



COMPARISON OF PAIN EXPERIENCE FOLLOWING TOOTH EXTRACTION AND PLACEMENT OF DENTAL IMPLANTS

Ananya. R¹, Dr. M.P. Santhosh Kumar^{2*}

Article History: Received: 12.12.2022

Revised: 29.01.2023

Accepted: 15.03.2023

Abstract

Objectives: Even with recent advancements in pain diagnosis and management in dentistry, there is still a knowledge gap about pain relief. The current study's aim was to contrast the pain felt during tooth extraction and dental implant installation.

Materials and methods: A total of 30 candidates who visited Saveetha Dental College were taken into account for this cross-sectional study, of whom 15 were referred for tooth extraction and another 15 for implant placement. The level of pain was assessed by visual analogue scale immediately after the procedure and in the interval time of 1 hr and 1, 3 and 7 days respectively. Data were analysed using an independent sample t-test, Pearson's Chi square test, SPSS (Ver. 20).

Results: The females experienced more pain during an extraction with 51.72% than males with 24.14%, followed by pain experienced during an implant placement was comparatively lesser in males with 10.34% than females by 13.79% respectively. The level of postoperative pain after tooth extraction was more than implant surgery.

Conclusion: This study showed that patients generally experience less pain after posterior implant surgery than simple tooth extraction.

Keywords: Pain, Implant placement, tooth extraction, Anxiety, Complications

¹Graduate student, Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India

^{2*}Professor, Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India

DOI: 10.31838/ecb/2023.12.s2.163

1. Introduction

Even with recent advancements in pain diagnosis and management in dentistry, there is still a knowledge gap about pain relief. Due to terrible experiences, many people avoid going to the dentist like the plague. Patients who are likely to have surgery typically struggle with anxiety, pain, and fear. One of the most frequent postoperative consequences is postoperative pain, which makes patients uncomfortable, requires them to take painkillers, makes it harder for them to carry out daily tasks, and makes them less attentive to dental care¹. People may react to dental surgery in a variety of ways, including tension, anxiety, and post-operative consequences like pain, swelling, and a restriction on mouth opening. Some patients refuse surgery or treatment, and occasionally this avoidance causes unfixable problems. Pain is a neural system signal that causes unpleasant sensations as a sting, prick, tingle, burn, or aching^{1,2}. According to the International Association for the Study of Pain (IASP), pain is a vindictive sensory and emotional sensation connected to actual or potential tissue damage³. In addition, pain has been described as one of the body's protection systems or alarms that sets it apart from other sensory perceptions like pressure, temperature, and tactile sensation⁴.

The 4th most prevalent fear among people is dread of receiving dental care. According to patient surveys, drilling, anaesthetic injection, and extraction are the three dental treatments that patients are most afraid of. In individuals who have had terrible dental experiences in the past, dental dread typically develops in childhood. In this instance, the dentist's professional conduct significantly contributes to the development of such a dread. The primary cause of learned fear in adulthood, however, is pain⁵. Patients may not always accurately express their anticipated anxiety and discomfort during treatment because they may anticipate a stimulus to be more severe than what they actually feel³. A detailed dialogue should be done in order to manage and regulate patients' worry and anxiety prior to a planned dental surgical operation. By educating patients, dental anxiety sufferers can better prepare for their treatments and experience a reduction in anxiety. Few details are known about the pain experienced after the surgical insertion of dental implants, despite the fact that this treatment option is becoming increasingly popular among patients. Comparing this experience to previous dental surgical experiences, such as dental extractions, is more pertinent to the patients since it can allow them to comprehend the expected discomfort after implant surgery, thereby impacting their decision-making process^{6,7}. Additionally, individuals should be aware that after implant

insertion surgery, there are a few contributing factors that could intensify pain perception.

