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RESEARCH ARTICLE

EFFECT OF ORAL CONTRACEPTIVES ON THE INCIDENCE OF ALVEOLAR OSTEITIS IN FEMALES.

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Abstract

Background:- Dry socket or localized alveolar osteitis (AO) is the most commonly encountered complications following extraction of teeth by general dentists and specialists, with associated pain due to inflammatory changes in the exposed socket wall following breakdown of blood clot in extraction socket.

Aim of the study:- To evaluate the incidence of alveolar osteitis among female patients attending Qassim university dental clinics consuming oral contraceptives.

Patients and method:-A total of 40 healthy women aged 20 to 40 years, all of whom underwent simple extractions of various teeth. 20 of the women were regular users of oral contraceptives. All patients were evaluated for postoperative pain.

Results:-The consumer group aged between 20-30 years 7 (43.8%) and 13 (54.2%) of the consumers aged 31-40. Non-consumer group aged 20-30 years 9 (56.2%) and 11 (45.8%) aged 31-40. The results showed that (85.0%) of the consumers have encountered AO, while (25.0%) only of the non consumers have had AO. On the other hand (15.0%) and (75.0%) haven't encountered any signs of AO, respectively highly significant difference between the groups ($p < 0.001$).

Conclusion:-The results of this study support the view that oral contraceptive use favours the appearance of dry socket and postoperative pain after extraction.

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Introduction:-

Dry socket or localized alveolar osteitis (AO) is the most commonly encountered complications following extraction of teeth by general dentists and specialists, with associated pain due to inflammatory changes in the exposed socket wall following breakdown of blood clot in extraction socket.^[1]

Terminology:-

Authors do not agree on terminology for this complication. "Dry socket" was first described in the literature in 1896 by Crawford^[2]. Since then, other terms have been used to refer to this complications, such as "alveolar osteitis", "alveolitis", "localized osteitis", "alveolitis sicca dolorosa", "localized alveolar osteitis", "fibrinolytic alveolitis", "septic socket", "necrotic socket", and "alveolgia", among others^[3,4]. Birn, whose series of articles provided a better understanding of the pathophysiology^[7,9], labeled the condition fibrinolytic alveolitis. Although most authors

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have accepted Birn's theories, the term fibrinolytic osteitis is the least used in the literature^[3,4]. "Dry socket", which is the generic term, and "alveolar osteitis" are more commonly used terms.

Signs & Symptoms:-

It is characterized by severe pain starting usually on the second or third day postoperatively. Several authors have agreed that pain and empty alveolus are found in all patients with AO^[5, 6,7]. Other defining factors that have been reported are radiating pain towards the ear and temporal region^[8,9], rare maxillary involvement in ocular and frontal regions^[5], halitosis^[8,10], seldom low-grade fever^[8,9], inflamed gingival margin^[11], bare bone^[11], ipsilateral regional lymphadenopathy^[8,9], and grayish discharge^[12]

Etiology:-

The exact pathogenesis of AO is not well understood. Birn's classic series of articles between 1963 and 1977 provided a better understanding of the likely pathophysiology^[5-13]. Birn suggested that the etiology of AO is an increased local fibrinolysis leading to disintegration of the clot. The fibrinolysis is the result of plasminogen pathway activation, which can be accomplished via direct (physiologic) or indirect (nonphysiologic) activator substances^[5]. Direct activators are released after trauma to the alveolar bone cells. Indirect activators are elaborated by bacteria. The fibrinolytic activity is local because initial absorption of plasminogen into the clot limits the activity of plasmin. In fact, it was found that active plasmin is inactivated in the general circulation by antiplasmins^[14]. Birn and others have further reviewed the local differences in the fibrinolytic activity between body tissue and found higher fibrinolytic activity with bone and uterine tissues, in comparison to skeletal muscle, kidney, heart, brain, liver, spleen, lung, and thyroid tissues^[15, 16]. But the factors capable of triggering fibrinolysis are more ambiguous. There have been numerous studies published over the years discussing the contributing or risk factors for development of AO. Some of the factors include trauma/difficult extraction, gender, increased age, smoking, oral contraceptives use and vasoconstriction activity of the local anesthetic agents.

