RESEARCH ARTICLE

Role of different methods of contraception and time of menstrual cycle on dry socket

Sidra Abid[1], Javeria Khan[2], Uzma Hameed[3], Mohsina Marufi[4], Amynah Charania Sheikh[5]

Abstract

Objective: To investigate the potential association between the use of contraceptives and the occurrence of dry socket following tooth extraction.

Method: The cross-sectional study was conducted at the Dow International Dental College, Karachi, from April to October 2023, and comprised female patients aged 18-45 years who underwent posterior maxillary and mandibular tooth extractions. All the extractions were conducted under local anaesthesia by the same surgeon. After extraction, the patients were given preventive anti-inflammatories and prophylactic antibiotics. Extraction success was the dependent variable, while contraceptive use was the independent variable, and the association between the two was evaluated. Data was analysed using SPSS 21.

Results: Of the 193 female subjects, female patients aged 18-45 years 68(35.2%) were in the follicular phase of their menstrual cycle, 106(54.9%) were in the luteal phase, and 19(9.8%) were in the ovulation phase. Regarding contraceptive methods, 133(68.9%) used oral contraceptive pills, followed by 28(14.5%) using combined oral contraceptive pills. The development of dry socket was observed in 61(31.6%) cases. A significant positive correlation was found between oral contraceptive use and an increased risk of dry socket ($p<0.05$). Women in the luteal phase had significantly higher odds of developing dry socket compared to those in the ovarian phase ($p=0.029$), while the odds of developing dry socket during the follicular phase were significantly lower compared to the ovarian phase ($p=0.001$).

Conclusion: There is a need to take oral contraceptives usage into account as a possible contributory factor for socket dryness in female dental extraction patients.

Keywords: Alveolar osteitis, Contraceptive agents, Menstrual cycle, Dry socket, Oral contraceptives.

(JPMA 75: 409; 2025) **DOI: https://doi.org/10.47391/JPMA.11164**

Introduction

Contraception, including oral contraceptives, intrauterine contraceptive devices (IUCDs) and other methods, is critical in modern family planning and women's reproductive health. Concurrently, dry socket, or alveolar osteitis (AO), is a major clinical problem after tooth extraction, characterised by intense postoperative pain and delayed wound healing. Contraception and oral health may appear to be separate fields of study, but they intersect at a vital point; the menstrual cycle. The menstrual cycle, a complex interplay of hormonal variations, impacts many physiological processes in the female body, including oral health. A dry socket is a painful dental condition that may occur following a tooth extraction.[1] AO is estimated to be around 3% for all standard extractions, and may surpass 30% for mandibular molars.[2] It postulates that the higher occurrence of dry sockets can be associated with the fibrinolytic impact of oral contraceptives, which may obstruct normal blood coagulation. However, the precise motive of AO is poorly understood, and there is tremendous controversy surrounding its aetiology, pathophysiology, and satisfactory prevention and treatment techniques.[3]

A dry socket is unaffected by characteristics, such as age, gender, or nutritional status. The likelihood of experiencing dry socket is positively associated with the quantity of oestrogen in oral contraceptives.[4] Research has emphasised the importance of considering the use of oral contraceptives and time of menstruation as a viable risk factor for AO occurrence in female patients undergoing dental extraction.[5] Also, refraining from performing surgical procedures on non-menopausal women during their menstrual cycle from day 1 to 22 may lower dry socket prevalence within the specific population.[6] Dental professionals must reflect on a range of separate independent factors that might result in the hazard of AO.[7]

In order to enable women to make informed decisions

[1]Department of Oral Surgery, Dow University of Health Sciences, Karachi, Pakistan; [2,3]Department of Anatomy, Dow University of Health Sciences, Karachi, Pakistan; [4]Dow University of Health Sciences, Karachi, Pakistan; [5]Department of Oral Biology, Dow University of Health Sciences, Karachi, Pakistan.

Correspondence: Sidra Abid. e-mail: sidraabid200@gmail.com

ORCID ID: 0009-0005-6509-6255

Submission complete: 17-11-2023 **1st Revision received:** 03-05-2024

Acceptance: 10-12-2024 **Last Revision received:** 09-12-2024

about contraception, healthcare professionals must possess a comprehensive understanding of how various contraceptive methods impact the occurrence of dry socket.[8]

The current study was planned to investigate the relationship between the use of contraceptives and the occurrence of dry socket following tooth extraction, and to assess how hormonal contraceptive use and menstrual cycle timing influence AO risk.