Wang et al. carried out a qualitative study on patients' perceptions of methods to lessen dental anxiety. Preparedness, teamwork, strengthened trust, and a personalised treatment plan were recognised as four aspects that could help patients feel less anxious. In this study, patients preferred to have more knowledge about the treatment's steps in order to be better prepared. Additionally, they said that participating in the formulation and decision-making processes of their treatment plans will lessen their anxiety and foster a stronger relationship with their dentists. Participants were particularly interested in learning about the predicted discomfort during and after treatment, the cost, the estimated length of the treatment, and the number of appointments required to finish it. This study supports the concept that well-informed patients will be less anxious about dental treatment⁸.

The patient's level of worry and anxiety and their experience of pain following dental operations are positively correlated. Following each of two sessions of periodontal surgery, a study examined the correlations between psychological factors present prior to surgery and the postoperative pain response and its impact on daily activities. 42 female patients with periodontitis who had never undergone surgery were assessed. They showed that measures of postsurgical pain following the initial surgery were favourably linked with presurgical scores on dental anxiety, exhaustion, and depression. After the second surgery, a lesser pattern of correlations was visible. According to the study, preoperative psychological state can be a useful indicator of postoperative discomfort and functional impairment. It is suggested that attempting to manage dental anxiety and emotional distress before surgery may help to lessen postsurgical pain and discomfort. It also bolsters the idea that patients' anxiety levels are lower as a result of their prior dental experiences⁹.

According to Al-Khabbaz et al., a variety of characteristics, including operator experience, female gender, and surgical difficulties, are linked to the reported pain severity in relation to the implant insertion operation. The postoperative and perioperative discomfort can be reduced in part by the surgeon's experience¹⁰. According to Morin et al.¹¹, more experienced surgeons created noticeably less discomfort than less experienced ones throughout the implant insertion operation. In addition, they discovered that patients' perceptions of pain following implant insertion varied depending on their gender, with women reporting greater total pain intensity than men. The modest degrees of discomfort experienced during healing, however, bother males more than women¹².

Increased postoperative discomfort and edema are linked to the placement of certain implants and the corresponding regenerative techniques (such as guided bone regeneration, sinus lift, and split ridge)¹³. Additionally, older people and smokers experience pain more severely. It has been demonstrated that patients have increased edema, pain, and discomfort the longer the process lasts. The placement of the implant and its proximity to important structures are related to where pain is felt. Patients with posterior implants experience more swelling than those with anterior implants, while patients with free-end spacing or entire edentulousness experience more swelling than those with interdental spaces^{13,14}.

González-Santana et al. examined the relationship between inflammation 48 hours following the operation and the various research factors as they investigated the pain and swelling in the first week following implant surgery placement as reported by the patients using VAS. More advanced patient age, edentulous patient surgery, free extremes, and surgical methods in the posterior area of the maxilla and mandible were all associated with statistically significant relationships¹⁵. Additionally, a strong correlation between edema and the quantity of implants used, surgery involving a sinus lift, and bone regeneration techniques was found. According to Yao et al findings, patients who had guided bone regeneration in conjunction with implant insertion may experience increased edema and bruising. The placement of the implant and its proximity to important structures are related to where pain is felt. Patients who had implants placed in the posterior rather than the anterior zone and those who had free-end spacing or were completely edentulous were said to experience more swelling than those who had interdental gaps. The timing of implant placement and loading has an impact on how much pain is felt. As patients must undergo a lengthy surgical procedure for both tooth extraction and implant installation, immediate implants may be more painful for them^{15,16}.

Patients had low to moderate pain and significant edema following rapid implant placement in the molar region with the regenerative treatment, according to Urban and Wenzel. Compared to normal or delayed loading, immediate loading may result in higher postoperative discomfort and swelling. Flapless surgeries heal more quickly than open flap procedures and have less intense and prolonged discomfort¹⁷. Without medicine, there is a considerable likelihood (43%) of not having any pain, and taking steroidal anti-inflammatory drugs may increase this likelihood. According to Khoully et al., short-term analgesic use within the first 72 hours after dental implant surgery is sufficient for postsurgical pain control¹⁸. However, it is advised

that analgesics be given throughout the first week following tooth extraction, indicating that tooth extraction has a drawn-out, uncomfortable healing process that demands utilising analgesics up to the seventh post extraction day. In order to decrease patients' fear and pain perception and so enhance the likelihood that they would accept their therapy, less invasive techniques are always desired¹⁹. Our team has extensive knowledge and research experience that has translate into high quality publications²⁰⁻²⁹. The current study's aim was to contrast the pain felt during tooth extraction and dental implant installation.