Contributing/Risk Factors:-

Surgical Trauma and Difficulty of Surgery:-

Most authors agree that surgical trauma and difficulty of surgery play a significant role in the development of AO^[4, 5, 17, 18]. This could be due to more liberation of direct tissue activators secondary to bone marrow inflammation following the more difficult, hence, more traumatic extractions^[19]. Surgical extractions, in comparison to nonsurgical extractions, result in a 10-fold increase incidence of AO^[20]. Lilly et al.^[6] found that surgical extractions involving reflection of a flap and removal of bone are more likely to cause AO.

Oral Contraceptives:-

Oral contraceptive is the only medication associated with developing AO. Oral contraceptives became popular in 1960s and studies conducted after 1970s (as opposed to studies prior to 1960s) show a significant higher incidence of AO in females^[21, 22, 23]. Sweet and Butler^[24] found that this increase in the use of oral contraceptives positively correlates with the incidence of AO. Estrogen has been proposed to play a significant role in the fibrinolytic process. It is believed to indirectly activate the fibrinolytic system (increasing factors II, VII, VIII, X, and plasminogen) and therefore increase lysis of the blood clot^[25]. Catellani et al.^[26] further concluded that the probability of developing AO increases with increased estrogen dose in the oral contraceptives.

Patient's Gender:-

Many authors claim that female gender, regardless of oral contraceptive use, is a predisposition for development of AO. MacGregor^[27] reported a 50% greater incidence of AO in women than that in men in a series of 4000 extractions, while Colby^[18] reported no difference in the incidence of AO associated with gender.

Smoking:-

Multiple studies demonstrated a link between smoking and AO. A dose dependent relationship between smoking and the occurrence of alveolar osteitis has been reported. Among a total of 4000 surgically removed mandibular third molars, patients who smoked a half-pack of cigarettes a day had a four- to five-fold increase in AO (12% versus 2.6%) when compared to nonsmokers. The incidence of AO increased to more than 20% among patients who smoked a pack per day and 40% among patients who smoked on the day of surgery^[28]. Whether a systemic mechanism or a direct local affect (heat or suction) at the extraction site is responsible for this increase is unclear^[19]. Blum speculated that this phenomenon could be due to the introduction of foreign substance that could act as a contaminant in the surgical site^[3].

Age of the Patient:-

Little agreement can be found as to whether age is associated with peak incidence of AO. The literature supports the general axiom that the older the patient, the greater the risk ^[4]. Blondeau et al. ^[29] concluded that surgical removal of impacted mandibular third molars should be carried out well before age of 24 years, especially for female patients since older patients are at greater risk of postoperative complications in general.

Local Anesthetic with Vasoconstrictor:-

It has been suggested that the use of local anesthesia with vasoconstrictors increases the incidence of AO. Lehner ^[30] found that AO frequency increases with infiltration anesthesia because the temporary ischemia leads to poor blood supply. However, the studies that followed indicated that ischemia lasts for one to two hours and is followed by reactive hyperemia, which makes it irrelevant in the disintegration of the blood clot ^[5, 31]. One study reported no significant difference in AO prevalence following extraction of teeth requiring infiltration anesthesia versus regional block anesthesia with vasoconstrictor ^[19]. It is currently accepted that local ischemia due to vasoconstrictor in local anesthesia has no role in the development of AO.

