

Article**The Incidence of Dry Socket Development and Its Risk Factors**

Emad H. Abdullah*, Sundus Anwer M. AL-Hamdani, Faaiz Alhamdani, and Khawlah Tarteab Hussein

Ibn Sina University of Medical and Pharmaceutical Sciences, Iraq.

*Correspondence: emad.g@ibnsina.edu.iq. Tel; + 964 7703474425

Available from: <http://dx.doi.org/10.21931/RB/CSS/2023.08.03.100>

Abstract

Dry socket (alveolar osteitis) is the most commonly encountered complication after tooth extraction in humans, and this has been widely reported. Dry socket lesion, although it is a self-limiting condition, the pain and discomfort that the patient complains of leads to lost days at work and many visits to the hospital. The exact and confirmed etiopathogenesis for dry sockets has yet to be well understood. This study aimed to determine the frequency, clinical picture, and risk factors for dry sockets. A total of 995 patients were included in this study. There were 593 (59.6%) male patients and 402 (40.4%) female patients. The age of patients ranged from 14 -70 years, with a mean of 33.9 ± 11.32 years, from January 2013 to March 2015. All consecutive patients were referred to the surgery Department in Al-Karama specialized dentistry center in Baghdad for consultation. A total of 995 patients were included in this study. Out of 995, 68 patients developed dry sockets (6.83%). Those patients who developed sockets were between (18-67) years (mean $33.9, sd \pm 11.32$), most of them in the third decade of life; there were 593 (59.6%) male patients and 402 (40.4%) female patients with a higher percentage of dry sockets than the female group, 33 (48.5%) of 68 cases who developed dry sockets had surgical extraction. There were significant differences in the development of socket pockets between the removal of the two teeth done surgically (51.5%) or non-surgically (48.5%), $p = 0.033$. The frequency of AO reported in this study is higher than the overall incidence of studies registered. There were significant differences concerning the patient's age and dry socket. There is no relationship between smoking and the occurrence of dry sockets found in the present study. It has been shown that the frequency of AO increases in patients with poor oral hygiene in the literature. Clinically, the picture of the dry socket that includes pain, empty socket and exposed bone were found in all patients.

Keywords: Dry socket, frequency, risk factor, oral hygiene, surgical extraction

Introduction

Dry socket (alveolar osteitis) is the most commonly encountered complication after tooth extraction in humans, and this has been widely reported. There are many definitions for dry socket nearly the same which is "pain occurring postoperatively in the extraction site, usually after 24 to 72 hours after tooth removal, associated with the disintegration of blood clot partially or totally within the extraction socket"^[1]. Other signs and symptoms that may occur are radiating pain

towards the ear ^[2, 3], halitosis ^[2, 4], low-grade fever ^[2,3], bare bone ^[5], and regional lymphadenopathy ^[2, 3]. There has been considerable variability in the incidence of dry sockets reported. It ranges between 0.5% to 5% For routine dental extractions^[6,7]. For surgical removal of lower third molars, the incidence varies from 5% and 30% ^[8]. So surgical removal results in about 10 times higher incidence of dry sockets and this has been well documented ^[1]. Dry socket lesion, although it is a self-limiting condition, the pain and discomfort that the patient complains of leads to lost days at work and many visits to the hospital. Nowadays, the success of any operation is estimated by the postoperative period; the shortest postoperative period is the most successful. A clear understanding of the condition will reduce the occurrence of it in patients undergoing dental extraction. As the exact and confirmed etiopathogenesis for dry sockets has yet to be well understood, many factors have been enumerated. In one of the review articles^[9], the authors mentioned many of these risk factors. They divided the articles into supporting or refuting that factors following are some of the risk factors which are attributed to the development of dry sockets have been mentioned in that review article,- Surgical-Trauma and Difficulty of Surgery, Patient's Gender, Mandibular Third Molars, Physical Dislodgement of the Clot, Smoking, Age of the Patient, Local Anaesthetic with Vasoconstrictor, Excessive Irrigation or Curettage of Alveolus, Systemic Disease, Bacterial Infection, Lack of Operator Experience, Oral Contraceptives.

The term dry socket describes the condition of the extraction socket of the tooth when the pain begins. On examination, the extraction socket appears empty, the blood clot is either partially or lost, and some surfaces of the socket bone are exposed. This bone is sensitive and painful to touch. The area of the socket has a lousy odor and Frequently complains of a foul taste ^[5]. The objective of this study was to determine the prevalence and risk factors of dry sockets as a complication of tooth extraction in the Al-Karama specialized dentistry center in Baghdad for consultation.