2. MATERIALS AND METHODS

Study design and study setting:

The current study is a prospective study. For the study, 30 patients who had been referred to the Saveetha Dental College's oral and maxillofacial surgery and Implant clinics were chosen at random (simple). Patients who underwent implant and tooth extraction belong to the age group between 21-30 years. Patients were made aware of the study when they signed up, and all participants provided written informed consent. Patients received assurances that they would not experience any risk or complications as a result of the trial. A thorough examination of systemic conditions, oral hygiene, and dental and oral health was conducted.

Inclusion criteria:

Patient satisfaction, signs that a tooth needed to be extracted (severe caries, inflammation and infection of the dental pulp with no chance of endodontic treatment), the requirement for single tooth replacement with dental implants, the absence of systemic disease, adequate jaw bone quality, and appropriate anatomy.

Exclusion criteria:

Uncontrolled systemic diseases (diabetes, cardiovascular disease, blood diseases, osteoporosis, malignancy, immunosuppressive diseases), inappropriate plaque control, pathological and periapical lesions in the area of the tooth that is to be extracted, pathological signs and symptoms surrounding dental implants, taking any pain medication 24 hrs before surgery, chronic pain in the head circumference (trigeminal neuralgia, unusual odontalgia, burning mouth syndrome, traumatic neuropathy, post-hemorrhagic neuralgia, and migraine), poor patient cooperation, patients with complications of tooth extraction (traumatic tooth extraction, post-operative infection, and dry socket), and pregnancy.

Utilising local anaesthetic block procedures, the patients had straightforward tooth extractions (inferior alveolar nerve block and long buccal nerve block). Using lignocaine 2% and adrenaline

1: 80000 palatal injection was performed after maxillary buccal infiltration.

A total of 30 candidates who visited Saveetha Dental College were taken into account for this cross-sectional study, of whom 15 were referred for tooth extraction and another 15 for implant

placement. The level of pain was assessed by visual analogue scale (Figure 1) immediately after the procedure and in the interval time of 1 hr and 1, 3 and 7 days respectively.



Figure 1: Visual analogue scale for pain assessment

Figure 1: Visual analogue for scale for pain assessment.

Data collection and Statistical analysis

Analysis used is a descriptive analysis – mean, range with tables and charts done using statistical software SPSS (Ver. 20). Independent variables are age, sex and dependent variables are tooth extraction and implant placement and association between categorical variables was evaluated.

Incomplete/censored data is managed by excluding it from the data. Independent sample ‘t’ test and Pearson’s Chi-square test were employed.

3. RESULTS

The outcomes of our study are depicted in figures 2,3.

