorations; such as (1) resin-based composite materials, and (2) glass-based materials, including glass ionomers and glass hybrids. Using these types of dental materials will decrease the mercury's risks on human's health and also contribute significantly in the reduction of the environmental mercury pollution.[5, 6]

Recently, several clinical approaches to treat dental caries lesions have shifted the focus to preserving tooth structure and use of adhesive materials. Considering this, Minimally Intervention Dentistry (MID) has become a crucial concept which includes three aspects to fulfil the requirement of preventive and restorative dentistry; these are early caries diagnosis, enhance remineralisation and minimal cutting of tooth surfaces.[7, 8] This approach is identified as an Atraumatic Restorative Treatment (ART). The ART technique was adopted in 1994 by the World Health Organisation (WHO) as an alternative technique for dental caries management in the developed countries either for treating deciduous and/or permanent dentitions.[9] The high viscous glass ionomer cement (GIC) is approved as an ideal candidate material to be used with ART technique; such as GC Fuji IX®, Ketac™ Molar and Glass Carbomer®.[10, 11]

One of the main advances in dental materials field is based on the modifications of the GIC chemical compositions, by introducing a bioactive glass in different particle sizes (for promoting remineralising ability) and/or using a highly molecular weight of poly-acrylic acid (for enhancing matrix strength).[12] When bioactive glass-containing dental materials come into contact with body fluid, will undergo to a sequence of bioactivity reactions; which is summarised into (1) ion exchange, (2) dissolution and (3) precipitation stages, leading to formation of apatite crystals in fractions identical to those of the natural bone and tooth components.[13] Formation of apatite crystals [hydroxyapatite-$Ca_{10}(PO_4)_6OH_2$ or fluorapatite-$Ca_{10}(PO_4)_6F_2$] in the bioactive glass-containing GICs occurs via delivering of calcium (Ca^{2+}), phosphate (PO_4^{3}), hydroxyl (OH^-) and/or fluoride (F^-) species at the interfaces between the GIC/tooth surfaces and/or the GIC/oral environment.[14] For this reason, the bioactive glass-containing GICs are considered as the most promising alternative restorative materials for posterior cavities.

The Libyan oral health care system is mainly privatized;[15] hence the dental professionals continually have to learn and update themselves with the latest advancements in dental materials and technology, to provide the best quality of care for their patients and to stay competitive in a privatized market. Additionally, it is crucial to educate their patients about the reasons behind phasing-out of dental amalgams, to take the right decision about the dental treatment options. Therefore, if the mercury-containing dental material (dental amalgam) is selected, the patient's consent is strongly needed. While this requires the adoption of polices and legislations at the national level, the dentists are ethically required to minimize risk and do the best for their patients.

Yours Sincerely;
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Libyan Authority for Scientific Research;
Tripoli, Libya

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Letter to Editor

A call to reform the Libyan oral health care system

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Dear Editor;

The Libyan healthcare system was once described as one of the best healthcare systems in Africa.[1] A recent study describing the Libyan oral health care system has been published which shows that health care is mainly privatized, and the governmental sector is poorly functioning with limited funding and unclear targets.[2] It is well known structural determinants of health such as the health system can have a negative impact on the health outcomes. [3] In the case of the Libyan systems, it seems the impact is heavy on preventive dental care which is deterred by limited resources in the governmental sector and payment issues in the private sector. This has been manifested in the high rates of oral disease in Libyan children and adults.[4-10] Furthermore, challenges in the oral health care system include barriers such as time constraints, insufficient incentives, and limited resources that hinder the provision of care.[11] However, in Libya, the oral health care system could experience similar or even more severe difficulties due to political instability, inadequate infrastructure, and a lack of trained professionals, which could further aggravate these issues.

There is an urgent need to raise the issue and mobilize actions to reform the oral health care system to meet the needs of the society and avoid further deterioration of health services and creating jobless dentists. Government expenditure on oral health in Libya primarily follows an outdated model that emphasizes diagnosis and treatment of oral and dental diseases, rather than funding programs aimed at preventing these conditions.[12] In 2012, Libya had approximately six dentists per 10,000 people.[13] Although the numbers of dentists is considered sufficient, large numbers of dental graduates are bombarded into the Libyan oral health care system which reflect improper planning of the dental workforces.[10]

The one might say the dental system of Libya was studied in Benghazi as a case,[2] however, similar situation applies to the whole country. For example, the dental faculty in Tripoli enrols up to 1,000 new students each year, and other institutions also admit substantial numbers.[14] This situation places considerable strain on the educational system and could, over time, negatively impact the job market for private dental practitioners.

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Original article

Children's oral health and parents' education status in Benghazi, Libya: a cross-sectional study

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ABSTRACT

Aim: The study aims to evaluate the impact of parents' education on the promotion of child dental care.

Methods: Data were collected via a questionnaire survey among parents who brought their children to the Pediatric Dental Department of the Faculty of Dentistry, University of Benghazi, Libya. The data were logged and analyzed using IBM-SPSS for Windows version 29.0 (SPSS Inc., Chicago, IL). Frequencies and percentages were measured to assess the influence of parental education on the dental knowledge of their children's oral care.

Results: More than two-thirds (69.2%) of parents sought dental care for their children when they expressed pain. More than half of parents (59%) reported the importance of deciduous teeth and its impact on successor teeth. Only 16% started brushing when the first primary tooth erupted, and 40% of their children brushed at least twice a day. In addition, only 39% of parents knew the correct time of the first permanent molar eruption. The frequency of parents who reported the correct total number of primary teeth, preferred treatment of primary teeth rather than extraction and asked their children to brush once daily increased with increasing the parents' education levels.

Conclusion: The present study displayed that a high parents' educational level does not directly subscribe to good oral health care for their children. The parents need further attention by presenting more programs dealing with dental health which will be useful in improving their children's oral health.

Key Words*: Parents, Education, Child, Dental health, Questionnaire, Oral hygiene*

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INTRODUCTION

Awareness of parents can play an important part in preserving dental health habits amongst children.[1] Unfortunately the proper management of primary teeth is not considered a main issue in most of the population as it is thought that deciduous teeth will fall out as the child grows, without influencing permanent teeth. Primary teeth are essential for meeting children's basic needs, and the health of permanent dentition relies on them. The treatment of primary teeth is crucial, as it is vital for proper eating, speech, and aesthetics, and also plays a significant role in building a child's confidence. The development and improvement of children's oral hygiene habits are most influenced by their immediate environment.[2] Parents are usually the main factor affecting children's progress of routine oral health habits. They are responsible for caring for their children and making important decisions on their behalf. Therefore, they should be aware of primary teeth, and their health.[3] Children's dental hygiene benefits significantly from educated parents who instill positive oral health habits.[3] Children's dental health benefits more from highly educated parents, while less-educated parents show less concern for dental care.[4,5] A study conducted among Libyan children found that dental caries incidence decreases as parents' educational levels increase.[6] Anyway, the aim of the previous study was different from our aim, the main aim of this study[6] was to assess the experience and prevalence of dental caries among school children aged 8 to10 years, in addition, the questionnaire in the previous study was not similar to the one of our study. Therefore, further study is needed to investigate the parent's education level and knowledge regarding the oral health of their children.

Children's dental health is significantly influenced by their parents' awareness and education levels. Dental management typically involves parental approval. Moreover, parental education is a common indicator of

socioeconomic status in studies on children's dental health[7-,10]

Several research in industrialized nations have shown an association between parents' education level and their children's dental habits.[4,11-14] However there are inadequate studies on the association between the parents' education level and their children's dental health behavior in developing countries. Unfortunately, there is few studies display if parental education level impacts on their preferences for oral care of their offspring.[6]

In Benghazi, it is assumed that education may play a vital part, which has been barely being evaluated. In light of this, the present study aimed to assess, through a questionnaire survey completed by parents, the prevalence of specific habits influencing their children's oral health. Additionally, it sought to investigate the relationship between parental education levels and their knowledge regarding their children's oral healthcare.

MATERIALS AND METHODS

Ethical approval was gained from the research ethical committee of the University of Benghazi. In addition, written informed consent was studied and accepted by the University's ethics committee and signed by all the parents before starting the study. Because there is no governmental classification of areas based on socioeconomic information in Libya, parents' education levels could be considered as a proxy measure of parental dental knowledge, attitudes, and awareness. A convenient sample of parents was included. The participants were enrolled from parents attending with their children aged between 2 to 12 years for dental treatment at the Pediatric Dental Department of the Faculty of Dentistry, University of Benghazi from 15th November 2022 to 20th February 2023. Inclusion criteria were parents of a healthy child who have primary or mixed dentition. Exclusion criteria for participation were parents of unhealthy children with permanent dentition only.

A self-designed questionnaire was prepared in English and then translated into simple Arabic language and validated in a previous study.[15] A questionnaire survey was used to gather the information in the form of 15 close-ended multiple-choice questions. The questions were easy to read and answer with two options (yes and no), multiple-choice questions, and ranking questions using agree, disagree, and don't know. The first part of the questionnaire survey included questions on demographic data such as name, age, sex, parental education qualification and child's age. The levels of parents' education were categorized as elementary school, intermediate school (high school), university degree and post-graduate degree. The second part contained questions that evaluated the parental knowledge and awareness of different treatment options regarding the frequency of habits affecting the dental health of their children, such as the frequency of tooth brushing, when they started tooth brushing, regular visits to the dentist, the importance of primary teeth, what they prefer extract or treat the primary teeth, if their children have previous bad dental experience, what is the total number of primary teeth and when the first permanent tooth erupts. The questionnaire was printed and copied according to the sample size. The researcher asked the parents to tick the most correct answer from the set list of answers in order to assess the effect of their education levels on their kids' oral health.

Data entry and statistical analysis were done using Statistical Package for the Social Sciences IBM-SPSS for Windows version 29.0 (SPSS Inc., Chicago, IL). The Chi-square test was utilized to compare percentages in order to assess variations in parental knowledge and practices based on their education level and to investigate the impact of parental education on their children's dental knowledge. The confidence level was set at 95%. A $P \leq 0.05$ was considered statistically significant.

RESULTS

Responses obtained from the parents were tabulated and the findings of the questionnaire were stated as frequency distribution and calculated in percentages. The questionnaires were excluded if they were either incomplete or if more than one answer was selected. Total number of sample size selected was 117 parents between 20 and 49 years of age. Out of the sample selected, 39.3% (n=46) were aged 20 to 29 years old, 35.9% (n=42) were aged 30 to 39 years and 24.8% (n=29) were aged 40 to 49 years old. The parents aged 20 to 29 were the highest percentage of the study sample. About 54.7% (n=64) of the sample were mothers and 35.9% (n=42) were fathers, 9.4% (n=11) were guardians. The children's ages were 2–12 years.

In the present study, the education level of parents was divided into four categories. According to parents' education Level, 57.3% (n=67) of the parents in this survey had a university degree followed by 16.2% (n=19) for respondents with a higher educational level (postgraduate degrees), similar percentage 16.2% (n=19) of respondents had up to elementary school level, and only 10.3% (n=12) had up to high school. Education level distributions of parents are given in Figure 1.

