

# Dry Socket in Patients Receiving Acetaminophen Versus Ibuprofen for Dental Extraction

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## ABSTRACT

**Objective:** To compare the frequency of dry sockets in patients receiving acetaminophen versus ibuprofen for simple dental extraction of mandibular molars.

**Methods:** It was double-blinded randomized controlled trial study conducted at the Oral & Maxillofacial Surgery Department at the Fatima Memorial Hospital, Lahore Pakistan from January 2018 to July 2018. One hundred patients were randomized using random number table into two groups each consisting of 50 patients. Group A received acetaminophen whereas group B received ibuprofen thirty minutes preoperatively and every eight hours postoperatively for two days. Both groups were followed for 48-72 hours after extraction for pain status and clot absence.

**Results:** In group A moderate pain was reported by 80% of patients whereas 18% faced severe pain. In group B 62% of patients had moderate pain and 36% had severe pain the difference was statistically insignificant ( $P > 0.05$ ). The clot was absent in 8% of patients in group A and 30% in group B which was statistically significant ( $P < 0.05$ ).

**Conclusion:** The study concluded that ibuprofen used for analgesia increases the occurrence of dry socket as compared to acetaminophen.

**Keywords:** Acetaminophen, Alveolar Osteitis, Alveolitis, Dry socket

## INTRODUCTION

Dry socket, commonly known as alveolar osteitis, is the most commonly occurring complication of dental extraction.<sup>1,2</sup> Clinically it presents as post extraction pain in and around the alveolar socket with increasing severity from 24-72 hours accompanied by absence of blood clot from extraction site which may be partial or complete, with the presence or absence of halitosis.<sup>3</sup> It presents 1 to 3 days after an extraction.<sup>1,2</sup> General range for occurrence of alveolar osteitis is from 1% to 4% for simple dental extractions.<sup>1</sup> Whereas the incidence of dry socket ranges between 1% to 45% for mandibular wisdom teeth.<sup>1</sup>

The pain can be very debilitating, may reach the temporal region, ear and neck and doesn't respond well to non-prescription and narcotic analgesics, resulting in loss of sleep.<sup>3</sup> Tooth extraction triggers the coagulation process that involves the formation of a primary platelet plug which is reinforced with fibrin mesh developed via coagulation cascade to establish a stable blood clot that seals the extraction wound.<sup>3</sup> The stability of blood clot determines development of dry socket; dry socket develops secondary to dislodgement of the blood clot.<sup>1-4</sup> This loss of the clot can be due to an increase in fibrinolytic activity initiated by inflammatory mediators that form plasmin from plasminogen, resulting in clot lysis due to the dissolution of fibrin.<sup>3-5</sup>

The typical pain experienced with alveolar osteitis has been associated with the production of kinins in the interior portion of alveolar socket.<sup>3-5</sup> Plasmin is involved in the process of transforming creating kinins from kallikrein in the alveolar bone marrow.<sup>6</sup> This indicates that the the presence

of plasmin could be descriptive for its substantial effects i.e. neuralgic pain and clot disintegration.<sup>6</sup>

Commonly prescribed analgesics are NSAIDs and/or Acetaminophen. Ibuprofen being an NSAID blocks cyclooxygenase 1 and 2 that interferes with platelet aggregation thereby may prevent primary platelet plug formation.<sup>7</sup> Interference with platelet plug formation disrupts the cascade of a stable clot formation which theoretically may result in clot loss which is the proposed pathogenesis of dry socket.<sup>1-7</sup> Unlike ibuprofen, Acetaminophen when administered orally at a dose of one gram should not theoretically interfere with platelet aggregation hence supporting our view of dry socket prevention

Since dry socket is the commonest and extremely painful complication of dental extractions, effective prevention or reduction in incidence of dry socket will have a considerable impact on post-dental extraction recovery i.e. pain and suffering, social impact and economic (off work, medicine cost and healthcare resource utilization). This study was planned to systematically study possibility of higher frequency of alveolar osteitis secondary to ibuprofen use that may interfere in clotting.

