Prevalence and Association of Dry Socket in Oral Health and Dental Management

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Abstract

Objective: To find the frequency, prevalence and risk factor/s associated with Dry Socket at a university hospital in Karachi. Material and methods: This prospective cross sectional study was performed in the Oral and Maxillofacial Department at a private university hospital. A total number of 1246 in as many patients extractions were carried out and the patients were requested to come back if any complications such as pain were experienced up to one week after extraction. On follow-up visit, patients were examined for the signs of dry socket. Questionnaires based on two sections were distributed to all operators: a) information inquiring the demographic profile of the patient together with systemic diseases; smoking status; consumption of antibiotics; and oral contraceptives. b) The patients' compliance to post-operative instructions, technique of anesthesia, level of experience, and location of tooth or teeth extracted were recorded. Results: A total of 41 (3.3%) extractions were found to be effected by dry socket in patients between ages of 11 to 80 years old. There was a slightly higher but statistically insignificant prevalence of dry socket noted in female 3.7% as compared to male 2.6%. 30 people were noted as heavy smokers (consuming >15 cigarettes per day). Following extractions, in those who smoked the prevalence of dry socket was statistically higher in smokers. 6.1% of the smokers developed dry sockets, as compared to 1.9% non-smokers. The prevalence of dry socket was significantly higher in Mandibular extractions (8.35%) than in maxillary extraction cases (1.4%). Conclusion: The prevalence of dry socket was significantly higher in smokers. There were more incidences of dry socket following open extraction as opposed closed extractions. Patients' medical history, age, gender, medications (pre/postoperative), extraction site and indication for extraction had no association with the development of dry socket.

Key Words: Teeth, Dry socket, Prevalence, Smoking, Surgical extraction

Introduction

For the first time, the terminology 'dry 'socket' was used in 1896 by Crawford [1]. While there are various terms used to describe dry socket; such as localized osteitis, localized osteomyelitis, necrotic socket, and postoperative alveolitis, in most literature and clinical practices it is commonly called as 'dry socket'. Hence, this article will use the generic term 'dry socket'. The condition of dry socket is known to be most common complication as a result of extraction. The pathogenesis and etiology of dry socket is still controversial; however, the disintegration of the blood, as a result of fibrinolysis is most accepted theory in current literature [2]. Various confounding factors contribute to the prevalence of dry socket; for instance, level of experience of the operator, traumatic, difficult and prolonged extraction [3], gender [4], smoking [5], site of extracted tooth [6], pre-existing infection [2,6], oral contraceptives [7]. Other possible risk factors include diabetes mellitus, failure to form blood clot, lack of compliance with post extraction instructions, gingivitis and periodontitis [6]. Dry socket is more common following the extraction of the mandibular third molar [8]. Literature associated with dry socket shows differences in the incidence of dry socket. Petri and Wilson's [9] studies shows 0% incidence; yet Erickson et al.'s studies [10] show 35% incidence of dry socket. The main objective of this non-interventional prospective study is to find the frequency, prevalence and risk factor/s associated with dry socket at a university hospital in Karachi, Pakistan.

Material and Methods

This prospective cross sectional study evaluates the prevalence and association of dry socket in a university hospital in Karachi, Pakistan. This study follows the Helsinki Declaration on medical protocol and ethics, and an approval of the research ethics committee of a private university was firstly obtained. Two specially designed questionnaires were completed from 1 March, 2015 to 1 July, 2015. One questionnaire was completed for every patient who had extraction in the Clinic. The other questionnaire was completed for every patient who was requested to come back in case of increased persistent pain for up to one week post-extraction. In this case, patients were examined for the signs of dry socket. Questionnaires were designed according: to demographic profile of the patient together with systemic diseases (diabetes, hypertension, imbalance of vitamin levels); smoking status; consumption of antibiotics; and oral contraceptives. Number of anesthesia cartridges, technique of anesthesia, level of experience, and location of tooth or teeth extracted were also recorded by the clinician (Questionnaire 1 and 2).

Description of the Sample: The number of patients included in this study were 1246 out of which, 722 were female (58%) and 523 were male (42%). All of them went through surgical and non-surgical extraction of teeth.

Data analysis

Data collected was analyzed using SPSS software version 20, with confidence interval of 95%. This study used chi-square tests for descriptive statistics and bi-variant data analysis. Multiple binary logistic regression was also used to test for the significance of associations between certain variables after adjusting the effect of others. The critical level of significance was set at $P<0.05$.

