Original Article

Association of Oral Hygiene Status and Dry Socket After Third Molar Surgery: A Prospective Cohort Study

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ABSTRACT

Objective: This study evaluates the effect of oral hygiene status on frequency of dry socket after lower third molar surgery.

Study Design: Cohort study

Place and Duration of Study: This study was conducted at the Oral Surgery Department of Khyber College of Dentistry, from August 2017 to December 2020.

Materials and Methods: Total 270 patients were included in this study. Hygiene status of the oral cavity was evaluated using Oral Hygiene Index-Simplified (OHI-S). Data analysis was done using SPSS version 20. Simple and multiple logistic regression analyses were applied to measure the associations of independent variables and dry socket. A p-value of less than 0.05 was taken as significant.

Results: Total of 55 (20.4%) patients developed dry socket with 28 male patients and 29 belonging to age group 25 years or less. Association of dry socket with OHS (p=0.005) and duration of procedure (p=0.009) was statistically significant. Patients with poor OHS, fair OHS and duration of surgery more than 30 minutes were at higher odds of developing dry socket with adjusted odds ratio of 3.064 (95% C.I.:1.412, 6.647), 2.065 (95% C.I.:0.986, 4.329) and 2.097 (95% C.I.:1.133, 3.881) respectively. Association of age groups and gender with dry socket was statistically not significant.

Conclusion: Dry socket more commonly develops in patients with poor and fair oral hygiene after impacted MTM surgery, irrespective of gender and age.

Key Words: Impaction, Dry socket, Oral Hygiene Index-Simplified (OHI-S)

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INTRODUCTION

Dry socket (DS), or alveolar osteitis, has been defined as "postoperative pain inside and around the extraction site, which increases in severity at any time between the first and third day after the extraction, accompanied by a partial or total disintegrated blood clot within the alveolar socket with or without halitosis.[1] It most commonly occurs after surgical extraction of impacted mandibular third molars (MTM).[2]

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Dry socket usually develops 1 to 3 days after extraction and characterized by moderate to severe pain that usually does not respond to analgesics. Other features of DS include local signs like open socket with food debris, tender inflamed gingiva, halitosis, exposed bone with severe tenderness.[1,3,4]

The precise pathogenesis of DS is not clear but increase in local fibrinolytic activity resulting in disintegration of the clot is suggested pathophysiology.[1] Fibrinolysis may occur as a result of direct tissue activators released due to trauma to the alveolar bone or release of indirect activators by bacteria.[5,6] The risk factors for DS include smoking, traumatic and difficult extraction, female gender, vasoconstrictors in local anesthesia, poor oral hygiene, excessive irrigation and curettage, pre-existing infection, oral contraceptives (OCP), diabetes and radiotherapy.[1,4,7-9]

Although many studies are conducted to identify the common risk factors that are associated with DS, the effect of oral hygiene status (OHS) on post-operative incidence of DS is little explored.[4,7,9] In this study we assessed the association of oral hygiene status with dry socket after surgical removal of impacted MTM. The results further clarified the role of OHS in the development of DS and may prompt the clinicians to

take preventive measures before embarking on the surgical extraction of impacted MTM when dealing with patients having poor oral hygiene.

MATERIALS AND METHODS

This prospective cohort study was conducted at Oral Surgery unit of Khyber College of Dentistry, Peshawar, from August 2017 to December 2020. Total 270 patients meeting the inclusion criteria were included in this study. All patients irrespective of age and gender, who had surgical extraction of moderately difficult impacted MTM with a Pederson score of 4 to 7 were selected consecutively in this study. The difficulty of surgery influences the incidence of DS so moderately difficult cases were selected to control its effect as confounding factor. All patients with systemic illness, immune-suppression, smokers, those on oral contraceptives, steroids and having undergone radiotherapy and chemotherapy were excluded from the study as these conditions are known risk factors for dry socket.

Ethical approval from the institution review board was taken. Detailed history and clinical examination was done after obtaining informed consent from all patients. Orthopantomogram (OPG) was done to evaluate MTM. A structured proforma was used to record the patients' demographics, OHS, duration of procedure (DoP) and presence or absence of dry socket. Duration of procedure was recorded from the start of the incision till the placement of last suture.

All the patients were evaluated for OHS using Oral Hygiene Index-Simplified (OHI-S) which is based on combined score of Debris Index-Simplified (DI-S) and the Calculus Index-Simplified (CI-S). The DI-S and CI-S were calculated independently and then added together to get the OHI-S. The results were interpreted as good, fair and poor based on OHI-S score of 0 to 1.2, 1.3 to 3.0 and 3.0-6.0 respectively.