## MATERIALS AND METHODS

Approach used was double blinded randomized trial carried out in the outpatient department of Oral & Maxillofacial surgery of Fatima Memorial Hospital, Lahore Pakistan from January 2018 to July 2018. After approval of ethical review committee, the informed consent was taken from all patients. A sample of 100 patients was taken for the research through non-probability consecutive sampling

technique. Optimate sample size was determine through Open-Epi sample size calculator, by taking level of significance as 5% and power of test as 80%, the percentage of dry socket in Ibuprofen as 30% & Acetaminophen as 10%, the calculated sample size came out as 50 in each group. Inclusion criteria were patients of either gender between 18-50 years of age reported to department for simple tooth extraction (without raising flap) of mandibular molars and willing for follow up were included in study. Patients allergic to Ibuprofen and Acetaminophen assessed on history or patients taking anticoagulants and oral contraceptives or Immuno-compromised patients or smokers or patients having active purulent infection around the tooth to be extracted assessed clinically or patients undergoing more than one extraction or patients undergoing traumatic extractions were excluded from the study.

Randomization was done through random number tables in the beginning and patients divided into two groups' i.e. A & B (50 patients in each group). All the patients were treated in exodontia department. Extraction was carried out under local anesthesia keeping in view the aseptic measures. Adequate hemostasis was achieved. Postoperative instructions & medication were given both in written & verbal forms. Acetaminophen & Ibuprofen were packaged either as Drug A or Drug B for double blinding (researcher and patient). Group A with 50 patients received drug A and group B with 50 patients received drug B as preemptive drug 30 minutes before surgery and eight hourly postoperatively for two days. Drug assignment to the two groups was done by supervisor

Patients were followed for 48 hours post-operatively for dry socket. Presence of moderate to severe pain (VAS 4-10) and absence of clot was diagnosed as dry socket. Extraction and patient review (Follow up) were done by researcher along with documentation. All the information were collected on a specially designed proformas. The code for the drugs given to the groups was broken after the completion of the statistical analysis to ensure double blinding and researcher analyzed the result for final conclusion.

All the data were entered into SPSS Version 23 and analyzed. Quantitative data was analyzed through mean and standard deviation whereas percentage and frequency were used for qualitative data like gender & presence of dry socket. A Chi-square test was used to compare incidence of dry socket between the two groups. If the p-value obtained was less then or equivalent to 0.5 then relation between the variables was considered significant. Confounding variables like age, gender and educational

status of patient were controlled by stratification for outcome variable. Post stratification chi-square test was applied to check the significance (P-value ≤ 0.05).

**RESULTS**

The mean age of group A(with acetaminophen) was 33.40 years with a female to male proportion of 1.7 :1 and the mean age of group B(with Ibuprofen) was 34.96 years with female to male ratio 1.9:1

In group A, 80% experienced moderate pain whereas 18% experienced severe pain. In the case of group B 62% patients experienced moderate pain and 36% experienced severe pain with p-value=0.126 that is statistically insignificant.

Table.1: Descriptive Statistics of Age & Gender

Variable	Groups	
	Acetaminophen	Ibuprofen
Age (Mean & SD)	33.40±10.05	34.96±9.48
Gender		
Male	18	17
Female	32	33

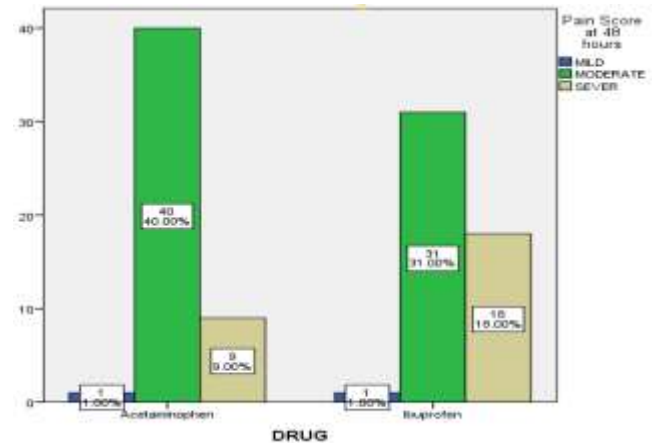


Figure 1: Severity of pain

Considering the clot status it was absent in 8% patients in Group A and 30% in Group B. In Acetaminophen group clot absence was 8% whereas in ibuprofen group it was 30% when calculated with respect to total number of patients' i.e. n=100 with p-value being 0.005 that is statistically significant.

