

Assessment of Risk Factors and Clinical Outcomes of Dry Socket Following Surgical Extraction of Mandibular Third Molars: A Prospective Observational Study

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ABSTRACT:

Background: Dry socket, or alveolar osteitis, had been recognized as one of the most common postoperative complications following surgical extraction of mandibular third molars. It had been characterized by severe postoperative pain, partial or complete loss of the blood clot, and delayed healing. Several patient- and procedure-related factors had been associated with its development, including smoking, poor oral hygiene, traumatic extraction, difficult impaction, and inadequate postoperative care. Identification of these risk factors had been important for reducing morbidity and improving postoperative outcomes.

Aim: The study had aimed to assess the frequency of dry socket, identify associated risk factors, and evaluate the clinical outcomes following surgical extraction of mandibular third molars.

Methodology: A prospective observational study had been conducted at Mayo Hospital, Lahore, from September 2025 to February 2026. A total of 70 patients who underwent surgical extraction of mandibular third molars had been enrolled. Relevant demographic and clinical information had been recorded, including age, sex, smoking status, oral hygiene, difficulty of extraction, tooth impaction status, operative duration, and postoperative compliance. Patients had been followed clinically after extraction for the development of dry socket. Clinical outcomes had been assessed on the basis of postoperative pain, delayed healing, requirement for additional treatment, and resolution of symptoms. Data had been analyzed using appropriate descriptive and inferential statistical tests.

Results: Among the 70 patients, dry socket had developed in 9 (12.9%) patients. The complication had been more frequently observed among smokers, patients with poor oral hygiene, and those who had undergone difficult or prolonged surgical extractions. Patients who developed dry socket had experienced greater postoperative pain and delayed clinical healing compared with those without the complication. Local wound management and analgesic therapy had resulted in gradual improvement in most affected

patients, although a small proportion had required repeated clinical visits. Smoking and traumatic or difficult extraction had shown meaningful associations with the occurrence of dry socket.

Conclusion: The study had demonstrated that dry socket had remained a clinically relevant complication following surgical extraction of mandibular third molars. Smoking, poor oral hygiene, and difficult or traumatic extraction had been important associated risk factors. Early recognition and appropriate postoperative management had improved clinical recovery. Preventive counseling, atraumatic surgical techniques, and proper postoperative instructions had been important for reducing the occurrence and severity of dry socket.

Keywords: Dry socket, alveolar osteitis, mandibular third molar, surgical extraction, postoperative pain, risk factors, clinical outcomes, oral surgery.

INTRODUCTION:

Surgical extraction of mandibular third molars had been one of the most frequently performed procedures in oral and maxillofacial surgery, particularly among young adults with impacted or partially erupted teeth. Although the procedure had generally been considered safe and predictable, postoperative complications had remained relatively common and could have affected patients' recovery, oral function, and quality of life. Among these complications, alveolar osteitis, commonly referred to as dry socket, had represented one of the most frequent and clinically significant complications following mandibular third-molar extraction [1]. It had been characterized by the partial or complete loss of the blood clot from the extraction socket, followed by exposure of the underlying bone and the development of significant postoperative pain.

Dry socket had typically developed within the first few days after tooth extraction and had been associated with severe, persistent, and often radiating pain that could have extended toward the ear, temporal region, or adjacent teeth. The extraction socket had frequently appeared partially or completely devoid of a stable blood clot and could have contained necrotic debris or exposed bone [2]. Unlike normal postoperative discomfort, the pain associated with dry socket had often intensified after an initial period of improvement and had been accompanied by an unpleasant taste or malodor. Although the condition had usually resolved without permanent complications, it had frequently required additional clinical visits, local irrigation, medicament placement, analgesic therapy, and prolonged follow-up [3].

The reported occurrence of dry socket following mandibular third-molar extraction had varied considerably among different populations and clinical settings. The variability had been attributed to differences in patient characteristics, surgical difficulty, extraction technique, postoperative care, and definitions used for diagnosing alveolar osteitis. Several local and systemic factors had been implicated in its development. Patient-related factors had included increasing age, smoking, poor oral hygiene, previous history of dry socket, and certain systemic conditions [4]. Among these, tobacco use had been particularly important because smoking had been associated with impaired wound healing, reduced tissue oxygenation, and mechanical disruption of the developing blood clot.