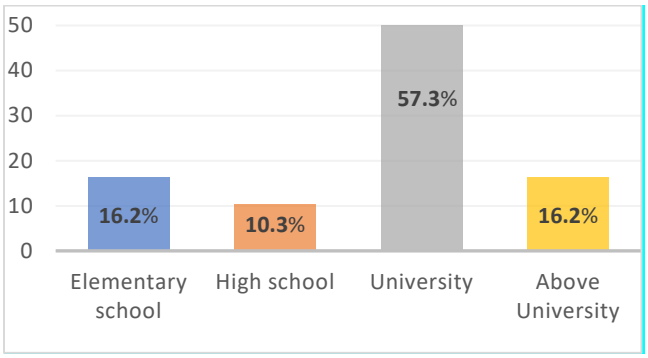

Figure 1. Distribution of the population sample according to education level

Regardless of parents' education level, of the total sample, about 40.2% of the parents stated that their children brush their teeth twice or more daily, 35.9% reported one time daily, while 15.4% reported one time weekly, and 8.5% reported that their children having no brushing habit. When parents were asked about when their children started tooth brushing, 68.4% of parents reported that once the primary molars erupted, 16.2% reported the correct answer, when the first primary tooth erupts, and 15.4% reported that their children don't brush their primary teeth. Of the sample, more than two-thirds 69.2% of parents reported visiting the dentist only for pain or an emergency and about 24.8% of parents reported taking their children to dental visits more than once per year. When the parents were asked if their child had previous bad dental experience, 55.6% reported no and 44.4% yes. When parents were asked about the importance of primary teeth in their children, most of them had an awareness of the importance of primary teeth. More than half of parents (59%) stated the importance of primary teeth and their impact on permanent teeth while 41% of the parents reported disagree or don't know. Around 83.8% of the parents prefer treatment of the primary teeth and 16.2% of them prefer extraction of these teeth. When the parents were asked about the total number of primary teeth, 38.5% reported the correct answer (20 teeth), 37.6% reported not knowing the answer and 24% of them reported the wrong answer. Among the sample, less than half (39.3%) of the parents correctly reported that the first permanent molar erupts at 6-7 years of age. Regarding parents' education levels, as the level of education increased, so did the frequency of parents who correctly reported the total number of primary teeth. Additionally, the frequency of parents who reported their children brushing their teeth once daily also increased with higher educational levels. Notably, none of the parents with post-graduate education reported that their children had no brushing habits. As the parents' educational level increased, the frequency of parents who reported the correct time for starting tooth brushing, after the first primary tooth erupts, decreased. Parents' education level showed no significant correlation with the frequency of children's dental visits. Most parents reported taking their children to the dentist only when they experienced pain. Restoration was the most commonly accepted treatment for primary teeth. As parents' education levels increased, the preference for treating primary teeth over extraction also increased. Conversely, lower education levels among parents corresponded with a higher preference for extracting primary teeth rather than treating them. Conversely, as the education level of the parents decreased, the frequency of parents who preferred the extraction of primary teeth over treatment increased. The study found no significant link between parents' education levels and their knowledge of when the first permanent molar erupts and less than half of the parents knew the correct timing. Anyway, more than half of parents with different education levels reported that their children have no previous bad dental experience. The current study showed that the level of parents' education has no positive effect to contribute good oral care of their children.

Table 1: The analysis of the questionnaire section regarding the influence of parents' education level on their child's oral health

Question	Parents' Education Level					
	Post-graduate	graduate Level	Inter-mediate school	Elementary school	Total	χ^2
	(%)	(%)	(%)	(%)	(%)	p
Do primary teeth affect permanent ones?						
Agree	57.9	58.2	66.7	57.9	59.0	1.68
Disagree	15.8	19.2	25.0	21.1	19.7	
I don't know	26.3	22.4	8.3	21.1	21.4	0.947
When do you take your child to visit the dentist?						
Once /year	10.5	4.5	8.3	0.0	05.1	9.28
More than once/year	15.8	23.9	33.3	31.6	24.8	
When feeling pain	73.7	71.6	58.3	63.2	69.2	
Never	00.0	00.0	00.0	05.3	00.9	0.41
Does your child have previous bad dental experience?						
Yes	47.4	38.8	41.7	63.2	44.4	3.66
No	52.6	61.2	58.3	36.8	55.6	0.31
What do you prefer extract or treat primary tooth?						
Extraction	15.8	11.9	25.0	26.3	16.2	3.09
Treatment	84.2	88.1	75.0	73.7	83.8	0.39
What is the total number of primary teeth?						
20 teeth	36.8	44.8	25.0	26.3	38.5	10.18
28 teeth	05.3	11.9	16.7	15.8	12.0	
32 teeth	05.3	14.9	00.0	15.8	12.0	
I don't know	52.6	28.4	58.3	42.1	37.6	0.34
How many times does your child brush his teeth?						
Once/day	52.6	34.3	41.7	21.1	35.9	10.70
Twice or more/day	21.1	44.8	33.3	47.4	40.2	
Once/week	26.3	11.9	08.3	21.1	15.4	
Never	00.0	09.0	16.7	10.5	8.5	0.30
When did your child start brushing?						
When the first primary tooth erupted	5.3	11.9	25.0	36.8	16.2	9.79
When the primary molars erupted	78.9	71.6	66.7	47.4	68.4	
Doesn't brush his primary teeth	15.8	16.4	08.3	15.8	15.4	0.13
When does first permanent molar erupt?						
6-7 years	31.6	38.8	41.7	47.4	39.3	10.30
10 year	26.3	28.4	16.7	31.6	27.4	
12 years	00.0	01.5	08.3	10.5	03.4	
18 years	05.3	04.5	08.3	0.0	04.3	
I don't know	36.8	26.9	25.0	10.5	25.6	0-59

DISCUSSION

In the current study, most parents (59%) recognized the significance of primary teeth regardless their educational level. Our results did not agree with the findings of another study conducted in India, which found that 82% of the parents were unaware of the importance of primary teeth and 96% of them had no awareness of them.[16] On the contrary, another study indicated that parents who acknowledged the significance of deciduous teeth positively impacted their children's oral health.[17]

About 38.5% of the sample was aware of the correct number of primary teeth. However, as the education level of parents increases, the proportion of parents who correctly identified the total number of primary teeth (20) also increases. A similar proportion (30%) was observed in an Indian study.[18]

In this study, when evaluating the impact of parents' education on the importance of maintaining primary dentition in their children by asking about preferred treatment choices for decayed primary teeth, most parents (83.8%), regardless of educational level, preferred treatment of primary teeth over extraction. Additionally, as the education level of the parents increased, the frequency of parents who preferred the treatment of primary teeth also increased. This might be due to the fact that children from families with highly educated parents had more opportunities to receive restorative management. Our results align with the findings of another study, which found that 86% of parents preferred to have these teeth filled.[18] Conversely, our figure exceeded that reported in an Indian study, where 53% of parents believed it was crucial to restore primary teeth.[19] Moreover, another study conducted in the United Kingdom reported that only 47% of parents stated a preference for having a decayed primary tooth restored, where 28% chose having the tooth extracted and 15% wanted the tooth left alone.[20] Additionally, in the current study, as the parents' educational level decreased, the frequency of parents who prefer extraction of primary teeth increased. However, our result (16%) did not align with the findings of another study, which found that 61% of parents would prefer to have these teeth extracted rather than restored.[16]

One study found higher education levels may increase interest in health education programs,[21] while another linked tooth brushing frequency to parents' education.[22] Our study found no significant correlation between parents' education level and the frequency of their children's tooth brushing. In this study, 40.2% of parents reported that their children brush their teeth twice or more daily. This figure is significantly lower than those reported in Denmark (78%) and Switzerland (85%), but it aligns with the percentages reported in Finland (40%)[23]and Turkey (40.5%).[15] Conversely, another study reported that 91.1% of parents only asked their children to brush once per day.[16]

Regular visits to the dentist every six months are essential for maintaining good dental health.[24] Our study revealed that none of the parents with higher education levels had ever arranged for their child to visit a dentist; however, the frequency of regular dental visits among educated parents was low. most parents only visited the dentist when their child experienced pain or an emergency. Upon inquiry regarding the motivation for seeking dental care, the findings indicated that parents' awareness of dental care is not influenced by their education level. Anyway, our findings were in line with other studies indicating that most parents took their children to dental services only in cases of pain.[16,19,25] The explanations for evading regular dental visits may comprise fear, anxiety, difficulty of accessibility to dental clinics, and lack of knowledge about the significance of regular dental visits. Our findings contrast with those of a previous study, which claimed that children of parents with higher education levels more frequently utilized dental services.[26]

Regardless of parents' educational level, this study found that adequate dental health knowledge was not observed among parents. Of the total surveyed, only 39.3% of parents were aware of the correct age of eruption of the first permanent molar. However, no correlation was found between the parents' education levels and how often they correctly answered when the first permanent molar erupts. The correct age (6-7years) of first permanent molar eruption was not recognized at least among more than half of the parents. However, their awareness was not significant in this regard. A lack of parental knowledge about the timing of tooth eruption increases the risk of dental caries due to factors like frequent carbohydrate consumption between meals and inadequate oral hygiene practices. Additionally, parents who are not aware of the correct age of eruption may not supervise their children's tooth brushing, putting these teeth at high risk for dental caries. Our result was higher than the findings of another study in Iran, which reported that only 30.0% of mothers knew the eruption time of the first permanent molar.[27] Our result was higher compared to the 18% reported by another study, which found that parents' education did not affect their awareness of the eruption time for the first permanent molar.[28] Similarly, another study found that parents had limited information about when the first permanent molar erupts.[29] This indicates that even educated parents need to learn more about first permanent molar's eruption time.

Parents' education is crucial in maintaining good dental health and hygiene by influencing the frequency of dental check-ups, dentist visits, and the adoption of essential oral health practices, which consequently impacts children's quality of life and educational progress.[30] The education of the parents is a main obstruction in preserving dental health and hygiene for their children

The three-way relationship between the parent, child, and dentist plays an important role in preserving and improving dental health, and efforts to instill good dental habits in children can positively impact their overall health as well.

The results of this study indicate that children in Benghazi require additional assistance to develop effective oral health habits, irrespective of their parents' education levels. This may be because parents' awareness does not always translate into action. Knowledge and educational programs should be established for parents to inspire them to seek preventive primary teeth health care and specialized oral health advice immediately even before the primary teeth erupt. This current study has certain limitations; the sample size was small, and the study didn't assess different regions in Benghazi. The use of a convenient small sample makes it difficult to generalize the results of the study to the city of Benghazi and Libyan population however this study may be used as a baseline for future studies.

CONCLUSION

This present study displayed proof that high parents' educational level does not directly provide good dental health habits of their children. Still, an increase in awareness will inspire parents to offer improved dental health to their children. Further research is necessary to evaluate the parental education level as a proxy measure of socioeconomic status and parental awareness concerning dental health of their children in different regions in Libya.

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Original article

Social Media Use and E-Professionalism among Libyan Dental Students at the University of Benghazi

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ABSTRACT:

Aim: This study aimed to assess dental students' social media (SM) usage and their perceptions of and attitudes towards e-professionalism.

Materials and methods: This study used a paper-based questionnaire administered to undergraduate dental students (4th year and interns) at the University of Benghazi, Libya, in 2022. The questionnaire included closed-ended questions to recognize dental students' use of social media platforms, their privacy settings and their perceptions and attitudes towards e-professionalism. The responses were compared according to the study year and whether the participants received professionalism-related training. The chi-square test was used for all comparisons, with the significance level set at $p<0.05$.

Results: A total of 364 students were included in the analysis (response rate: 73.5%). Almost all participants used multiple SM platforms. However, the most frequently used platforms were Facebook (84.3%) and Telegram (76.9%). More than half of the respondents (57.5%) considered their online behaviour to be a personal activity that would not affect their job opportunities in the future (71.1%). On the other hand, a considerable proportion of the respondents described posting information about dental patients as unprofessional (70.9%). Overall, a small proportion of participants (6.4%) considered communication with patients on SM unprofessional. Interns, however, were more likely to report this as unprofessional ($P = 0.026$).

Conclusion: The current study demonstrated the widespread popularity of SM platforms, notably Facebook and Telegram, among dental students at the University of Benghazi. The study also highlights concerns about students' perceptions of what constitutes unprofessional behaviours when using SM platforms with blurred personal-professional boundaries. The study's findings underscore the necessity of creating guidelines for social media use among Libyan dental students and incorporating e-professionalism into the dental curriculum.

