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Knowledge and Awareness of Socket Preservation Procedures Among Dental Students - A Survey

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ABSTRACT

Introduction: The volume of the alveolar bone after extraction is maintained through socket preservation, typically for an implant or fixed partial denture pontic site. This surgery aids in making up for the loss of facial bone tissue. When implant placement must be postponed due to patient- or site-related issues, socket preservation should be taken into account. Autograft, allograft, xenograft, and alloplast are frequently used as biomaterials in socket grafting procedures.

Materials and Methodology: An online survey was conducted among 200 undergraduate dental students consisting of questions on socket preservation, its usage, forms, types of grafts to test their knowledge. The result was obtained and respective responses were statistically analyzed in SPSS using descriptive analysis.

Results: 66% of the students did not have knowledge about the use of socket preservation. 56% answered correctly that the growth factors used for socket preservation are BMP-2 and MSC. 67% were unaware that guided bone regeneration can improve ridge height and width. 56% of the students knew autograft is the golden standard when it comes to grafts. 45% were aware that socket sealing aids better tissue healing.

Conclusion: The knowledge of socket preservation, its techniques and various bone grafts is unsatisfactory among dental students. There is a need for more knowledge, awareness and research regarding socket preservation.

Keywords: *Awareness, Grafting, Knowledge, Ridge Grafting, Socket Preservation, Socket Sealing, Wellbeing, Health, Disease*

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1. INTRODUCTION

The most frequent surgical treatment in dentistry is tooth extraction. After teeth are removed, the alveolar bone no longer serves as a supporting structure. It is consequently gradually resorbed. [1]. A functional dental unit is not the only thing lost when a tooth is extracted. Additionally, it results in a significant local transformation of the architecture of the hard and soft tissues, which may have ramifications for the prosthetic rehabilitation of the future edentulous site, including the placement of a dental implant in a location that is both aesthetically pleasing and functional [2]. Numerous clinical, cast model, and radiographic investigations have been used to study the postextraction dimensional modification of the alveolar ridge in humans [3]. The buccal aspect experiences the greatest amount of alveolar modification in the horizontal dimension.

In actuality, "bundle bone," a tooth-dependent tissue that fully and irreversibly vanishes after tooth removal, makes up the

majority of the buccal bone, which is normally relatively thin. As a result of tooth loss and the resorption of the alveolar walls, soft tissues collapse into the alveolus, reducing the original alveolar dimensions. Although there is a large interindividual variance, remodelling activities may continue for up to a year after tooth extraction, and three months after tooth extraction, up to 50% of the initial alveolar width may be reduced[4].

A surgical approach called "socket preservation" preserves the alveolar ridge following extraction in an effort to avoid or reduce the need for additional augmentation surgeries in the future for implant-prosthetic rehabilitations. The fundamental component of the suggested membrane-free or membrane-assisted bone or bone substitute transplant procedures is socket preservation. Another strategy for socket preservation focuses primarily on accelerating alveolar healing through the use of biological mediators. Beyond their role in hemostasis, platelets serve several other purposes.

Growth factors and cytokines released by activated platelets that are crucial for the healing of both soft and hard tissues [5,6]. When compared to tooth extraction alone, ridge preservation employing the Guided Bone Regeneration technique has been found to improve ridge height and breadth dimensions[7,8]. According to these clinical studies, implants were effectively inserted into the increased ridges, frequently without the need for additional bone grafting. The aim of this survey study is to assess the knowledge and awareness of socket preservation treatment among undergraduate dental students in chennai .

2. MATERIALS AND METHODS

This online survey study was conducted at Chennai, India. The sample size was 200 which consisted of undergraduate dental students from various colleges in chennai. The study instrument was a structured questionnaire consisting of ten multiple choice questions (MCQs), encompassing major aspects of socket preservation. An online survey was conducted and they were asked to fill the questionnaire for which ample time was provided. An online questionnaire was prepared on the online platform survey planet and was circulated among the students. The study was carried out in the month of Dec 2025. To minimise sampling bias we included all responses. There was no sorting of responses done. Once the survey was complete the data was tabulated, then imported to SPSS, a statistical software by IBM. Descriptive Statistical analysis was carried out.