Aim of the study:-

The aim of the study was to evaluate the incidence of alveolar osteitis among female patients attending Qassim university dental clinics consuming oral contraceptives

Materials and Methods:-

A total of 40 women aged 20 to 40 years, all of whom underwent simple extractions of various teeth for various reasons at the Dental Clinics of Qassim University were included in the study. Patients more than 45 years were excluded from the study because of much lower incidence of oral contraceptive use in this age group. Of the 40 patients, 20 were taking oral contraceptives. The remaining 20 patients were not taking contraceptives. The mean age of the sample was (31.67). The study was started in January 2016 and completed by April 2015. All extractions were performed under local anaesthesia (2% lidocaine with 1:80,000 epinephrine). Patients were told that in case of pain they could use analgesics, in accordance with its severity. The observation phase of the post extraction pain has started from the day of extraction until the third day, positive and negative complications were recorded for each patient. Several variables were collected from the records: Age, Tooth Number, Jaw and use of oral contraceptives. Healthy individuals i.e, not suffering from any systemic disease were included, while those were suffering from any systemic disorders were excluded. One of the cases that attended qassim dental clinics she was 45 years a regular user of oral contraceptives, #25 has underwent simple extraction th3 2nd day a dry socket has developed (Figure 3)

**Statistical Analysis:-**

Data were processed and analyzed through SPSS program (version 17). The descriptive statistics were calculated (mean, SD) by using descriptive analysis. Data were described in the form of frequency and percentage. Chi square test was used to compare between different study groups at $P < 0.05$

Results:-

A total of 40 female patients attending Dental Clinics at Qassim University based on consuming the oral contraceptives were included in the study.

(Table1) shows the descriptive statistics for the study groups which includes the consumer and non-consumer of oral contraceptives and categorized into 2 age groups. The consumer group aged between 20-30 years 7 (43.8%) and 13 (54.2%) of the consumers aged 31-40. Non-consumer group aged 20-30 years 9 (56.2%) and 11 (45.8%) aged 31-40.

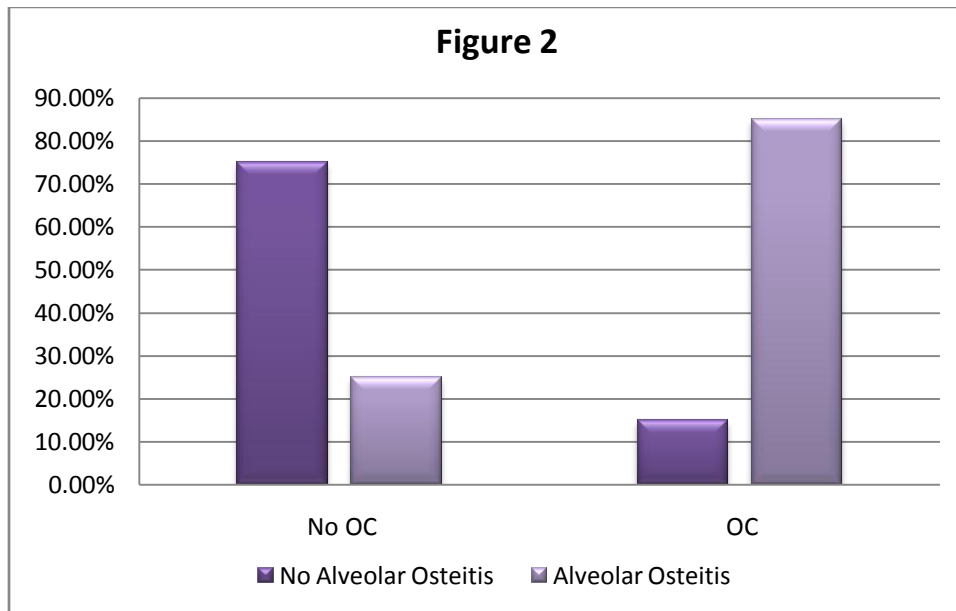
Table 1:-Descriptive Statistics for the study groups.

| | | Age Groups | | | | | |
|--------------|------------|------------|--------|--------|--------|-------|--------|
| | | 20-30 Y | | 31- 40 | | Total | |
| | | No. | % | No. | % | No. | % |
| consuming OC | NO OC | 9 | 56.2% | 11 | 45.8% | 20 | 50.0% |
| | Consume OC | 7 | 43.8% | 13 | 54.2% | 20 | 50.0% |
| | Total | 16 | 100.0% | 24 | 100.0% | 40 | 100.0% |

(Table2) shows the relation between consuming the oral contraceptive and incidence post extraction Alveolar Osteitis (AO) between female patients whom regular users of oral contraceptive in comparison with the non-consumers. The results showed that (85.0%) of the consumers have encountered AO , while (25.0%) only of the non-consumers have had AO. On the other hand (15.0%) and (75.0%) haven't encountered any signs of AO , respectively highly significant difference between the groups (p<0.001).