Materials and Methods

Samples

This represents a prospective observational study. Oral Surgery Department in Al-Karama specialized dentistry center in Baghdad for consultation. It varied from January 2013 to March 2015. All consecutive patients who were referred to our center for dental extractions under local anesthesia were included in this study. Patients who had only deciduous teeth extracted were not included in the study.

A total of 995 patients were included in this study. There were 593 (59.6%) male patients and 402 (40.4%) female patients. The age of patients ranged from 14 -70 years, with a mean of 33.9 ± 11.32 years.

Data collection

The following data were recorded for each patient: biodata, medical history, the reason for extraction, number and type of teeth extracted, time taken for the extraction to be done, amount and technique of local anesthesia, smoking habits, use of oral contraceptives, oral hygiene status, and postoperative medications. If the extracted tooth was an impacted third molar, its depth and angulation were also recorded. All the extractions were carried out under local anesthesia; 2% lignocaine with 1: 80,000 adrenaline. The patients were instructed to return to the clinic if there was any increased or persistent pain in the extraction socket within 7 days.

Diagnosis of dry socket

The term dry socket describes the appearance of the tooth extraction socket when the pain begins. On examination, the tooth socket appears empty, with a partially

or entirely lost blood clot, and some bony surfaces of the socket are exposed. The exposed bone is sensitive and is the source of the pain. The area of the socket has a foul odor, and the patient frequently complains of a foul taste⁵. The following data were recorded for those diagnosed with dry sockets: biodata, day of presentation, day of onset of dry socket, and teeth involved.

Data Analysis

Data were then analyzed using SPSS® for Windows (version 20; SPSS Inc, Chicago, IL, USA). Descriptive statistics and bi-variant data analysis using chi-square tests were done as appropriate. The critical level of significance was set at $P < 0.05$.

Results

A total of 995 patients were included in this study. Out of 995, 68 patients developed dry sockets (6.83%). Those patients who developed sockets et were between (18-67) years (33.9 ± 11.32), most of them in the third decade of life (Table 1).

Age group	No.	%
< or=20	5	7.353
21 to 30	29	42.65
31 to 40	13	19.12
41 to 50	17	25
>50	4	5.882
Total	68	100

Table 1. Distribution of dry sockets by age group.

There were 593 (59.6%) male patients and 402 (40.4%) female patients with a higher percentage of dry sockets than the female group(table 2). 288(28.9%) of these patients were smokers, of whom 235 (81.3% of the total sample) were heavy smokers (smoked more than 20 cigarettes per day), and 19(27.1%) of the smoker patients developed ped dry sockets. While the non-smoker patients who developed dry sockets were 49(72.1%), this means that there is no correlation between the dry socket and cigarette smoking table(2). Eighty-seven anterior teeth and 908 posterior teeth were extracted. All dry sockets developed from the extraction of posterior teeth except for three anterior teeth ($p=0.004$). 26(38.3%) maxillary teeth out of 434(43.62 %) developed dry socket while there were 42(61.7% mandibular teeth out of 561(56.38%) developed dry socket ($p=0.017$)(Table2). A total of 19 (27.94%) of 68 who developed dry sockets had good oral hygiene, while the remaining patients had poor oral hygiene, 72.06% ($p=0.049$) (Table 2). In this study, according to the local anesthesia technique, patients develop dry sockets more with block anesthesia (61.76%) than with infiltration anesthesia (38.24%). Also, when the number of cartridges increases, the incidence of dry sockets increases (Table 2).

Factor	Group	AO	Total	P value
Gender	Male	31 (45.6%)	593 (59.6%)	0.049 S
	Female	37 (54.4%)	402 (40.4%)	
Tobacco smoke	Smoker	19(27.9%)	288(28.9%)	0.049 S
	Non-smoker	49(72.1%)	707(71.1%)	
Site of extraction	Maxilla	26(38.3%)	434(43.6%)	0.017 S
	Mandible	42(61.7%)	561(56.4%)	
Oral hygiene	Good	19(28%)	613(61.6%)	0.049 S
	Poor	49(72%)	382(38.4%)	
Amount of local anesthesia	<2	31(45.6%)	690(69.35%)	0.049 S
	>=2	37(54.4%)	305(30.65%)	

Technique of local anesthesia	Infiltration	26(38.24%)	466(46.8%)	0.005 HS
	Block	42(61.76%)	529(53.2%)	
Method of extraction	Nonsurgical	33(48.5%)	752(75.6%)	0.033 S
	Surgical	35(51.55)	243(24.4%)	
Extraction time	>10	54(79.4%)	380(38.2%)	0.049 S
	=<10	14(20.6%)	615(61.8%)	

Table 2. Relationship of gender, tobacco smoke, site of extraction, oral hydrogen, amount and technique of local anesthesia, method of extraction, extraction time and dry socket.