Table 2: Comparison of clot absence and dry socket between both groups

Drug	Clot Absence		P-value	Dry Socket		P-value
	Yes	No		Yes	No	
Acetaminophen	4(8%)	46(92%)	0.005	4(8%)	46(92%)	0.005
Ibuprofen	15(30%)	35(70%)		15(30%)	35(70%)	

With respect to gender it was found that incidence of dry socket among males in group A was 4 % whereas in group B 8% .Similarly among females in group A it was 4 % whereas in group B 22% with p-values being 0.007 and 0.301 for female and male respectively, statistically significant for female. Incidence of dry socket was 8% (n=4)

in Group A (n=50) whereas in group B (n=50) it was 30 % (n=15) with p-value 0.005 that is statistically significant. This study reveals favorable effect of Acetaminophen given preoperatively. Incidence of dry socket with respect to educational status came out to be highest in Secondary with p-value 0.003 that is statistically significant.

Comparison of dry socket incidence between age categories 18-34 and 35-50 revealed higher incidence of dry socket in group B for those falling in category 18-34 with p-value being 0.025 for age category 18-34 that is

statistically significant and 0.101 for age category 35-50 being statistically insignificant.

Table 3: Stratification w.r.t effect modifiers between both groups

Variables		Drug	Dry Socket		Total	Sig.
			No	Yes		
Gender	Male	Acetaminophen	16	2	18	0.301
		Ibuprofen	13	4	17	
	Female	Acetaminophen	30	2	32	0.007
		Ibuprofen	22	11	33	
Education	Uneducated	Acetaminophen	1	0	1	0.667
		Ibuprofen	1	1	2	
	Primary	Acetaminophen	6	1	7	0.731
		Ibuprofen	5	1	6	
	Secondary	Acetaminophen	22	1	23	0.003
		Ibuprofen	17	11	28	
	Graduate	Acetaminophen	17	2	19	0.574
		Ibuprofen	12	2	14	
Age Category	18-34 years	Acetaminophen	27	2	29	0.025
		Ibuprofen	18	8	26	
	35-50 years	Acetaminophen	19	2	21	0.101
		Ibuprofen	17	7	24	

**DISCUSSION**

Significantly higher presentation of Dry Socket in patients taking Ibuprofen in comparison with Acetaminophen p=0.005 thus affirming antiplatelet drug's role of Alveolar Osteitis.<sup>7</sup> Further stratification showed significantly higher occurrence of Alveolar Osteitis in female patients and patients with secondary education 18-34 year age group. The frequency of alveolar osteitis was found to show no major different in males' patients that were taking either acetaminophen or ibuprofen.

This study reports 38% overall incidence of alveolar osteitis as shown in Table. 4. The excessive variation seen in occurrence of dry socket can be credited to dissimilarities in the methods of evaluation and diagnostic criteria; in intermixed or inconsistent data of fully erupted, partially impacted and non-impacted mandibular wisdom teeth extractions, in perioperative care of extraction sockets; in different age groups and extraction methods or surgical competence.<sup>8-13</sup> Also, pain thresholds within the population have a great difference.<sup>13</sup> Lack of clinical reliability was seen in studies reporting 1% incidence, while studies showing remarkably high frequency (>30%) suggest that either the sample size was inadequate or other variables were introduced.<sup>13</sup>