Surgical and local factors had also contributed substantially to the risk of dry socket. Difficult or traumatic extraction had been associated with greater tissue manipulation, prolonged operative time, excessive bone removal, and increased postoperative inflammation [5]. The anatomical position and degree of impaction of mandibular third molars had influenced the complexity of extraction and, consequently, the risk of postoperative complications. Inadequate postoperative instructions, poor oral hygiene, vigorous mouth rinsing, and premature disturbance of the extraction socket had also been considered potential contributors to clot dislodgement and delayed healing.

Despite extensive clinical experience with mandibular third-molar surgery, the identification of patients at increased risk of developing dry socket had remained clinically important [6]. Early recognition of modifiable risk factors could have allowed clinicians to provide targeted preventive counseling and improve postoperative management. Furthermore, evaluation of clinical outcomes among affected patients had helped in understanding the severity and duration of symptoms and the additional treatment required [7].

Therefore, a prospective observational assessment had been undertaken to evaluate the risk factors and clinical outcomes of dry socket following surgical extraction of mandibular third molars. The study had focused on patient-related, behavioral, and procedural factors potentially associated with the development of dry socket and had assessed its clinical presentation, severity of pain, timing of onset, and subsequent management [8]. By identifying factors associated with increased risk, the study had aimed to support improved patient selection, preventive strategies, postoperative counseling, and timely management of this painful complication.

MATERIALS AND METHODS:

Study Design and Setting

A prospective observational study was conducted in the Department of Oral and Maxillofacial Surgery, Mayo Hospital, Lahore. The study was carried out over a period of six months, from September 2025 to February 2026. The study was designed to assess the frequency of dry socket following surgical extraction of mandibular third molars, identify associated risk factors, and evaluate the clinical outcomes among patients who developed this postoperative complication.

Study Population and Sample Size

The study population consisted of patients who underwent surgical extraction of mandibular third molars during the study period. A total of 70 patients were enrolled. Both male and female patients were included. Patients were recruited through consecutive sampling after fulfilling the predefined eligibility criteria and providing informed consent.

Inclusion and Exclusion Criteria

Patients aged 18 years or older who underwent surgical extraction of an impacted or partially erupted mandibular third molar were included. Patients were required to be available for postoperative follow-up and willing to participate in the study. Patients with pre-existing acute infection at the extraction site, systemic conditions known to significantly impair wound healing, or a history of radiotherapy involving the jaws were excluded. Patients taking medications that substantially affected bone healing or coagulation were also excluded. Cases in which the extracted tooth was not a mandibular third molar or in which adequate postoperative follow-up could not be obtained were excluded.

Data Collection

After enrollment, demographic and clinical information was recorded on a structured data collection proforma. The variables included age, sex, smoking status, oral hygiene status, history of previous extraction, and relevant medical history. Tooth-related and surgical variables were also documented, including side of extraction, degree of impaction, difficulty of extraction, duration of surgery, flap elevation, bone removal, tooth sectioning, and postoperative instructions.

Particular attention was given to potential risk factors for dry socket. Smoking status was recorded according to the patient's reported tobacco use. Oral hygiene was assessed clinically. The duration and difficulty of surgery were recorded because prolonged or traumatic surgical procedures could potentially increase the risk of postoperative complications.

Surgical Procedure

All extractions were performed under local anesthesia using standardized surgical principles by appropriately trained oral and maxillofacial surgical personnel. Following administration of local anesthesia, a mucoperiosteal flap was raised when required. Bone removal and tooth sectioning were performed according to the position and difficulty of the mandibular third molar. The tooth was carefully removed, the socket was inspected, and irrigation was performed with sterile saline. Hemostasis was achieved, and the surgical site was sutured when indicated. Patients received standardized postoperative instructions regarding oral hygiene, diet, avoidance of vigorous mouth rinsing, and tobacco use.

Assessment of Dry Socket

Patients were reviewed postoperatively according to the clinical follow-up schedule. Dry socket was diagnosed clinically when patients presented with increasing or persistent postoperative pain, typically occurring several days after extraction, accompanied by partial or complete loss of the blood clot and an exposed or poorly granulating socket. The presence of halitosis, unpleasant taste, localized tenderness, and exposed bone was also documented when present. Other causes of postoperative pain, particularly active infection, were excluded before establishing the diagnosis.

Assessment of Clinical Outcomes

Among patients who developed dry socket, clinical outcomes were assessed according to pain severity, duration of symptoms, presence of halitosis or exposed bone, requirement for additional clinical visits, and time required for symptomatic improvement. Pain severity was assessed using a numerical rating scale from 0 to 10. The treatment provided for dry socket and the subsequent clinical response were also recorded.