33 (48.5%) of 68 cases who developed dry sockets had surgical extraction. There were significant differences in the development of socket pockets between the removal of the two teeth done surgically (51.5%) or non-surgically (48.5%), $p=0.033$ (Table 2). Caries and their sequelae indicated tooth extraction in 58.82% of teeth with dry sockets. A minor percentage of dry sockets occur in teeth with advanced periodontitis (3%) (Table 3). Regarding the clinical picture of dry socket, pain, empty socket, and exposed bone were present in 68 (100%) of cases, halitosis was present in 29 (42.64%) of cases, foul taste in 30 (44.11%) of cases, edema of surrounding tissue 52(76.47) of cases. Regional lymphadenopathy 30 (44.11%) of cases and only 10 (14.7%) cases presented with fever. We divided the time for removal of the teeth into two groups: below 10 minutes and above or equal to 10 minutes. There was a significant difference ($p=0.049$) between these groups; the more time taken to remove teeth, the more the incidence of dry sockets (Table 2). As far as the pain severity is concerned, 48 patients (70.58%) had severe pain. The remaining patients had moderate pain. Some of those patients describe other symptoms of pain, like throbs (22.05%) and radiating (41.7%).

Indications for Extraction	Dry socket	total no. of patient
advanced caries	40(58.82%)	793(79.69%)
advanced Periodontitis	3(4.4%)	96(9.65%)
orthodontic treatment	10(14.7%)	13(1.3%)
Pericoronitis	15(22.06%)	93(9.35%)

Table 3. Indications for extraction.

Discussion

Dry socket is the most common and painful complication in the healing of extraction wounds, defined as focal osteomyelitis in which the blood clot has disintegrated or been lost with the production of a foul odor and severe pain but no suppuration^[4], probably the two most commonly cited pathogenesis for dry socket lesions are trauma inflicted during extraction of the teeth and the risk of infection^[5-7]. Mamoun^[10] implies that inflammation does not fundamentally cause dry socket lesions, and he proposes a different model for the initiation and pathogenesis of the lesion. Depending on his model, it is suggested another terminology for this phenomenon: "post-extraction peri-alveolar exposed bone ostealgia syndrome."

The frequency of AO reported in this study(6.83%) is higher than the overall incidence of 0.5% to 5% registered in the literature^[6,7]. This difference could be attributed to variations in the diagnostic criteria required by different researchers. Also, this incidence includes both surgical and nonsurgical cases; if we take only nonsurgical cases, the incidence will be 4.3%, and this will be within the reported range. It has been well documented that those surgical extractions result in about 10 times higher incidence of AO^[1,11].

Although this is similar to the findings of several other studies, ^[12,13] including MacGreoger^[6], who reported a 50% greater incidence of AO in women than in men in a series of 4000 extractions it is in disagreement with the results of Nusair and Abu Younis^[14], usually the possible explanation written in the literature that women use contraceptive pills. However, there were no significant differences in our study concerning the use of these pills and the occurrence of dry sockets. The incidence of the dry socket has been reported to increase in females when extraction occurs on days 1 to 22 of the menstrual cycle in non-menopausal women in both oral contraceptive users and nonusers^[15,16].

