DOI: https://doi.org/10.54393/pjhs.v7i2.3478

PAKISTAN JOURNAL OF HEALTH SCIENCES
(LAHORE)
https://thejas.com.pk/index.php/pjhs
ISSN (E): 2790-9352, (P): 2790-9344
Volume 7, Issue 02 (February 2026)

Original Article

OPEN ACCESS

Association of Dry Socket (Alveolar osteitis) with Gender and Site of Extraction (Maxillary and Mandibular)

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ARTICLE INFO

Keywords:
Alveolar osteitis, Mandibular Extraction, Maxillary Extraction, Smoking, Oral Surgery Outcomes

How to Cite:
Ahmed, Z., Alam, J., Saddique, A., Shah, R., Azhar, M. S., Rehman, M. U., Shar, M. K., & Ahmed, K. (2026). Association of Dry Socket (Alveolar osteitis) with Gender and Site of Extraction (Maxillary and Mandibular): Dry Socket (Alveolar osteitis) and Its Association with Gender and Extraction Site. Pakistan Journal of Health Sciences, 7(2), 73-77. https://doi.org/10.54393/pjhs.v7i2.3478

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Received Date: 10th September, 2025
Revised Date: 6th January, 2026
Acceptance Date: 13th January, 2026
Published Date: 28th February, 2026

ABSTRACT

American dentist James Young Crawford coined the phrase "dry socket" (Alveolar Osteitis) in 1896 to refer to an acute infection of alveolar bone surrounding the location of a tooth extraction. Severe pain, the lack of a blood clot inside the socket, and food particles inside the socket are clinical indicators of dry socket. Most frequently seen after the extraction of mandibular third molars, the incidence of dry socket ranges greatly, from 1% to over 25%. **Objectives:** To assess the frequency of dry socket and its association with gender and site of teeth extraction at a tertiary care hospital. **Methods:** The descriptive cross-sectional study was conducted at the Department of Oral and Maxillofacial Surgery of Jinnah Postgraduate Medical Center, Karachi. Demographic data, such as age and gender, and clinical data, such as the extraction site, smoking status, extraction type and extent, and the frequency of dry socket within five days after extraction. **Results:** Dry socket was found in 22.5% higher in male, 26.5% compared to female 17.3%. The incidence of dry socket was significantly greater in mandibular extractions 31.1% than in maxillary extractions 8.7% with a p-value of less than 0.01. Smokers exhibited a notably higher rate of dry socket 41.7% compared to non-smokers, 9.7%. Furthermore, 41% of surgical extractions resulted in dry socket, compared to 13.6% of non-surgical extractions. **Conclusions:** The reported frequency of dry socket was slightly higher in male as compared to female, and it was more commonly observed in patients who underwent mandibular tooth extractions.

INTRODUCTION

The American dentist James Young Crawford coined the phrase "dry socket" (Alveolar Osteitis) in 1896 to refer to an acute infection of the alveolar bone surrounding the location of a tooth extraction [1]. Severe pain, the lack of a blood clot inside the socket, and food particles inside the socket are clinical indicators of dry socket [2]. Most frequently seen after the extraction of mandibular third molars, the incidence of dry socket ranges greatly, from 1% to over 25% [3]. Several reasons have been related to an increased risk of developing alveolar osteitis, while some remain controversial [4]. These include the extraction location, smoking, being a woman, being younger, having had difficult or traumatic extractions, not practiced good dental hygiene, and had a history of dry socket episodes. Additionally, recent research points to the possible involvement of bacterial components in the

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pathophysiology of dry socket by indicating that individuals may have a unique microbiome. This underlines the importance of applying evidence-based strategies in routine dental practice to improve patient outcomes [5, 6]. Furthermore, a higher incidence of dry socket and other surgical problems has been associated with systemic health disorders such as diabetes and immunosuppression. Different incidence rates and gender distributions are reported by a number of studies in the literature [7]. For example, Chandran et al conducted a retrospective study in Chennai, India, and found that out of 1,341 extractions, 72 cases (5.37%) were complicated by dry socket. Among these, 44 (7.86%) were females, and 28 (6.18%) were males, with a higher prevalence in mandibular third molars (28.5%) compared to maxillary teeth (22.7%) [8]. According to a local cross-sectional survey, 9.0% of patients had dry socket, with female experiencing a slightly greater frequency (9.7%) than male (8.2%). In that study, the maxillary region accounted for 52.9% of dry socket instances, whereas the mandibular region accounted for 47.1% [9]. In contrast, Khan et al. reported that 75.7% of dry socket cases were in male and 24.2% in female, though they did not distinguish between maxillary and mandibular sites an important consideration, as mandibular extractions are known to be more commonly associated with dry socket [10]. Understanding the link between systemic health and oral health is crucial in developing individualized treatment plans for patients undergoing dental extractions. A comprehensive approach allows for tailored preventive and therapeutic interventions, ultimately improving patient care. The findings of this study will be used to inform future research and raise awareness in order to improve the quality of life for affected people.

