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Photobiomodulation Therapy for Alveolar Osteitis Recovery in Oral Contraceptive Users

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ABSTRACT

Background: Users of oral contraceptives have an elevated possibility of alveolar osteitis (dry socket) after extraction of tooth because of impaired fibrinolytic activity.

Objective: This randomized clinical trial aimed to assess the efficacy of low-level laser Therapy (Photobiomodulation) combined with Zinc Oxide Eugenol (ZOE) dressing in managing Alveolar Osteitis (AO) among women using oral contraceptives (OCs).

Methods: Fifty female cases diagnosed with dry socket following traumatic lower Third molar extraction have been randomly assigned to either an experimental group (laser + ZOE) or a control group (ZOE only). Pain levels, Oral Health-Related Quality of Life, and Socket volume have been measured at multiple intervals over 30 days.

Results: The results revealed a significantly greater reduction in pain scores and socket volume, as well as improved OHIP-5 scores in the laser group, particularly from day 4 onward.

Conclusion: These findings suggest that laser therapy shows potential adjunct to conventional treatment in controlling pain and enhancing healing outcomes in oral contraceptive users,

Keywords: *Alveolar Osteitis, Oral Contraceptives, Laser Therapy, Zinc Oxide Eugenol.*

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1. INTRODUCTION

AO (frequently identified as 'dry socket') is a postoperative complication differentiated by severe pain and foul odor at the tooth extraction site (1). Post-extraction pain typically arises 24–72 hours after tooth removal, often following traumatic extraction. This occurs due to complete or partial disintegration of the blood clot in the socket, which is a famous pathognomonic finding of alveolar osteitis (dry socket) (2).

Women using Oral Contraceptives (OCs) exhibit elevated incidence rates of alveolar osteitis (AO), with risk directly correlating to estrogen dosage. Current evidence suggests coordinating surgical removal with hormonal cycles may reduce complications (3). Accordingly, elective exodontia in OC users should be scheduled during the menstrual phase to

minimize AO risk (4). The use of oral contraceptives (OCs) may precipitate alveolar osteitis through enhanced fibrinolytic activity. Which is mediated via estrogen's upregulation of plasminogen and clotting factors (II, VII, VIII, and X) (5).

The primary goals in dry socket management are: pain control and protection of the exposed socket to facilitate natural healing. Maneuvers like: Local socket debridement, systemic pain killers and topical dressings should be used. However, Alvogyl remains a widely-used medicated dressing (containing butamben anesthetic, iodoform antiseptic, and eugenol anti-inflammatory), current evidence shows no single superior treatment modality (6). Emerging consensus suggests combining multimodal approaches (6,7).

Many previous studies aimed to reduce patients suffering from intolerable pain and boost the natural repair of the socket cavity. Pain profoundly affects various aspects of quality of life; it was a significant contributor to social isolation. Effective pain management, therefore, has the potential to greatly improve the quality of life after tooth extraction (8). A variety of interventions have been employed with the challenges in the kind of assessment scale used. Low-level laser therapy and zinc oxide eugenol were commonly used therapies to accelerate healing of the socket and minimize the patient's suffering, consequently improving his quality of life (6). Zinc Oxide Eugenol (ZOE) is frequently used to manage discomfort following alveolar osteitis. It involve eugenol, which has a strong sedative, anodyne, and analgesic effects as well as having antibacterial properties (7,9).

Laser therapy is a Photobiomodulation treatment (PBT) that utilizes lasers, LEDs, or bandwidth lighting within the apparent red & near-infrared spectra with energy less than 500 mW, ensuring therapeutic advantages without considerable heat or structural changes in tissues. It is a non-invasive treatment using light wavelengths among 650 & 1000 nanometre to decrease inflammation, promote tissue repair, and relive pain. Researches indicate that LLLT enhances oral health-related quality of life (OHRQoL) by stimulating cellular activities like ATP production, protein synthesis, and inflammation reduction. It has been used to control many complications related to conventional dental treatments (10,11,12,13).