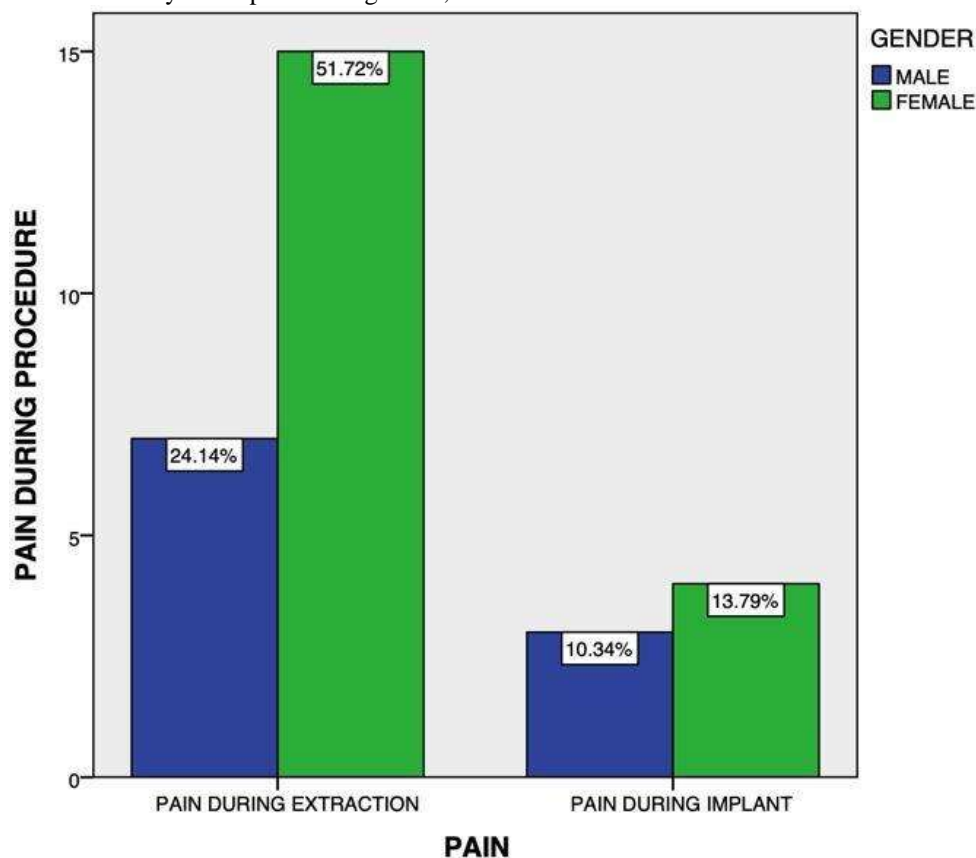


Figure 2: Bar chart depicting the association between gender and pain experienced during extraction and implant placement.

X axis represents the gender of the patients and Y axis represents the pain experienced during an extraction and an implant placement. Blue bars represent Males and red bars represent Females. The females experienced more pain during an extraction with 51.72% than males with 24.14%,

followed by pain experienced during an implant placement was comparatively lesser in males with 10.34% than females by 13.79% respectively. Chi square analysis was done ($p = 0.78$; $p > 0.05$ which was statistically not significant)

