
Incidence of alveolar osteitis in diabetic patients attending university hospital

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KEYWORDS

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ABSTRACT

Aim: The primary objective of this study is to determine the incidence of alveolar osteitis in diabetic patients. While the secondary objectives are to evaluate the relationship of alveolar osteitis in diabetic patients and age, assess the incidence of alveolar osteitis between diabetic vs. non-diabetic patients, evaluate the relationship of alveolar osteitis between males and females, and finally to observe the incidence of alveolar osteitis between smokers and non-smokers.

Materials and Methods: The design of the research is a cross sectional study intended to assess the incidence of alveolar osteitis among diabetic patients.

Results: Data were analyzed using SPSS software. This research paper consisted of a sample of 100 subjects, of whom 61% were aged between 20-30 years; 58% were males; 30% were medical students; 66% were smokers and 10% had smoked immediately after tooth extraction; 29 % were diabetic patients controlled with medication and diet. The majority of the participants, 75%, underwent extraction in the a lower jaw and 99% involved posterior teeth, whereas 38% did not recall when the extraction had been done. In 63% of subjects pain was the most experienced complication after the extraction, which occurred between 1st -3rd day in 42% of the cases. The type of pain was sharp in 37% of cases and many, 33%, had pain radiating to the jaw area. Halitosis was experienced by 26% of the subjects and 69% of them did not recall when they had started experiencing the bad smell. 37% visited the dentist for a follow-up visit after 1 week and only 37% had knowledge about alveolar osteitis. 39% of the subjects did experience alveolar osteitis and 44% perceived the cause to be due to not following the dentist's instructions.

Conclusion: This study investigated the incidence of alveolar osteitis between diabetic and non-diabetic patients and among Gulf Medical University students and patients in the teaching hospital. The sample subjects were asked to fill a questionnaire then data was collected and analyzed. Males had higher experience of alveolar osteitis than females. However, on the contrary, other studies did not support that, and this could not reflect the true incidence and further investigations are required. Mandibular extractions had higher risk of alveolar osteitis than maxillary extraction. Pain was the most reported complication experienced after the extractions and the pain radiation was mostly to the jaw. Additionally, none of the previous studies in the literature review have considered asking the participants about their previous extraction experience date. However, within the limits of this research paper, the results were acceptable. In future research papers, a longitudinal study could be conducted, in which the subjects could be followed and an accurate blood glucose level could be specified to be able to generalize the results.

Introduction

Exodontia is one of the commonest procedures in oral surgery and dentistry (1). It may take different forms such as routine extraction or surgical complicated procedure. There are many complications associated with the extraction procedures such as pain, bleeding trismus and dry socket (2). Dry socket is considered the most common major complication that follows

extraction of teeth/tooth in oral surgical procedures (2). It is a painful acute inflammation of the alveolar bone around the extracted tooth and it is depicted by severe pain, breakdown of the clot formed within the socket making the socket empty (devoid of clot), and often filled with food debris (3). Usually there is mild swelling and redness of the gingival, halitosis, bone exposure, and severe tenderness on examination.

The specific etiology of alveolar osteitis is not well understood, but it is an increased local fibrinolysis leading to disintegration of the clot. Nevertheless, several local and systemic factors are known to be contributing to the etiology of alveolar osteitis (4,5). One of the contributory factors is the surgical trauma and the level of difficulty of the surgery which may play a significant role in the development of this condition. Other factors such as increased bone density, decreased vascularity, and reduced capacity of producing granulation tissue are responsible to show more alveolar osteitis in the mandibular third molar areas (5). Additionally, systemic diseases such as diabetes mellitus predispose patients to a higher risk in developing alveolar osteitis due to altered healing (6). Huang et al. (2013) worked on a study and their aim was to determine whether there is any difference in delayed healing after dental extractions in Type II diabetics, oral hypoglycemics and non-diabetic patients. The prospective patients referred for dental extractions were divided into two groups: known diabetics and nondiabetics. Their study did not support that diabetics had increased delayed healing. They observed that type II diabetics on oral hypoglycaemics must be treated the same as non-diabetic patients for extractions (7). Jha et al. (2014) talked about the common oral manifestations in diabetic patients. It was found out that one of the most frequent oral manifestations in diabetic patient is dry socket due to the reduction of blood supply to the socket and the reduced wound healing after extraction (8). Karbassi et al. found that the rate of prolonged bleeding and incidence of dry socket between two groups at socket blood sugar levels under 126 mg/dL and comparison of the frequency of prolonged pain, fever and infection between two groups at socket blood sugar levels ≥ 126 mg/dL presented statistically significant differences (9). Doumani et al. observed that dry sockets were more common and frequent in the mandible than the maxilla. About 38.3% of the dentists thought that the cause of dry socket is trauma during extraction, while 73.9% believed that bacterial infection was the cause of dry sockets (10). Al Hindi found that the total reported cases of dry socket development were 7 cases, 6 of which were females. The cases reported were related to extractions in the mandible (11). Khan et al. reported that the frequency of dry socket was notably higher in smokers and that its incidence is higher in the age group between 21-30 years (26.8%) (12).

