

# Prevalence Rate and Risk Factors of Dry Socket in Saudi Arabia

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## Abstract

The most common procedure performed at the dentist's office is a tooth extraction or (Exodontia). One of the most common post-extraction complication conditions is Alveolar Osteitis which is known as Dry Socket. The study aimed to determine the prevalence and risk factors of dry sockets after tooth extraction among the Saudi Arabian population. In this study, we use an observational Cross-sectional study by using an online questionnaire. The questions are formulated by the authors and were completed over a period between July 2022- July 2023 in Saudi Arabia. The sample is Saudi Arabian adult patients above 18 years old. The main questions of the study include inquiries about the prevalence rate and risk factors affecting dry sockets. About (3.5%) of individuals who participated in this current study reported that they had dry sockets before. Smoking multiple times/day was found to be a risk factor for dry sockets. As regards systemic diseases (2%) of participants who had dry sockets were diabetic and (1.5%) of them were hypertensive. The etiology of dry socket is multifactorial and ultimately it is the host's healing potential that determines the severity and duration of the condition. There is a significant association between the occurrence of dry socket and smoking habits, diabetes, and high blood pressure, (p-value =0.036, 0.001, 0.001), respectively. The risk factors for this temporary and debilitating condition are identified. Surgeons must recognize these risk factors in patients with particular medical conditions and include this information as a part of the informed consent.

**Keywords:** Dry socket, Risk factors, Alveolar osteitis, Extraction

## INTRODUCTION

A dry socket is a known major complication that succeeds tooth extraction, It was termed by Crawford in 1896 to describe alveolar osteitis or "dry socket" [1]. Dry socket or medically, alveolar osteitis, is a dental term for a condition that may occur after adult tooth extraction where a blood clot either does not form or is dislocated from the extraction area [2]. The bone within the socket or around the occlusal area of the socket is exposed because the bone was not closed by an initial and persistent blood clot or a layer of vital, persistent, healing epithelium in the days after the extraction [3]. It is characterized by pain and halitosis at or near the site of tooth extraction [4]. The condition carries several symptoms along with pain, such as inflammation that may extend to other areas of the face [5]. The condition is very common where 0.5%-5.6% of extraction patients experience this. Another research also found a similar statistic, where between 3 and 5 percent of all extractions are thought to develop alveolar osteitis [5]. However, the odds increase to around 30% with the removal of third molars [6]. A dry socket is evident when the bone in the extraction site is exposed and it usually entails severe pain, unpleasant odor, and inflamed gingiva among other symptoms [7].

Many risk factors increase the chances of patients experiencing this condition. For example, as we mentioned earlier, the extraction of the third molar entails higher chances of developing a dry socket [8]. Also, poor oral hygiene, smoking, failure to properly care for the area, and traumatic extractions were found to have a significant effect on the likelihood of developing dry sockets [9].

Following the search criteria of the study was published, eleven papers were discovered that demonstrated data gathered from 10195 participants from ten different countries (including 3007 smokers and 7188 non-smokers) [10]

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following the search criteria [11]. To determine the frequency of dry sockets, a sample size of 350 patients who have recently had extractions was collected for this study. There were 241 male patients (69%) and 109 female patients (31%). Dry socket was found in 14 patients (4%) of the total sample, with 11 (78.57%) male patients and 3 (21.42%) female patients [12].

Understanding patients' awareness of the condition is important for healthcare providers. For example, more awareness of the condition may lead to early condition detection and treatment. Due to the lack of studies about dry sockets in Saudi Arabia and because of the prevalence of the condition along with its severe symptoms, in this research, we aim to determine the prevalence and risk factors of dry sockets after tooth extraction among the Saudi Arabian population. This paper aims to determine the prevalence and risk factors of dry sockets after tooth extraction among the Saudi Arabian population.

## MATERIALS AND METHODS

### Study Design, Study Setting, Participants, Recruitment, and Sampling Procedure

This study uses an observational cross-sectional study using an online questionnaire. The questions were formulated by the authors and were deployed between July 2022- July 2023 in Saudi Arabia. In this research, we employ a survey methodology for data collection. The sample is Saudi Arabian adult patients aged 18 years and older. We asked participants for basic background information such as age, gender, oral hygiene habits, smoking history, diabetes, blood disorders, and genetic diseases. The main questions of the study include inquiries from Prof. Dry Socket.

Participants consented before taking the online survey. Participants are anonymous and their identifying information will be confidential. The survey tool is Google Forms and it was distributed to patients using a snowball method. Three of the researchers shared the survey link with their patients and asked them to share it with anyone they knew who might fit the descriptions of the study sample.