Considering the therapeutic effects of laser therapy and the challenges associated with managing dry sockets, laser therapy could be an undertaking solution for oral contraceptive users (14,15). Moreover, this investigation aimed to explore the potential efficiency of low-level laser therapy when combined Zinc Oxide dressing in pain control, healing acceleration, & its impact on oral quality of life in females using oral contraceptives

2. METHODOLOGY

Study Design

The present research is a randomized clinical controlled trial (RCT) designed to evaluate the efficiency of laser therapy combined with zinc oxide eugenol dressing in comparison to zinc oxide eugenol dressing alone in managing dry socket among females using oral contraceptives. The study assessed outcomes related to pain, quality of life, and socket volume.

Ethical Considerations

- The research protocol has been approved by the BUC-Institutional Ethical Committee, approval number: BUC-IACUC-231015-38, date of approval October 15, 2023.
- Every subject expressed written consent before enrolment.
- Participants can withdraw from the research at any time without penalty.
- Adverse events have been monitored and reported to the Institutional Ethical Committee.
- The trial was registered at the Clinical Trial. Gov [NCT06865508].

Study Population

- This research was a research collaboration between the School of Oral and Dental Medicine and the School of Physical Therapy at Badr University in Cairo. The patient's recruitment was by the Department of Oral & Maxillofacial Surgery from the Outpatient Dental Clinic. The treatment has been carried out at the Outpatient Physical Therapy Clinic of Badr University in Cairo (BUC). The target population included females using oral contraceptives and diagnosed with dry sockets (alveolar osteitis) following traumatic dental extractions based on clinical criteria.

Inclusion Criteria:

- Female patients aged from 25–40 years.
- Females currently using Oral Contraceptives for at least 3 months prior to participation.
- Dry socket at lower third molar.

- **Exclusion Criteria:**
  - Presence of systemic diseases (e.g., diabetes, hypertension, heart diseases, and immunodeficiency disorders)
  - Smoking or tobacco use.
  - Allergies to Zinc Oxide or Phototherapy.
  - Patients who were on antibiotics after extraction.
  - Pregnancy or breastfeeding.
  - Patients on radiotherapy of the head and neck.

Sample Size Calculation

The means of the quality of life have been estimated utilizing information from a pilot investigation, which involved ten participants who were randomly allocated to 1 of 2 treatment groups (five participants each). Based on the T-test, it was anticipated that each group would require at least 24 participants., (the variance among both independent means (two groups), α=0.05, β=0.82, & effect size=0.8. Subsequently, to account for possible dropout rates, 50 participants have been allocated.

Assessment

Before enrolling in the study, the pain level, oral quality of life and socket volume of all patients were assessed at day 0, which defined as the first day to detect the presence of dry socket.

- The Visual Analogue Scale (VAS) is a self-reported 10-point scale used to measure pain level at day 0, 4, 7 (16).
- The quality of life was measured by the Arabic form of the Oral Health Impact Profile (OHIP5- Ar) at day 0, 7 and 14 (17).
- The socket volume was measured using volumetric measurement method through injecting saline in the socket cavity, the amount of injected saline is equal to the socket volume in millimetres at day 0, 14 and 30 (18).

Randomization and Allocation

After signing the agreement form. Participants were allocated at random to one of 2 groups utilizing a computer-generated randomization procedure. (Figure 1):