With this background we conducted a study to determine the incidence of alveolar osteitis in diabetic patients. We also intended to evaluate the predisposing factors that contribute to the occurrence of alveolar osteitis.

Materials and methods

A case-controlled cross sectional study was carried out at the Gulf Medical University and its teaching hospital in Ajman. The proposal was submitted to GMU ethics committee for approval. The study was performed through a questionnaire that was distributed to a sample of 100 subjects, which included controlled diabetic patients and a control group recruited from Gulf medical university students and patients at the Thumbay Hospital Al Jurf Ajman. All the patients with controlled diabetes, who had been submitted to extractions of lower posterior teeth and who agreed to sign the consent form were included in the study. Those who did not wish to participate in the research were given the opportunity to refuse to participate. The investigator ensured that all subjects enrolled for the study received adequate verbal and written information about the purpose, procedure and benefit of the study. The interviewer obtained written consent from participants before administering the questionnaire.

Cases of anterior extractions, non-controlled diabetes and extractions in the maxilla were excluded. A standard written consent form was used. Data were collected using the interview-based questionnaire, which was prepared after an extensive review of the literature and eventually validated by 3 experts (maxillofacial specialist, oral medicine specialist, and oral radiology specialist). The questionnaire included three parts. Part 1 included the socio-demographic profile of the participant (age, gender, education level, and occupation); part 2 included details of dental history, part 3 focused patient's knowledge of alveolar osteitis. Data were analyzed with SPSS software and Chi square test was performed for associations.

Results

The study was performed on a sample of 100 subjects, 61% of whom were in the 20-30 years age group, 58% were males and 30% were medical students; 66% were smokers and only 10% had smoked immediately after tooth extraction. Twenty nine percent of the subjects were controlled diabetic patients under medication and diet. The majority (75% of the participants) had a lower extraction experience and 99% removed their posterior teeth, whereas 38% did not recall when the extraction was carried out. Pain in 63% was the most experienced complication after the extraction which occurred between 1st -3rd day in 42% of cases. The type of pain was sharp in 37% of cases and many (33%) had pain radiating to the jaw area. Halitosis was experienced by 26% of the subjects and 69% of these did not recall when did they had started experiencing the bad smell. As for the follow-up visit, 37% visited the dentist after 1 week and only 37% had a knowledge about alveolar