### Sample Size

By using, Qualtrics calculates the minimum sample size was 384. The sample size was approximately calculated with a confidence level of 95%.

By using the following formula:

$$n = P(1-P) * Z_{\alpha/2}^2 / d^2 \text{ confidence level of } 95\%.$$

$$n = (1.96)^2 * 0.50 * 0.50 / (0.05)^2 = 384.$$

N: sample size

Z: confidence level  $(1 - \alpha) = 1.96$

P: estimated knowledge

$$Q: (1 - 0.50) = 0.50$$

D: maximum acceptable error = 0.05

## Analyzes and Entry Method

Data collection and basic analysis were conducted using SPSS. Running basic statistics, we report frequencies and percentages of categorical data. All other data such as nominal and ration data were coded using scales and we report their means and standard deviations.

Participants' responses were downloaded from Google Forms and saved in the "Microsoft Office Excel software" program. Then the data using the Statistical Package of Social Science Software (SPSS) version 20.

## RESULTS AND DISCUSSION

**Table 1** shows the socio-demographic characteristics of the Participants. About 400 individuals participated in this study. More than half of them (51.8%) were males. About (53.3%) of the studied participants were in the age category of (18-27) years old. As regards the highest education degree (53.3%) of them had a Bachelor's degree.

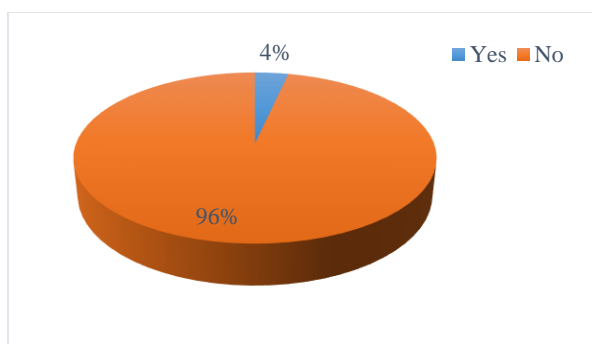
**Table 1.** Socio-demographic characteristics of the Participants (No= 400)

variables	No	%	
Age	Mean $\pm$ SD median (Range)	30.87 $\pm$ 10.62 26.50 (18- 60)	
	18 - 27	213	53.3
	28 - 37	72	18
	38- 47	67	16.8
	48-57	43	10.8
	$\geq$ 58	5	1.3
Gender	Male	207	51.8
	Female	193	48.3
Highest education degree	No formal educational credential	14	3.5
	High school diploma or equivalent	117	29.2
	In some colleges, no degree	15	3.7
	Bachelor's degree	213	53.3
	Master's degree	30	7.5
Doctoral or professional degree.	11	2.8	

**Table 2** Shows the Prevalence of dry socket occurrence after tooth extraction among participants. About (3.5%) of individuals who participated in this current study reported that they had dry sockets before.

**Table 2.** Prevalence of dry socket after tooth extraction among participants (No= 400)

Variable	Answer	No	%
Have you ever had a dry socket before	Yes	14	3.5
	No	386	96.5



**Figure 1.** Prevalence of dry socket after tooth extraction among participants (No= 400).

As shown in **Table 3**, the relation between the Socio-demographic characteristics of Participants and the occurrence of dry sockets. (1.5%), (1.3%), (0.5%) and (0.3%) of Participants who reported that they had dry socket before were in the age group (48-57), (18- 27), (38- 47) and ( $\geq 58$ ) years old respectively. There is a statistically significant association between age and the occurrence of dry sockets with a P-value  $< .05$ .

**Table 3.** Relation between occurrence of dry socket and Socio-demographic characteristics of Participants

Variables	occurrence of dry socket		P_ Value*
	Yes (No=14) (3.5%)	No (No=386)(96.5%)	
	No (%)	No (%)	
<b>Gender</b>			
Female	7 (1.8)	186 (46.5)	.894
Male	7 (1.8)	200 (50)	
<b>Age</b>			
18 - 27	5 (1.3)	208 (52)	$< .001$
28 - 37	0	72 (18)	
38- 47	2 (0.5)	65 (16.3)	
48-57	6 (1.5)	37 (9.3)	
$\geq 58$	1 (0.3)	4 (1)	
<b>Highest education degree</b>			
No formal educational credential	0	14(3.5)	.833
High school diploma or equivalent	4(1)	113(28.3)	
In some colleges, no degree	0	15(3.8)	
Bachelor's degree	8(2)	205(51.3)	
Master's degree	1(0.3)	29(7.3)	
Doctoral or professional degree.	1(0.3)	10(2.5)	

\*Chi-Square Test

The distribution of participants according to risk factors of occurrence of dry socket. Smoking multiple times/day was found to be a risk factor for dry sockets. As regards systemic diseases (2%) of participants who had dry sockets were diabetic and (1.5%) of them were hypertensive. Also (.5%) had lung diseases and the same percentage reported having heart diseases. In addition (1.5%) were currently taking

medicines. Among females who had dry sockets before (1%) of them were taking birth control pills. Moreover (1%) of those who had dry sockets reported having conditions or therapies that may affect the immune system. These risk factors are statistically significant associated with dry socket occurrence with P-value  $< .05$  (**Table 4**).