Key Words*: Dental students, Digital professionalism, E-professionalism, Social media, Libya*

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INTRODUCTION

The term social media (SM) is generally used to describe internet-based websites and applications where users can engage in social networking by communicating with other people and sharing their thoughts and daily activities via audio, visual and textual content.[1] SM platforms such as Facebook, Twitter/X, Instagram, and TikTok have become integral parts of modern culture and every aspect of life. SM has been quickly adopted in health care and education for its merits of free sharing and instant access to knowledge and debates.[2] It is now used in online teaching, health education, and promoting awareness of scientific news, publications and scientific events,[3] which has expanded its popularity among the healthcare and scientific communities.[4] The use of SM for communicating health and academic information surged during the COVID-19 pandemic and proved to be an effective and safe communication tool.[5]

In dentistry, SM has been used for advertisement and marketing and the promotion of professional activities,

such as workshops and conferences, as well as for academic purposes such as professional networking and education.[6] However, SM is challenging for healthcare professionals and educators, who ought to maintain professionalism even in virtual environments, such as SM platforms.[7,8] Consequently, the term e-professionalism has been coined and emerged as a new study area that reflects professional standards while using SM.[9] Consequently, e-professionalism guidelines and standards were developed by dental organizations, such as the British General Dental Council and the Australian Dental Association.[10,11]

SMs are widely used in dental education to enhance student engagement, communication and interaction with colleagues, staff and patients.[12,13] However, the benefits of SM include the potential risk of violating e-professionalism,[14,15] such as providing false information, a negative digital footprint, privacy breaches, poor content quality, loss of direct patient contact, use of nonsecure networks, and miscommunication.[12,13] Therefore, many U.S. dental schools have developed policies for SM use.[16,17] However, guidelines for using SM among dental students are still lacking in many areas worldwide, particularly in the Middle East and North Africa, where the use of SM is becoming increasingly popular.[18] Libya is an Arab Spring country where the use of SM played a pivotal role in the rise in 2011, and since then, the use of SM platforms has increased.[19,20] The number of social media users in Libya at the start of 2024 was equivalent to 85.2 percent of the total population, but it's important to stress that social media users may not represent unique individuals.[21] Anecdotal evidence suggests that Libyan dental students rely heavily on SM platforms to communicate with colleagues and patients, access and exchange study materials and openly discuss their clinical work. In recent years, online teaching has been introduced in many Libyan dental academic institutions in response to recurrent armed conflicts and the COVID-19 pandemic.[22] While professionalism is a core component of dental curriculum lectures, there is a lack of guidelines for the use of social media (SM) and local standards regarding e-professionalism in dentistry. It remains unclear how teaching general ethical principles impacts the online behaviours of dental students. Therefore, in light of the emphasized need to revise curriculum and teaching practices,[23] this study aims to investigate the usage patterns of SM among dental students, their attitudes towards and perceptions of e-professionalism, and assess whether explicit teaching of professionalism influences these attitudes and behaviours.

MATERIALS AND METHODS

Study Design and Participants

Ethics approval was granted from the research ethics committee of the Faculty of Dentistry, University of Benghazi (Ref Number: 057). Participation in the study was voluntary, and implied consent was obtained from participants by completing and returning the questionnaire. The data collected were anonymized to protect the participants' identities and ensure confidentiality.

A cross-sectional survey using a self-administered questionnaire was conducted at the Faculty of Dentistry of the University of Benghazi, which is the oldest dental school in Libya.[24] The undergraduate program comprises four academic years (2 preclinical and 2 clinical), preceded by a predental year and followed by a year of internship. The subject of ethics and professionalism is introduced in the Dental Public Health course in the fourth year. It is delivered through a lecture that covers the definition of ethics and professionalism, ethical principles, dentists' responsibilities, ethics in social media , consent, and confidentiality.

All new 4th-year dental students (n= 256) and internship students (n= 346) in the 2022/2023 academic year were included in the study population. External internship trainee (who completed their 4th year in another dental school) were excluded. Participants were approached at the beginning of the academic year to ensure that fresh fourth-year students who did not receive ethics or professionalism training were recruited, which allowed comparison with internship trainees.

Data collection

The data for the current study were collected at the beginning of the academic year between September and December 2022. The questionnaires were handed to the students through the registrar's office when they completed their registration for the new academic year. All accessible dental students who met the inclusion criteria were invited to complete a paper-based, self-administered questionnaire and return it within a week. The researcher's phone number and email were made available to answer questions related to the study.

The questionnaire used in the present study was developed from previous studies [25,26] and validated for use in the Libyan culture. The validation process comprised two distinct phases. In the first phase, a discussion among the research team was conducted to identify topics irrelevant to the Libyan culture. For example, when *drinking alcohol at social events*, the *GDC guidelines* were removed. The questionnaire was tested for clarity and understandability in the second phase among fifteen randomly selected fourth-year students and interns. Since no amendments were suggested, these responses were included in the analysis.

The final questionnaire included a brief introduction that covered the purposes of the study and confirmed the confidentiality of the responses, followed by 19 questions. It takes 20 minutes, on average, to complete. The questions were divided into four sections. Section A included demographic data (gender, study year, age). Section B: SM use; Section C: Perceptions of professionalism; and Section D: Attitudes towards SM behaviours. Various closed-ended responses were used. For example, the frequency of SM use was assessed on a four-point Likert scale, 'daily', 'weekly', 'occasionally', and 'not a user', whereas in section C, students were asked to rate 10 different online behaviour on a dichotomous scale as either professional or unprofessional. The dichotomous scale was chosen to clearly distinguish between professional and unprofessional behaviour, avoiding ambiguity. In section D, a three-point Likert scale ('agree,' 'neither agree nor disagree,' 'disagree') was used to assess students' attitudes, selected for its simplicity and clarity. The data were managed and analyzed using the Statistical Package for the Social Sciences (IBM, SPSS 25). Counts and proportions were used to describe the distribution of the study sample and responses to questionnaire items. The chi-square test was used to compare 4th-year students' and interns' responses to the use of SM platforms and their perceptions and attitudes toward online behaviours. All analyses were conducted at a P-value of <0.05.

RESULTS

A total of 495 students who were registered in their fourth year and internship completed the questionnaire. Of these, 364 participants returned complete questionnaires suitable for analysis, for a response rate of 73.5%. Most participants were females (314, 87.2%) aged between 22 and 27 years (mean age = 24 years, SD=2.7).

The frequency of using different SM platforms. Telegram and Facebook were the most used platforms (307 daily users, 84.3% and 280 daily users, 76.9%, respectively). Twitter was the least frequently used SM platform (103, 28.3% used it daily). Instagram, Snapchat and YouTube were used daily by less than half of the respondents; 38.7%, 41.2%, and 41.5%, respectively (Figure 1).

The daily use of SM platforms among 4th year students and interns was compared. A statistically significant difference was observed only in the daily use of Telegram; a significantly greater proportion of 4th-year students used Telegram than did interns (P <0.001). There were no statistically significant differences (p>0.05) in the proportions of fourth-year students or interns who used Instagram, Snapchat, YouTube, or Twitter (Table 1).

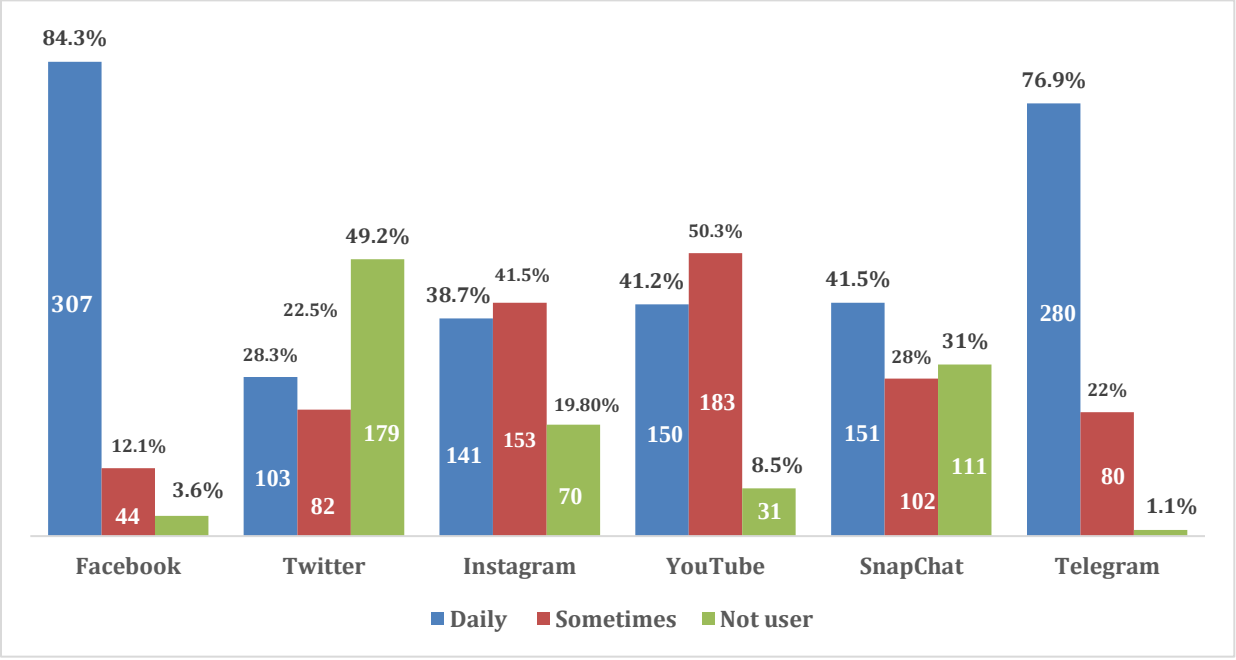

Figure 1: The Frequency of Social media sites used by dental students

Table 1 Frequency of use of social media platforms (used daily) by 4th year and internship students.

	N (%)	P-value
Facebook		
4th year	150 (84.3%)	
Internship	157 (84.9%)	0.984
Twitter		
4th year	55 (30.9%)	
Internship	48 (25%)	0.525
Instagram		
4th year	73 (41%)	
Internship	68 (36.8%)	0.721
YouTube		
4th year	73 (41%)	
Internship	77 (41.6%)	0.086
Snapchat		
4th year	69 (38.8%)	
Internship	82 (44.3%)	0.519
Telegram		
4th year	155 (86.5%)	
Internship	125 (67.6%)	<0.001***

Chi-square test was used to compare subgroups 4th year and Internship students
***P≤0.001

As regarding statistics of the online behaviours, these were perceived as nonprofessional by the whole study sample. A comparison of these responses by study year reflected that almost all respondents (346, 96.6%) described negative comments about personal characteristics or sensitive topics on SM as "unprofessional". More than half of the respondents (211,58.4%) described discussing patients' conditions, or cases in open groups on SM as "unprofessional", yet only 44 (12.2%) of respondents considered discussing patients' conditions in private groups on SM as "unprofessional". Similarly, few respondents considered sharing photos of yourself dental students in a clinical setting (70,19.4%) to be an "unprofessional" behaviour. A total of 23.6.4% and 19.5% of the patients and clinical staff, respectively, agreed on SM. Bivariate comparisons revealed that a significantly greater percentage of interns (17, 9.2%) than 4th-year students (6, 3.4%) described communicating with patients on SM as "unprofessional" (P= 0.026) (Table 2).

Table 2: proportions of participants who rated online behaviours as unprofessional and comparisons by year of study

Online behaviours	Considered Unprofessional N (%)	4th year	Internship	P-value
1. Sharing photos of yourself or fellow dental students at social events	72 (20.2%)	32 (18.3%)	40 (22.1%)	0.370
2. Sharing photos of yourself or other students in a clinical setting	70 (19.4%)	30 (17.1%)	40 (21.6%)	0.283
3. Facebook or other social media posts that reveal a dental patient's identifying information.	254 (70.8%)	121(69.5%)	133(72.3%)	0.568
4. Posts describing interactions with a patient that does not reveal any identifying information.	56 (15.8%)	22(12.7%)	34 (18.8%)	0.118
5. Communicating or engaging with patients on social media	23 (6.4%)	6 (3.4%)	17(9.2%)	0.026*

6. Negative critical comments regarding the faculty teaching process, staff, or colleagues	190 (52.5%)	95 (53.7%)	94 (51.1%)	0.623
7. Interacting with clinical staff and tutors on social media	19 (5.3%)	8(4.5%)	11 (6.1%)	0.519
8. Discussing patients' conditions or cases in closed or Private groups on social media.	44 (12.2%)	19(10.7%)	25 (13.6%)	0.426
9. Discussing patients' conditions or cases in open groups on social media	211 (58.4%)	99 (56.3%)	112(60.9%)	0.374
10. Negative critical negative comments about personal characteristics or sensitive topics	346 (96.6%)	170(97.1%)	175(96.2%)	0.604

*Chi-square test was used to compare subgroups 4th year and Internship students *P≤0.05*

Most respondents (210, 57.7%) agreed that their online behaviour is personal and separate from their life as dental students. Similarly, 71.1% of the respondents disagreed with the statement that 'online behaviour might affect their future job opportunities'. More than half of the participants (56.6%) did not agree with the statement: "patients would question their professionalism if they viewed their profiles". However, less than half of the respondents (172,47.3%) were worried about unprofessional SM posts, and 48.9% disagreed with the statement: "dental curricula placed too much emphasis on professionalism" (Figure 2).
Attitudes toward e-professionalism across different year groups are compared. Although interns exhibit greater concern about unprofessional posts on SM and their potential impact on future job opportunities than fourth-year students do, there is no statistically significant difference in attitudes toward e-professionalism between the two groups (Table 3).