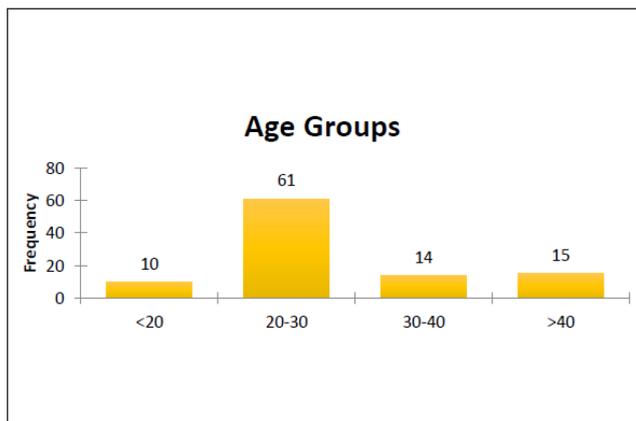


Figure 1 Age of subjects

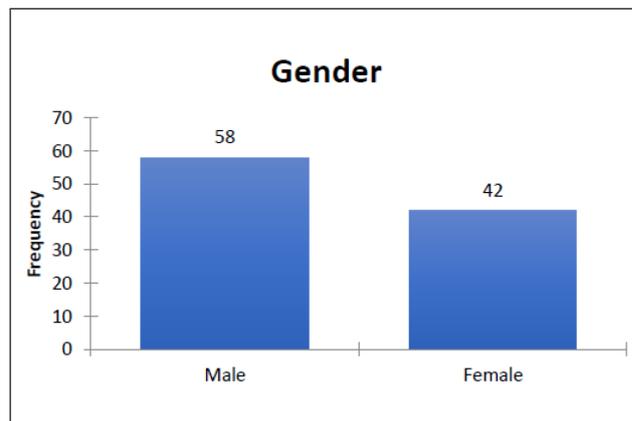


Figure 2 Bar graph showing the number of males compared to females

osteitis. 39% of the subjects did experience alveolar osteitis and 44% perceived the cause to be due to not following the dentist's instructions. As for the age groups, n. 10 subjects were less than 20 years old, n. 6 subjects were in the age group of 20-30 years, n. 14 in the 30-40 years age group, and n. 15 were older than 40 years (Figure 1). When the occurrence of dry socket was compared between the different age groups, a statistically significant difference ($P < 0.0001$) was observed. When the gender of the subjects was analyzed, 58 participants were males compared and 42 female subjects (Figure 2).

The majority of subjects (n. 30) were medical students, followed by an equal number of employees (n. 18) from both the private and the public sector; n. 12 subjects were professionals who run their own business and only n.13 subjects were non-medical students; laborers were only n. 9 participants in the study. When habits of the study subjects were evaluated, it was observed that n. 66 were smokers, and n. 34 did not smoke. When the occurrence of dry socket was compared with smoking habits, a statistically significant difference ($P < 0.0001$) was observed.

The next aspect of the survey was concerned with the health of subjects. It was observed that n. 29 of the patients were diabetic, and n. 71 were non-diabetic patients. All of the 29 diabetic patients were controlled with medication and diet. When the occurrence of dry socket was compared between diabetic and non-diabetic subjects, a statistically significant difference ($P < 0.0001$) was observed. When enquired about previous history of extraction, the majority of subjects, n. 38 did not recall their extraction dates, n. 37 had their tooth extracted one year before, n. 21 had undergone extractions in the previous month, and n. 4 had been extracted one week before.

When the extraction sites of the patients were analyzed, it was observed that n. 75 extractions were

carried out in the mandibular region and n. 25 in the maxilla (Figure 3). When the occurrence of dry socket was compared between upper and lower jaw, a statistically significant difference ($P < 0.0001$) was observed. When the extraction site was further evaluated for location in the arch, it was observed that n. 99 extractions were carried out in the posterior region and only n. 1 in the anterior region. On enquiring about smoking after extraction, 10% of the respondents answered in affirmative whereas 90% did not smoke after extraction. When complications after extraction were further tested, n. 64 of study subjects complained of pain on the day of tooth extraction and (n=36) did not feel any kind of pain. When the nature of pain was considered, n. 27 individuals experienced dull/boring ache pain, n. 8 individuals experienced a throbbing/burning pain. Many individuals (n. 37) had a sharp type of pain, while (n= 28) subjects did not experience pain.

On the evaluation of the presence of bad breath, n. 74 respondents reported bad breath and n. 26 had no such experience. When asked about the duration of bad breath, in n. 9 individuals it lasted 1-3 days after extraction, n. 17 had bad breath for 3-5 days, whereas n. 5 had bad breath after 1 week. When asked about the causes of dry socket, n. 44 reported that it was not following instructions after extraction, n. 16 thought that eating and drinking on the site of the extraction could be the cause, n. 39 believed that it was caused by infection and n. 20 reported trauma as the cause (Figure 4).

