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## Oral and Maxillofacial Surgery/Original Research

# Risk factors assessment for dry sockets: A logistic regression analysis study



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### ABSTRACT

**Aim:** To investigate the effect of age, gender, address, type of extraction, type of operator and the arch of the tooth involved in the occurrence of dry sockets. A secondary aim of the study was to calculate the incidence of dry sockets in Islamabad, Pakistan.

**Materials and methods:** This study was conducted in the Oral and Maxillofacial Surgery Department at Islamic International Dental Hospital from April till May 2013. Data were collected for any complaints of dry socket following tooth extractions, by means of a structured questionnaire. All patients above 18 years of age were included. Mean and standard deviation were calculated for age. Frequencies were calculated for gender, address, operator type, arch and the outcome (occurrence of dry socket). A binary logistic regression analysis was conducted to establish a risk model to relate the variables with the occurrence of dry socket. Pearson's Chi-square test was applied to assess the frequency of occurrence with age.

**Results:** Out of 1670 patients, 1563 adults fulfilled the inclusion criteria. 80 patients reported with dry socket, the incidence being 5.12%. Logistic regression analysis showed a statistically significant association between age and the development of dry socket (OR=0.953, 95% CI=0.926–0.961). None of the other factors had a significant association with the occurrence of dry sockets.

**Conclusion:** A significant association exists between patient's age and development of dry socket. An inverse relationship was noted between the increase in age and occurrence of dry socket. No such association is noted between patient gender, address of the patient, location of the tooth, operator and extraction type.

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## 1. Introduction

Alveolar osteitis, more commonly termed as 'dry socket', occurs when the blood clot at the site of a tooth extraction is dislodged or gets disintegrated by fibrinolysis, before the wound has healed. Dry socket has been reported to be the most common complication following tooth extraction [1]. The term was first coined by Crawford in 1896 [2]. Since then it has remained a subject of much interest in the field of dentistry and numerous definitions of dry socket have

emerged. A more recent definition describes it as, "postoperative pain in and around the extraction site, which increases in severity at any time between 1 and 2 days after the extraction, accompanied by a partially or totally disintegrated blood clot within the alveolar socket with or without halitosis" [3]. Several other terms have been used to describe dry socket including alveolar osteitis, fibrinolytic alveolitis, alveolitis sicca dolorosa, localized osteomyelitis and delayed extraction wound healing [4].

A single terminology has not yet been agreed upon. However, Birn labelled the complication as 'fibrinolytic alveolitis' which is probably the most accurate of all the terms, but is also the least used in the literature [5,6]. In most cases, the more generic lay term 'dry socket' tends to be used.

The exact pathogenesis is not well understood, however clinical and laboratory studies have shown the significance of locally increased fibrinolytic activity in the pathogenesis of dry socket. Birn in 1972 showed increased fibrinolytic activity and activation of

\* Asian AOMS: Asian Association of Oral and Maxillofacial Surgeons; ASOMP: Asian Society of Oral and Maxillofacial Pathology; JSOP: Japanese Society of Oral Pathology; JSOMS: Japanese Society of Oral and Maxillofacial Surgeons; JSOM: Japanese Society of Oral Medicine; JAMI: Japanese Academy of Maxillofacial Implants.

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plasminogen to plasmin in the presence of tissue activators in dry sockets [5]. This fibrinolytic activity is thought to affect the integrity of the postextraction blood clot. Birn also stated that the increase in fibrinolysis was unlikely to dissolve the blood clot before the second day postextraction, because the clot contains antiplasmin, which must be neutralized before clot dissolution can occur [3].

The incidence of dry socket has been reported as 1–4% following routine dental extractions, with the incidence increasing to 10 times greater for lower as compared to upper teeth [8]. The incidence rates have been reported to vary greatly for third molar extractions, ranging from 1 to 45% [9].

Although the exact aetiology of dry socket has not been exactly determined, a number of risk factors (systemic and local) have been reported. Some of these have been debated extensively and often interplay of factors is implicated. Predisposing factors include gender [10–12], tooth location [13], trauma to the alveolar socket [14], presence of a vasoconstrictor in local anaesthesia [15], smoking [16], oral contraceptive pills, menstruation, residual foreign bodies, root segments, ejection of saliva after extraction [17], systemic diseases [18], operator skill [14,19], difficulty of surgery, deeply impacted mandibular third molars [20], previous experience of dry socket and poor oral hygiene [21].