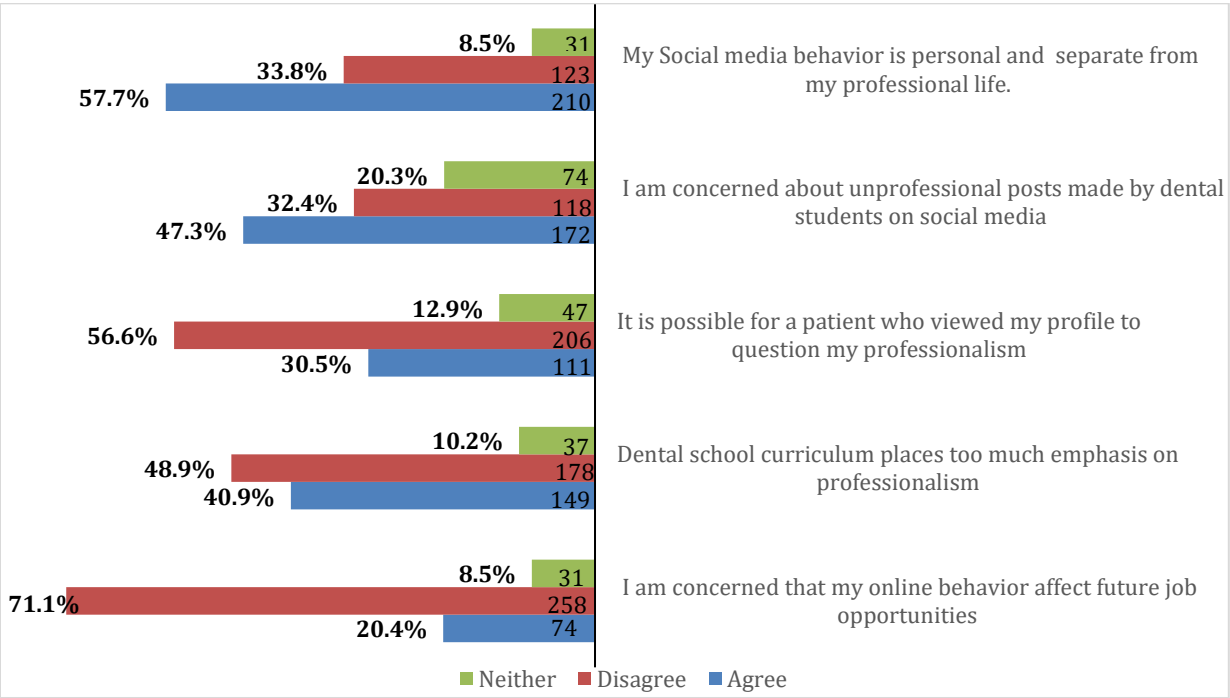

Figure 2: The Frequency of Dental students' attitudes toward e-professionalism.

Table 3: Comparisons of attitudes toward e-professionalism by year of study

	4th year			Intern			P-value
	Agree	Disagree	Neither	Agree	Disagree	Neutral	
1.My Social media behaviour is a personal thing and is separate from my professional life at dental school.	98 (55.1%)	65 (63.5%)	15 (8.4%)	112 (60.2%)	58 (31.2%)	16 (8.6%)	0.55
2.I am concerned about unprofessional posts made by dental students on social media	74 (41.6%)	64 (36%)	40 (22.4%)	98 (52.7%)	54 (29.0%)	34 (18.3%)	0.094
3. It is possible for a patient who viewed my personal profile to question my professionalism	58 (32.6%)	98 (55%)	22 (12.4)	53 (28.5%)	108 (58.1%)	25 (13.4)	0.713
4.The curriculum at the dental school places emphasis on professionalism	79 (44.4%)	84 (47.2%)	15 (8.4%)	70 (37.4%)	94 (50.3%)	23 (12.3%)	0.373
5.I am concerned that my online behaviour could affect my future job opportunities	34 (19.1%)	123 (69.1%)	21 (11.8%)	40 (21.6%)	135 (73%)	10 (5.4%)	0.057

Chi-square test was used to compare subgroups 4th year and Internship students

DISCUSSION

The present study demonstrated that almost all the participants were actively using multiple SM sites, with Telegram and Facebook being the most frequently used platforms. Taken together, these findings may indicate that SM is an integral part of dental students' academic and social life.[14,17] The popular use of Facebook is not surprising given that it is the most popular SM platform among the Libyan general population,[21] and similar findings were reported in previous studies conducted among dental students worldwide.[25, 27-30] What stands out in the present study is the very popular use of Telegram, which might be explained by its technical properties that facilitate the communication and exchange of study materials among students.[31,32] Interestingly, the use of Telegram decreased significantly during the internship compared to the unchanged use of other SM platforms. These findings are associated with anecdotal evidence indicating that Libyan dental students use Telegram to support their studies and preparations for exams rather than for entertainment. Whereas other platforms known for entrainment, self-documentation, and social interaction, such as Twitter and Instagram,[33] remained unchanged. A previous study among Iranian students reported a similar use of Telegram, identifying it as the most popular application for learning and educational purposes.[32] The preference for Telegram among both Libyan and Iranian dental students highlights several similarities. Both groups of students tend to favour versatile and secure messaging platforms that facilitate academic communication and resource sharing. These platforms support large group chats, file sharing, and the distribution of educational content, making them ideal for collaborative learning environments.

In the present study, many of the respondents considered personal photos at clinics and social events as normal activities, whereas disclosing patients' information and posting negative comments on patients and staff were considered unprofessional. Similar findings were reported among dental students in other countries both regionally and worldwide.[18, 25] Interestingly, unlike dental students in other countries such as Greece, the UK, and Malaysia,[27,34,35] most participants in the current study considered their SM activities as personal and do not have a significant impact on their careers as future dentists. Consequently, it is not surprising that the participants in the current study had blurred personal-professional boundaries manifested by linking their online professional behaviour to patients and privacy concerns. Although this might be partly attributed to the fact that these students are digital natives, who integrate SM into their daily lives and social norms, there are no local, or national guidelines for e-professionalism. Therefore, developing or adopting existing e-professionalism guidelines is urgently needed. In addition, the present study showed that traditional teaching of

professionalism produced negligible differences in students' attitudes and perceptions of SM-related behaviours. This finding confirms the previously highlighted importance of providing dental undergraduates with e-professionalism training, including hands-on experiences of how to maintain professional conduct while using SM.[36] For instance, dental students might learn how to interact with patients on social media through a professional page, ensuring that professional relationships and boundaries are maintained.[37] By integrating e-professionalism, students can also engage underserved communities, promoting awareness of neglected oral health issues beyond traditional campaigns, and fostering a more equitable approach to public health in Libya.[38]

The present study has several limitations. First**,** recruitment was challenging since students' attendance was irregular, and electronic questionnaires were not possible, because there were no official university emails for the students. However, the response rate was relatively high. Secondly, the data were limited to a public dental school, which restricts the generalizability of the findings to all dental students in Libya, especially those attending private dental schools. Nevertheless, the University of Benghazi is regarded as a reference for other dental schools in terms of curriculum and teaching strategies.[39] Although a similar situation is highly expected in other dental schools, further research is required to provide tangible evidence of this situation in other Libyan dental schools.

CONCLUSION

This study revealed that SM platforms were widely used among a sample of Libyan dental students, providing evidence that SM is an integral part of the daily activities of dental students in modern societies. However, a considerable number of the participants exhibited blurred definitions of what constitutes professional online behaviours. It can be stated that depending solely on teaching professionalism via lectures seems inadequate for achieving the desired attitudes and perceptions of e-professionalism. The present study underscores the need to incorporate e-professionalism training in the undergraduate curriculum and develop guidelines for SM use among dental students.

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Original article

Antibiotic Prescribing Regimen and Resistance Awareness Among Eastern Libyan Dentists

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ABSTRACT:

Background: The frequent use of antibiotics in dentistry for prophylaxis and treatment has contributed to a significant global public health issue: antibiotic resistance.

Aim: This research aims to evaluate the patterns in the prescription of antibiotics and their prophylactic usage in treating systemic conditions. Additionally, it investigates the awareness as well as adherence to guidelines for antibiotic prescription, as well as the awareness of antibiotic resistance among dentists with advanced degrees and postgraduate (AD) qualifications, and those with bachelor's Degrees (BD) in the eastern region of Libya.

Materials and Methods: This cross-sectional study employed a questionnaire to gather data from a representative sample of 130 Libyan dentists in the eastern region (including Benghazi, Almarj, Albayda, Derna and Tobruk cities).

Results: Most of the antibiotics prescribed by dentists were amoxicillin with clavulanic acid followed by amoxicillin alone, and both participant groups were adherent to the recommendations for prescribing antibiotics with statistically significant variation between the two groups.

Conclusion: This study revealed a tendency to overprescribe and utilize antibiotics for particular dental diseases. The majority of dentists were aware of resistance to antibiotics and adhering to the antibiotic prescription guidelines, the participants acknowledged the recommended use of antibiotics as a preventive strategy for systemic conditions.

Keywords: Antibiotics resistance, Dentists, Libya, Awareness, Adherence, Prescription, Prophylaxis, Guidelines

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INTRODUCTION

Since their discovery in the late 1920s, antibiotics have been among the medications that dentists administer the most frequently.[1,2] In order to treat oral and dental infections, dentists frequently prescribe antibiotics for therapeutic or preventive purposes. 10% of all antibiotic prescriptions are considered to be associated with dental infections.[3]

Referring to the NICE guidelines, antibiotics are not recommended for healthy individuals at low risk when there is no evidence of infection spreading. For dentoalveolar infections, the primary options are Phenoxymethylpenicillin PO 500 mg every six hours, Amoxicillin PO 500 mg three times a day or Benzylpenicillin IV 1.2 g, they work effectively. If the infection is severe, concurrent Metronidazole therapy should be addressed. In cases of a penicillin allergy, use 500 mg of Clarithromycin PO/IV every 12 hours along with the same kind of concurrent care as described above.[4,5]

Global antibiotic consumption, expressed as defined daily doses, grew by 65% between 2000 and 2015.[6] This rise in use was mostly evident in low- and middle-income nations, where utilization of antibiotics has been noticed to be significantly higher than in high-income countries. The correct administration of antibiotics in a wide range of medical circumstances has attracted greater attention in recent years from a variety of health groups.[2-7]

The ability of bacteria to resist an antimicrobial medication that was once successful in treating infections caused by them is known as antimicrobial resistance.[8] Furthermore, because resistant genes are easily transferred through interpersonal connections and human or animal waste, antibiotic resistance affects not merely the individual using the medication but also everyone else.[7]

Despite there are many reasons for the increasing incidence of resistance, the most significant one is antibiotic abuse, even if prescribing antibiotics is still seen to be a relatively unimportant act. The world is rapidly approaching a post-antibiotic lifespan in which ordinary diseases and mild injuries that have been treated for decades could once again be fatal if immediate, coordinated action is not implemented.[9-11]

Dentistry may have a significant impact on the issue of antibiotic resistance since antibiotic prescriptions by dentists are now routinely written for non-clinical reasons, such as pain management, irreversible pulpitis, and localized dentoalveolar abscess.[12-15]

Previous studies from Egypt showed that the participants demonstrated a considerably adequate understanding of the issue of bacterial resistance, however in their practices, they displayed varied degrees of adherence to antibiotic prescribing guidelines, mostly in overprescriptions for situations where antibiotics were unnecessary.[16-19] Identically, Jordanian dental specialists and dentists of the National Health Service NHS in England tend to prescribe Amoxycillin and metronidazole.[20,21] Moreover, dentists in Jordan tend to overprescribe antibiotics.[20]

As a consequence of this, it is critical to use antibiotics sensibly in dental practice to both increase efficacy and decrease resistance and side effects.[12-15]

This emphasizes how crucial it is to understand how dentists prescribe antibiotics, including the duration, type of medication, frequency, and need to prescribe before, during, and after dental procedures.

Consequently, the objective of this study was to evaluate Libyan general practitioners' and specialists' prescribing patterns for antibiotics and whether they adhere to professional guidelines.

MATERIALS AND METHODS

This cross-sectional study employed a questionnaire to gather data from a sample of Libyan dentists at the eastern region, via an email containing an electronic link to the Google Forms-generated survey. The study conducted from February to June 2024, invited participation from 700 dentists who had been working in various basic and specialty dental clinics in the eastern region of Libya(Benghazi, Almarj, Albayda, Derna and Tobruk cities). The responses included 130 dentists who completed the questionnaire, yielding a response rate of 18.5%. To increase the response rate, reminder emails and phone message notifications were sent to the participants

Bias

To reduce selection bias, all dental professionals who participated in the study were randomly chosen at random and requested to anonymously complete a self-administered questionnaire. To minimize information bias, the study's nature and aim were explained to each participant in the same way.