Discussion

Alveolar osteitis is defined as an extraction socket where the blood clot has not formed and is associated to pain (2). It is one of the most common complications following teeth extraction in oral surgery (1). There is no clear etiology for the main cause of alveolar osteitis. However, there are multiple

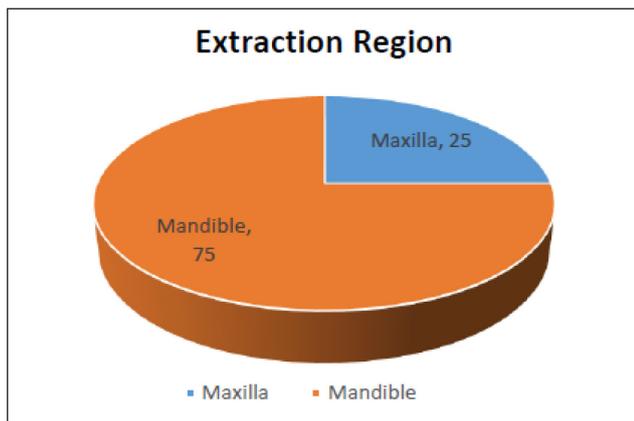


Figure 3 Distribution of site of extraction

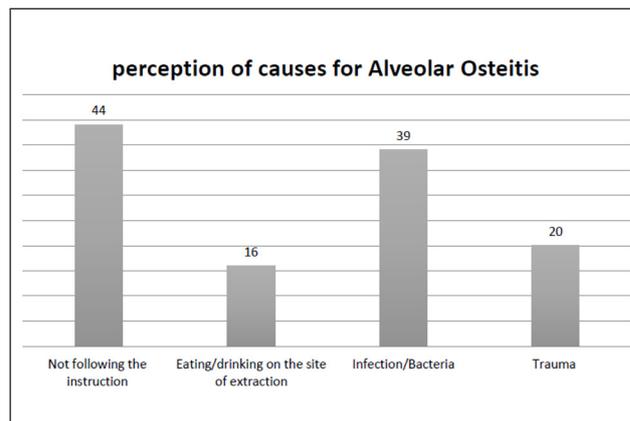


Figure 4 Bar graph shows the opinion of the participants on the cause of alveolar osteitis

factors that contribute to its occurrence after an oral surgery procedure, ranging from factors related to the dentist or surgeon to factors associated with the compliance of the patient. The factors are traumatic or difficult exactions, systemic diseases such as diabetes mellitus, smoking habit, and the failure to follow the post-operative instructions (1).

The overall incidence of alveolar osteitis is about 3.9% (2). When comparing its frequency in maxillary and mandibular arches, it is more common in the mandible due to the type of compact bone and the difficulties of extraction of lower teeth, which may lead to trauma during the surgical removal. It is more common in posterior teeth than anterior ones and more specifically in lower 1st and 3rd molars. Another risk factor is gender: females have higher risk of developing alveolar osteitis than males and that could be due to the hormonal difference between the two genders. Certain bad habits such as smoking or poor oral hygiene could contribute to alveolar osteitis.

As mentioned above, systemic factors such as diabetes mellitus could increase the risk of alveolar osteitis. Diabetes is a metabolic disorder in which the ability to regulate the blood glucose level is disturbed (11). Many diabetic patients are more susceptible to infections and they experience delayed and poor wound healing. The reason behind this type of complication in diabetes is the changes that occur in the capillaries as the altered permeability and the stress-induced tissue hypoxia (11). With regard to the number of published studies about the incidence of alveolar osteitis in diabetic patients, there is not enough evidence for a thorough understanding of the mechanisms and the causative factors of alveolar osteitis in these patients. This type of complication after the extraction of teeth is on the rise and it is very important to have a full, clear knowledge about all the possible risk factors associated with it. This will help bring out social awareness on this issue and

maintaining oral and general health of individuals. For that reason, this study is made to spot a light on the incidence of alveolar osteitis in diabetic patients at Gulf Medical University, Thumbay Hospital, Ajman, UAE.

The sample of this study included 100 subjects which was based on the primary article of previous studies conducted. The study was conducted using a questionnaire which was distributed to students and faculty staff who had previously given their consent and permission.

Questions regarding the socio-demographic status of the participants were tested. Most participant (61%) were in the age group of 20-30 years, which could be explained by the fact that most of the students belong to that age group. A study by Qadus et al. showed a similar result, with a high incidence of alveolar osteitis in 20-40 years old (2). Another 15% includes the age group >40 years. A study by Karbassi et al. had an average age of 44 and 43 years (16). The third age group (14%) was between 30-40 years. The lowest percentage (10%) was for the age group of <20 years, which may suggest that only few students of first and second year participated in the survey and no previous studies have documented any statistics about that age group. The gender distribution in this study was 58% for males and 42% for females. The difference was statistically significant when taking in account the incidence of alveolar osteitis. A study by Qadus et al., observed that females in their study were 2.37 times more likely to develop dry socket in contrast to males.