Table 2:- Relation between OC and Alveolar Osteitis

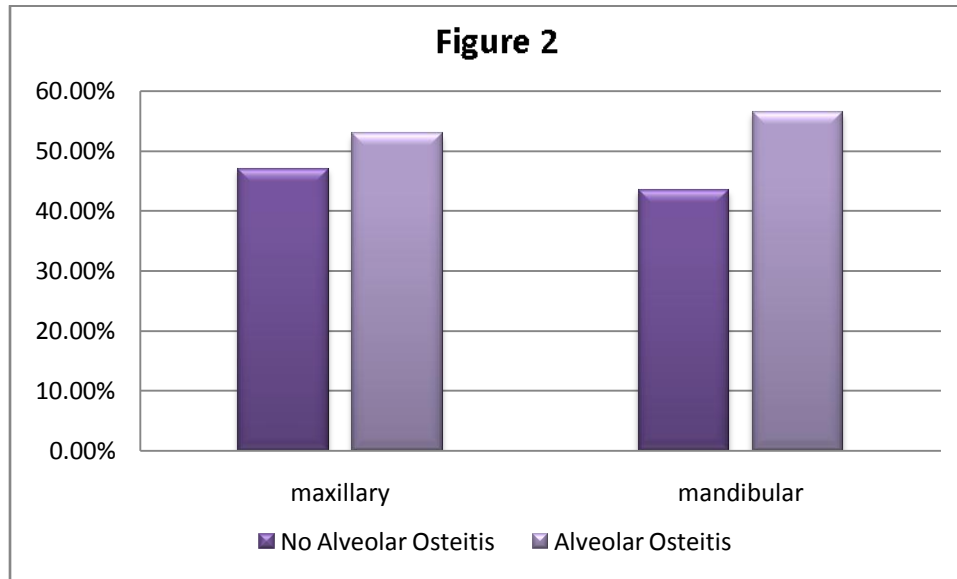
| | NO OC | | Consume OC | | Total | | p |
|----------------------|-------|-------|------------|-------|-------|-------|---------|
| | No. | % | No. | % | No. | % | |
| No Alveolar Osteitis | 15 | 75.0% | 3 | 15.0% | 18 | 45.0% | P<0.001 |
| Alveolar Osteitis | 5 | 25.0% | 17 | 85.0% | 22 | 55.0% | |



(Table 3) shows comparison between the incidence of AO in the Maxilla and Mandible. 13 (56.50%) of the extracted teeth were in the Mandible have developed AO, while 9 (52.90%) of them were in the Maxilla. On the contrary 10 (43.50%) in the Mandible and 8 (47.10%) in the Maxilla haven't developed AO.

Table 3:-Alveolar Osteitis in different Jaws

| | | Jaw | | | |
|----|----------------------|-----------|-------|------------|-------|
| | | Maxillary | | Mandibular | |
| | | No. | % | No. | % |
| AO | No Alveolar Osteitis | 8 | 47.1% | 10 | 43.5% |
| | Alveolar Osteitis | 9 | 52.9% | 13 | 56.5% |



Discussion:-

The most common postoperative complication of extraction is dry socket, due to fibrinolysis of the clot, typically as a result of invasion by oral-cavity bacteria.^[32] The healing process of the extraction site is disrupted and delayed. The term "dry socket" comes from the appearance of the wound. Since no blood clot is present, exposed bare bone is visible.^[33] The incidence of post-extraction dry socket among women began to show a marked increase with respect to the incidence among men from the 1960s onwards, when oral contraceptives came into widespread use. In 1974, Schow^[21] observed post-extraction dry socket in 45% of women taking oral contraceptives, versus 17% of women not taking contraceptives, leading him to suggest that the incidence of dry socket is increased by oral contraceptive use. Similarly, in 1977, Sweet^[24] observed post-extraction dry socket in 19% of women taking oral contraceptives, versus 17% of women not taking contraceptives.