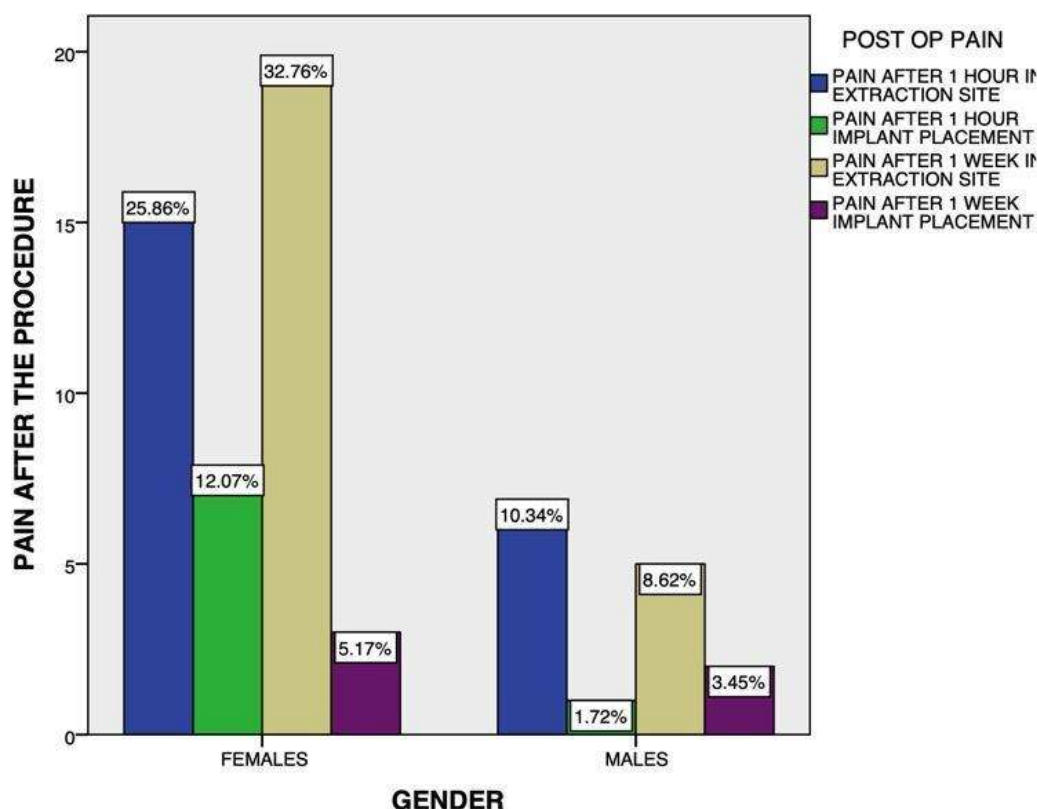


Figure 3: Bar chart depicting the association between gender and pain experienced during extraction and implant placement after 1 hour and 1 week review.

X axis represents the gender of the patients and Y axis represents the pain experienced during an extraction and an implant placement after 1 hour and 1 week review. Blue bars represent pain after 1 hour. green bars represent pain after 1 hour of implant placement, yellow bars represent pain after 1 week of extraction and violet bars represent pain after 1 week of implant placement. Females had more pain post extraction than males and pain experienced during an extraction was comparatively higher than an implant placement. Chi square analysis was done ($p = 0.78$; $p > 0.05$ which was statistically not significant)

4. DISCUSSION

Patient safety and patient-centred treatment have become their own area of study in medicine. As a result, there is now widespread consensus regarding the significance of patient assessments of their oral health status in dentistry research and education. Priority is given to Oral Health-Related Quality of Life after taking into account the

assessments (symptoms and indicators) provided by patients (OHRQOL)^{13,30}. Additionally, there is a tonne of evidence in the literature that denture status and tooth loss have an impact on OHRQOL. Additionally, the distribution and location of tooth loss have an impact on OHRQOL. A cutting-edge tooth replacement alternative that restores lost dental function is a dental implant. Over the years, tooth extraction has become a highly popular surgery. Implant surgery has increased in popularity recently as a method of replacing lost teeth. Numerous studies and investigations have focused on how patients rate their treatment and its results³¹. The patient's attitude regarding treatment restrictions, benefits, and drawbacks are just a few of the many variables that influence the decision to receive dental care. Therefore, it is reasonable for patients to compare various therapies (extraction, implant surgery)¹³.

According to this study, while looking at the gender, the pain experienced by females is comparatively higher with around 51.72% than males with just 24.14%. With this less sample size

we cannot conclude that it is gender specific. During the procedure, pain experienced during an extraction was comparatively higher than in an implant placement.

In one study, Tabrizi et al. examined the levels of discomfort felt by patients who underwent both tooth extraction and dental implant surgery. In a crossover trial, they evaluated the pain intensity in 40 patients at 12, 24, 48, and 72 hours following each procedure using a self-reported visual analogue scale (VAS). Their findings demonstrated that dental implant surgery pain decreased more quickly than tooth extraction pain over time, and that implant surgery postoperative pain is modest with moderate inflammation. They came to the conclusion that patients who had undergone implant surgery as well as tooth extraction felt much less discomfort^{19,32}.

This result is consistent with what Abolfazil et al. found in their investigation. The patients in the cross-sectional study got ibuprofen (400 mg) every six hours for postoperative pain control after uncomplicated tooth extractions for posterior teeth under local anaesthetic. All patients underwent dental implant procedures two months later, and they also got ibuprofen (400 mg) every six hours. The VAS was used to measure pain levels immediately following the procedure as well as at intervals of 6 hours, 3 hours, and 7 days, respectively. They claimed that tooth extraction caused more postoperative discomfort³³.