A significant decrease was noted in the occurrence of alveolar osteitis in females (p=0.007) whereas the difference is insignificant among males (p=0.301) as given in Table. 5. The occurrence of dry socket is known to be greater in female patients.<sup>13,15,18</sup> It has been suggested that oestrogens trigger the fibrinolytic system indirectly like pyrogens and certain drugs, and therefore are supposed to result in the formation of dry socket by causing blood clot lysis.<sup>18</sup> A critical review reported higher incidence(p=0.04) of dry socket in females irrespective of whether they used oral contraceptives or not.<sup>13</sup> The current study shows insignificant incidence of dry socket among males compared to that of females which is in agreement with other studies that report higher dry socket occurrence in

females. Chandran and Oginni et al reported insignificant difference between the incidence of alveolar osteitis in females and males (7.86% versus 6.18% respectively in the study of Chandran et al, and 5.1% versus 3.9% in the study of Oginni et al.<sup>13</sup> Research carried out by Almeida et al did not differentiate between gender, but presented the data, which indicated insignificant difference(P =0.611) between the genders.<sup>13</sup> Momeni et al reported a higher frequency of alveolar osteitis in females, but the relation was not able to hold significant (P > 0.1).

A reason for the debate might not be considering the fact that "gender" is a variable which actually comprises of a number of factors that are not often measured (hormonal, habitual, etc).<sup>122</sup>

Alveolar bone contamination due to poor oral hygiene is another important contributory factor for the initiation of dry socket.<sup>13</sup> The association was proven when this complication was found in patients who had neglected oral health or localized infection sites, such as severe periodontitis and pericoronitis etc.<sup>14</sup> Less educated patients that show lack of attention towards are more likely to develop dry socket.<sup>15</sup> Egauvoen conducted a study amongst 2218 patients, and reported 3.65 times higher risk of dry socket in patients with poor hygiene as compared to those who maintained a proper hygiene.<sup>15-17</sup> On the contrary, Momeni et al showed a significantly lower rate of alveolar osteitis in patients who had poor oral hygiene as well as in those who had systemic illnesses in comparison to those who were systemically healthy with good oral hygiene.<sup>18</sup> They, however, did not validate this interesting result.<sup>18</sup> In the current study the frequency of dry socket p=0.003. Possible reason for this is not clear as patients with even lesser education had lesser Dry Socket incidence. This may be further investigated in a prospective study.

Bruce et al also acknowledged that aging itself is a risk factor as it creates complications.<sup>118</sup> Chuang et al recognized increasing age prone to developing more

complications after dental extraction including alveolar osteitis, but the effect of aging on dry socket was not determined independently.<sup>19</sup> the increased morbidity may be due to age related regressive tissue changes and surgical challenges.<sup>20</sup> Dental extractions may become more traumatic and lengthier in old age patients due to brittle roots and dense bone thus surgical difficulty may be attributed to aging.<sup>21</sup> Oginni and Egauvoen et al reported the highest frequency of alveolar osteitis in the third decade followed by the fourth and sixth, in 2218 and 3008 patients.<sup>22</sup> Whereas dry socket was found to be more frequent in the fourth decade as reported by AlHindi et al.<sup>23</sup> Current study shows higher incidence of dry socket ( $p=0.025$ ) in 18-34 year age group (Table. 7) which agrees with Egauvoen and Oginni et al.

## CONCLUSION

Significantly high frequency of dry socket is observed in females taking ibuprofen. This highlights role of Anti Platelet effect of Ibuprofen in female patients. There can be hormonal effects in view of no significant difference of dry socket frequency among male patients. The occurrence of alveolar osteitis in routine oral surgery practice is inevitable. Various treatment modalities are aimed for palliative care for this condition. Main findings of the research is that Ibuprofen used for analgesia especially in female patients increases the occurrence of dry socket as compared to Acetaminophen. Any effect of Acetaminophen in reducing dry socket occurrence needs to be established using placebo.