**Table 4.** Distribution of participants according to risk factors of occurrence of dry socket (No=400)

Variables	occurrence of dry socket		Total (No=400)(100%)	P_ Value*
	Yes (No= 14) (3.5%)	No (No=386)(96.5%)		
	No (%)	No (%)		
			No (%)	

<b>Smoking habits</b>				
Multiple times a day	7 (1.8)	66 (16.5)	73 (18.3)	
Once a day	0	10 (2.5)	10 (2.5)	
Once a week	0	5 (1.3)	5 (1.3)	.036
Once a month	0	16 (4)	16 (4)	
Never	7 (1.8)	289 (72.3)	296 (74)	
<b>Diabetes</b>				
Yes	8(2)	16(4)	24(6)	< .001
No	6(1.5)	370(92.5)	376(94)	
<b>High blood pressure</b>				
Yes	6 (1.5)	17 (4.3)	23(5.8)	< .001
No	8 (2)	369 (92.3)	377 (94.3)	
<b>Lung disease</b>				
Yes	2(0.5)	12(3)	14(3.5)	.025
No	12(3)	374(93.5)	386(96.5)	
<b>Blood disorders</b>				
Yes	3 (0.8)	30 (7.5)	33 (8.3)	.068
No	11(2.8)	356 (89)	367 (91.8)	
<b>Heart disease</b>				
Yes	2 (0.5)	10(2.5)	12(3.0)	.012
No	12(3)	376(94)	388(97)	
<b>Family history of diseases e.g (diabetes, cancer, heart disease)</b>				
Yes	7 (1.8)	177 (44.3)	184 (46)	
No	5 (1.3)	160 (40)	165 (41.3)	.912
Maybe / Not Sure	2 (0.5)	49 (12.3)	51 (12.8)	
<b>Currently taking any drugs or medicines</b>				
Yes	6 (1.5)	96 (24)	102 (25.5)	
No	6 (1.5)	277 (69.3)	283 (70.8)	.022
Maybe / Not Sure	2 (0.5)	13 (3.3)	15 (3.8)	
<b>Have any allergies</b>				
Yes	5(1.3)	80(20)	85(21.3)	
No	8(2)	268(67)	276(69)	.401
Maybe / Not Sure	1(0.3)	38(9.5)	39(9.8)	
<b>Are you pregnant</b>				
Yes	0	7(1.8)	7(1.8)	
No	7(1.8)	179(44.8)	186(46.5)	.860
Not Applicable (Male) (Male)	7(1.8)	200(50)	207(51.8%)	
<b>Are you breastfeeding</b>				
Yes	0	4(1)	4(1)	
No	7(1.8)	182(45.5)	189(47.3)	.915
Not Applicable	7(1.8)	200(50)	207(51.8)	
<b>Taking birth control pills</b>				
Yes	4 (1)	16 (4)	20(5)	
No	4 (1)	169 (42.3)	173 (43.3)	< .001
Not Applicable (Male)	6 (1.5)	201 (50.3%)	207(51.8)	
<b>Having Conditions or therapies that could affect your immune system</b>				
Yes	4 (1)	3 (0.8)	7 (1.8)	< .001
No	8 (2)	375 (93.8)	383 (95.8)	

Maybe / Not Sure	2 (0.5)	8 (2)	10 (2.5)	
<b>Have you ever had hepatitis, jaundice (other than at birth) or liver disease</b>				
Yes	0	2 (0.5)	2 (0.5)	
No	13 (3.3)	377 (94.3)	390 (97.5)	.364
Maybe / Not Sure	1 (0.3)	7 (1.8)	8 (2)	

\*Chi-Square Test

As illustrated in **Table 5**, the distribution of participants according to their previous experience of tooth extraction. Out of all participants (34.5%) stated that they visited an oral and maxillofacial surgery clinic before. About (37%) of them reported that they had one tooth extraction before. The majority of them (76.5%) informed that it was a simple extraction. Nearly (27.3%) of them had experienced complications after the extraction by the first Day. The most common complication that occurred after extraction was throbbing Pain in the site of extraction or near the ear, temple, neck, or eye. Additionally, the majority of them reported that pain was relieved with painkillers only.