González-Santana et al. evaluated the pain and inflammatory response after dental implant insertion. They used verbal and visual analogue scales to examine the patients' reports of pain and swelling throughout the first week following implant surgery placement (VAS). The majority of patients experienced mild to moderate discomfort, peaking at 6 hours after surgery, and significant edema, peaking at 48 hours. Analysis of discomfort six hours after surgery revealed a statistically significant relationship between the number of implants and the level of pain experienced by patients who had had several dental implants. They found that minor discomfort and significant inflammation were present following implant insertion^{15,33}.

According to our study, the post op pain after 1 hour of extraction and 1 hour of implant placement was compared where 24.86% of females and 10.34% had post op pain after 1 hour of extraction and only 12.07% of females and 1.72% of males had post op pain after 1 hour of implant placement. Pain analysis was again done post 1 week of extraction and implant placement of the patients where 32.76% of females and 8.62% of males still had pain in the extraction site while only 5.17% of females and 3.45% of males had pain in the implant site.

Al-Khabbaz et al. conducted a multicenter prospective study to evaluate the discomfort related to surgical implant insertion. Following surgery, the mean pain scores of the patients were assessed at 24 hours, 1, 6, and 12 weeks. They claimed that the pain they felt after having the implants surgically placed was typically mild and gradually subsided over time^{10,15,33}.

Hashem et al. used questionnaires to evaluate the relationship between pain sensation and anxiety after dental implant placement. They measured how much pain interfered with everyday activities by using a visual analogue scale (VAS). Salivary cortisol samples were taken one week prior to surgery, on the day of surgery, and three and six days later in order to examine pain and anxiety. According to their findings, after implant insertion, the majority of patients experienced mild to moderate pain and impairment with everyday activities. The amount of discomfort on average and the restriction of daily activities peaked on the first postoperative day and decreased to about half the maximum level by the second or third day. On the day of surgery, patients reported the highest levels of anxiety, but the salivary cortisol level did not support this finding because there was no difference. Conclusion: Implant placement is a mild to moderately uncomfortable, anxiety-inducing surgery with certain restrictions on daily activities. Symptoms are anticipated to appear over the first three postsurgical days^{10,15,33,34}.

Yao et al comparative investigation found a strong correlation between surgical tooth extraction and increased discomfort and bleeding on the first post-op day. However, implant placement with assisted bone regeneration was linked to increased bruising and swelling. According to reports, straightforward implant healing processes resemble basic extraction processes¹³. Recently, the patient's perspective, or how they view their dental health, has come to be regarded as a crucial consequence in contemporary implant dentistry. An investigation was made on how patients view the perioperative phases of implant placement, to see if the total perceived difficulty of the surgical procedure is related to a particular stage of treatment, and to compare how patients view implant placement versus tooth extraction³⁵. The loads were highest for anaesthesia and lowest for side effects when treatment stages were taken into account. The study's findings showed that, despite the fact that implant placement involves essentially the same surgical technique and tools for incision, mucoperiosteal flap reflection, bone drilling, and suturing, patients appear to find these operations less taxing than surgical tooth extraction. Several researchers have shown that implant insertion was assessed as being less taxing than surgical tooth extraction, especially in terms of bone and soft

tissue manipulations like pressure during incision or vibration caused by drills^{35,36}.

Lesser sample size is the limitation of our study and it is difficult to conclude that the pain intensity is gender specific. Further long-term prospective studies are required to establish facts obtained in our study.

5. CONCLUSION

According to the current study, pain levels were much higher in the hour following tooth extraction than they were in the same time frame following implant surgery. The degree of pain following tooth extraction was also somewhat higher than after implant surgery after 7 days, but this difference was not statistically significant, showing that the patient's pain level, regardless of the kind of surgery, gradually decreased to zero over the course of a week. Therefore, it may be said that posterior implant surgery causes less discomfort for patients than a straightforward tooth extraction. Patients' anxiety levels can be lowered and postoperative pain and discomfort can be affected by explaining the surgical method for implant insertion and the expected postsurgical pain. Less postsurgical discomfort and everyday activity restrictions accompany the implant insertion surgical process compared to tooth extraction.