There were significant differences concerning the age of the patient and dry socket; the peak age incidence of dry socket in this study was 21-30 years. This is similar to reports by Ogunlewe^[13] and Oginni et al. ^[17] but is at variance with the report of Eshghpour^[1]. The reasons for this particular age predilection may be due to surgical trauma when removing these teeth, considering the amount of bone that should be removed (increased number of third molar extractions in this age group) and a greater prevalence of smoking at this age. There is no relationship between smoking and the occurrence of dry sockets found in the present study, which is similar to the findings of Parthasarathi et al. ^[19]. Other studies found that a high incidence of alveolar osteitis is evident in those who smoke at least 5 cigarettes daily.^[20]

Halabí et al. ^[21] found that published evidence on this risk factor is scarce, and more research is needed to analyze the cumulative effect of smoking on the development of dry sockets. They also suggested measuring Tabaco use on the day after that extraction. Many workers reported site-specificity in the occurrence of the socket, with the mandibular molar area being the most commonly affected site ^[6, 7]. This is in agreement with the findings of our study, where there are significant differences in the occurrence of socketed in mandibular posterior teeth. This could be due to surgical trauma (difficulty of extraction) of posterior teeth. Traumatic extraction was found to be a significant risk factor associated with the development of alveolar osteitis ^[21]. Harrowing extraction leads to compression of the socket and possible thrombosis of the underlying vessels, reducing blood perfusion. Some associate trauma with a reduction in tissue resistance and, consequently, wound infection by anaerobes^[1], and that is why dry socket occurs more in surgically removed teeth (14.4%) than nonsurgical removal (4.4%) and also occur when the time is taken for removal of teeth increased.

However, other reports ^[22,23] found no such difference; Mandibular and maxillary teeth were affected almost equally by dry sockets.

It has been shown that the frequency of AO increases in patients with poor oral hygiene ^[24]. This is in agreement with the findings of our study, although some report no difference in the incidence of the Dry socket concerning oral hygiene status (poor versus good) ^[13]. The literature is divided concerning the effects of local anesthetic on the incidence of dry sockets. The common belief that local anesthesia with a vasoconstrictor is one of the causative factors in the occurrence of dry socket due to ischemia caused by the action of a vasoconstrictor had been rejected by the fact that ischemia lasts for approximately two hours and is then followed by reactive hyperemia ^[9, 25]. This is in agreement with the result of our study, where more cases of dry sockets occurred when block anesthetic, not infiltration technique, was used. The explanation for this may be due to the difficulty of extraction and extraction of posterior teeth (that required block anesthesia), not the action of vasoconstrictor in local anesthesia. Clinically the picture of the dry socket that includes pain, empty socket and exposed bone were found in all patients, which is in agreement with the findings of several other studies ^[3, 5].

Conclusions

There were significant differences concerning the age of the patient and the dry socket. It has been shown that the frequency of AO increases in patients with poor oral hygiene. The picture of the dry socket that includes pain, empty socket, and exposed bone was found in all patients; there are significant differences in sockets in mandibular posterior teeth than in other teeth. There is no relationship between smoking and the occurrence of dry socket, teeth Traumatic extraction was found to be the major risk factor

Author Contributions: Conceptualization, methodology, EHA; validation, formal analysis and investigation, EHA and SAMA; data curation; writing-original draft preparation, and editing, FA and KT H.; All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of Ibn Sina University of Medical and Pharmaceutical Sciences, Baghdad, Iraq.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Blum, I.R. Contemporary views on the dry socket alveolar osteitis: a clinical appraisal of standardization, aetiopathogenesis, and management: a critical review. *Int J Oral Maxillofac Surg* 2002; 31: 309-317.
2. Fridrich k.l., Olson r.a.j. 'Alveolar osteitis following surgical removal of mandibular third molars,'. *Anesthesia Progress*, 1990;37(1):32-41.
3. Vezeau PJ. Dental extraction wound management: Medicating postextraction sockets. *Journal of Oral and Maxillofacial Surgery*. 2000 May;58(5):531-7.
4. Rajendran R, Sivapathasundharam B, Shafer's textbook of oral pathology, 7th ed. Elsevier, 2012:2380.
5. Hupp J, Ellis E, Tucker M. Contemporary Oral, and Maxillofacial Surgery. 7th ed. by Elsevier, Inc.; 2019. p.202-203.
6. MacGregor AJ. Etiology of dry socket: A clinical investigation. *British Journal of Oral Surgery*. 1968 Jan;6(1):49-58.
7. Krogh WH. Incidence of dry socket *J Am Dent Assoc and Dent Cos* 1937; 24: 1829-36.
8. Babar A, Ibrahim MW, Baig NJ, Shah I, Amin E. Efficacy of intra-alveolar chlorhexidine gel in reducing the frequency of alveolar osteitis in mandibular third molar surgery. *J Coll Physicians Surg Pak* 2012;22:91-4.
9. Kolokythas, A., Olech, E., Miloro, M. Alveolar osteitis: a comprehensive review of concepts and controversies. *International Journal of Dentistry* 2010: 249073 Epub10 pages.
10. Mamoun J: Dry Socket Etiology, Diagnosis, and Clinical Treatment Techniques. *J Korean Assoc Oral Maxillofac Surg* 2018;44:52-58.
11. Torres-Largares, D., Serrera-Figalo, M.A., Romero-Ruiz, M.M., Infante-Cossio, P., Garcia-Calderon, M., Gutierrez-Perez, J.L. Update on dry socket: a review of the literature. *Medicina Oral Patologia Oral y Cirugia Bucal* 2005; 10 (1): 77-85.
12. Adeyemo WL, Ladeinde AL, Ogunlewe MO. Clinical evaluation of post-extraction site wound healing. *J Contemp Dent Pract* 2006;7:40-49.
13. Ogunlewe MO, Adeyemo WL, Ladeinde AL, Taiwo OA.: Incidence and pattern of presentation of dry socket following nonsurgical tooth extraction. *Nig Q J Hosp Med*. 2007 Oct-Dec;17(4):126-30.