Patients and Methods

The cross-sectional study was conducted at the Dow International Dental College, Karachi, from April to October 2023. After approval from the ethics review committee of Dow University of Health Sciences (DUHS), Karachi, the sample size was calculated using OpenEpi with 2% margin of error, 95% confidence interval (CI) and 80% power.[9] The incidence of dry socket, which ranges 5-20% worldwide, has been reported to be 14% in Pakistan[10] and this value was used for sample size estimation. The sample was raised using non-probability purposive sampling technique. Those included were non-pregnant female patients aged 18-45 years who underwent posterior maxillary and mandibular tooth extractions. Patients with no other bone pathology, and no acute pericoronitis were also included. Those aged >45 years were excluded due to much-decreased prevalence of contraceptive use in this particular age bracket.

After taking informed consent from all the participants, data was collected using a standardised questionnaire designed to collect information on several key variables, such as the type of contraception used, the phase of the menstrual cycle at the time of tooth extraction, and whether or not they experienced dry socket after the dental procedure.

The same dental surgeon performed all extractions under local anaesthesia (2% lidocaine with 1:80,000 epinephrine) by using the same surgical approach, along with an absorbable suture used to close the wound initially. The patients were given preventive anti-inflammatories (20mg of piroxicam every 12 hours for 3 days) and prophylactic antibiotics (500mg of amoxicillin every 8 hours for 7 days) after the extraction. Patients were allowed to use analgesics depending on their pain intensity. House officers along with the operating surgeon performed follow-ups on 3rd and 7th postoperative day. The patients were asked about analgesic usage, and the incidence and extent of dry socket was noted based on clinical features and symptoms, like necrosis of the wound clot, exposed alveolar bone, unpleasant odour, and constant severe postoperative discomfort.

Data was analysed using SPSS 21. Extraction success was the dependent variable, while contraceptive use was the independent variable. Descriptive statistics were used to summarise the demographic and clinical characteristics of the participants. Chi-square test was applied where necessary. For further exploration of the relationship between contraceptive use and extraction success, logistic regression analysis was used with odds ratios (OR) and 95% CIs. $P<0.05$ was considered statistically significant.

Results

Baseline Characteristics: A total of 193 female participants aged 18-45 years were included in the study. The distribution of participants across the menstrual cycle phases was as follows: 68 (35.2%) in the follicular phase, 106 (54.9%) in the luteal phase, and 19 (9.8%) in the ovulation phase (Table 1). Regarding contraceptive methods, 104 (53.9%) participants reported no use of contraception, while 28 (14.5%) used combined oral contraceptives (COCP), 7 (3.6%) used emergency contraception pills (ECP), and 9 (4.7%) used intrauterine contraceptive devices (IUCD). Notably, 34 (17.6%) participants used unspecified oral pills, and 1 (0.5%) reported using Primovate tablets (Table 1).

Development of Dry Socket by Menstrual Phase: The incidence of dry socket varied across menstrual phases. Among participants in the follicular phase, 17 (25%) had healed, and 51 (75%) developed dry socket. In the luteal phase, 100 (94.3%) participants healed, while only 6 (5.7%) developed dry socket. For participants in the ovulation phase, 15 (78.9%) healed, and 4 (21.1%) developed dry socket (Table 2).

Table-1: Baseline characteristics.

Variables	n (%)
Present Cycle Phase	
Follicular phase	68 (35.2)
Luteal phase	106 (54.9)
Ovulation phase	19 (9.8)
Contraceptive Method	
COCP	28 (14.5)
Diane 35	1 (0.5)
ECP	7 (3.6)
Implanon	7 (3.6)
Injection	4 (2.1)
Injection and Pills	1 (0.5)
IUCD	9 (4.7)
No Contraception	104 (53.9)
Pills (Unspecified)	34 (17.6)
Primovate Tablets	1 (0.5)
Development of Dry Socket	
Healed	132 (68.4)
Dry Socket	61 (31.6)

COCP: Combined oral contraceptive pills, ECP: Emergency contraception pills, IUCD: Intrauterine contraceptive device.