Participants:

Inclusion criteria

Libyan dentists from the eastern region in general practice who have completed a bachelor's degree in oral and dental medicine, a master's or doctoral degree in a specialization of dentistry.

Exclusion criteria

1. Any nationality outside of Libya.
2. Dental professionals who do not practice clinical dentistry, (dentists who only perform official duties and do not practice clinical dentistry or treat patients).

Sources of data and measurement methods

Data was collected using English validated self-administered questionnaire based on the earlier research by Konde *et al*[22] and Mariam *et al.*[17]

The data collection technique involved using a specially designed form to gather essential general information and data on antibiotic prescription patterns. Closed-ended (Yes/No) and multiple choice questions composed the questionnaire. There were two sections on the questionnaire: The first part contained the participants' personal demographic and employment-related data, such as level of dental education achieved, work experience and workplace. and the second half included questions about dentists' awareness of and reactions related to the prescription of antibiotics for dental patients.

This observational research was reported in accordance with the STROBE guidelines. The Faculty of Medicine, University of Derna's Research Ethics Committee approved the current study.

Outcomes

This survey was created to evaluate:

- The prescribing behaviors for antibiotics in cases of pulpitis, localized intraoral swelling, draining sinus tract, dental trauma, acute swelling of the face, dry socket, periodontal diseases in pediatric, pericoronitis for partially erupted tooth, extraction by open wound, simple extraction, periapical infection, apical periodontitis, evidence of anaerobic infection.
- Antibiotic implement as a prophylaxis measure for systemic health issues, such as cardiovascular disorders, blood dyscrasias, diseases linked to viruses, respiratory disorders, juvenile diabetes.

- The knowledge of and compliance with the prescribing guidelines for antibiotics.
- The understanding of and adherence to antibiotic prophylactic protocols.
- The dentist's viewpoint on potential reasons why antibiotics are misused.
- dentists, both general practitioners and specialists, awareness of antibiotic resistance.

All statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 26.0. Descriptive statistics were employed to compute numbers, frequencies, and percentages for every category in the categorical data. To compare the prescription manner among general and specialty dentists, a Chi-square test was performed.

RESULTS

Out of the 700 questionnaires distributed, only 130 dental practitioners responded. Among them, 58 (44.6%) held a Bachelor of Dental Surgery, and 72 (55.4%) had advanced or postgraduate degrees. Table 1 presents the participants' practice information and demographic data, showing that 54.6% of participants were working in clinical practice, 8.5% were academics, and 36.9% were working in both. Approximately 14.6% of participants had less than two years of clinical experience, 11.5% had 2 to 5 years of experience, and 73.8% had more than 5 years of experience. Table 2 showed clinical situations for standard antibiotic prescriptions where there was a non-significant statistical difference in antibiotic prescriptions for both advanced and bachelor's degree dentists for various oral diseases, with the exception of pulpitis and localized intraoral swelling.

Table 3 highlights the patterns of antibiotic prescription among dentists with advanced degrees and those with bachelor's degrees, where, as table 3 shows, amoxicillin with clavulanic acid (75% and 81.03%), was given more frequently than amoxicillin(20.83 % and 15.51%). Table 4 indicates that the majority of antibiotic prescriptions are for a period of 5-7 days.

Numerous dentist specialists (73.61%) and bachelor's degrees (81.03%) recommend prophylactic antibiotics for the situation of cardiovascular diseases without statistical significance difference between both groups (p=0.387). Most dentists did not recommend antibiotics for several systemic conditions with no statistically significant difference observed between the two groups (Table 5).

Table (1): Demographic information and practice experience for the research population

variable	N	Percent %
Bachelor of dental surgery	58	44.6
Advanced degree and postgraduate training	72	55.4
Less than 2 years	19	14.6
from 2 to 5 years	15	11.5
More than 5 years	96	73.8
Clinical practice	71	54.6
Academics	11	8.5
Both	48	36.9

Table(2): Experimental circumstances for frequently antibiotics prescription among advanced and bachelor's degree dentists

	Advanced degree and postgraduate		Bachelor's degree		
	Yes/ No	N	Yes / No	N	P- Value
Pulpitis	Yes No	12 60	Yes No	17 41	0.059*
Draining sinus tract	Yes No	33 39	Yes No	30 28	0.508
Localized intraoral swelling	Yes No	31 41	Yes No	36 22	0.021*
Acute facial swelling	Yes No	65 7	Yes No	55 3	0.484
Dental trauma	Yes No	34 38	Yes No	26 32	0.787
Pediatric periodontal diseases	Yes No	20 52	Yes No	22 36	0.222
Pericoronitis	Yes No	45 27	Yes No	39 19	0.578
Simple extraction	Yes No	46 26	Yes No	2 56	0.441
Extraction by the open method	Yes No	43 29	Yes No	38 20	0.407
Periapical abscess	Yes No	46 26	Yes No	42 16	0.305
Apical periodontitis	Yes No	30 42	Yes No	28 30	0.459
Dry socket	Yes No	24 48	Yes No	21 37	0.631
Evidence of anaerobic infection	Yes No	60 12	Yes No	46 12	0.359

Table (3): The routinely prescribed antibiotic
Advanced degree and postgraduate(N=72) bachelor's degree(N=58)

	N	Percent	N	Percent
Amoxicillin	15	20.83	9	15.51
Amoxicillin with clavulanic acid	54	75	47	81.03
Ampicillin with Sulbactam	0	0	1	1.72
Amoxicillin with flucloxacillin	3	4.16	1	1.72
Total	72	100.0	58	100.00

Table (4): The prescription period of the antibiotic
Advanced degree and postgraduate(N=72) bachelor's degree(N=58)

	N	Percent	N	Percent
Less than 5 days	6	8.33	4	6.89
5 to 7 days	66	91.66	53	91.38
More than 7 days	0	0	1	1.72
Total	72	100.0	58	100.0

Table (5): prescribed antibiotic for systemic conditions

	Advanced degree and postgraduate(N=72)			Bachelor's degree(N=58)			
	Yes/ No	N	Percent %	Yes/ No	N	Percent %	P- Value
Cardiovascular diseases	Yes No	53 19	73.61	Yes No	47 11	81.03	0.387
Viral infections	Yes No	4 68	5.55	Yes No	3 55	5.17	0.970
Juvenile diabetes	Yes No	21 51	29.17	Yes No	20 38	34.48	0.339
Blood dyscrasias	Yes No	15 57	20.83	Yes No	10 48	17.24	0.458
Respiratory disorders	Yes No	14 58	19.44	Yes No	14 44	24.14	0.438

Regarding the awareness of the guidelines, 76.39% of specialists, and 91.38% of bachelor's degree dentists acknowledged the standards for prescribing antibiotics with a statistically significant difference between both groups (p=0.000). Additionally, 83.33 % of the advanced degree dentists and 91.38 % of the bachelor's degree dentists demonstrated awareness of the antibiotic prophylaxis rules, also with statistically significant difference between the two groups (p=0.000).

Concerning adherence to guidelines, 77.78% of advanced degree 84.48% of bachelor's degree dentists adhered to the antibiotic prescription guidelines with a statistical significance difference between the two groups (p=0.000) while 77.78 % of AD dentists and 81.03 % of BD dentists were adherents to the antibiotic prophylaxis guidelines with statistical significance difference between both groups (p=0.000) as displayed in Table 6

Table (6): Awareness of dental practitioners to the antibiotic prescription and prophylaxis recommendations, and antibiotic resistance

	Advanced degree and postgraduate(N=72)			Bachelor's degree(N=58)			
	Yes/ No	N	Percent %	Yes/ No	N	Percent %	P- Value
Awareness of antibiotic prescription guidelines	Yes No	55 17	76.39	Yes No	53 5	91.38	0.000
Adherence to antibiotic prescription guidelines	Yes No	56 16	77.78	Yes No	49 9	84.48	0.000
Awareness of antibiotic prophylaxis guidelines	Yes No	60 12	83.33	Yes No	53 5	91.38	0.000
Adherence to antibiotic prophylaxis guidelines	Yes No	56 16	77.78	Yes No	47 11	81.03	0.000
Awareness of antibiotic resistance	Yes No	68 4	94.44	Yes No	55 3	94.83	0.051

Almost the entire AD and BD were knowledgeable of the issue of antibiotic resistance. The greater part of them were understanding that inappropriate antibiotic usage and self-medication contribute to increasing the incidence of resistance to antibiotics with no statistically significant difference throughout the two group (Table 6). Prior to prescribing the antibiotics, most of the respondents inquire if the patient has previously used antibiotics in the past week and emphasize the importance of adhering to the prescribed dosage, (Table7). A small percentage of dentists prescribed antibiotics due to insistent parents or a crowded waiting area. Additionally, 11.11% of AD and 13.79% of BD dentists prescribed antibiotics to maintain the patient's condition until they could see a specialist, with no statistically significant difference between the two groups, as indicated in Table 7
.

Table (7): The potential factors of antibiotic misuse from the dentist's perspective

	Advanced degree and postgraduate (N=72)			**Bachelor's degree(N=58)**			
	Yes/ No	N	Percent %	Yes/ No	N	Percent %	P- Value
Self-medication.	Yes No	62 10	86.11	Yes No	48 10	82.75	0.602
Parents insist	Yes No	9 63	12.50	Yes No	8 50	13.79	0.830
Inquire from the patient about taking a course of antibiotics in the past 1 week before prescribing antibiotics	Yes No	65 7	90.27	Yes No	52 6	89.65	0.907
Advise the patient to adhere to the dosage regimen and inform the consequences of not doing so	Yes No	68 4	94.44	Yes No	53 5	91.37	0.498
Prescribe antibiotics to sustain the patient until the specialist treats the patient	Yes No	8 64	11.11	Yes No	8 50	13.79	0.647

DISCUSSION

Globally, antibiotic resistance is rising at an alarming rate, implementing the opportunity to treat common infectious diseases in dangerous circumstances. The misuse and overuse of antibiotics, in addition to inadequate infection prevention and control, all contribute to the development of antibiotic resistance.[23] Depending on the foundation of global regulations, observing the achievement of public health programs, and pinpointing new developments and risks improving all over the world antimicrobial resistance monitoring is fundamental.[18] Consequently, this study aims to add to a wealth of knowledge about the misuse and usage of antibiotics, particularly with regard to the treatment of patients in the eastern region of Libya.

The results of this study indicated a propensity for improper use and overuse of antibiotics for particular diseases, such as pulpitis and localized intraoral swelling. These results were consistent with several studies that suggest that the main causes may be insufficient knowledge about the disease, an inaccurate diagnosis, insufficient time, patient expectations, parental pressure, and the rejection of surgical treatment. [9,11,24,25]

The antibiotic most commonly prescribed was amoxicillin with clavulanic acid, which was followed by Amoxicillin only.