Also, a study by Akinbami et al. found out that 63.2% of females had a higher incidence of dry socket when compared to males (1). This reflects that there are more male students at GMU compared to females and the gender predilection difference could be due to the bias in the reporting of the patients to the hospital.

When the occupation of subjects was evaluated, the

medical student category had the highest rank (30%) and this is because the survey was distributed among medical students at GMU. The lowest category was to the group that own business 9%. Certain habit that were considered and could have an impact on the incidence of alveolar osteitis was if the patient had a history of smoking habits. There is a significant difference between smokers and non-smokers and the experience of dry socket. In this study 66% were smokers compared to 34 % non-smokers. Other studies showed compatible results. Abu-Younis et al., conducted a study and found out that the frequency of dry socket in smokers was higher (12%) than in non smokers (4%) (13). Another study by Doumani et al. showed that 94.8% of the internship dentists agreed that the prevalence of dry socket is higher in smokers than the non-smokers (10). Another study by Khan et al., reported that heavy smokers (i.e. who smoked >15 cigarettes per day), had 6.1% higher risk of developing dry socket (12). In addition, Bowe et al. reported that the effect of smoking is a reduced blood supply to the extraction socket which leads to dry socket. This could be due to the activity of vasoconstrictive nicotine on the tissues (14).

Diabetes is a very common systemic disease and it is a risk factor for the development of alveolar osteitis. In this study, out of 100 subjects, 71% were non-diabetic and 29% were controlled diabetic patients (uncontrolled diabetic patients were excluded from the study). The participants were asked about their last extraction experience, 38% of them did not recall when it was performed, while 37% had an extraction one year before, 21 had it one month before, and only 4% had their extraction in the previous week. This could impact the patient ability to accurately recollect their previous extraction experience with dry socket because majority of the patients either did not recall, or had undergone extraction one year before. Additionally, none of the previous studies in the literature considered asking the participants when their previous extraction experience had occurred.

There was a statistically significant difference between the occurrence of alveolar osteitis in maxillary and mandibular arch. This study had 25% maxillary extractions, and 75% mandibular extractions. Other studies showed similar results of higher incidence of alveolar osteitis in the mandible than maxilla (1,10). Gowda et al. found that the incidence of alveolar osteitis was 10 times higher in the mandible than the maxilla. The reason could be the fact that the mandible is composed of compact bone which is denser than the spongy bone in the maxilla. Traumatic extractions are also more common in the mandibular arch compared to maxilla, which may cause more alveolar osteitis in the mandible (4). Results were also statistically significant when it came to the site

of extraction. Posterior extractions have higher risk of developing alveolar osteitis than anterior extractions. In this study, 99% of the patients experienced posterior extractions. A study by Anyanechi found out that molar socket was more predominant in both jaws (15). A possible explanation for the difference could highlight that posterior teeth are more neglected when considering oral hygiene by the patient, which may lead to earlier loss of those teeth than others.

The participants were asked to record the complications they had experienced after extraction. Pain was the most reported symptom (63%), followed by bleeding (21%), and swelling (14%); 14% could not remember. The type of pain they experienced was sharp type of pain (37%) which was felt generally between 1st to 3rd day. These results agree with the literature and previous studies that were published (9). The pain is constant sharp pain that increases in intensity on the 72 hours following the exactions. A study by Khan showed that pain was the most common complaint from the patients (12). The pain could sometimes radiate to several areas in the head and neck region depending on the arch of extraction. In this study, pain radiation was to the jaw (33%), to the head (21%) and to the jaw (17%). However, a study by Doumani et al. reported that the most radiating pain was to the head and neck (10). Another study by Fridrich et al. found that pain was radiating to the ear and the temporal bone (16). Pain radiation to the head and neck areas may vary from one patient to another and on whether the extraction was done in the upper or lower jaw. Additionally, some patients may tend to exaggerate their pain response and over react to it. A study by Karbassi et al. found that prolonged bleeding was common, particularly in diabetic patients compared to a control group (9). Other studies considered the experience of fever and trismus, which was not investigated in this study.