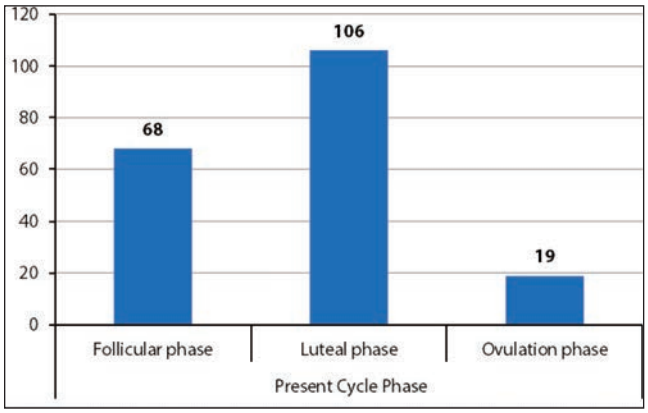

Figure-1: Distribution of Phases of Menstrual Cycle in Participants.

Table-2: Dry socket and menstrual cycle.

	Development of Dry Socket	
	Healed	Dry Socket
Present Cycle Phase		
Follicular phase	17	51
Luteal phase	100	6
Ovulation phase	15	4

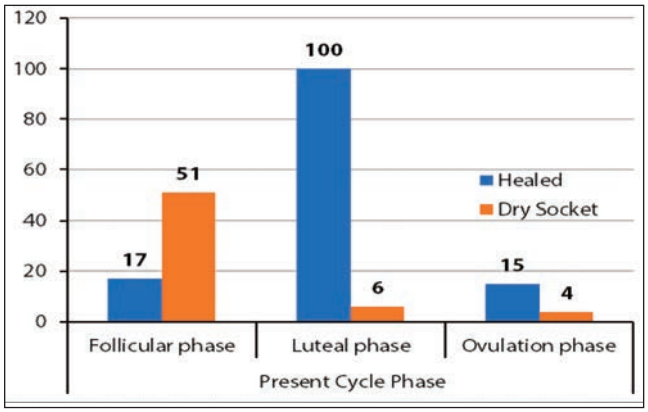

Figure-2: Relationship between menstrual phase and dry socket.

Table-3: Contraceptive method and dry socket.

	Development of Dry Socket	
	Healed	Dry Socket
Contraceptive Method		
COCP	11	17
Diane 35	0	1
ECP	4	3
Implanon	3	1
Injection Method	0	1
Injection and Pills	0	1
IUCD	6	3
No	104	29
Pill	0	1
Primovate Tablets	0	1

COCP: Combined oral contraceptive pills, ECP: Emergency contraception pills, IUCD: Intrauterine contraceptive device.

Table-4: Contraceptive method and dry socket.

Variable	Coefficient (B)	*p*-value	Odds Ratio	95% CI for OR
Ovarian Phase	Ref			
Luteal Phase	1.56	0.029	4.757	(1.17- 19.2)
Follicular Phase	-2.197	0.001	0.111	(0.03 - 0.39)
Combined Hormonal Contraceptive		Ref		
Long-term Contraceptive	0.97	0.037	2.637	(1.06 - 6.5)
Constant	0.54	0.423	1.716	-

CI: Confidence interval.

The relationship between contraceptive use and the incidence of dry socket was also examined. Among those using COCP, 11 (39.3%) healed, while 17 (60.7%) developed dry socket. For other contraceptive methods, such as Diane 35 and ECP, 1 and 3 participants respectively developed dry socket, though the proportions were small. Notably, 104 (96.2%) participants not using contraception healed, while 29 (3.8%) Logistic regression analysis was performed to assess the association between menstrual phase, contraceptive method, and the incidence of dry socket. The analysis revealed that participants in the luteal phase had significantly higher odds (OR 4.757, 95% CI 1.17–19.2) of healing from dry socket compared to those in the ovarian phase. In contrast, participants in the follicular phase had significantly lower odds (OR 0.111, 95% CI 0.03–0.39) of healing, suggesting that the follicular phase is associated with a higher likelihood of developing dry socket (Table 4).