The reason behind this issue could be that Amoxicillin is effective against oral anaerobes and streptococci, which makes it suitable for treating odontogenic infections. Additionally, When amoxicillin is combined with clavulanic acid, it has the benefit of maintaining its effectiveness against beta-lactamases, which are often produced by microorganisms associated with odontogenic infectious diseases.[26,30]

Regarding the frequency of antibiotic recommendation, the majority of dental practitioners across both groups prescribed antibiotics for 5-7 days, which allowed for the elimination of symptoms and eliminated the possibility of a clinical or microbiological recurrence.[26-31]

While dentists generally recommended antibiotics for systemic conditions such as cardiovascular diseases, the majority indicated they would not prescribe antibiotics for viral infections, juvenile diabetes, blood dyscrasias, or respiratory disorders.[27,28]

Although it is possible for oral pathogens to spread and infect distant tissues during dental procedures, there is no direct evidence of this occurring. Therefore, it is uncertain when and under what circumstances systemic prophylactic antibiotics are truly necessary.[27,28]

The American Heart Association (AHA) suggests that patients with cardiovascular diseases need to receive antibiotic prophylaxis because they have the greatest risk of adverse effects.[29,30]

In this study, a large number of advanced degree dentists (73.61%) and bachelor's degree (81.03%) prescribed prophylactic antibiotics for cardiovascular patients with no statistically significant difference between both groups. Several studies have linked endodontic infections to systemic diseases, including cardiovascular conditions.[31] This connection has raised concerns about dental management for patients scheduled for cardiovascular surgery. The practice of dental screening and management of oral infections, such as caries, endodontic infections and periodontal infections before any invasive cardiovascular procedure remains controversial due to the lack of detailed information in existing guidelines.[32]

In our study, participants demonstrated awareness of the antibiotic prescription guidelines, with a statistically significant difference between the two groups. They also showed awareness of the antibiotic prophylaxis recommendations, again with a statistically significant difference between the groups. These results in disagreement with the finding of Al-Johani. *et al*, who reported that 65.9% of the dentists did not follow any specific guidelines.[18] Comparable results have been observed in other studies conducted in the USA.[13,33]

The American Dental Association released guidelines on the use of antibiotics for emergency management of pulpal and periapical dental pain and oral swelling. They concluded that antibiotics are not recommended for healthy adults diagnosed with symptomatic irreversible pulpitis, with or without symptomatic apical periodontitis, or pulp necrosis and symptomatic apical periodontitis. Instead, these patients should be referred for definitive dental treatment. However, if dental treatment is not possible and symptoms worsen, a delayed prescription of amoxicillin or penicillin V potassium is recommended for patients with pulp necrosis and symptomatic apical periodontitis. Conversely, the expert panel recommended prescribing antibiotics along with urgent dental treatment for immunocompromised patients diagnosed with pulp necrosis and acute apical abscesses with systemic involvement.[34]

The results revealed that nearly all AD and BD were attentive of antibiotic resistance and understood that self-medication and improper usage of antibiotics contribute to its development, with no statistically significant difference between the two groups. These findings are consistent with a survey conducted in Derna (eastern region of Libya) by Rabee *et al*., which found that 6.7% of participants used antibiotics through self-medication.[35]

Antimicrobial resistance is driven by various aspects, such as improper antibiotic prescriptions, overuse or misuse of antibiotics, and inappropriate patient compliance with antimicrobial medication, often not following treatment recommendations.[36] Recently, there has been a growing trend in the inappropriate utilization of antibiotics throughout Europe. In its entirety, 7–10% of antibiotic administrations occur in outpatient settings, with dentistry contributing a comparatively higher proportion of these prescriptions. Numerous studies have shown that dentists frequently do not follow antibiotic prescription guidelines, particularly for prophylactic purposes in dentoalveolar surgery.[37,38]

The results of the current investigation indicated that the majority of the participant dentists followed the antibiotic prescription guidelines, with statistically significant variations between the two groups. Similarly, adherence to the antibiotic prophylaxis guidelines also showed statistical significance between the groups. According to an updated global survey, non-adherence to antibiotic therapy, which highlights improper usage and potentially increases the risk of treatment failure, reinfection, and antimicrobial resistance, was estimated to be around 22.3%, varying between 9% and 44% among different countries.[39] The findings of this study contradict those of a study conducted among dentists in Jeddah, which revealed a lack of adherence to antibiotic prescription guidelines.[18]

STUDY LIMITATIONS

The data was collected using participants' self-reported information and did not involve reviewing patient records to verify the accuracy of prescriptions. Moreover, it is concerning that reporting bias may exist since dentists' answers might not accurately represent their real practices. Furthermore, an additional possible issue with self-administered questionnaire research is non-response bias. The responses from participants could have differed positively or negatively compared to those of non-respondents, making it challenging to determine the likely direction of the non-respondents' answers.

CONCLUSION

Conclusions of this study indicated that participants had greater inclination to overprescribe and overuse antibiotics for particular dental diseases. Nearly all AD and BD were aware of antibiotic resistance and adhering to the guidelines for antibiotics prescription, the participants were aware of the guidelines for the

prescription and prophylactic use of antibiotics for systemic conditions.

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Original article

Retrospective Clinicopathological Study of 33 Cases of Pleomorphic Salivary Adenoma Diagnosed in Benghazi

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ABSTRACT

Background: Pleomorphic salivary adenoma (PSA) is the most frequently found neoplastic tumor in major and minor salivary glands. It has a high recurrence rate and there is a possibility for benign PSA to transform into malignant form. No study on clinical and histopathological features of pleomorphic adenoma in Libya was found. occurrence of benign PSA is more common than PSA with malignant foci.

Aim: The present study aimed to retrospectively analyze the clinical and histopathological features of cases diagnosed as pleomorphic adenoma and compare our findings to those of other studies.

Materials and Methods: In this retrospective study, the pleomorphic salivary adenoma cases diagnosed between 1994-2019 in the Department of Oral Pathology, Dental School, University of Benghazi, Libya were retrieved. The diagnosis was confirmed by reevaluation of hematoxylin and eosin-stained slides. Descriptive statistics were used to describe the clinical data of the patient's demographics and clinical features of the tumor.

Results: It was found that among 33 diagnosed cases of PSA, 11 cases were males and 22 cases were females. The most common age range was 10-29 years (21 cases). The most common intra-oral site was the palate (15 cases) followed by buccal mucosa (6 cases) and submandibular glands and parotid glands were most commonly affected among major salivary glands. Benign pleomorphic adenoma (24 cases) was most common, myoepithelium was reported in 2 cases and malignant foci were reported in 7 cases.

Conclusion: This study revealed that Females were more affected than males. The most common location of pleomorphic adenoma was the palate. The myoepithelioma is a rare.

Keywords: *Pleomorphic Salivary Adenoma, Retrospective, Clinicopathological, Libya.*

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INTRODUCTION

Pleomorphic adenoma, the most common salivary gland tumor, constituting up to two-thirds of all salivary gland tumors. It is also referred to as benign mixed tumors, because of its twofold origin from both epithelial and myoepithelial elements.[1,2,3] It has a natural history of slow growth over a long period of time. The cause of pleomorphic adenoma is not well understood. However, the incidence of this tumor has been rising over the past 15-20 years, particularly in relation to radiation exposure. One study proposes that the oncogenic simian virus (SV40) might be involved in the onset or progression of pleomorphic adenoma. Additionally, previous head and neck irradiation is considered a risk factor for the development of these tumors.[4] It makes considerable interest for its relatively high recurrence rate (4% and 45%)[5,8] and its potential for malignant transformation (2% to 24%).[9,10]

Pleomorphic adenoma is diagnosed by its histopathological features. It consists of two kinds of cells, i.e., epithelial and myoepithelial cells and contains a variable stroma that can be of the hyaline, myxoid, chondroid or fibrous type. The epithelial cells are organized into various formations such as nests, chains, sheets or duct-like structures within these different types of stroma.[7,10-13] No study on clinicopathological features of pleomorphic adenoma in Libya was found in the medical literature. The aim of the present study therefore was to analyze retrospectively the clinicopathological features of pleomorphic salivary adenoma such as age and gender of the patient, site of

the tumor, and its histopathological subtypes in Libyan patients and to compare our findings with the results of similar studies from other parts of the world.

MATERIALS AND METHODS

In this retrospective study, the pleomorphic salivary adenoma cases were diagnosed between 1994-2019 in the Department of Oral Pathology, Faculty of Dentistry, University of Benghazi. The diagnosis was confirmed by reevaluation of hematoxylin and eosin-stained slides, the pleomorphic adenomas of either major or minor salivary glands were predominantly well-circumscribed and were defined by epithelial cells organized in nests, sheets, and duct-like structures. The cell types included either epithelial or myoepithelial cells, with the myoepithelial cells displaying a plasmacytoid or spindle-shaped morphology. The stroma was either fibrous or myxo-chondroid. (Figure 1).

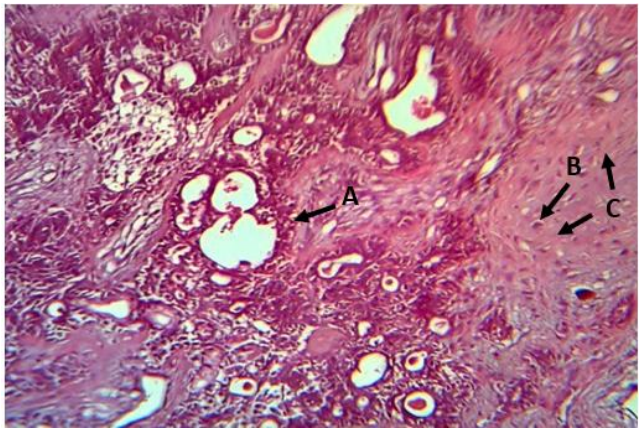

Figure 1: A photomicrograph of H&E stained section of pleomorphic adenoma showing neoplastic epithelial cells arranged in duct-like structure (A) and islands and also showing myoepithelial cells (B) surrounded by myxochonromatous stroma (C) (Magnification x 100).

Descriptive statistics were employed to outline patient demographics, including age at tumor diagnosis and gender, as well as clinical features of the tumor, such as site, recurrences, and histopathological types.

RESULTS

This study comprises 33 cases of pleomorphic adenoma with 11 cases occurring in men, and 22 cases occurring in women (M:F=1:2). Pleomorphic salivary adenoma occurred in patients over a wide age range (8-70years), most commonly in patients age group range from 10-29 years (Table 1). The mean patient age at the time of diagnosis was 28.5 years.

Table 1. Distribution of PSA according to age and gender

Age	Male	Female	Total
0-9	0	2	2
10-19	4	9	13
20-29	4	4	8
30-39	1	2	3
40-49	1	1	2
50-59	1	1	2
60-69	0	2	2
70-79	0	1	1
Total	11	22	33

Intra-orally, 15 cases occurred in the palate, followed by buccal mucosa (6 cases). Extra-orally, parotid glands (5 cases) are most commonly affected among major salivary glands followed by submandibular glands (3 cases) (table 2). The clinical symptoms and signs at diagnosis include swelling (32 cases), and pain, (one case), (Table 3).

Table 2. Distribution of PSA according to site

	Site	Number of cases
Major	Parotid	5
	Submandibular	3
	Sublingual	0
Minor	Palatal	15
	Buccal	6
	Labial	3
	Tongue	0
	Floor of mouth	1
	Total	33

Histologically, among the 33 cases of PSA, 2 cases (6.1%) were of myoepithelioma subtype and 7 cases (21.2%) showed malignant foci (table 4).

Table 3. Presenting symptoms of PSA

Symptom	Number of cases
Swelling	32
Pain and tenderness	1
Total	33

Table 4. Histological subtypes of PSA

	PSA	Myoepithelioma	PSA with malignant foci	Total
Number of cases	24	2	7	33

DISCUSSION:

A pleomorphic salivary adenoma is the most common neoplasm arising from salivary gland tissue, accounting for about 81.2% of all salivary tumors.[14] Clinically, PSA usually presents as a slow-growing, painless mass and has a relatively long course.[15] To the authors' best of knowledge, despite the small number of cases, this is the first study to describe the PSA in a Libyan population. In this study several interesting findings were reported, some of them were in agreement with previous studies conducted elsewhere and other findings were surprisingly different. In the present study, females (22 cases) were more affected by PSA than males (11 cases), This finding is similar to the results of other studies such as that of Irani et al.[16]

In the present study, PSA is more prevalent in 10-29 years of age group; this finding is contrary to many studies which found PSA common in the 4th-5th decades of life. [16] It is unclear why but this could have something to do with environmental risk factors specific to our country. However, further research is needed to understand why younger individuals are more likely to be affected by PSA.

Another surprising finding in the present study was that the palatal salivary tissue is the most common site for occurrence of PSA {15 cases representing (45.5%)}. In many studies, the parotid gland was reported to be the most common site for pleomorphic adenomas, followed by the submandibular gland.[14,17]

It is difficult to explain this finding and further research is required to understand this phenomenon.

The present study has some limitations which should be considered before making conclusions. First, the study is retrospective in nature and hence the authors have little influence over the data collection process. For example, no additional information was collected about the risk factors and hence limited the ability to explain results. Given the constraints of the available data and the small sample size, our findings should be interpreted with caution. Nevertheless, the study provided new insights into the distribution of PSA among Libyans and can serve as a baseline for future studies.

CONCLUSIONS:

In conclusion, our study has found that females were more affected than males. The most common location of pleomorphic adenoma was the palate. The myoepithelioma subtype is a rare occurrence and benign PSA is more common than PSA with malignant foci.