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Results

A total number of 1246 permanent teeth were extracted in as many patients. Only single extractions were included in the study. While maxillary anterior and posterior teeth constituted 294(28%) and 198(16.7%) of the total extractions respectively, mandibular anterior teeth and posterior teeth constituted 506(39.1%) and 248(15.2%) out of the total extractions respectively. There were 723 female (58%) and 523 male (42%). A total of 41 (3.3%) extractions were found to be effected by dry socket in patients between age 11 to 80 years old. 27(66%) dry sockets occurred in female patients and 14(34%) were found in male patients (*Table 1*).

There is a slightly higher prevalence of dry socket noted in female 3.7% (27 dry sockets in 722 extractions) as compared to male 2.6% (14 dry sockets in 523 extractions) but the difference was statistically insignificant.

Table 1. *Prevalence of dry socket by gender.*

Patients	Total no. of extraction (%)	No. of dry socket (%)
Gender		
Female	723 (58%)	27 (66%)
Male	523 (42%)	14 (34%)
Total	1246	41

Table 2. *Reasons for extraction: cases of dry socket.*

Reasons for Extraction	No of cases (%)
Dental caries	20
Periodontal Disease	10
Prosthetic Reasons	5
Impaction	4
Orthodontic Reasons	1
Pericoronitis	1

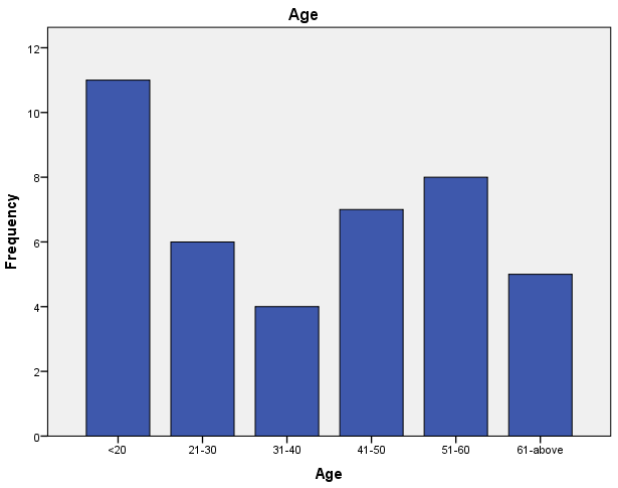

Figure 1. *Distribution of dry socket prevalence in different age groups.*

As shown in *Table 2*, there were various reasons for teeth extraction in the age groups studied. The primary reason was dental caries; in 41 cases of dry socket, 20 teeth were extracted due to dental caries. Other reasons were periodontal disease (10 cases), pre-prosthodontic extractions (5 cases), impaction (4 cases), pericoronitis (1 case) and orthodontic (1 case).

Patients under 20 years had the highest prevalence of dry socket, and patients between 31-40 years of age had lowest prevalence of dry socket as shown in *Table 3*. This difference was statistically insignificant (*Figure 1*).

Table 3. *Prevalence of dry socket by age groups.*

Age (year)	Total # of extraction	# of Dry Socket
<20	424	11(2.5%)
21-30	100	6 (6%)
31-40	93	4 (4.3%)
41-50	225	7 (3.1%)
51-60	303	8 (2.6%)
61-above	101	5 (4.9%)
	1246	41

As it is shown in the *Figure 2* above, the majority of dry socket cases were found in mandibular teeth 33(80.4%) as compared to maxillary teeth being 8(19.5%). The mandibular third molar 16(39.02%) had the highest frequency of dry socket. The mandibular second molar 10(24.3%) followed by premolars 9(21.9%) followed by maxillary first molar 6(14.6%).

Statistically significant difference was noted in maxillary and mandibular extractions. Following maxillary extractions, the prevalence of dry socket noted as 1.4% and mandibular extractions 8.3% which was statistically significant ($p<0.05$).

The main complain of patients was pain associated with dry socket. In addition, there were some clinical features associated with pain which include denuded bone, halitosis, and empty socket present in 18(43%) patients. The same clinical features without halitosis were present in 10(24%) patients. Moreover, the same clinical features without denuded bones were noted in 6(14%) patients. Pain with empty socket found in 7(17%) cases. Pain and empty socket were found in 41(100%) patients, out of which denuded bone was noted in 28(68%). Furthermore, halitosis was present in 24(58%) patients.