**Table 5.** Distribution of participants according to their previous experience of tooth extraction (No=400)

Variable	No (%)
<b>Have you ever visited an oral and maxillofacial surgery clinic?</b>	
Yes	138 (34.5)
No	262 (65.5)
<b>How many tooth extractions did you have</b>	
1	148 (37)
2	81 (20.3)
3	56 (14)
4	59 (14.8)
5+	56 (14)
<b>It was simple extraction or surgical extraction</b>	
simple	306 (76.5)
Surgical	94 (23.5)
<b>Did you experience any complications during the extraction?</b>	
Yes	50(12.5)
No	350(87.5)
<b>Did you experience any complications after the extraction on the first Day?</b>	
Yes	109 (27.3)
No	291 (72.8)
<b>What type of complication was it</b>	
Bleeding	21 (5.2)
throbbing Pain in the site of extraction or near the ear, temple, neck, eye	50(12.5)
Swelling.	17(4.3)
Bad breath	6(1.5)
Bad taste	8(2)
Visible bone in the socket	7(1.8)
<b>Is the pain relieved with painkillers or need to visit the ER</b>	
Relieved with painkillers.	366 (91.5)
went to ER	34 (8.5)

**Table 6** Shows the distribution of participants' awareness about dry sockets. Only (21%) of them heard about dry sockets before. Approximately one-third (33%) of participants agreed that patient who did not follow post-extraction instruction was most prone to receiving a dry socket. The majority of them (86.8%) reported that if a dry socket happened the most suitable advice was to visit a dental clinic. More than (30.5%) were informed that taking medications given by oral surgeons was the best way to reduce the risk of dry sockets.

**Table 6.** Distribution of participants according to their awareness about dry sockets (No=400)

Variable	No (%)
<b>Did you hear about dry sockets before</b>	
Yes	84(21)
No	316 (79)
<b>Who is most prone to receiving a dry socket</b>	
Smoking	117(29.3)
Bad oral hygiene.	79(19.8)
uncontrolled metabolic diseases	20(5)
blood disorder	52(13)
not following post-extraction instruction	132(33)
<b>If it happens, what you should do</b>	
Visit dental clinic	347(86.8)
Take painkillers alone	19(4.8)
take antibiotics Without a prescription	7(1.8)
Visit the dental clinic and take antibiotics Without a prescription	4(1)
Visit the dental clinic and take painkillers alone	23 (5.8)
<b>what can you do to reduce the risk of dry socket?</b>	
Take medications given to you by your oral surgeon	122 (30.5)
Avoid drinking through a straw 48-36 hours post-surgery	19 (4.8)
Avoid smoking	54 (13.5)
Avoid consuming hot liquids 1-2 days post-extraction	71(17.8)
Drink cold fluids as they facilitate the formation of clots and they prevent disintegration	74 (18.5)
Avoid sport in the First 24 Hours	6 (1.5)
Avoid mouth rinsing forcefully	54 (13.5)

One of the conditions that affect how extraction wounds heal is alveolar osteitis (AO) [13]. Frequently to as "dry-socket," which is one of the frequent post-operative issues that causes intense pain "post-operative pain" inside and around the extraction-site, usually caused by a partially or completely disintegrated blood clot within the socket, this type of

extraction complications is typically connected with the extraction of impacted third molar-teeth and mandibular molar-teeth, and it worsens between the first and third day after the extraction [14].

A dry-socket develops as a result of the blood clot's dissolution via fibrinolysis [15]. Dry sockets can happen for a variety of reasons. For instance, oral contraceptives, menstrual cycle, immediate postextraction socket irrigation with normal saline, smoking, surgical-trauma, single-extractions, age, sex, history of illness, systematic disorder, extraction site, amount of anesthesia, operator experience, antibiotics used before surgery, the difficulty of the surgery, and the previous surgical site infection [16]. Palliative care is the focus of the conventional treatment options, which include irrigation of the surgical site, not curing the extraction socket, and There are new products on the market that can speed up the healing of the socket, including PRGF and GECB. Packing with a zinc oxide-eugenol paste on iodoform gauze might be considered to treat acute pain episodes [17].

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The purpose of the study was to ascertain the prevalence and risk factors for dry sockets following tooth extraction in the population of Saudi Arabia.