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Original article

Oral Health Awareness and Practices among Libyan University Students: Insights into Non-Bacterial Tooth Wear

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ABSTRACT

Background: Tooth substance loss, when unrelated to bacterial activity, encompasses several conditions such as attrition, abrasion, erosion, and resorption. Each of these forms of tooth wear results from different etiological factors, including mechanical forces, dietary acids, and physiological processes. Despite the significance of these conditions, awareness of non-bacterial causes of tooth wear is limited among the general population, especially young adults. University students, who are exposed to various stressors and lifestyle habits, may be at increased risk for these issues.
Objective: This study investigates oral health awareness and practices among Libyan university students, with a specific focus on their knowledge and understanding of non-bacterial causes of tooth wear, including attrition, abrasion, erosion, and resorption
Methods: A cross-sectional study was conducted using an online Google Forms survey, distributed via social media. A total of 523 responses were collected. The questionnaire gathered demographic data, oral health practices, symptoms of non-bacterial tooth substance loss, and awareness of conditions like attrition, abrasion, erosion, and resorption. Descriptive statistics were used to summarize prevalence and awareness levels. The chi-square test was used to examine associations between demographic factors, oral health habits, and non-bacterial tooth substance loss awareness. Statistical significance was set at $p < 0.05$. The data were analyzed using IBM-SPSS version 28.
Results: The study involved 523 Libyan university students, revealing a significant age skew towards 21-23 years (56.8%), with a majority female population (69.8%). Most participants were from the Dental field (62.9%). In terms of oral health practices, 38.2% visited the dentist every six months, and 57.9% brushed twice daily. Awareness of non-bacterial tooth loss conditions varied, with 68.9% recognizing abrasion and 54.1% erosion. Notably, 45.5% reported experiencing tooth wear symptoms, and 99.2% showed strong interest in learning about non-bacterial causes of tooth wear, with a binomial test confirming this interest as statistically significant ($p < 0.001$).
Conclusion: This study underscores a significant awareness of non-bacterial tooth substance loss among Libyan university students, alongside a marked interest in further education on this subject. Despite the generally proactive oral health practices observed, there is variability in awareness of specific conditions such as erosion and resorption. The overwhelmingly high interest in learning about non-bacterial causes of tooth wear, supported by statistical significance, indicates a critical need for enhanced educational initiatives. Targeted interventions are essential to bridge existing knowledge gaps and promote effective preventative strategies within this demographic.

Keywords**:** *Non-bacterial, loss of tooth substance, Attrition, Abrasion, Erosion, Resorption, Prevalence, Awareness, Libya.*

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INTRODUCTION

Non-bacterial loss of tooth substance (NBTLS) represents a significant yet often under-recognized dental health concern worldwide. This condition, which includes attrition, abrasion, erosion, and resorption, involves the progressive loss of tooth structure without the involvement of bacterial activity. The etiology of NBTLS is multifactorial, comprising mechanical,

chemical, and physiological factors. If left unmanaged, NBTLS can lead to long-term dental complications such as hypersensitivity, compromised aesthetics, and impaired function.[1]

Attrition refers to tooth wear resulting from direct tooth-to-tooth contact, commonly linked with parafunctional habits such as bruxism. Bruxism is often associated with stress and lifestyle factors, particularly prevalent among university students.[2,3] On the other hand, it is caused by external mechanical forces, such as aggressive brushing, which is frequently observed in younger adults. When combined with the use of abrasive toothpaste, improper brushing techniques can exacerbate enamel wear.[4,5] Erosion, the chemical dissolution of dental hard tissues due to acidic substances, has become increasingly prevalent, particularly with the rise in consumption of soft drinks, energy drinks, and fruit juices.[6,7] Lastly, resorption involves the internal or external degradation of tooth structure, often related to systemic conditions or trauma, although its occurrence is less common compared to other forms of NBTLS.[8]

Recent studies emphasize the increasing prevalence of NBTLS due to lifestyle changes, particularly dietary habits and stress-related behaviors. The rising consumption of acidic beverages has been linked to the acceleration of tooth erosion, particularly among university students.[9] Additionally, stress-induced bruxism is now recognized as a significant factor contributing to attrition, potentially leading to severe tooth wear, hypersensitivity, and aesthetic concerns if untreated. Furthermore, modern interventions—such as the use of fluoride, potassium nitrate, and other remineralizing agents—have shown promise in mitigating dentinal hypersensitivity, a common outcome of NBTLS.[10,11]

Globally, university students' awareness of NBTLS remains insufficient, as many engage in high-risk behaviors like frequent consumption of acidic beverages and improper oral hygiene techniques. A study by Young *et al*. (2011),[12] revealed that only 30% of students recognized that acidic drinks could cause erosion, while fewer than 20% identified stress-induced bruxism as a cause of attrition. These findings underscore the necessity for targeted education to reduce the risk factors associated with NBTLS and enhance long-term oral health outcomes.

In Libya, limited data exists on the prevalence and awareness of NBTLS, particularly among university students. Given the stress, poor dietary habits, and inadequate oral health knowledge often observed in this population, understanding the prevalence of NBTLS is crucial. This study aims to bridge the gap in the literature by exploring how prevalent these conditions are, the level of awareness surrounding them, and the behaviors that contribute most to their development. By assessing the knowledge and prevalence of attrition, abrasion, erosion, and resorption among Libyan university students, this study seeks to identify key areas for intervention to reduce the incidence of NBTLS and improve overall oral health.

Recent evidence highlights the importance of preventive education, focusing on proper brushing techniques, dietary modifications, and stress management to mitigate the risks of NBTLS.[13,14] In regions like Libya, where awareness and data are limited, targeted educational initiatives could significantly contribute to the reduction of NBTLS and promote better oral health practices among young adults.

MATERIALS AND METHODS

Study Design and Population

This observational cross-sectional study aimed to assess the prevalence and awareness of non-bacterial tooth substance loss (NBTLS) among a sample of 523 Libyan university students, aged 18 to 27+ years. A convenience sampling method was utilized, with participants recruited through an online survey distributed across various social media platforms, including Facebook, Instagram, and WhatsApp. Participation was entirely voluntary, and the randomized nature of the sampling may introduce selection bias.

Survey Design

The survey instrument consisted of questions derived from previously validated questionnaires to ensure both relevance and reliability in assessing NBTLS and awareness levels. The questionnaire was divided into three sections: demographic information, self-reported prevalence of NBTLS (including attrition, abrasion, erosion, and resorption), and awareness of NBTLS.

Data Collection

Data were collected from an initial sample of 550 respondents, of which 523 responses were cleaned and retained for analysis. The survey was administered through a structured Google Form in Arabic, consisting of three sections: demographic information and oral health practices; self-reported prevalence of non-bacterial tooth surface loss and awareness of its types (including attrition, abrasion, erosion, and resorption); and awareness of NBTLS and related causative behaviors. Awareness was measured as a binary response ("Yes" or "No"). The survey remained open for seven months, with periodic reminders to encourage participation.

Responses were automatically recorded and stored in Google Sheets, facilitating efficient data management and analysis. This survey design enabled the collection

of detailed data, providing a comprehensive overview of NBTLS prevalence and awareness within the target population.

Data Management and Analysis

Collected data were imported into Microsoft Excel for analysis. The data were analyzed using IBM-SPSS for Windows version 28 (SPSS Inc., Chicago, IL). Descriptive statistics, including frequencies and percentages, were calculated to summarize the prevalence and awareness of NBTLS. To examine the relationship between awareness and demographic variables, a Chi-square test of independence was performed, with statistical significance set at $p < 0.05$. Additionally, a binomial test was employed to evaluate whether the proportion of participants expressing interest in learning more about non-bacterial causes of tooth wear (99.2%) significantly differed from an assumed proportion of 50%, representing equal interest versus lack of interest. These statistical tests allowed for a rigorous assessment of the key variables in the study.

RESULTS

Demographic Distribution of Survey Participants

Age Distribution: The largest age group among participants was 21-23 years, consisting of 297 individuals (56.8% of the sample). The second largest group was aged 24-26, with 134 participants (25.6%), followed by those aged 27 and above, accounting for 47 individuals (9%). The smallest group, aged 18-20, included 45 participants (8.6%). A chi-square test confirmed a statistically significant deviation from an equal distribution across age groups ($\chi^2 = 321.35$, $p < 0.0001$), indicating a pronounced skew toward the 21-23 age group.

Gender Distribution: Females comprised the majority of the sample, with 365 participants (69.8%), while males made up a smaller proportion, with 158 participants (30.2%). This gender disparity shows that females were more than twice as numerous as males in the study population. **Table. 1**

Field of Study: The distribution of participants by field of study revealed that a significant majority (62.9%) were from the Dental field, totaling 329 individuals. This was followed by 80 participants (15.3%) from the Sciences, and 57 participants each from the Medical field and the "Other" category, representing 10.9% each. This concentration of dental students highlights a notable focus within the participant pool, with smaller but relatively equal representation in the Sciences, Medical, and other fields.

Oral Health Practices

Frequency of Dental Visits

The chart illustrates participants' frequency of dental visits, shedding light on their oral health practices. The largest group, 38.2% (200 respondents), reported visiting a dentist every six months, reflecting a proactive approach to oral health. However, 33.1% (173 respondents) only seek dental care when faced with a problem, indicating a more reactive approach. Additionally, 25% (131 respondents) visit a dentist annually, while a small proportion of participants (3.6%**,** 19 respondents) have never visited a dentist. These results suggest that while some individuals prioritize regular check-ups, a considerable portion only seek dental care when necessary, potentially delaying early intervention. **Figure.1**

Tooth Brushing Frequency Among the Population

The chart illustrates the frequency of regular tooth brushing among the population. A significant portion, 57.9% (303 individuals), reported brushing their teeth twice a day. This is followed by 22.6% (118 individuals) who brush once a day. A smaller group, 18% (94 individuals), indicated that they brush only occasionally. Notably, a very small percentage of the population, 1.5% (8 individuals)**,** reported never brushing their teeth. These results demonstrate that while the majority of individuals maintain a regular brushing routine, there is a notable fraction that practices less frequent oral hygiene habits. As shown in **Figure.2**

Table 1. Demographic distribution of participants

Demographic Category	Group	Number of Participants	Percentage (%)	Statistical Test
Age	18-20	45	8.6%	$\chi^2 = 321.35$, $p < 0.0001$ *
	21-23	297	56.8%	
	24-26	134	25.6%	
	27+	47	9%	
Gender	Female	365	69.8%	N/A
	Male	158	30.2%	

The age distribution shows a statistically significant skew towards the 21-23 age group ($\chi^2 = 321.35$, $p < 0.0001$). Regarding gender distribution, females comprise the majority at 69.8% of the participants, compared to 30.2% of males.

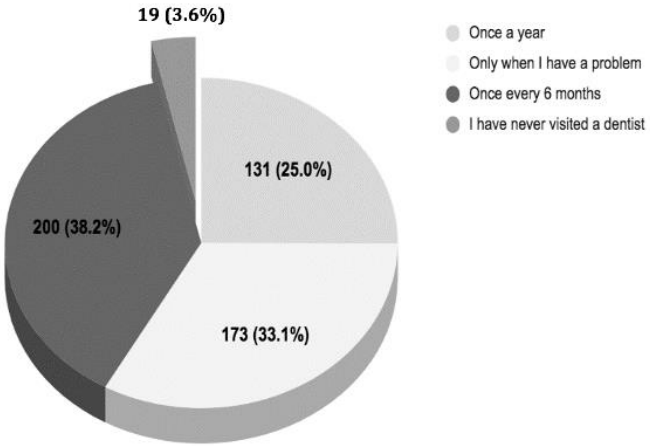


Figure 1: Frequency of dental visits, with most participants visiting every six months (38.2%), followed by visits only for problems (33.1%) and annual visits (25%). A small percentage (3.6%) have never visited a dentist.

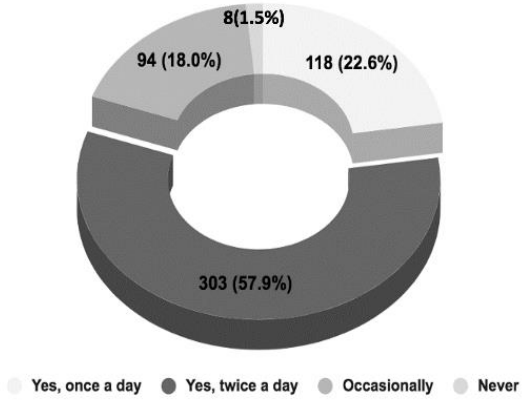


Figure 2: Tooth brushing frequency among participants, with 57.9% brushing twice a day, 22.6% brushing once a day, 18% brushing occasionally, and 1.5% never brushing.