The higher incidence of dry socket among women taking oral contraceptives has been attributed to the pharmacological activity of the drug, since oral contraceptives induce increased fibrinolysis,^[34] and since dry socket has been attributed to increased fibrinolytic activity.^[35,36] Birn^[5] has suggested that trauma of the alveolar bone may induce transformation of plasminogen into plasmin, favouring fibrinolysis of the clot.

The great majority of more recent studies have supported these hypotheses,^[37-38] and have considered oral contraceptive use to be a risk factor for dry socket after third molar removal. Some authors, including Larsen,^[39] have not detected any association between contraceptive use and dry socket, though it should be noted that this study was based on a relatively small sample.

In this study alveolar osteitis developed between 31 to 40 years on average. These results are almost similar to Ogunlewe et al^[42] and Khorasani^[43] who reported that the average age of people with dry socket was 36.61 ± 13.59 years and without dry socket 42.86 ± 15.49 years.

In the recently conducted study, it has been reported that the frequency of AO is age dependent, with most studies marking the peak age of 20 to 40 years old. 44 Present study is in agreement with some other studies, and found a significant role for age, as reported by Baqain et al and Chuang SK et al respectively.^[40,41] The results of this study also showed the prevalence of dry socket to be highest in second and third decades of life with a peak incidence in the [21-39] year age group which is in agreement with results of many researches^[45, 46, 47, 48, 49]. The possible explanation for this age dependence is still unknown, but the presence of well-developed alveolar bone and the relative infrequency of periodontal diseases at this age (both make tooth extraction more difficult) may provide a possible explanation.^[46]

The results of the present study support the view that oral contraceptive use increases the risk of dry socket: specifically, the incidence of dry socket was higher in the women taking oral contraceptives than in the women not taking oral contraceptives. Our values for the incidence of dry socket (in both the contraceptives group and the non-contraceptives group) are similar to those reported in previous studies that have evaluated the incidence of complications after removal of mandibular third molars.^[50-51]

Present study results also coincide with the recently conducted study by Majid Eshghpour et al, the frequency of AO development following mandibular third molar surgery was 14.74%.^[52] Similarly in the current study the frequency of AO, was in accordance with previous study reports, that alveolar osteitis developed more in mandible compared to maxilla.

A.G. Garcia et al. (2003) had investigated whether oral contraceptive use affects the incidence of complications (pain, trismus, dry socket) in women undergoing removal of impacted mandibular third molars. Postoperative pain was significantly more frequent among women taking contraceptives, both on day 1 (30% of women taking contraceptives used analgesics, versus 11% of women not taking contraceptives, $p < 0.001$) and on day 5 (14% versus 5%, $p = 0.024$). Similarly, dry socket occurred more frequently among women taking contraceptives than among women not taking contraceptives (11% versus 4%, $p = 0.017$). Those results are similar to the result of the current study.

In this study of **Mohammed H. Abu Younis and Ra'ed O. Abu Hantash (2011)** There were 1305 dental extractions performed in 805 patients. The overall frequency of dry socket was 3.2%. The incidence of dry socket following non-surgical extractions was 1.7% while it was 15% following surgical extractions ($P < 0.005$). The study mentioned that the use of oral contraceptives is a factor that raises the prevalence of dry socket among female patients. In present study also the Dry socket developed more frequently in female consuming oral contraceptives than the non-consumers

Conclusion:-

Through this study we conclude that women taking oral contraceptives are at increased risk for dry socket and postoperative pain after extraction.

The higher incidence of dry socket may be related to the fibrinolytic effect of oral contraceptives interfering with blood clotting. And the study also showed that age had a direct and profound impact on post-extraction alveolar osteitis

Recommendations:-

More studies must be conducted in order to avoid the effects of oral contraceptives on the healing process. The dentist must be cautious when to do extraction and try to follow un traumatic procedure.

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