3. RESULTS

In this study a total of 200 dental students participated. Out of which 58% were female students and 45% male students as shown in [Figure 1]. When asked if they knew what socket preservation is used for, only 34% were aware which has been illustrated in [Figure 2]. When asked what growth factors are used for socket preservation, 56% of the participants said both BMP-2 and MSC as illustrated by [Figure 3]. When asked if they were aware that guided bone regeneration has helped improve ridge height and width, only a mere 33% thought it was true as shown in [Figure 4]. When the participants were asked which graft is the goal standard, 56% of the participants answered that it was autograft as illustrated using [Figure 5]. When the participants were asked if soft tissue healing was better with socket sealing, only 45% of the participants believed it to be true as illustrated by [Figure 6]. When asked what types of membranes are used for socket preservation, 45% of the participants answered that it was resorbable as illustrated by [Figure 7]. When asked what socket sealing is best seen with, 38% of the participants answered that it was Bio-Oss as illustrated by [Figure 8]. When asked what are the ideal properties of a barrier membrane, 57% of the participants answered that it was both biocompatibility and durability on exposure as clearly illustrated in [Figure 9]. When asked if surgical grade calcium sulfate added to grafts has increased angiogenesis, 62% of the participants answered that it was false as seen in [Figure 10].

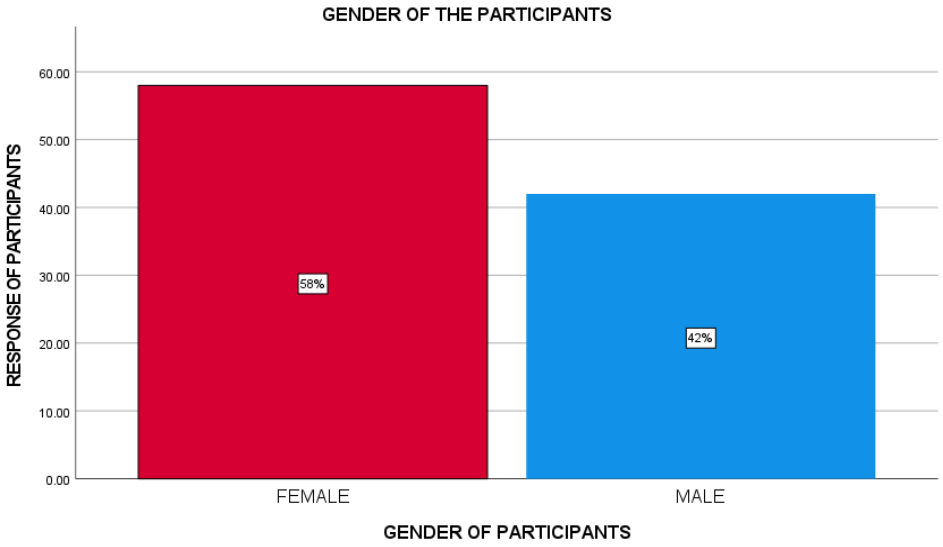

Figure 1: This graph represents the gender distribution of participants who took part in the study. X axis represents the gender distribution. Y axis represents the percentage of participants taking part in the study. The population consisted of 58% female participants as depicted by the red bar and 42% male participants as depicted by the blue bar.

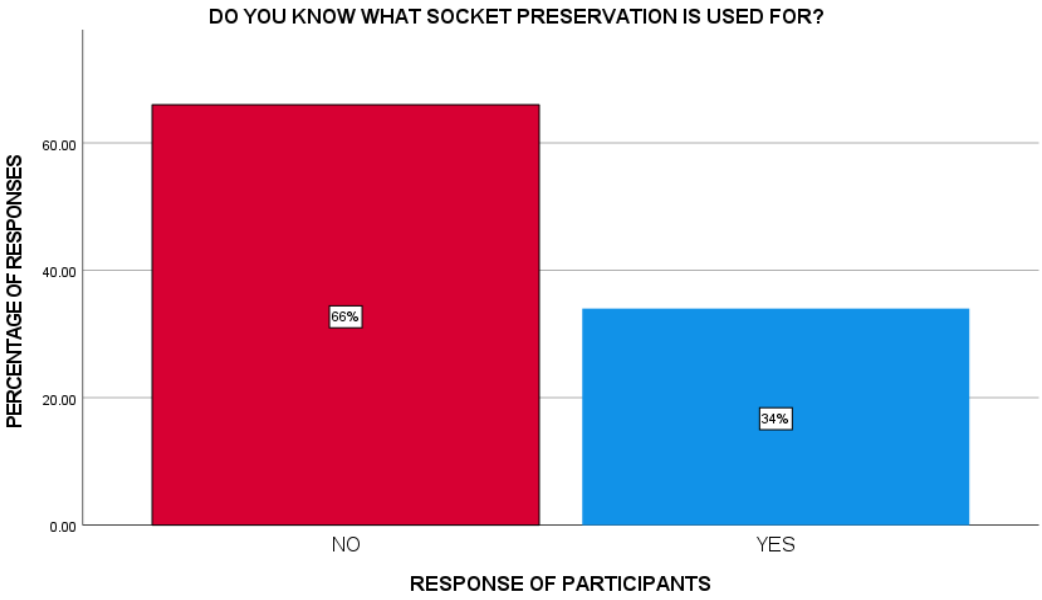

Figure 2: This graph shows responses to the question,"Do you know what socket preservation is used for?". X axis represents the response of the students. Y axis represents the percentage of responses in the study. The responses consisted of 66% no as denoted by the red bar and 34% yes as denoted by the blue bar.