Procedure

All the extractions were performed under local anesthesia, using a standardized method by a single operator who had completed post graduate training in maxillofacial surgery to control the operators' bias. After the procedure all patients were given post operative instruction in verbal and written form. All patients were advised Ibuprofen 400mg 8 hourly, orally for 5 days. Patients were advised to start warm saline gargles after 48 hours.

Patients were followed up on the phone to record the information daily and asked to return immediately in case there were any signs and symptoms of DS. Diagnosis of DS was based on increasing pain in and around extraction socket after 24 hours of extraction and empty socket with disintegrated or dislodged clot. All patients returned on 6th post-operative day for routine examinations and removal of stitches. The patients were examined and those who did not have any signs and symptoms of dry socket were considered to have healed sockets.

The data was analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Chi-square test was applied to assess the association between different variables and dry socket. Simple and multiple logistic regression analyses were used to find crude and adjusted Odds Ratio (with 95% confidence intervals) to measure the strength of relationships between independent variables (age groups, gender, OHS and DoP) and post-operative dry socket. Statistical significance level was kept at $p \leq 0.05$. Hosmer-Leme show test was used to make sure the model is a good fit to the data.

RESULTS

Out of the total 270 patients, 54.4% (n=147) were male. Majority of the patients in this study belonged to age group 25 years and below (n=156, 57.8%). Good OHS (n=111, 41.1%) was found in majority of the patients followed by fair and poor OHS. Extraction was completed within 30 minutes in majority of cases (169, 62.6%). Further details are given in table I.

Table No.I: Distribution of Age, Gender, Oral Hygiene Status and Duration (n=270)

Variables	N (%)
Gender	
Male	147 (54.4)
Female	123 (45.6)
Age Groups	
≤25	156 (57.8)
≥26	114 (42.2)
Oral Hygiene Status	
Good	111 (41.1)
Fair	98 (36.3)
Poor	61 (22.6)
Duration of procedure	
< 30 mins	169 (62.6)
>30 mins	101 (37.4)

Dry socket was diagnosed in 55 (20.4%) patients. Out of the total 147 male patients 28 (19%) returned with DS while 27 (22%) female patients developed DS. This difference was statistically not significant (P=0.555). Similarly, in this study DS developed in 29 (18.6%) patients belonging to 25 years and below age group while 26 (22.8%) patients were diagnosed with DS in 26 years and above age group. This association had no statistical significance (P=0.395). Dry socket was diagnosed in 21 (34.4%) patients out of the total 61 with poor OHS. The association of OHS and DS was statistically significant (p=0.005). Similarly, DS developed in 29 (28.7%) of total 101 patients whose DoP was more than 30 minutes. The association of DoP with dry socket had statistical significance (p=0.009). Details are presented in table 2.

Table No.2: Association of Age, Gender, Oral Hygiene Status and duration of procedure with Dry Socket (n=270)

Variables	Dry Socket		P value
	Yes n (%)	No n (%)	
Gender			0.555
Male	28 (19)	119 (81)	
Female	27 (22)	96 (78)	
Age Group			0.395
≤25	29 (18.6)	127 (81.4)	
≥26	26 (22.8)	88 (77.2)	
Oral Hygiene Status			0.005 *
Good	15 (13.5)	96 (86.5)	
Fair	19 (19.4)	79 (80.6)	
Poor	21 (34.4)	40 (65.6)	
Duration of procedure			0.009 *
< 30mins	26 (15.4)	143 (84.6)	
>30mins	29 (28.7)	72 (71.3)	

*p-value significant- <0.05

Table No.3: Regression Analysis for estimates of association between independent variables and Dry Socket

Variables	P Value*	Crude OR* (95% C.I.)	P value**	Adjusted OR** (95% C.I.)
Gender				
Male	R			
Female	.555	1.195 (0.661-2.163)	.470	1.254 (.678-.2.318)
Age Groups				
≤ 25	R			
≥26	.396	1.294 (0.714-2.346)	.510	1.231 (0.663-2.285)
Oral Hygiene Status				
Good	R			
Poor	0.002	3.360 (1.574-7.173)	.005	3.064 (1.412-6.647)
Fair	0.036	2.183 (1.054-4.520)	.055	2.065 (0.986-4.329)
Duration				
<30mins	R			
>30mins	0.009	2.215 (1.215-4.038)	0.018	2.097 (1.133-3.881)

* Simple Logistic Regression
** Multiple Logistic Regression
OR Odds ratio
C.I. Confidence Interval
R Reference=1.0

Hosmer and Lemshow test suggested that the model is a good fit to the data as p>0.05 (p=.618).