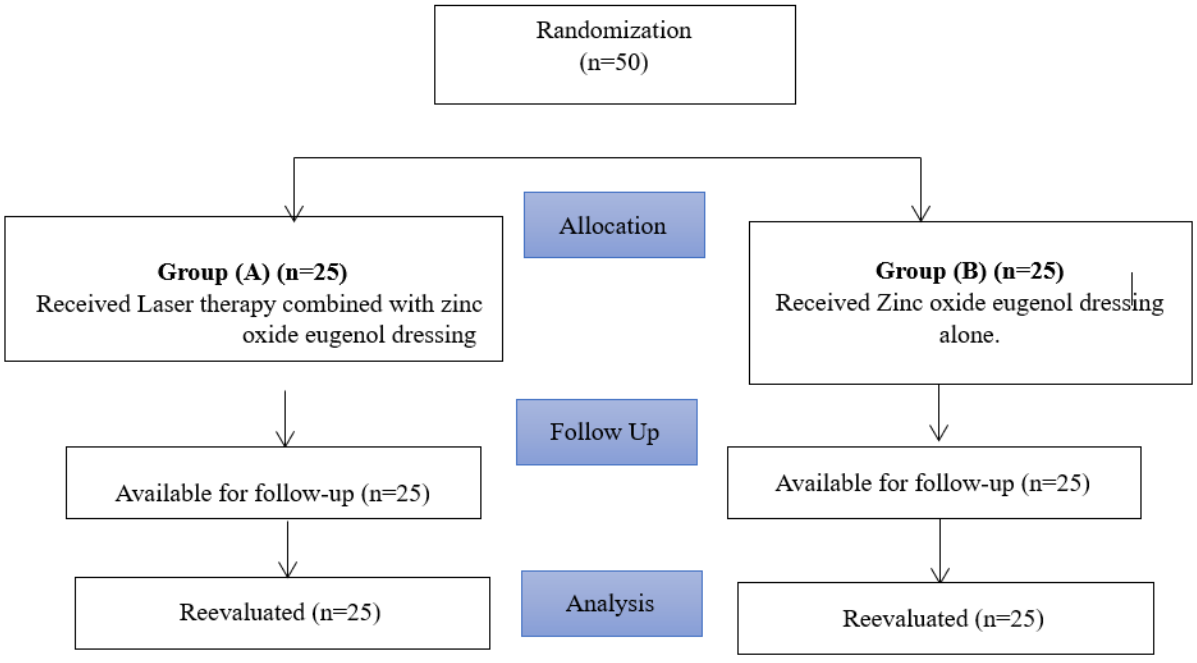

Figure 1: The study flow chart.

Treatment procedure

1. **Experimental Group (Group A):** the patients received intra oral laser therapy in addition to Zinc oxide eugenol dressing. The socket of each patient was irrigated with normal saline with the same procedure as control group, then, the socket was irradiated at the 3 surfaces (Buccal, lingual and Middle). The laser device used emitted lasers with power output of 500 mW and simultaneous wavelengths of 810 and 980 nm (19). The laser probe used was 1 cm in diameter and directed perpendicular to each surface, each surface received 30J (total treatment energy 90J for the socket). The treatment last for 3 minutes. After finishing the radiation, the cavity was filled with the Zinc Oxide eugenol dressing. The procedure was repeated day after day for 2 consecutive weeks, 6 sessions in total.
2. **Control Group (group B):** the socket of the patient was irrigated with normal saline to clean the exposed bone from debris and bacteria. Then, the socket cavity was filled with appropriate amount of Zinc Oxide Eugenol dressing, the procedure is repeated day after day for 2 consecutive weeks (20).

Both groups received standard post-extraction care instructions, including oral hygiene advice and pain management. The patients were advised to use mouth wash 3 times/ day and take one 1000 mg tablet of paracetamol once daily at bedtime.

Outcome Measures

Primary Outcome

- Pain level
- Socket volume

Secondary Outcomes

- Oral Quality of life

Blinding

Masking was applied as follows:

- The researcher performed the data analysis was blinded to group assignments.

Statistical analysis

An unpaired t-test has been utilized to examine the features of the subjects between groups. The Shapiro-Wilk test has been applied to assess the normality of the information's distribution. Levene's test evaluated the homogeneity of differences among groups. A mixed MANOVA has been performed to examine the effect of therapy on VAS, socket volume, & OHIP5. Post-hoc analyses utilizing the Bonferroni correction have been conducted for subsequent comparisons. All statistical analyses have been deemed significant at a p-value under 0.05. Statistical analyses have been performed applying SPSS version 25 for Windows (IBM SPSS, Chicago, IL, United States of America).

3. RESULTS

Subject characteristics

The characteristics of those participating in both groups are illustrated in Table (1). There were insignificant variations among the groups' ages. (p-value above 0.05).

Table 1. Comparative analysis of subject characteristics among group A & B:

	Treatment group	Control group	MD	t-value	p-value
	Mean ± standard deviation	Mean ± standard deviation			
Age (years)	31.40 ± 4.04	31.44 ± 3.98	-0.04	-.0.03	0.97

Effect of treatment on VAS, socket volume & OHIP5:

Mixed MANOVA indicated a significant interaction between treatment and time (F = 224.81, p-value equal 0.001, partial eta squared = 0.97). A & main effect of time was observed (F = 1125.43, p-value equal 0.001, partial eta squared = 0.99). A substantial main impact of therapy has been observed (F = 217.26, p-value equal 0.001, partial eta squared = 0.93).