The aim of our study was to prospectively calculate the incidence of dry socket in an urban area of a third world country – Pakistan. A secondary aim of this study was to assess the role of various risk factors as predictors for the occurrence of dry socket.

## 2. Methods

This was a prospective, observational study conducted at the Islamic International Dental Hospital (IIDH) at Riphah International University. All patients who visited the Oral Surgery Department of IIDH for tooth extractions during the months of April and May 2013 were recruited for the purpose of the study. Ethical approval was taken from the Research Ethics Committee of Riphah International University. Those patients whose extractions had to be done under general anaesthesia and those less than 18 years of age were excluded from the sample. The baseline was a cohort of 1563 adults. Informed consent was taken from all participants. They were scrutinized and a questionnaire along with clinical examination was used to collect the data.

Out of the 1563 patients considered, 80 patients returned within 5 days of the extraction with a severe pain in their extraction socket with partially or fully dislodged blood clots and they were marked as patients with dry sockets. Periapical radiograph was taken to rule out the broken down root or any foreign body. These patients were treated for dry socket. The sockets were washed with normal saline followed by the placement of Alveogel dressings [3,7].

Clinical variables were recorded as follows: age of the patient, patient gender (male or female), address of the patient (Rawalpindi or Islamabad), location of the tooth (maxilla or mandible), operator (dental student or dentist), tooth position (anterior or posterior), impaction status (impacted or non-impacted) and extraction type (simple or surgical). After the surgery all patients received verbal instruction on postoperative care.

Patients with positive clinical diagnosis were identified as cases. Others were identified as controls. A total of 80 matched controls were obtained at random.

The sample size was estimated to comply with an occurrence of 10 events per variable [22]. Since, there were eight variables, a sample size of 80 participants was calculated to be sufficient to design a logistic regression model. Data were tabulated in MS Excel and exported to SPSS v.20.0 for data analysis. Mean and standard deviation were calculated for age. Frequencies were calculated for gender, address, operator type, arch, tooth position, impaction

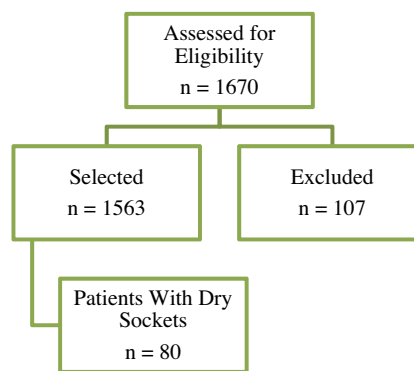


Fig. 1. Sample size selection.

status and the outcome (dry socket). A binary logistic regression analysis was conducted to establish a risk model to relate the variables with the occurrence of dry socket. For statistical purposes, an arbitrary *p* value of less than .05 was considered as significant.

## 3. Results

During a period of 2 months from April till May 2013, 1670 patients visited the oral surgery department IIDH. Out of these 1670 patients, 107 patients did not meet the inclusion criteria. Thus, a total sample of 1563 patients were included in the study as illustrated in Fig. 1. No patients were lost during follow-up.

During 2 months of our study, 80 patients were identified with dry socket representing an overall incidence of 5.12%. The mean age was  $44.53 \pm 15.87$  for patients with dry socket and  $36.18 \pm 11.72$  for patients without dry socket. The frequency distributions of the various demographic variables, including gender, address, extraction type, operator, arch, tooth position and impaction status have been illustrated in Table 1.

Table 1  
Dry socket distribution based on mean age in years, gender, address, extraction type, operator and arch between cases and controls (*n* = 70).

	Cases	Controls	<i>p</i> value
Age	44.53 ± 15.87	36.18 ± 11.72	.001
Total	40.35 ± 14.52		
Gender			.927
Male	44	44	
Female	36	36	
Total	80	80	
Address			.207
Rawalpindi	3	4	
Islamabad	77	76	
Total	80	80	
Extraction type			.351
Simple	77	76	
Surgical	3	4	
Total	80	80	
Operator			.027
Student	41	38	
Dentist	39	42	
Total	80	80	
Arch			.533
Mandible	40	41	
Maxilla	40	39	
Total	80	80	
Tooth position			.045
Anterior	1	12	
Posterior	79	68	
Total	80	80	
Impaction status			.007
Impacted	24	10	
Non-impacted	56	70	
Total	80	80	

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