Patient with poor OHS, fair OHS and those with DoP longer than 30 minutes are main determinants of post-operative DS in both simple and multiple logistic regression analyses. The odds of post-operative DS in patients with poor OHS was 3 times higher than those with good OHS with crude odd ratio of 3.36(C.I.:1.574, 7.173) and adjusted odds ratio of 3.064(C.I.:1.412, 6.647). Similarly, patients with fair OHS and DoP longer than 30 minutes were also at higher odds of developing post-operative DS in both simple and multiple logistic regression analyses. Details are given in table 3.

DISCUSSION

Dry socket is a well-established complication of wisdom tooth surgery that causes moderate to severe pain which is usually unresponsive to analgesics.[10,11] The incidence of DS after removal of moderately difficult impacted MTM in our study is 20.4%. Dry socket is significantly associated with OHS and DoP while its association with age groups and gender is statistically not significant. The overall incidence of 20.4% DS reported in this study is comparable to some other studies.[7,12] However this incidence is much higher than many other studies done worldwide.[12-14] This higher incidence of DS in our study can be due to the fact that we included moderately difficult extractions in our study. Some studies reported higher incidence of DS with increasing difficulty and longer duration.[8,12]

In this study we have found a significant relationship of OHS with DS. Similar results were reported by Akinbame and Godspower[15] who noted a significant relation of poor oral hygiene with DS in their study. Other studies also found bad oral health as a risk factor for development of DS.[11,12] Parthasarathi et al[16] in their study found that all cases of DS occurred in patients with poor oral hygiene while patients with good oral hygiene did not report any case of dry socket. Similarly, Peñarrocha et al[17] found that poor OHS was associated with greater post operative pain and required more analgesics as compared to patients with good OHS. Other studies have also reported poor oral hygiene and micro-organism as risk factors for higher incidence of DS.[1,8,9] However, Halabi et al[18] did not find any statistically significant relation between OHS and DS. The higher incidence of DS in patients with poor OHS in our study can be due to the higher number of oral micro-organism found in these patients that may activate fibrinolysis and thus, dry socket. Catellani[19] in his study on bacterial pyrogens postulated that they indirectly activate fibrinolysis. Another reason for higher incidence of DS in these patients may be lack of oral health awareness and motivation to follow the post operative instructions.

In this study the DoP is also significantly associated with DS. Some other studies also reported the association of increase DoP to post extraction DS.[8,10]

However Alwarikat[11] did not find any significant relation of DoP and DS. The higher incidence of DS with longer duration can be due to the increased trauma occurring in lengthy procedures, which results in increased inflammation of alveolar bone and release of direct tissue activators which may cause fibrinolysis and dry socket as proposed by Birn.[5]

In this study we have not found a significant association of age groups with DS. Similar results were reported by other authors who found no significant relation of DS to age.[7,9,10] However, Osunde et al[14] and Haraji and Rakhshan[20] found age as a significant factor and concluded that younger age lowers the risk of DS. Gbotolorun et al[21], on the other hand, found a higher incidence of DS in 25 years and below age group. Other authors have reported the 3rd decade as most common age group for DS.[8,13]

The study does not reveal any significant difference in the incidence of DS based on gender. Other studies around the world reported similar results.[4,8-10] This is in contrast to many other studies which found female gender as a risk factor for development of DS.[11,18,22] They attributed the higher incidence of DS in their studies to the use of OCP among female patients and the hormonal fluctuation in different phases of menstrual cycle during which the procedure is carried out. However, in our study we excluded female patients taking oral contraceptives. The limitation of this study is that we selected moderately difficult cases on the basis of Pederson score 4-7 to nullify the confounding effect of surgical difficulty, however, the difficulty within this score can vary greatly as there are other multiple factors influencing the surgical difficulty. Further studies with bigger sample sizes and more effective control of surgical difficulty and other confounding factors are needed to evaluate the association of OHS and DS.

CONCLUSION

This study reveals that patients with poor and fair OHS undergoing MTM surgeries are more likely to develop DS post operatively. Dry socket also developed more commonly after lengthy procedures. The incidence of DS is not affected by age and gender of the patients.

Recommendations: On the basis of this study we recommend that in patients with poor and fair OHS, optimal OHS should be attained before carrying out MTM surgery, wherever possible. Furthermore in patients with poor and fair OHS, and in those where DoP exceeds 30 minutes, strong consideration should be given to preventive measures such as pre-operative rinses and post-operative medicated dressing of the extraction socket.

Author's Contribution:

Concept & Design of Study:	Tariq Sardar
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Revisiting Critically:	Tariq Sardar, Umer Ullah
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