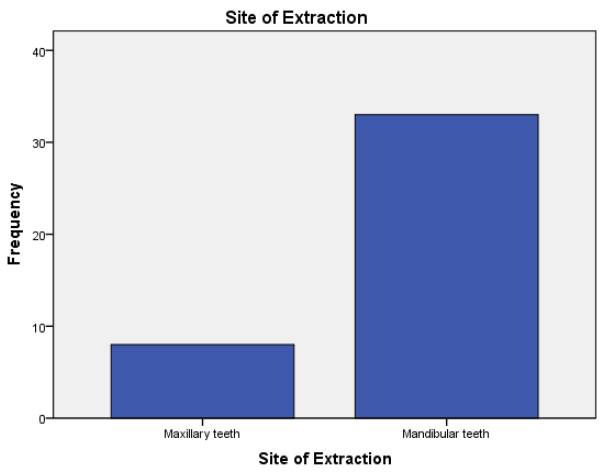

Figure 2. *Prevalence of dry socket in mandibular and maxillary teeth.*

Out of 1246 patients, 407 were smokers (11 female and 396 male). There were thirty people were noted as heavy smokers (consuming>15 cigarettes per day). Following extractions in those who smoked, the prevalence of dry socket was 6.1% (407 extractions were found to have 25 dry socket) as compared to 1.9% (1239 extractions were found to have 16 dry socket cases). This difference was statistically significant (P=0.001).

Furthermore, following non-surgical extraction of teeth, the prevalence of dry socket per tooth was 2.4% (24 out of 983), while surgical extraction was 6.4% (17 out of 263). This difference was statistically significant (P=0.002).

The prevalence of dry socket was 2.0% (22 of 790) and 1.03% (2 of 193) following closed extractions and open extractions, respectively but this difference was statistically insignificant. The prevalence of dry socket was 6.7% (14 of 208) when extractions were performed by postgraduate students and 5.4% (3 of 55) when performed by consultants. This difference was also statistically insignificant (P=0.553).

Participants (patients) received verbal postoperative instructions from the operators. There were 1200 patients who were prescribed post-extraction medications. Analgesics (paracetamol, ibuprofen or both) were prescribed to 496 patients, and a combination of antibiotics (metronidazole, amoxicillin or both) and analgesics prescribed for 750 patients.

There was no statistically significant association between the development of dry socket and patient's age, operator experience and presence of systemic diseases (Diabetes, Hypertension imbalance of vitamin levels).

Discussion

Dry socket is an important clinical complication characterized by severe pain starting on second or third day after the extraction of teeth. The main cause of clinical complication is due to an increased fibrinolysis which leads to dissolution of the clot. Some of anti-fibrinolytic mendicants have the ability to decrease the prevalence of dry sockets when placed topically in the extraction site [11]. The initiating factor of fibrinolytic activity is associated with surgical trauma and bacterial infections [2].

The prevalence of dry socket and its clinical features seem similar to the literature studied on the subject. The overall prevalence of dry socket was 3.3%. This figure is slightly lower as compared to figures found in other developing countries (Sri Lanka) [12]. This variation could be due to criteria of the diagnoses, age of the patient, gender, medical health, surgical technique and skills of the operator including other factors such as excessive alcohol and tobacco consumption.

Gender

Our results show that in females, there was higher prevalence of dry socket as compared to male (*Table 1*) but this difference was statistically insignificant. Similar findings we found in other studies which showed high female preponderance [13]. Some researchers have suggested that this is due to hormonal coupled with oral contraceptive pills that can progress the fibrinolytic actions in blood and women's saliva during the menstrual cycle [7]. Interestingly, in South Asian country context, male consumes more alcohol and tobacco as compared to female [14]; yet the result of this study shows that prevalence of dry socket is higher in female. This could be another research question to take ahead.

Age

The result of the following study show that the prevalence of dry socket is high in the age-group between 21-30 (26.8%), coinciding with the outcomes of other studies [15]. There is no possible explanation for this. However, the existence of well-developed alveolar bone and infrequent periodontal diseases could be a reason why this very age group is involved [16].

Site of extraction

Most of the authors reported specific site of dry socket occurrence, and the mandibular molar area was noted as most commonly affected site [15]. It must be noted that no scientific proof of blood supply scarcity exists due to a typical anatomical structure around the alveolar sockets of the mandibular molars, and no evidence showing any kind of link between blood supply insufficiency and dry socket [2]. Amaratunga and Senaratne have strongly suggested that increased bone density, insufficient blood supply, and a reduced capacity of producing granulation tissue are accountable for the dry socket in the mandibular site, which could explain a higher incidence of dry socket following extraction of third molars followed by first and second molars [12].

It has also been suggested that the aforementioned increased incidence of dry socket in third molars could be due to the difficulty of extractions [13]. It could be explained that firstly, the trauma during difficult extractions involving extensive trauma to the tissues and bone can release the tissue activators secondary to bone inflammation [2]. Second reason could be the decrease in perfusion of blood due to the constriction or thrombosis of blood vessels. On the other

hand, some authors suggest no effects of surgical extractions can be seen on dry socket [17].