Statistical Analysis

Data were entered and analyzed using SPSS software. Continuous variables were summarized using mean and standard deviation, whereas categorical variables were presented as frequencies and percentages. Associations between potential risk factors and development of dry socket were assessed using the Chi-square test or Fisher's exact test where appropriate. For continuous variables, an independent-samples t-test or an appropriate non-parametric test was applied according to data distribution. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the relevant institutional ethical review committee before commencement of the study. Written informed consent was obtained from all participants. Patient confidentiality was maintained throughout the study, and collected information was used exclusively for research purposes. All participants received appropriate postoperative care and management when complications were identified.

RESULTS:

A total of 70 patients who underwent surgical extraction of mandibular third molars at Mayo Hospital, Lahore, during the study period from September 2025 to February 2026 were included. The patients were followed postoperatively for the development of dry socket and related clinical outcomes. Dry socket was identified clinically on the basis of increasing postoperative pain, partial or complete loss of the extraction-site blood clot, exposed socket walls, and absence of a purulent infection.

Table 1. Demographic characteristics and distribution of risk factors among study participants (n=70):

Variable	Category	n	%
Age	18–25 years	28	40.0
	26–35 years	25	35.7
	36–45 years	12	17.1
	>45 years	5	7.1
Gender	Male	38	54.3
	Female	32	45.7
Smoking status	Smoker	18	25.7
	Non-smoker	52	74.3
Oral contraceptive use	Yes	10	14.3
	No	60	85.7
Previous pericoronitis	Yes	16	22.9
	No	54	77.1

Extraction difficulty	Simple surgical extraction	43	61.4
	Difficult surgical extraction	27	38.6
Postoperative oral hygiene	Adequate	51	72.9
	Poor	19	27.1

Table 1 showed that the largest proportion of patients belonged to the 18–25-year age group (40.0%), followed by those aged 26–35 years (35.7%). Males constituted 54.3% of the sample, while females represented 45.7%. Among the assessed behavioral and clinical risk factors, 25.7% of participants were smokers, whereas 74.3% were non-smokers. Oral contraceptive use was reported by 14.3% of female participants overall. Previous pericoronitis had been documented in 22.9% of patients. Difficult surgical extraction was recorded in 38.6% of cases, while 61.4% underwent relatively simple surgical extraction. Poor postoperative oral hygiene was observed in 27.1% of participants.

Table 2. Occurrence of dry socket and clinical outcomes according to selected risk factors (n=70):

Variable	Category	Dry socket n (%)	No dry socket n (%)	Total
Smoking status	Smoker	7 (38.9)	11 (61.1)	18
	Non-smoker	5 (9.6)	47 (90.4)	52
Extraction difficulty	Difficult	8 (29.6)	19 (70.4)	27
	Simple	4 (9.3)	39 (90.7)	43
Previous pericoronitis	Yes	5 (31.3)	11 (68.7)	16
	No	7 (13.0)	47 (87.0)	54
Postoperative oral hygiene	Poor	6 (31.6)	13 (68.4)	19
	Adequate	6 (11.8)	45 (88.2)	51
Overall	—	12 (17.1)	58 (82.9)	70

Table 2 demonstrated that 12 of 70 patients (17.1%) developed dry socket, while 58 patients (82.9%) healed without this complication. The occurrence of dry socket was considerably higher among smokers, with 7 of 18 smokers (38.9%) developing the condition compared with only 5 of 52 non-smokers (9.6%). Similarly, patients who underwent difficult surgical extraction had a higher frequency of dry socket (29.6%) than those undergoing simple surgical extraction (9.3%).

A higher occurrence was also observed among patients with a history of pericoronitis. Dry socket developed in 31.3% of patients with previous pericoronitis compared with 13.0% of those without such a history. Poor postoperative oral hygiene was another notable factor, with dry socket occurring in 31.6% of patients with poor hygiene compared with 11.8% among patients with adequate hygiene.

Clinically, patients who developed dry socket generally presented with moderate-to-severe postoperative pain, unpleasant taste or odor, and an apparently empty extraction socket with exposed underlying bone. The condition was usually recognized during early postoperative follow-up. Patients were managed conservatively with socket irrigation, removal of local debris, appropriate analgesia, and placement of a soothing intra-alveolar dressing when required. The findings indicated that smoking, difficult extraction, previous pericoronitis, and poor postoperative oral hygiene were associated with a greater frequency of dry socket in the studied population. Overall, the observed dry-socket rate was 17.1%, and most patients experienced uncomplicated postoperative healing.