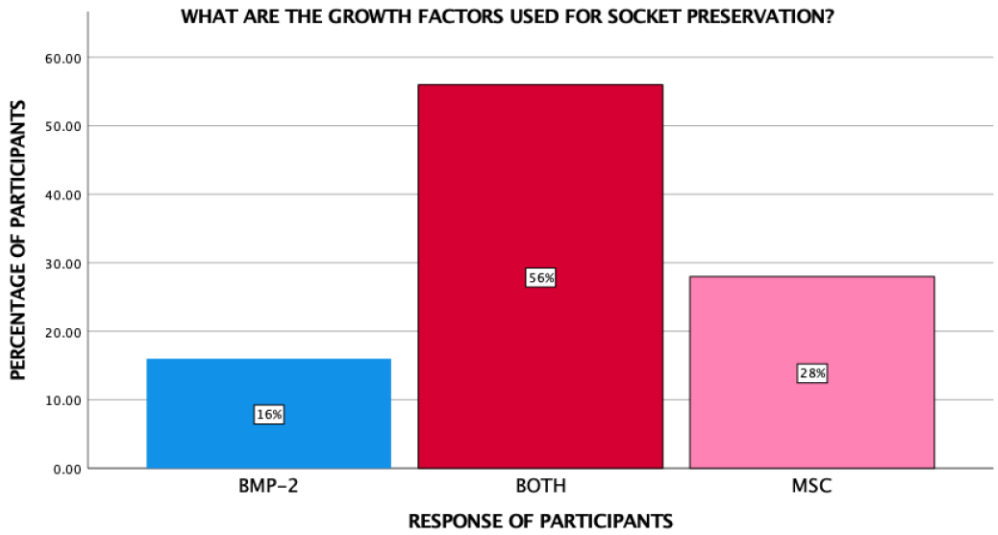

Figure 3: This graph shows responses to the question,"What are the growth factors used for socket preservation?". X axis represents the response of the students. Y axis represents the percentage of responses in the study. 56% of the respondents answered the question as both BMP-2 and MSC which has been denoted by the red bar, 28% answered as MSC alone denoted by pink bar and 16% responded as BMP-2 alone which has been represented as the blue bar.

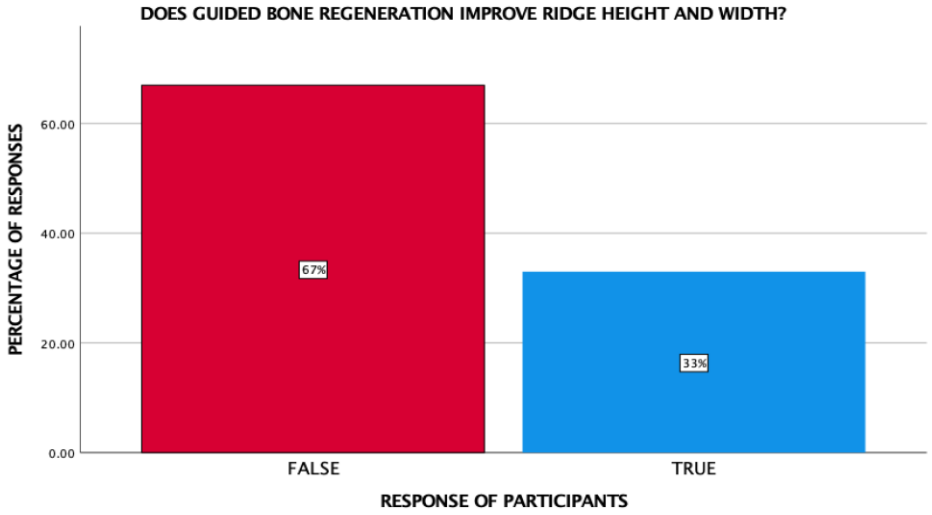

Figure 4: This chart shows responses to the question,"Does guided bone regeneration improve ridge height and width?". X axis represents the response of the students. Y axis represents the percentage of responses in the study. 67% of the participants answered that it was false as denoted by the red bar and 33% of the participants answered that it was true as represented by the blue bar.