## REFERENCES

- Khan BT, Kiani M, Saeed M, Khan A. Risk factors assessment for dry sockets: A logistic regression analysis study J Oral Maxillofac Surg Med Pathol. 2015;27(6):753-756.
- Crawford JY. Dry socket. Cosmos 1896;38:929.
- Awang MN. The aetiology of dry socket: a review. Int Dent J 1989;39(4):236-40
- Khan M, Ahmad T, Hijab S. Frequency of dry socket, pain, wound dehiscence and swelling one week after removal of mandibular third molar impaction. JKCD. 2015;5(2).
- Preetha S. An overview of dry socket and its management. IOSRJDMS. 2014;13(5):32-35.
- Kolokythas A, Olech E, Miloro M. Alveolar Osteitis: A comprehensive review of concepts and controversies. Int J Dent. 2010;2010:1-10.
- Akinbami B, Godspower T. Dry Socket: incidence, clinical features, and predisposing factors. Int J Dent. 2014;2014:1-7.
- Cardoso C, Rodrigues M, Júnior O, Garlet G, de Carvalho P. Clinical concepts of dry socket. J Oral Maxillofac Surg. 2010;68(8):1922-1932.
- Björnsson G, Haanaes H, Skoglund L. A randomized, double-blind crossover trial of paracetamol 1000 mg four times daily vs ibuprofen 600 mg: effect on swelling and other postoperative events after third molar surgery. Br J Clin Pharmacol. 2003;55(4):405-412.
- Munsterhjelm E, Munsterhjelm N, Niemi T, Ylikorkala O, Neuvonen P, Rosenberg P. Dose-dependent inhibition of platelet function by acetaminophen in healthy volunteers. Anesthesiology. 2005;103(4):712-717.
- Qi D, May L, Zimmerman B, Peng P, Atillasoy E, Brown J et al. A randomized, double-blind, placebo-controlled study of acetaminophen 1000 mg versus acetaminophen 650 mg for the Treatment of Postsurgical Dental Pain. Clinical Therapeutics. 2012;34(12):2247-2258.
- Al-Sukhun J, Penttila H. The cyclooxygenase-2 inhibitor celecoxib and alveolar osteitis. J Ir Dent Assoc. 2011; 57 (1): 50-53.
- Blum IR: Contemporary views on dry socket (alveolar osteitis)A clinical appraisal of standardization, aetiopathogenesis and management: A critical review. Int J Oral Maxillofac. 2002;Surg31:309.
- Vezeau PJ: Dental extraction wound management: Medicating postextraction sockets. J Oral Maxillofac Surg. 2000;58:531.
- Birn H: Etiology and pathogenesis of fibrinolytic alveolitis("dry socket"). Int J Oral Surg 1973;2:211.
- Birn H: Bacteremia and fibrinolytic activity in "dry socket."Acta Odontol Scand 1970;28:773.
- Carvalho PSP, Okamoto T, Carvalho ACP: The influence of intra-alveolar curettage on wound healing after tooth extraction:A histological study in rats. J Nihon Univ Sch Dent 1982;24:28.
- Catellani JE: Review of factors contributing to dry socket through enhanced fibrinolysis. J Oral Surg 1979;37:42.
- Lilly GE, Osbon DB, Rael EM, et al: Alveolar osteitis associated with mandibular third molar extractions. J Am Dent Assoc 1974;88:802.
- Sisk AL, Hammer WB, Shelton DW, et al: Complications following removal of impacted third molars: The role of the experience of the surgeon. J Oral Maxillofac Surg 1986; 44:855.
- Jerjes W, El-Maaytah M, Swinson B, et al: Experience versus complication rate in third molar surgery. Head Face Med 2006;2:14.
- Larsen PE: Alveolar osteitis after surgical removal of impacted mandibular third molars. Identification of the patient at risk. Oral Surg Oral Med Oral Pathol 1992;73:393.
- Silva TA, Lara VS, Silva JS, et al: Dentin sialoprotein and phosphoprotein induce neutrophil recruitment: A mechanism dependent on IL-1beta, TNF-beta, and CXC chemokines. Calcif Tissue Int 2004;74:532.