In our research, we discovered that 3.5% of participants experienced a dry socket following tooth extraction. A different investigation carried out at a Palestinian Dental Teaching Center [19], revealed that the overall prevalence of dry sockets was 3.2%. Another study conducted to investigate the incidence of dry sockets in recent times in a Nigerian Tertiary Hospital [6] revealed that overall incidence was 1.4% and much less than figures documented in most reports outside Nigeria and 5.6% in the study of Houston *et al.* [20, 21]. The incidence of dry sockets has been reported in the literature to be about 0.5–5.6% and following surgical extraction of third molars, it is up to 30% [22, 23]. Another study conducted at Kathmandu University Teaching Hospital (KUTH), Dhulikhel, Kavre, Nepal [24], revealed that the incidence of dry sockets was found as 3.9% in this study.

Regarding the relation between the occurrence of dry sockets and the Socio-demographic characteristics of participants, we have found a statistically significant association between age and the occurrence of dry sockets with a P-value < .05.

We have discovered a statistically significant correlation between the risk factors for developing dry sockets and

smoking, diabetes, and high blood pressure, respectively (p p-value =0.036, 0.001, and 0.001). Diseases of the lungs, the heart, and the current use of any drugs or medications (p p-values =0.025, 0.012, and 0.022, respectively). taking birth control pills, having illnesses or undergoing treatments that may have an impact on the immune system, respectively (p-value =0.001, 0.001). [25] revealed a significantly greater frequency of AO with oral contraceptive users compared with nonusers. Another study done by Bortoluzzi MC *et al.*, [26] revealed that smoking was found to be statistically associated with the development of postoperative complications and dry sockets. Mohammed H Abu Younis and Ra'ed O Abu Hantash [27] reported that smoking, surgical trauma, and single extractions are considered predisposing factors in the occurrence of dry socket, on the other hand, factors like age, sex, medical history, extraction site, amount of anesthesia, and operator experience have no effect on the observation of dry socket. The overall frequency of dry sockets was 3.2%. The incidence of dry sockets following non-surgical extractions was 1.7% while it was 15% following surgical extractions. The incidence of dry socket was significantly higher in smokers (12%) than in non-smokers (4%), age, sex, medical history, extraction site, amount of local anesthesia, and experience of operator played no role in the occurrence of dry socket which is not consistent with our results. Another two studies were done by Eshghpour *et al.*, [28] and Hasan Momeni, *et al.*, [19] to identify the risk factor & the risk group of dry sockets. Eshghpour *et al.*, [29] reported that the incidence of Dry Sockets was 19.14%, age, gender, systemic disorder, and antibiotics use before surgery revealed no significant associations with Dry Sockets and the incidence of Dry Sockets was significantly relevant to smoking, difficulty of the surgery according to pre-surgery radiograph evaluation and perception of surgeon post-surgery, length of surgery, and several capsules used to reach anesthesia, Hasan Momeni, *et al.*, [18] reported that the incidence of dry socket was 0.6% and females were more common involved than males (0.08% versus 0.04%). reported that traumatic extraction, tobacco use after extraction, and previous surgical site infections are all linked to an increased risk of developing alveolar osteitis. This association between these factors and the onset of alveolar osteitis is statistically significant [30]. Another investigation carried out in a Jordanian dental training facility [31] found that a clear linear relationship between the amount of smoking and the incidence of dry socket was seen (P = 0.034), and that dry socket prevalence was substantially greater in smokers (9.1%) than in non-smokers (3%) after surgical and non-surgical extractions. The conclusions of this study are at odds with those of Johnson and Blanton., [17] who showed no significant difference in the prevalence of dry socket between smokers and non-smokers.

## CONCLUSION

The etiology of dry socket is multifactorial and ultimately it is the host's healing potential that determines the severity and

duration of the condition. The incidence of dry sockets in our study after tooth extraction among participants was (3.5%).

There is a significant association between the occurrence of dry socket and smoking habits, diabetes, and high blood pressure, ( $p$ -value =0.036, 0.001, 0.001) respectively. Lung disease, heart disease, currently taking any drugs or medicines ( $p$ -value =0.025, 0.012, 0.022) respectively. Taking birth control pills, having Conditions or therapies that could affect the immune system ( $p$ -value =0.001, 0.001) respectively. The occurrence of dry sockets in everyday oral surgery or dental practice is unavoidable. The risk factors for this temporary and debilitating condition are identified. Surgeons must recognize these risk factors in patients with particular medical conditions and include this information as a part of the informed consent. Treatment options for this condition are generally limited and directed toward palliative care. Prevention methods include avoiding smoking before and after surgery and traumatic surgery.

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**ETHICS STATEMENT:** Ethical approval was obtained from the research ethics committee of King Abdulaziz University, Jeddah, with (application number: 151-12-22). An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

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