In this study, the onset of dry socket occurred (42%) within the 1st to 3rd day. This has been noticed by other authors such as Kolokythas et al., who found out that the onset of alveolar osteitis was in the 1st to 3rd day of extraction and about (95%) reported to be within a week (6).

In this study the experience of foul smell after the extraction, only (26%) experienced bad smell or breath. It has been suggested that the foul odor could be resulting from the accumulation of food debris, bacterial products inside the extraction socket. The literature supports the presence of bad smell or otherwise called halitosis after the surgical extraction of teeth with dry socket. A study by Gowda GG, mentioned about the clinical features of alveolar osteitis which included intense pain and halitosis (4). In a study by Doumani et al., about 81.7% of internship dentists believed that alveolar osteitis is accompanied

by noticeable halitosis and foul taste (10). However, other studies such as the one by Khan et al. found that approximately 24% of the patients had similar clinical features of pain but without halitosis (12).

In this study, since the questionnaire investigated a previous extraction case, there is a high possibility that the patients could not recall the exact sign and symptoms they had faced. About the investigation on how the patients followed up with the dentist after extraction, 37% followed up with the dentist after 1 week, 35% did not follow-up, 18% within 2nd to 5th day, 8% could not remember if they ever followed with their dentist after their extraction, and only 2% followed up within the 1st day post extraction. The reason why this question was asked is related to the severity of the case, since true alveolitis is accompanied by the symptoms of dry socket and requires follow-up visit. In a study by Ahmedi et al., which was focusing on the effect of chlorhexidine mouthwashes on the occurrence of post extraction dry socket (18), patients were asked to come back for a follow-up visit after 48 hours and after 7 days to evaluate the presence or absence of any dry socket-related symptoms (18). When questioned about the perception of possible causes for alveolar osteitis, the answers were different and tended to be a combination of many factors. In this study 44% thought that the cause of alveolar osteitis is not following the dentist's instructions after the extraction, 39% thought it was related to infection, 20% believed it was related to trauma and complications during the extraction, while only 16% considered eating and drinking on the site of extraction to be the cause.

Bulter et al, suggested that the cause of alveolar osteitis is bacterial infection, trauma, and biochemical agents (18). In the same study, trauma was chosen by 38.3%, while bacterial infection was supported by 73.9% of the participants. (18) Birn et al suggested that the factors that initiate the fibrinolytic activity is surgical trauma and bacterial infection (20). When it comes to diabetes and the risk of infection, there is limited relationship between them. In case of trauma, a study by Larsen found out that inexperienced surgeons had a higher chance of causing trauma during extraction, which may contribute to the overall dry socket later, this was more observed in mandibular third molar extractions (21). About 37% of the subjects had a background knowledge about what alveolar osteitis is, which is also more commonly known as dry socket. Other studies have investigated the knowledge of dentists instead of the patients themselves. A study by Doumani et al. assessed the knowledge of internship dentists in Saudi Arabia regarding dry socket (10), other studies have explored the knowledge of patients. The importance of considering this background question is to bring out awareness and make sure that

individuals who experience this kind of complication after extraction can manage it or follow-up with their dentist. The experience of dry socket was observed in 39% of the subjects, out of these 29% were diabetic. A significant difference was noticed between the incidence of alveolar osteitis among diabetic and non-diabetic individuals. The reason behind this could be linked to the effect of diabetes and high sugar levels on the diabetic socket. A study by Gupta et al. found out that a major limitation of wound healing with random blood sugar above the normal is having the tendency to develop dry socket (5). However, a study by Hassan et al, who investigated the healing of extraction socket, they found there were no statistical differences between diabetic state and delayed healing (the result varies depending on the sample size and the population to be studied).

Conclusion

This study investigated the incidence of alveolar osteitis between diabetic and non-diabetic subjects, who were asked to fill a questionnaire then data were collected and analyzed. Unlike other studies, males had higher experience of alveolar osteitis than females, as this could not reflect the true incidence, further investigations are required. Mandibular extractions had higher risk of alveolar osteitis than maxillary extraction. Pain was the most reported complication experienced after the extractions and pain radiated mostly to the jaw. Additionally, none of the previous studies in the literature had considered asking the participants about their previous extraction experience. Within the limits of this research work, the results were acceptable. In future research papers, a longitudinal study could be conducted, in which the subjects could be followed and an accurate blood glucose level could be specified in order to generalize the results.

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