Between group comparison

An insignificant variance has been found in VAS, socket volume and OHIP5 between groups on day 0 (p-value above 0.05).

A significant reduction has been observed in VAS of treatment group in comparison with with control group on day 4 (MD = -6.48, $\eta p^2 = 0.93$, $p < 0.001$), and day 7 post treatment (MD = -2.76, $\eta p^2 = 0.86$, p-vale under 0.001).

There was insignificant in variance in socket volume among groups on day 14 (p-value above 0.05), while there a significant reduction in socket volume of treatment group in comparison with control group on day 30 post treatment (MD = -0.19, $\eta p^2 = 0.94$, p-value under 0.001).

A significant reduction has been observed in OHIP5 of treatment group in comparison with control group on day 7 (MD = -9.84, $\eta p^2 = 0.87$, $p < 0.001$), and day 14 post treatment (MD = -2, $\eta p^2 = 0.79$, p-value under 0.001). (Table 2).

Within group comparison

Treatment group

There was a significant reduction in VAS on day 4 and day 7 following management in comparison with day 0 (p-value under 0.001) and a significant reduction on day 7 compared with day 4 post treatment (p-value under 0.001).

There was insignificant variance in socket volume between day 0 and day 14 post treatment (p-value above 0.05), while there was a significant decrease on day 30 in comparison with day 0 and day 14 post treatment (p-value under 0.001).

There was a significant reduction in OHIP5 on day 7 and day 14 following treatment than day 0 (p-value under 0.001) and a significant decrease on day 14 than day 7 post treatment (p-value under 0.001). (Table 3-5).

Control group

There was insignificant variance in VAS between day 0 and day 4 following treatment (p-value above 0.05), while there was a significant reduction on day 7 than day 0 and day 4 following treatment (p-value under 0.001).

There was insignificant variance in socket volume between day 0, day 14 and day 30 post treatment (p-value above 0.05).

There was an insignificant variance in OHIP5 between day 0 & day 7 following treatment (p-value above 0.05), while there was a significant reduction on day 14 than day 0 and day 7 following treatment (p-value under 0.001). (Table 3-5).

Table 2. Comparison of VAS, socket volume and OHIP between groups.

Outcomes		Treatment group	Control group	MD	95% CI	p-Value	ηp^2
		Mean ± standard deviation	Mean ± standard deviation				
VAS	Day 0	8.76 ± 0.78	9.08 ± 0.70	-0.32	-0.74: 0.10	0.13	0.05
	Day 4	2.28 ± 0.98	8.76 ± 0.83	-6.48	-7.00: -5.96	0.001	0.93
	Day 7	0.20 ± 0.41	2.96 ± 0.68	-2.76	-3.08: -2.44	0.001	0.86
Socket volume (mm)	Day 0	0.35 ± 0.04	0.34 ± 0.03	0.01	-0.01: 0.03	0.25	0.03
	Day 14	0.34 ± 0.03	0.33 ± 0.02	0.01	-0.01: 0.02	0.29	0.02
	Day 30	0.13 ± 0.02	0.32 ± 0.03	-0.19	-0.21: -0.18	0.001	0.94
OHIP5	Day 0	16.52 ± 2.52	16.44 ± 2.24	0.08	-1.27: 1.43	0.91	0.001
	Day 7	5.68 ± 1.84	15.52 ± 2.00	-9.84	-10.93: -8.75	0.001	0.87
	Day 14	1.68 ± 0.56	3.68 ± 0.48	-2	-2.29: -1.71	0.001	0.79

VAS, Visual Analog Scale; **OHIP 5**, 5-item Oral Health Impact Profile**; CI, confidence interval; ηp2, Partial eta squared.**

Table 3. Comparison of VAS between day 0, 4 and day 7.

VAS	Day 0 vs Day 4			Day 0 vs Day 7			Day 4 vs Day 7		
	MD	95% CI	p value	MD	95% CI	p value	MD	95% CI	p value
Treatment group	6.48	5.97: 6.99	0.001	8.56	8.13: 8.99	0.001	2.08	1.63: 2.53	0.001
Control group	0.32	-0.19: 0.83	0.39	6.12	5.69: 6.55	0.001	5.8	5.35: 6.25	0.001

Table 4. Comparison of socket volume between day 0, 14 and day 30.