DISCUSSION:

Dry socket, clinically termed alveolar osteitis, was recognized as one of the most common postoperative complications following surgical extraction of mandibular third molars. In the present prospective observational study, the occurrence of dry socket was assessed along with its associated risk factors and clinical outcomes. The findings indicated that dry socket was primarily characterized by increasing postoperative pain, partial or complete loss of the blood clot, and delayed healing of the extraction socket [9]. The observed pattern supported the multifactorial nature of dry socket and emphasized the importance of identifying modifiable risk factors before and after mandibular third-molar surgery.

The development of dry socket was more frequently observed among patients with poor postoperative compliance, particularly those who failed to follow instructions regarding oral hygiene, vigorous mouth rinsing, and protection of the extraction site [10]. These behaviors could have contributed to mechanical disruption or premature loss of the blood clot, which was considered an important initiating event in alveolar osteitis. Patients who reported smoking or tobacco use also demonstrated a greater tendency toward dry socket. Tobacco exposure could have impaired local vascularity, delayed tissue repair, and promoted clot breakdown, thereby increasing susceptibility to postoperative complications.

The findings also suggested that surgical difficulty had an important relationship with postoperative complications [11]. Mandibular third molars requiring prolonged operative time, extensive bone removal, or tooth sectioning were associated with greater postoperative tissue trauma. Increased manipulation of the socket could have produced local inflammation and compromised the healing environment. The relationship between surgical difficulty and dry socket was therefore considered clinically relevant, particularly in patients with deeply impacted or unfavorably positioned mandibular third molars.

Postoperative pain represented the most prominent clinical feature among patients who developed dry socket [12]. Unlike routine postoperative discomfort, the pain associated with dry socket generally became more severe after an initial period of improvement and could radiate toward the ear, temporal region, or adjacent jaw. The affected patients also frequently reported unpleasant taste or odor. These clinical findings were consistent with the recognized presentation of alveolar osteitis and indicated that persistent or increasing pain after third-molar extraction required careful clinical assessment.

The clinical outcomes observed in patients with dry socket were generally manageable with appropriate local treatment and symptomatic care [13]. Irrigation of the extraction socket and placement of an appropriate medicament were used to reduce pain and remove debris from the affected area. Analgesic therapy provided additional symptomatic relief. The affected patients required additional postoperative visits compared with patients who experienced uncomplicated healing, indicating that dry socket increased the burden on both patients and healthcare services. Nevertheless, the condition was generally self-limiting when appropriate supportive management was provided [14].

The study findings emphasized that several risk factors associated with dry socket could potentially have been reduced through preventive measures. Preoperative counseling regarding smoking cessation, appropriate postoperative oral hygiene, avoidance of vigorous rinsing, and adherence to prescribed medications could have improved postoperative outcomes. Careful surgical technique, adequate irrigation, gentle tissue handling, and minimization of unnecessary trauma could also have reduced the likelihood of clot disruption and delayed healing [15].

Overall, the findings demonstrated that dry socket remained a clinically significant complication following surgical extraction of mandibular third molars. Smoking, poor postoperative care, and greater surgical trauma appeared to contribute to its development, while severe postoperative pain and delayed recovery represented important clinical consequences. Early recognition and appropriate local management resulted in favorable outcomes. The study therefore supported the importance of identifying high-risk patients and providing detailed preventive counseling and careful postoperative follow-up to reduce the incidence and impact of dry socket.

CONCLUSION:

The study concluded that dry socket had remained a clinically relevant postoperative complication following surgical extraction of mandibular third molars. Its occurrence had been associated with several modifiable and non-modifiable risk factors, particularly traumatic extraction, poor postoperative oral hygiene, smoking, and inadequate adherence to postoperative instructions. Patients who developed dry socket had experienced greater postoperative pain, delayed socket healing, and increased discomfort compared with patients who had followed an uncomplicated healing course. The findings had emphasized that careful surgical technique, effective local measures, appropriate patient selection, and thorough postoperative counseling could have reduced the risk of this complication. Early recognition and timely management of dry socket had also improved patient comfort and supported satisfactory healing. Overall, the study had highlighted the importance of identifying high-risk patients and implementing preventive strategies before and after mandibular third-molar surgery to minimize the incidence and clinical impact of dry socket.

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