Conflict of Interest

There were no conflicts of interest as declared by the authors.

Acknowledgment

The authors thank everyone who enabled us to carry out this study.

Source of Funding

Self

6. REFERENCES

- Klages U, Ulusoy O, Kianifard S, et al. Dental trait anxiety and pain sensitivity as predictors of expected and experienced pain in stressful dental procedures. *Eur J Oral Sci* 2004; 112: 477–483.
- Klages U, Kianifard S, Ulusoy O, et al. Anxiety sensitivity as predictor of pain in patients undergoing restorative dental procedures. *Community Dentistry and Oral Epidemiology* 2006; 34: 139–145.
- Review for 'Distribution of mature and newly regenerated nerve fibres after tooth extraction and dental implant placement: An immunohistological study'. Epub ahead of print 2022. DOI: 10.1111/joor.13338/v2/review1.
- AlQutub AW. Pain Experience after Dental Implant Placement Compared to Tooth Extraction. *Int J Dent* 2021; 2021: 4134932.
- Curzik D, Jokic-Begic N. Anxiety sensitivity and anxiety as correlates of expected, experienced and recalled labor pain. *Journal of Psychosomatic Obstetrics & Gynecology* 2011; 32: 198–203.
- Brignardello-Petersen R. Minimally invasive flapless approach results in less pain and better healing after implant placement compared with conventional surgery. *The Journal of the American Dental Association* 2017; 148: e24.
- Koga S, Seto M, Moriyama S, et al. Anxiety before dental surgery under local anesthesia: reducing the items on state anxiety in the State-Trait Anxiety Inventory-form X. *Journal of Dental Anesthesia and Pain Medicine* 2017; 17: 183.
- Wang M-C, Vinall-Collier K, Csikar J, et al. A qualitative study of patients' views of techniques to reduce dental anxiety. *Journal of Dentistry* 2017; 66: 45–51.
- Croog SH, Baume RM, Nalbandian J. Pre-surgery psychological characteristics, pain response, and activities impairment in female patients with repeated periodontal surgery. *J Psychosom Res* 1995; 39: 39–51.
- Al-Khabbaz AK, Griffin TJ, Al-Shammari KF. Assessment of pain associated with the surgical placement of dental implants. *J Periodontol* 2007; 78: 239–246.
- Morin C, Lund JP, Villarroel T, et al. Differences between the sexes in post-surgical pain☆. *Pain* 2000; 85: 79–85.
- Gibson B. Summary of: Antibiotic prophylaxis in dentistry: part I. A qualitative study of professionals' views on the NICE guideline. *British Dental Journal* 2011; 211: 24–25.
- Yao J, Lee KK, McGrath C, et al. Comparison of patient-centered outcomes after routine implant placement, teeth extraction, and periodontal surgical procedures. *Clin Oral Implants Res* 2017; 28: 373–380.
- Tan WC, Krishnaswamy G, Ong MMA, et al. Patient-reported outcome measures after routine periodontal and implant surgical procedures. *Journal of Clinical Periodontology* 2014; 41: 618–624.
- González-Santana H, Peñarrocha-Diago M, Guarinos-Carbó J, et al. Pain and inflammation in 41 patients following the placement of 131 dental implants. *Med Oral Patol Oral Cir Bucal* 2005; 10: 258–263.
- Caton State. The Efficacy of Standard and Mini-dental Implants for Mandibular Tissue-supported Implant Retained Overdentures. 2008.
- Berggren U. Dental Fear and Avoidance: A Study of Etiology, Consequences and