Use of Additional Oral Hygiene Methods

The chart illustrates the use of additional oral hygiene methods, such as mouthwash and dental floss. A majority of participants, 58.1% (304 individuals), reported not using any supplementary oral hygiene methods, while 41.9% (219 individuals) indicated that they do incorporate such methods into their routine. To assess whether this difference is statistically significant, a chi-square test was conducted. The results revealed a statistically significant difference between the two groups ($\chi^2 = 26.98$, $p < 0.0001$), indicating that the majority of the population relies solely on basic oral hygiene practices, with a notable minority utilizing additional methods like mouthwash or flossing. This significant difference underscores the need for increased awareness of the benefits of supplementary oral hygiene practices. As shown in **Figure.3**

Non-Bacterial Loss of Tooth Substance

Awareness of the presence of different types of NBTLS

The bar chart illustrates participants' awareness of conditions related to tooth wear. The majority, 68.9% (350 individuals), are familiar with abrasion (tooth wear from brushing or external factors). Erosion, due to acid exposure, is known by 54.1% (283 individuals), while attrition (tooth-to-tooth grinding or clenching) is recognized by 41.1% (215 individuals). Fewer participants, 10.7% (56 individuals), have heard of resorption (loss of tooth structure due to internal or external causes). A small group, 7.1% (37 individuals), indicated they were unfamiliar with any of the listed conditions. This suggests a higher awareness of common forms of tooth wear, such as abrasion and erosion, compared to more complex conditions like resorption. As shown in **Figure.4**

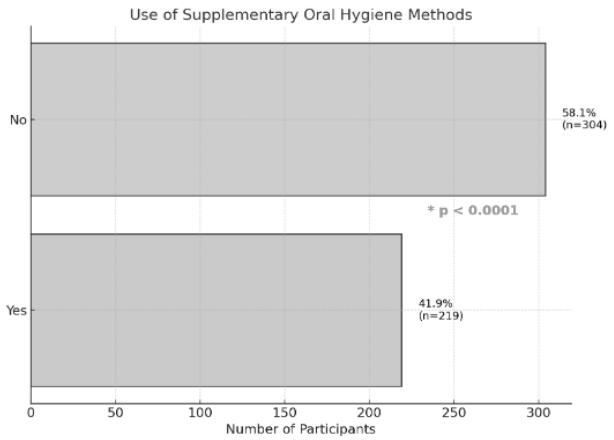


Figure 3: Use of additional oral hygiene methods, showing 58.1% of participants not using any, while 41.9% incorporate extra methods such as mouthwash or dental floss

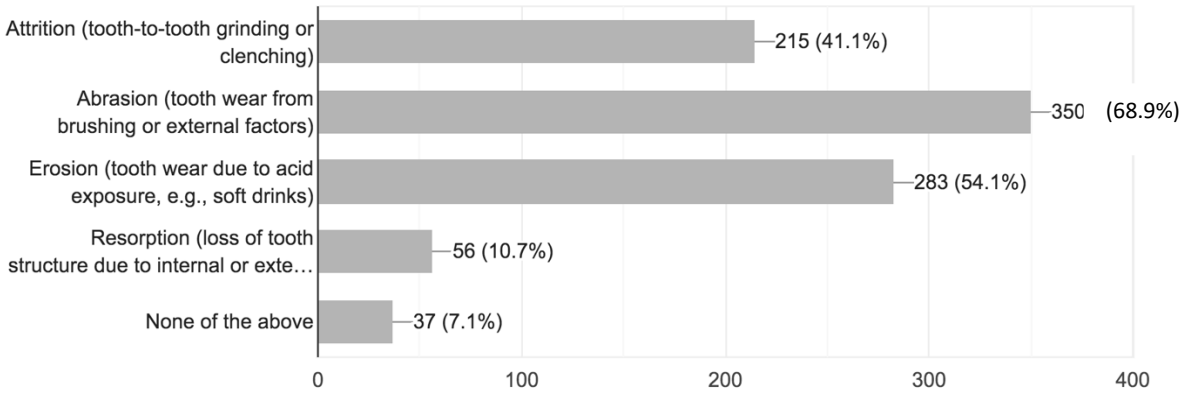


Figure 4: Awareness of tooth wear conditions among participants, with the highest familiarity for abrasion (68.9%), followed by erosion (54.1%), attrition (41.1%), and resorption (10.7%). A small portion (7.1%) is unfamiliar with any condition

Prevalence of Tooth Wear Symptoms

The chart illustrates participants' experiences with symptoms of tooth wear, such as sensitivity, flat teeth, or notching near the gum line. A total of 45.5% (238 individuals) reported experiencing these symptoms, while the majority, 54.5% (285 individuals), indicated that they had not experienced any such symptoms. This suggests that nearly half of the population has encountered some form of tooth wear symptoms. As shown in **Figure.5**

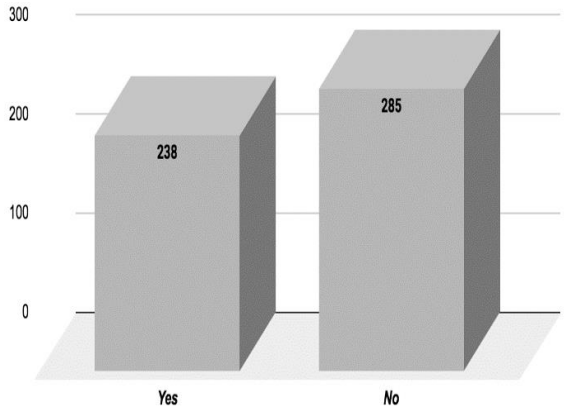


Figure 5: Prevalence of tooth wear symptoms, with 45.5% of participants experiencing symptoms such as sensitivity or flat teeth, while 54.5% reported no symptom

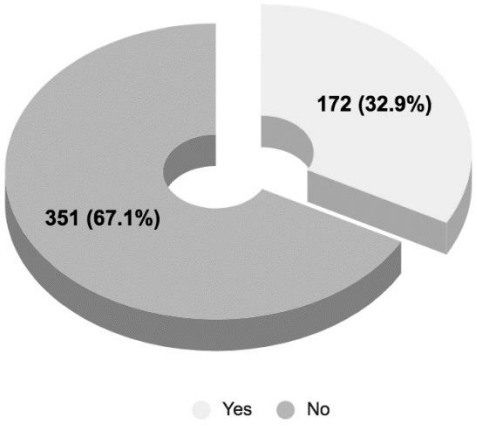
Awareness and Prevention

Awareness of Non-Bacterial Tooth Substance Loss

The chart presents responses to the question: "Were you aware that tooth substance can be lost due to non-bacterial factors such as grinding, abrasion, or acid erosion?" Out of the total respondents, 67.1% (351 individuals) were unaware of this fact, while 32.9% (172 individuals) were aware before participating in the study. **Figure.6**

A chi-square test was performed to evaluate whether the observed difference between the two groups (aware and unaware of non-bacterial factors causing tooth substance loss) was statistically significant. The test yielded a chi-square statistic of 61.26 and a p-value < 0.0001.

The results also revealed that bruxism was reported by 30% of participants and 58.3% of participants consumed acidic beverages occasionally, 18.4% several times a week, and 18.9% daily. This finding highlights a considerable gap in awareness regarding non-bacterial factors that contribute to tooth damage. It emphasizes the need for enhanced education on these causes, including grinding, abrasion, and acid erosion, in order to prevent further dental damage.



Figur.6. Awareness of Non-Bacterial Tooth Substance Loss Before the Study: 32.9% (172 individuals) were aware. The difference is statistically significant (χ^2 = 61.26, p < 0.001)

DISCUSSION:

The increasing prevalence of non-bacterial tooth substance loss (NBTLS) among younger populations, particularly university students, is an emerging concern in oral health. Despite a general rise in oral health awareness, many remain unfamiliar with the specific non-bacterial factors that contribute to tooth loss. This study underscores the need for targeted interventions that address both knowledge gaps and preventive strategies. The demographic distribution in this research, with a higher representation of younger participants (aged 21–23) and female students (69.8%), mirrors findings from previous studies.[15,16] While the predominance of dental students in the sample may explain the higher awareness and engagement with oral health topics, this skew limits the generalizability of results to non-dental and male students. Gender disparities in health research, as seen in similar studies,[17] suggest that future research should employ stratified sampling to ensure a balanced representation across demographic groups.

In terms of oral health practices, 57.9% of participants reported brushing their teeth twice daily, and 38.2% visited the dentist every six months, aligning with global recommendations.[18,19] However, 3.6% of participants indicated they never visited a dentist, signaling an important gap in dental care access. Similar disparities have been identified by Brown *et al.* (2021),[20] particularly in underserved populations. Addressing these gaps through community-based health programs or subsidized dental services could help mitigate long-term consequences resulting from neglected dental care.

Awareness of NBTLS conditions, such as abrasion (68.9%) and erosion (54.1%), points to a stronger understanding of visible and more common forms of tooth wear. However, lower awareness of less frequent conditions like attrition (41.1%) and resorption (10.7%) highlights significant knowledge gaps. This aligns with findings from previous studies,[21,22] suggesting the need for targeted educational campaigns, especially among dental students. By integrating comprehensive NBTLS education into both public health initiatives and dental curricula, these knowledge gaps can be effectively bridged, ensuring future oral health professionals are equipped to address these lesser-known conditions.

The prevalence of tooth wear symptoms, such as sensitivity and flat teeth (45.5%), reflects findings from similar studies.[13,17] This highlights the importance of early diagnosis and intervention, as many individuals may not seek dental care until they are made aware of NBTLS. Public health efforts should focus on raising awareness about early symptom recognition and promoting timely dental check-ups to prevent further progression of tooth loss.

Behavioral factors such as bruxism (30%) and daily acidic beverage consumption (18.9%) emerged as significant contributors to tooth loss in this study. These findings are consistent with existing literature on the role of lifestyle factors in tooth wear.[8,21] However, a deeper exploration into why these behaviors are prevalent among university students is necessary. Stress, a well-documented aspect of university life, is likely a key factor driving bruxism, as students often face academic pressure, financial concerns, and lifestyle

changes that elevate anxiety levels.[23] The psychological impact of stress is known to manifest physically in oral habits like bruxism, often as a coping mechanism.[24]

In contrast, the frequent consumption of acidic beverages may not only reflect personal choices but also be culturally ingrained, influenced by social trends, peer pressure, and the easy accessibility of these drinks in university environments.[25] In some cultures, sugary and acidic beverages are aggressively marketed to young adults, who incorporate them into their daily routines.[26] Additionally, these drinks are often associated with convenience, energy boosts, and socialization, likely exacerbating their consumption among students. The varied prevalence of these behaviors across different studies suggests that personal awareness and lifestyle choices may differ by region and cultural norms.

This underscores the importance of incorporating lifestyle-focused oral health education into broader preventive strategies. By addressing the stress-related causes of bruxism and the social and cultural factors driving the consumption of acidic beverages, more effective interventions can be developed. Educating students on how stress-induced bruxism and excessive acidic beverage intake contribute to tooth wear could play a crucial role in reducing the prevalence of these harmful behaviors.

Limitations of Self-Reported Data and Online Surveys

A key limitation of this study is the reliance on self-reported data, which is susceptible to various biases, including recall bias and social desirability bias. Participants may have overreported positive behaviors, such as brushing frequency, while underreporting negative behaviors, such as acidic beverage consumption. Additionally, the use of online surveys may have introduced selection bias, as health-conscious individuals are more likely to participate. Despite efforts to maintain anonymity and encourage honest responses, these biases pose significant challenges, as highlighted in similar studies.[27] Furthermore, the self-reported nature of the data may lead to inaccuracies in the assessment of tooth loss symptoms, as participants might not accurately recall or interpret their experiences. Incorporating clinical assessments or objective measures could enhance the accuracy and reliability of future studies, providing a more comprehensive understanding of tooth wear.

Opportunities for Future Research and Practical Applications

This study provides a valuable foundation for further research into the prevalence and awareness of NBTLS. However, future studies should consider employing a more diverse sampling method to include a broader range of participants, especially those who may be less likely to engage in online surveys. Additionally, longitudinal studies could provide insights into the progression of NBTLS over time and the effectiveness of preventive measures. Practical applications of this research include developing targeted public health campaigns that address the gaps in awareness, particularly regarding lesser-known conditions like resorption. Dental professionals could also benefit from continued education on the non-bacterial causes of tooth wear, ensuring they provide comprehensive care and prevention strategies to patients.

CONCLUSION

The findings of this study provide important insights into the awareness and prevalence of non-bacterial tooth substance loss (NBTLS) among Libyan university students. It is clear that while many individuals are aware of common conditions like abrasion and erosion, there is a significant gap in understanding fewer familiar conditions such as attrition and resorption.

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