Socket volume (mm)	Day 0 vs Day 14			Day 0 vs Day 30			Day 14 vs Day 30		
	MD	95% CI	p value	MD	95% CI	p value	MD	95% CI	p value
Treatment group	0.01	0.001: 0.01	0.07	0.22	0.21: 0.23	0.001	0.21	0.20: 0.23	0.001
Control group	0.01	0.001: 0.01	0.53	0.02	0.001: 0.03	0.12	0.01	0.001: 0.02	0.37

Table 5. Comparison of OHIP5 between day 0, 7 and day 14.

OHIP5	Day 0 vs Day 7			Day 0 vs Day 14			Day 7 vs Day 14		
	MD	95% CI	p value	MD	95% CI	p value	MD	95% CI	p value
Treatment group	10.84	9.50: 12.18	0.001	14.84	13.58: 16.10	0.001	4	3.07: 4.93	0.001
Control group	0.92	-0.42: 2.26	0.28	12.76	11.50: 14.02	0.001	11.84	10.91: 12.77	0.001

4. DISCUSSION

Alveolar Osteitis is a frequent complication after the operation following routine tooth extraction, especially in lower mandibular teeth. The etiology was not fully understood; accordingly, a multifactorial nature may be postulated. Many factors contribute to dry socket occurrence including excessive trauma during extraction, smoking, bad oral hygiene, multiple anesthetic carpules with vasoconstrictor, and oral contraceptive pill use (20-23).

Women who take oral contraceptives have been found to have a lower phagocytic capacity in their neutrophils compared to those who do not. Moreover, the dose related relationship between the concentration of the drug and the incidence of AO was suggested by Tang 2022 as OC drug formulation was altered over time because of evidence of venous thrombosis noticed with high estrogen old formulation. That's why new oral contraceptives (low estrogen) need further investigation about their linking with AO. Most research highlighted evidence of AO in females on OCP, especially after wisdom tooth removal (20, 39). On the contrary, Parhasarahi et al. suggested no difference in AO incidence between females taking OCP and those not taking OCP (24, 25).

The widespread use of oral contraceptive pills (OCPs) among women highlights the importance of this finding in patient care. The present research is the 1st to examine the combined effect of low-level laser therapy with Zinc Oxide dressing on pain control, accelerating healing, and its effect on oral quality of life specifically in females using oral contraceptives.

The treatment group had a significantly reduced mean VAS score in comparison with the control group on day 4 (p-value under 0.001). There was insignificant variation in socket volume between day 0 and day 14 post-treatment (p -value above 0.05). However, there was a substantial decrease on day 30 compared to day 0 and day 14 post treatment (p-value under 0.001). There was a significant reduction in OHIP5 on days 7 and 14 following therapeutic intervention in comparison with day 0 ($p < 0.001$). These results are in line with prior researches illustrating that LLLT is effective in modulating inflammatory mediators and enhancing analgesic effects, especially in soft tissue injuries and post-surgical oral

environments (26,27). The analgesic mechanism is believed to involve increased mitochondrial activity, reduction in prostaglandin E2, and modulation of the neural pain threshold (28).

Improving Patients' quality of life during the healing period was a major demand. Two main tracts were assumed: Preventive measures and management measures. That's why many treatment options were proposed such as placement of antiseptic, anesthetic, and obtundant dressing (Alvogyl or Zinc Oxide Eugenol). Moreover, platelet-rich plasma, medicinal plant extract, chlorohexidine mouthwash/gel, Salicept oral patch, and low-level laser biomodulation, all above mentioned were tried with different results (7, 29-31).

Universally used dressing (Alvogyl /Alveogyl) old and new formulations were replaced in this study by Zinc Oxide Eugenol, because of the conflict of the new formulation Alvogyl containing only eugenol as an obtundent dressing and it was introduced into the market long time ago. Taking into consideration that the old formulation (Eugenol- Iodoform and Butamben) was more effective than zinc oxide dressing as regards pain relief (32-35).