The results of this study show a significant difference in the prevalence of dry socket between smokers and non-smokers which oppose the results of other studies conducted on the subject. It has been known that smoking can dislodge the clot by decreasing the tissue perfusion [18]. It also decreases the role of leukocytes important for wound healing. Furthermore, smokers could have poor oral hygiene and failure to adhere to post-operative instructions, which could result an increase in dry socket [19]. It is stated that patient who smoke on the first surgery day, has higher chances of dry socket as compared to patient smoking on the second day. Yet, the mechanism is unclear whether it is a direct effect of smoke on extraction side or systemic effect resulting in an increase in dry socket.

In this study, clinical picture of dry socket was similar to the dry socket's literature. Empty sockets and pain were noted in all patients which is comparable to other authors [20]. Bare bone, while being reported as a potential clinical feature of dry socket-in the named study, noted in 68% patients, and was more common in simple extractions as opposed to surgical extractions. Yet, it is also likely that bare bone can be found in surgical extractions but was obscured by the sutured flap over the socket orifice. Furthermore, patients who had a poor oral hygiene, the halitosis was frequent. One of the causes of this problem is the foodstuff impaction on an empty socket and its fermentation by bacteria [12].

Non-surgical extractions were performed by postgraduate and undergraduate students and surgical extractions were carried by consultants and postgraduate students. There was no significant difference in the prevalence of dry socket following non-surgical extractions performed by undergraduate and postgraduate students ($p=0.558$) and following surgical extractions performed by postgraduate students and consultants ($p=0.513$). This study fails to show operator's (undergraduates, post graduates and consultants) experience as a risk factor for dry socket occurrence. Although the similar observations were made by Larsen [21] and Field et al. [16], it is different from those of Oginni et al. [15] and Alexander [22] who reported that dry socket is more prevalent in extractions performed by less experienced practitioners.

Although postgraduates and undergraduates, both, performed non-surgical extractions, this study failed to produce low prevalence of dry socket in non-surgical extractions carried by postgraduate students which could be due to the fact that postgraduates perform way more challenging extractions as compared to undergraduates. Furthermore, on patients whom the extraction was performed by postgraduate kept their follow- up appointments (and therefore, they could be diagnosed with dry socket) as compared to those patients whose case was performed by undergraduate students.

This study does not show lower prevalence of dry socket in surgical extractions performed by consultants. This could be understood given the number of challenging cases consultants have undertaken as well as variation in the quality of patient they presented. In most cases, patients diagnosed by consultants were considered as high income groups; therefore, it is assumed that they had a low pain tolerance and were attentive to postoperative complication.

The outcome of this study shows no significant association between tooth extraction and the reason for tooth extraction. This is also shown in the studies of other authors [19]; excluding teeth with pericoronitis- linked to a higher prevalence of dry socket. Yet, it has not been shown in this study due to small number of teeth with pericoronitis cases.

Conclusion

The outcomes of this study bring us to the following conclusion:

- The prevalence of dry socket was statistically different among patients who smoke and those who do not smoke.
- There were more incidences of dry socket following surgical extraction as opposed to non-surgical.
- Patients' medical history, age, gender, medications (pre/ postoperative), extraction site and indication for extraction had no association with the development of dry socket.

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Questionnaire 1 used for all subjects.

Please check all that apply

Patient's name		File number	Date
Gender (Male /Female)		Age (Years)	
Smoking: No/Yes			
If yes (Cigarettes/day)			
Medical History			
Medications			
Teeth Extracted			
Reason for extraction	Advanced caries		
	Advanced periodontal disease		
	Orthodontic treatment		
	Pericoronitis		
	Others, specify		
Extraction technique	Simple elevation		
	Root separation		
	Flap without bone removal		
	Flap with bone removal		
Operator	Undergraduates (4th year dental students)		
	Post graduate students;		
	Consultant		
Number of local anesthetic cartridges used			
Post-operative instructions given? Yes/ No			
Postoperative medications prescribed			

Questionnaire 2: Used for subjects with a dry socket.

Please tick all that apply:

Patient's name: …… File number: …… Date…….

Gender: Male/ Female Age: …….years old

Name Socket affected:

Signs and symptoms:

Pain

Empty socket

Bare bone

Halitosis

Others:

Onset of symptoms:

Immediately after extraction

24 hours afterextraction

48 hours afterextraction

72 hours afterextraction

Other, specify

Treatment provided:……..

Packing with Alvogyl

Medications:……