Dry socket remains a frequent and painful complication following tooth extraction, with reported incidence and distribution varying widely across populations. Existing studies show inconsistent findings regarding its association with gender and extraction site, and local data remain limited and fragmented. This lack of uniform evidence makes it difficult to identify high-risk groups and plan targeted preventive strategies. This study aims to evaluate the association between dry socket and gender, as well as the extraction site (maxillary or mandibular), in the local population to support improved risk stratification and clinical decision-making.

METHODS

An analytical cross-sectional study was carried out at the Department of Oral and Maxillofacial Surgery at Jinnah Postgraduate Medical Centre in Karachi, with institutional ethical review committee clearance (No.F.2-81/2024-GENL/164/JPMC) from January 1, 2025, to July 15, 2025. The sample size was calculated using Open Epi Online software based on a reported dry socket prevalence of 8.2% in male 9, a 95% confidence level, and a 5% margin of error [9]. The study comprised 120 patients. Non-probability consecutive sampling was used to find the participants. All patients were recruited from the Outpatient Department after taking consent and a history with clinical examination. The study procedure, the reason for using their data for research, and the risks and advantages involved were all explained to the participants. Inclusion criteria consisted of patients aged between 18 and 60 years of either gender who presented to the outpatient department for permanent tooth extraction of mandibular or maxillary teeth. Patients with conditions that could affect the healing process, including osteopetrosis, ulcerative gingivitis, Paget's disease, malignancy, systemic diseases, osteomyelitis, coagulation disorders, or any other relevant medical conditions, were excluded. Pregnant women and those who did not provide consent were also excluded from the study. A structured Performa was used to collect data, which included clinical information such as the kind and extent of extraction, smoking status, the site of extraction, and the existence of dry socket within five days after extraction, in addition to demographic information such as age and gender. Dry socket, or alveolar osteitis, was defined as delayed healing without infection and was confirmed through a combination of the patient's complaint of pain beginning on the third postoperative day and clinical findings such as partial or complete loss of the blood clot and exposed bone, as assessed by a senior consultant. Smoking was defined as a history of smoking more than 10 cigarettes per day for a duration exceeding two years. SPSS version 27.0 version was used to analyze the data collected. The mean and standard deviation were used to display descriptive statistics like age, whereas frequency percentages were used to display categorical variables, including gender, smoking status, site, kind, and amount of extraction, and incidence of dry socket. The association was assessed by using chi square test, and a $p<0.05$ was considered significant.

RESULTS

A total of 120 patients were enrolled having mean age of the patients was 36.4 ± 11.2 years, ranging from 18 to 65 years. 68 (56.7%) were male, and 52 (43.3%) were female. Forty-eight patients (40%) were smokers, while 72 (60%) were non-smokers. The site of extraction was maxillary teeth in 46 patients (38.3%) and mandibular teeth in 74 patients (61.7%). In terms of extent, 85 patients (70.8%) underwent single-tooth extractions, whereas 35 (29.2%) had multiple teeth extracted. Regarding the type of procedure, 39 patients (32.5%) had surgical extractions and 81 (67.5%) had non-surgical extractions (Table 1).

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Table 1: Demographic and Clinical Characteristics of the Patients (n = 120)

Variables		Frequency (%), Mean ± SD
Age	Years	36.4 ± 11.2
Gender	Male	68 (56.7%)
	Female	52 (43.3%)
	Total	120 (100.0%)
Smoking Status	Smokers	48 (40.0%)
	Non-Smokers	52 (60.0%)
	Total	120 (100.0%)
Site of Extraction	Maxillary Teeth	46 (38.3%)
	Mandibular Teeth	74 (61.7%)
	Total	120 (100.0%)
Extent of Extraction	Single Tooth	85 (70.0%)
	Multiple Teeth	35 (29.2%)
	Total	120 (100.0%)
Type of Extraction	Surgical Extraction	39 (32.5%)
	Non- Surgical Extraction	81 (67.5%)
	Total	120 (100.0%)

The overall frequency of dry socket was 22.5% higher in male (26.5%) compared to female (17.3%) (p>0.05). The occurrence of dry socket was significantly greater in mandibular extractions (31.1%) than in maxillary extractions (8.7%), with a p-value of less than 0.01. Smokers exhibited a notably higher rate of dry socket (41.7%) compared to non-smokers (9.7%), and this association was highly significant (p<0.001). Additionally, dry socket occurred more frequently following surgical extractions (41%) than non-surgical extractions (13.6%) (p<0.01) (Table 2).