Discussion

The current study sought to look into possible correlations between COCPs and dry sockets after tooth extraction. When a tooth is pulled, a dry socket can occur, in which some or all of the bone in the socket or around the occlusal edge of the socket becomes exposed. It is characterised by rapid, severe pain that begins 2-4 days after tooth extraction, and is not followed by any symptoms of infection or inflammation.[11] When a tooth is pulled, a blood clot frequently forms in the socket, but this blood clot may break loose or disintegrate before the incision has healed completely. This may cause agonizing pain by exposing the underlying bone and nerves. Excruciating pain, significant halitosis, an awful odour, and a greyish appearance are all symptoms of a clinically diagnosed dry socket. Its aetiology has been the topic of various reported theories, including bacterial infection, trauma and biochemical agents.[12] Dry socket is caused by inadequate blood supply to the tissue, heavy anaesthetic use, hormonal contraception, smoking, severe surgery, and failure to follow postoperative instruction. Risk factors include cigarette smoking, surgical trauma, single extractions, gender, age, previous medical history, systemic disorder, the extraction site, amount of anaesthesia, operator experience, preoperative antibiotic use, oral contraceptives, cycles of menstruation, and socket

irrigation with normal saline immediately following extraction.[12]

The discussion frequently focusses on recognising people at high risk and mentally preparing them to deal with the possibility of getting dry sockets.[13] The current study has underlined the importance of additional research to identify participants for the route, kind, and dosage of hormone medication or contraception used during exodontia. The risk of having a dry socket increases when using an oestrogen-containing oral contraceptive. The risk of dry sockets associated with oral contraceptives can be decreased by scheduling extractions on days 23 through 28 of the pill cycle.[9] Doctors should include oral contraceptive use as a risk factor while preventing or treating a dry socket in female patients. This may comprise informing patients that using oral contraceptives increases their risk of developing AO, and recommending that they discontinue use before surgery, if possible. Dry socket has been linked to the usage of oral contraceptives and harm caused during extraction. They appear to work by boosting fibrinolytic activity in the alveolar bone, leading to clot breakdown.[11]

The hormonal changes during the menstrual cycle may be responsible for the possible relationship between periods and dry sockets. Progesterone and oestrogen levels change during the menstrual cycle, influencing various physiological processes, such as inflammation and wound healing.[12,13] A rise in fibrin lytic activity in dry sockets could explain the condition's sluggish healing and prolonged discomfort. While some studies have not found a clear correlation, others have theorised a link between the menstrual cycle and the likelihood of developing dry sockets after teeth extraction.[14]

The current findings suggest a possible relationship between using COCPs and an increased likelihood of having a dry socket after tooth extraction. A higher occurrence of dry socket was noted in the follicular phase (51 cases) compared to the luteal and ovulation phases, which showed a much lower incidence of dry socket (6 and 4 cases, respectively). Logistic regression analysis further supported these findings, demonstrating that women in the luteal phase were significantly more likely to develop dry socket compared to those in the ovarian phase. In contrast, the follicular phase was associated with a significantly lower likelihood of developing dry socket. The current findings are consistent with previous studies examining the relationship between COCPs and dry sockets, whereas other studies have shown inconsistent outcomes.[15,16] Variations in reported results may be attributable to differences in the methodology, sample size, and characteristics of patients across different studies.

The current study has some limitations. First, the sample size was fairly small, which could have hampered the study's statistical ability to detect minor relationships. Second, few women had used contraception, and many were unsure about the specific drugs they were taking. Furthermore, the study did not account for any possible confounding factors that could influence the occurrence of dry sockets, including smoking habits or oral hygiene routines.

Despite the limitations, however, the findings shed light on the potential connection between COCPs and dry sockets. While planning teeth extractions, dentists should bear in mind the possibility of socket dryness in COCP users. Furthermore, the findings underscore the importance of obtaining full medical records of patients, particularly details regarding the use of contraceptives, in order to enhance post-extraction care, and limit the incidence of dry sockets. While the study provides beneficial data, it also highlights the need for more research to fully understand the intricate connection between contraceptive usage and the likelihood of getting AO. This understanding can help healthcare professionals develop more targeted prevention and treatment methods to limit the occurrence of this severe post-extraction complication in vulnerable groups.

Conclusion

There is a need to take oral contraceptives usage into account as a possible contributory factor for socket dryness in female dental extraction patients.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

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Author Contribution:
SA: Writing, data collection, procedures and data input.
JK: Concept, data analysis and methodology.
UH & ACS: Concept and methodology.
MM: Data collection, writing and proofreading.