Chaurasia et al. commented that Zinc oxide was more efficient in decreasing pain compared to Alveogyl. In contrast, Daly et al. reported Alvogyl old formula is more efficient in alleviating pain at day seven when compared to the zinc oxide group (36,37).

The present clinical trial, pain relief was significant in the experimental group particularly on the 4th day, as the VAS score registered 2, compared to the control group which was 8 in VAS score (high score may be due to defective healing in the contraceptive group), this consistent with the result of Kamal et al, who stated that pain decreases to 2-4 VAS score on 4th day in the laser group (38), in comparison with curettage and irrigation group the pain decreases to 4-6 VAS score. Taking into consideration different laser settings between studies (30-34).

Furthermore, at day 30 post-treatment, the treatment group had a significantly reduced socket volume than the control group, indicating accelerated tissue healing. This aligns with literature supporting LLLT's role in stimulating fibroblast proliferation, angiogenesis, and collagen synthesis (39). Zinc Oxide, known for its antimicrobial and anti-inflammatory properties, may act synergistically with LLLT by maintaining a moist wound environment conducive to repair (40).

Importantly, the utilization of oral contraceptives has been scientifically correlated with delayed wound healing and increased risk of dry socket due to estrogen-mediated alterations in clot stability and fibrinolysis. The significant improvements in both pain and healing in the LLLT plus Zinc oxide group suggest that this combined approach may counteract some of the negative wound-healing effects of OCs, offering a tailored therapeutic strategy for this subpopulation (41).

Quality of life, as measured by the OHIP-5 index, significantly improved in the treatment group at both day 7 (MD = -9.84, $\eta p^2 = 0.87$, $p < 0.001$) and day 14 (MD = -2, $\eta p^2 = 0.79$, $p < 0.001$). This underscores the psychosocial and functional benefits of pain reduction and accelerated healing. These results echo those of Lauritano et al., who found improved OHIP scores following LLLT interventions in oral surgery patients (42).

Both red and infrared lasers sped up the healing process. PBM Therapy's promise as a preventive intervention was further demonstrated by a considerable reduction in the possibility of suffering AO in the 1st week after surgery. According to a clinical trial by Kaya et al., LLLT resulted in quicker post-therapy decreases in VAS scores, however Acemannan was beneficial palliative treatment for AO (34).

Three groups were studied by Eshghpou et al. (4). Over the course of three days, the group who received Alvogyl reported less pain, the 660 nanometers laser group exhibited steady pain drop., and the 810 nanometers diode laser group showed significant pain reduction. Although Alvogyl seemed to alleviate pain faster in comparison with LLLT, the 660 nanometers laser ultimately outperformed Alvogyl's early benefit (43).

Kamal et al. report that in control group, the pain score decreased to VAS 4-6 on day four, which was linked to clinical evidence indicating some GT development laying down within the socket. As early as day 4, a significantly reduced VAS score of 2-4 has been recorded in the LLLT-treated sockets, and clinical assessment revealed a greater quantity of granulation tissue inside the healing socket. This finding showed that the amount and pace of granulation tissue (GT) production in the dry socket are inversely correlated with the pain score, indicating that LLLT is significantly helpful in promoting dry socket healing and symptom alleviation (P =.001) (9, 38).

According to Kim et al. (44), it has been anticipated that the LLL irradiation for initial healing following installation of the dental titanium implants improved overall bone osteogenesis and resorption, and laser irradiation didn't damage the tissue. However, additional clinical trials are required to explore the targeted clinical use of LLL.

Kamal et al. described a significant reduction in pain among patients receiving low-level laser therapy (LLLT) in comparative clinical research. Visual Analog Scale (VAS) scores dropped from 7–10 on day 0 to 1–2 by day 4 and further diminished to 0–1 by day 7. These results align with our findings, where the treatment group also showed significantly decreased VAS scores than the control group on both days 4 and 7 (6).

Our observations are supported by Kamal et al., showing that the treatment group's socket volume was significantly lower at this period. (38), who found that patients receiving LLLT had a greater amount of granulation tissue and a significant decrease in socket volume by day 30.