Table 2: Associations of Dry Socket with Demographic Characteristics

Group	Dry Socket (n)	Total (n)	Report Association (%)	p-value
Overall	27	120	22.5	–
Gender				
Male	18	68	26.5	>0.050
Female	9	52	17.3	
Site of Extraction				
Mandibular	23	74	31.1	<0.010*
Maxillary	4	46	8.7	
Smoking Status				
Smokers	20	48	41.7	<0.001*
Non-Smokers	7	72	9.7	
Type of Extraction				
Surgical	16	39	41.0	<0.010*
Non-Surgical	11	81	13.6	

*Indicates statistical significance at p≤0.05

DISCUSSION

In this study, the overall frequency of alveolar osteitis was reported as of 22.5%, which is higher than the typically reported range of 1% to 5% for routine extractions, but within the range of 20% to 30% for mandibular third molar extractions [11]. Several risk factors were evaluated, including gender, smoking status, site of extraction, type of extraction, and whether the procedure was surgical or non-surgical [12]. Most of the patients with dry socket were observed in the male gender (26.5%) compared to female (17.3%), although this difference was not statistically significant. This trend aligns with previous studies, such as the work by Nusair *et al.* and Asif *et al.* who also reported a higher frequency in male, attributing the difference to behavioral factors such as smoking [13, 14]. In a separate study conducted in Swat, Khan *et al.* reported that only 4% of patients developed dry socket following tooth extraction. The incidence was notably higher among male patients, particularly those within the 20 to 30-year age group. Additionally, the prevalence of dry socket was found to be significantly greater among smokers compared to non-smokers, indicating a strong association between smoking and the development of this postoperative complication [15]. The site of extraction showed a significant association with dry socket occurrence, with mandibular extractions (31.1%) being more prone compared to maxillary extractions (8.7%). This finding is consistent with the literature, indicating that mandibular teeth, especially molars, are at higher risk due to denser bone and lower vascularity, leading to compromised healing [16, 17]. Smoking was found to be a significant risk factor, with 41.7% of smokers developing dry socket compared to only 9.7% of non-smokers (p<0.001). This aligns with a study conducted by Saeed *et al.* in Bangladesh, which reported a non-significant association with smoking and the development of alveolar osteitis, suggesting that smoking did not appear to be a major contributing factor to the reported rate of dry socket in the study population [18]. Localized tissue ischemia may play a significant role in delayed wound healing and the development of thrombotic microvascular occlusion, potentially as a result of nicotine-induced vasoconstriction, which reduces blood flow to the surgical site. Additionally, nicotine can enhance platelet aggregation, further promoting the formation of microthrombi within small blood vessels, thereby exacerbating tissue hypoxia and impairing the normal healing process [19]. For instance, a study by Cardoso *et al.* revealed a 1% prevalence of dry socket [2], while Tandon *et al.* reported 20.6% at 48 h to 41.2% at two weeks post-extraction, with significant associations with smoking, poor oral hygiene, and surgical technique [20]. This is supported by findings from Sakka *et al.* who noted that surgical trauma increases fibrinolytic activity and delays healing, predisposing the socket to clot disintegration [21]. This study was limited by its observational design and lack

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of long-term follow-up, which may have underestimated delayed cases of alveolar osteitis. Additionally, factors such as oral hygiene, surgical technique variability, and patient compliance were not fully controlled, which could influence the results. Future research should include multicenter studies with standardized surgical protocols and comprehensive assessment of behavioral and clinical risk factors to better understand dry socket prevalence and prevention.

CONCLUSIONS

In this study, reported dry socket was notably higher in males and more commonly associated with extractions of lower teeth. These results indicate that gender and site of extraction had a role in the development of dry socket. For the understanding of this complication, it is important to introduce preventive measures in clinical practices and the conduct of large-scale studies.

Authors' Contribution

Conceptualization: ZA
Methodology: ZA, AS, MKS
Formal analysis: JA, MUR,
Writing and Drafting: RS, MSA
Review and Editing: ZA, JA, AS, RS, MSA, MUR, MKS, KA

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

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