14. Farhan, S. M., Abdulateef, S. M. Al-Enzy, A. F. M, Mohammed, Th. T., Saeid, Z. J. M., Al-Khalani, F. M. H. & Abdulateef, F. M. Effect of heat stress on blood alkalinity of broiler chicks and its reflection in improving the productive performance. *Indian Journal of Ecology*. 2020, 47: 107-109.
15. Eshghpour M, Rezaei NM, Nejat A. Effect of menstrual cycle on the frequency of alveolar osteitis in women undergoing surgical removal of a mandibular third molar: a single-blind randomized clinical trial. *J Oral Maxillofac Surg*. 2013;71:1484-89.
16. Oginni FO. Dry socket: a prospective study of prevalent risk factors in a Nigerian population. *J Oral Maxillofac Surg*. 2008;66:2290-95.
17. Oginni FO, Fatusi OA, Alagbe AO. A clinical investigation of dry socket in a Nigerian teaching hospital. *J Oral Maxillofac Surg* 2003;61:871-876.
18. Eshghpour M, Nejat AH. Dry socket following surgical removal of impacted third molar in an Iranian population: incidence and risk factors. *Niger J Clin Pract*. 2013;16:496-500.
19. Parthasarathi K, Smith A, Chandu A. Factors affecting the incidence of dry socket: a prospective community-based study. *J Oral Maxillofac Surg* 2011;69:1880-4.
20. Al-Belasy FA. The Relationship of Shisha, Water Pipe. Smoking to Postextraction Dry Socket. *J Oral Maxillofac Surg* 2004; 62: 10-14.
21. Halabí D, Escobar J, Muñoz C, Uribe S. Logistic regression analysis of risk factors for the development of alveolar osteitis. *J Oral Maxillofac Surg* 2012;70:1040-4.
22. Omar Khaled Attallah, Thafer Thabit Mohammed and Nasr Nuri Al-Anbari. Effect of Adding Grape Pomace and Resveratrol on Some Physiological Traits and Gene Expression to Prevent Hemorrhagic Fatty Liver Syndrome in Laying Hens . IOP Conference Series: Earth and Environmental Science. 2022, 1060 (1), 012076. doi:10.1088/1755-1315/1060/1/0120.
23. Adeyemo WL, Ladeinde AL, Ogunlewe MO. Influence of trans-operative complications on socket healing following dental extractions. *J Contemp Dent Pract* 2007;8:52-59.
24. Peñarrocha-Diago M., Sanchis J. M., S'aez U., Gay C., and Bag'an J. V. "Oral hygiene and postoperative pain after mandibular third molar surgery," *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics* 2001; vol. 92, no. 3, pp. 260–264.
25. Yehya, W. A. . SEASONAL MONUMENTAL INSECTS ACCOMPANYING EUPHRATES POPLAR LEAVES. *Journal of Life Science and Applied Research*. 2020, 1, 45-53.

Received: May 15, 2023/ Accepted: June 10, 2023 / Published: June 15, 2023

Citation: Abdullah, E.H.; AL-Hamdani, S.A.M.; Alhamdani, F.; Hussein, K.T. Frequency and Risk Factors Standing Behind the Development of Dry Socket. *Revis Bionatura* 2023;8 (3) 100. <http://dx.doi.org/10.21931/RB/CSS/2023.08.03.100>