The present evidence demonstrates that therapeutic laser treatment provides a promising alternative to conventional mechanical debridement (MD) because of its photothermal action, which cuts tissues accurately and effectively, and photobiomodulation, which activates cells' regenerative and anti-inflammatory potential. We now know more about laser treatment's effectiveness in reducing inflammation and promoting regeneration as a result of its growing popularity. The interaction of the laser beam with human tissues, the way light scatters, reflects, and absorbs through tissues, and tissue ablation induced by heating and evaporating water serve as the foundations for antibacterial, anti-inflammatory, and activation-regulated biological processes (44).

Our findings of lower OHIP-5 ratings according to the intervention group on days 7 and 14 were supported by the Photobiomodulation Therapy Study (2022), which discovered that LLLT significantly enhanced patients' quality of life by lowering pain and discomfort related to dry socket. In patients with AO, they found that PBMT after MC (mechanical curettage) with Alveogyl dressing is more effective in lowering SPP (self-rated post-operative pain) than MC with or without Alveogyl dressing (15).

Chaurasia et al. (37) concluded that ZOE paste is superior to Alvogyl in managing dry socket for both initial and ongoing pain alleviation. This contrasts with our findings, where LLLT showed superior pain reduction compared to ZOE. Compared to ZOE, PRF reduces pain more effectively when administered to treat AO. in individuals who receive ZOE dressing treatment. PRF is less intrusive, less expensive, less likely to cause antigenicity, more patient-compliant, and provides superior pain and healing than ZOE. However, ZOE dressing provides an easy, traditional, economical, non-invasive, and convenient approach (45, 46).
The application of ZOE as an intra-socket medication led to a considerable lessening in acute pain levels in cases when compared to standard saline irrigation. As a result, honey and Zinc oxide can be efficiently utilized to manage dry socket as an adjuvant to other established management methods (47).

Moreover, pain relief was significant on the 7th day in both groups. Accordingly, quality of life was optimized regarding the sleep pattern, function, and work return on the 7th day in the laser group only, while on the 14th day, both groups showed improvements. Our results are in accordance with those of Kaya et al. (34), Pain relief and socket healing were associated, which may be because soft tissue production began on the fourth day in the socket depth. Using measures of the socket volume, the healing process was monitored. Throughout all follow-up periods, no difference was observed between the groups; however, after 30 days, the laser group's socket volume significantly decreased in comparison with the Zinc Oxide group.

Lemes et al. (48) hypothesized conflicting findings about the benefits of laser therapy for healing of the wound. The type of laser used, and its particular settings are blamed for the disagreement. However, Rosa et al. (49) proposed that laser therapy might be a good substitute for traditional dry socket therapies, providing less invasive pain alleviation and accelerating healing with fewer adverse effects.

The biological impact of the laser therapy depends on its wavelength and mode (pulsed or continuous). In regard to the use of dual wavelength (810, 980 nm) different penetration levels were provided, red light facilitates surface healing through photobiomodulation therapy (PBMT), while infrared wavelengths promote deeper tissue repair (19,50-52). Kaya et al. reported Laser therapy using an 808 nm diode laser was more effective than Alvogyl and SaliCept patch in treating AO (34).

Jovanovic et al. (53) reported the effectiveness of LLL used daily for 8 days over Zin Oxide and Eugenol. Likewise, Kamal et al. used a single vs double laser sessions, the results were insignificant despite of slight increase in fibroblast and insulin growth factors released. Laser had positive results in treating dry sockets for healthy and compromised patients (38). Few researchers monitor dry socket healing in compromised patients. Accordingly, the current study monitored the contraceptive pill-taking women.

Overall, the combined use of LLLT and Zinc Oxide Eugenol dressing demonstrates a clinically and statistically significant advantage over standard care in managing pain, promoting healing, & improving oral health-related quality of life, particularly in hormonally sensitive populations like females using OCs.

Conclusion

This study highlights that Photobiomodulation Therapy provides superior outcomes compared to conventional management of Alveolar Osteitis in Oral Contraceptive users. The synergistic effect of Photo-biomodulation and the anti-inflammatory properties of Laser therapy offer a valuable therapeutic strategy for improving recovery and controlling complications following tooth extraction.

Conflict of Interest

The authors state no conflict of interest related to this research. No personal or financial relationships shaped the research design, data collection, or material

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