- Treatment. 1984.
- Khoully I, Braun RS, Ordway M, et al. Post-operative pain management in dental implant surgery: a systematic review and meta-analysis of randomized clinical trials. *Clin Oral Investig* 2021; 25: 2511–2536.
- Rudolph A, Hilbert A. Post-operative behavioural management in bariatric surgery: a systematic review and meta-analysis of randomized controlled trials. *Obesity Reviews* 2013; 14: 292–302.
- Ramesh A, Varghese S, Jayakumar ND, et al. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. *J Periodontol* 2018; 89: 1241–1248.
- Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol* 2019; 90: 1441–1448.
- Priyadharsini JV, Vijayashree Priyadharsini J, Smiline Girija AS, et al. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species. *Archives of Oral Biology* 2018; 94: 93–98.
- Teja KV, Ramesh S, Priya V. Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study. *J Conserv Dent* 2018; 21: 592–596.
- Manohar MP, Sharma S. A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists. *Indian J Dent Res* 2018; 29: 716–720.
- Nandakumar M, Nasim I. Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis. *J Conserv Dent* 2018; 21: 516–520.
- Varghese SS, Ramesh A, Veeraiyan DN. Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students. *J Dent Educ* 2019; 83: 445–450.
- Panchal V, Jeevanandan G, Subramanian E. Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial. *J Indian Soc Pedod Prev Dent* 2019; 37: 75–79.
- Nair M, Jeevanandan G, Vignesh R. Comparative evaluation of post-operative pain after pulpectomy with k-files, kedo-s files and mtwo files in deciduous molars-a randomized clinical trial. *Braz Dent J*, <https://bds.ict.unesp.br/index.php/cob/article/view/1617> (2018).
- Felicita AS. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The sling shot method. *Saudi Dent J* 2018; 30: 265–269.
- Wang M, Rausch-Fan X, Zhan Y, et al. Comparison of Implant Placement Accuracy in Healed and Fresh Extraction Sockets between Static and Dynamic Computer-Assisted Implant Surgery Navigation Systems: A Model-Based Evaluation. *Materials* 2022; 15: 2806.
- Aljazaeri S. A comparison between rural and urban residents attending Basrah Dental College south of Iraq for tooth extraction between 2018-2021 and its relation to the dental health care situation in Iraq. *Basrah Journal of Surgery* 2022; 28: 2–13.
- Tabrizi R, Mohajerani H, Nabtieh A, et al. Do Patients have the Same Experience of Pain Following Tooth Extraction and Dental Implants? *Ann MaxillofacSurg* 2020; 10: 88–90.
- Tanidir AN, Atac MS, Karacelebi E. Information given by multimedia: influence on anxiety about extraction of impacted wisdom teeth. *Br J Oral MaxillofacSurg* 2016; 54: 652–657.
- Kim S, Lee Y-J, Lee S, et al. Assessment of Pain and Anxiety Following Surgical Placement of Dental Implants. *The International Journal of Oral & Maxillofacial Implants* 2013; 28: 531–535.
- Park S-Y, Kim Y-G, Suh J-Y, et al. Long-term outcomes of adjacent and antagonistic teeth after implant restoration: a focus on patient-related factors. *Journal of Periodontal & Implant Science* 2021; 51: 135.
- Min K-S, Lee H-W, Lee H-S, et al. Comparison of gene expression in human periodontal ligament cells cultured from teeth immediately after extraction and from teeth cryopreserved for 1 week. *Cryobiology* 2010; 60: 326–330.
- Santhosh K. Knowledge, attitude and practices regarding needlestick injuries among dental students. *Asian J Pharm Clin Res*. 2016;9(4):312-5.
- Balaji R, Duraisamy R, Kumar MP. Complications of diabetes mellitus: A review. *Drug Invention Today*. 2019 Jan 15;12(1).
- Gayathri MM. Knowledge and awareness among patients about dental implants. *Journal of Pharmaceutical Sciences and Research*. 2016 May 1;8(5):351.
- Palanivelu, J., Thanigaivel, S., Vickram, S., Dey, N., Mihaylova, D., & Desseva, I. (2022).

Probiotics in functional foods: survival assessment and approaches for improved viability. *Applied Sciences*, 12(1), 455.

SK M. Knowledge, attitude, and practices regarding infection control among undergraduate dental students. *Asian J Pharm Clin Res*. 2016;9(1):220-4.