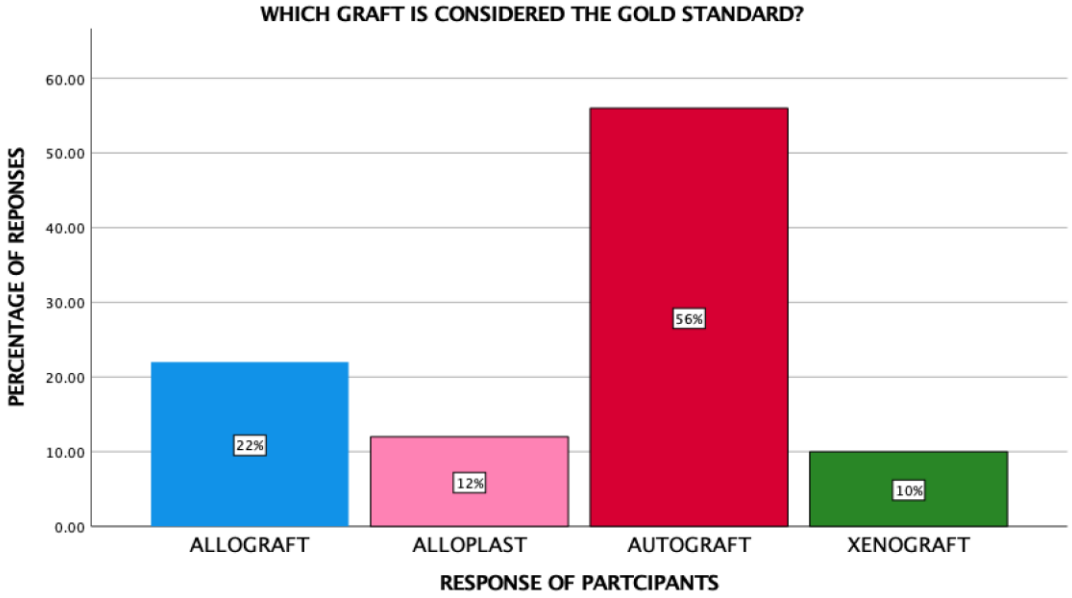

Figure 5: This graph shows responses to the question,"Which graft is considered the gold standard?". X axis represents the response of the students. Y axis represents the percentage of responses in the study. The responses consisted of 56% autograft denoted by red bar followed by 22% allograft as denoted by the blue bar, 12% alloplast as represented by the pink bar and finally 10% xenograft as denoted by the green bar.

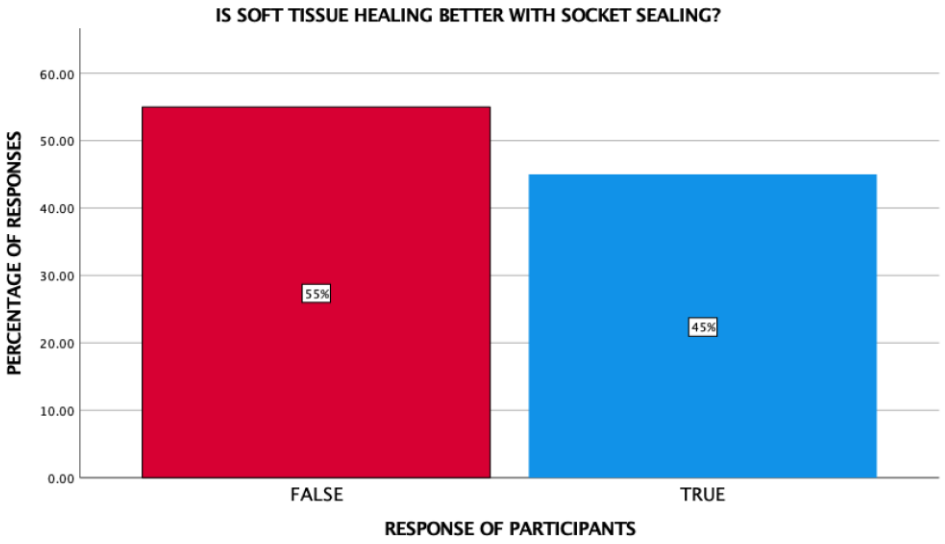

Figure 6: Bar chart showing responses to the question,"Is soft tissue healing better with socket sealing?". X axis represents the response of the students. Y axis represents the percentage of responses in the study. The responses consisted of 55% false as denoted by the red bar followed by 45% true as represented by the blue bar.

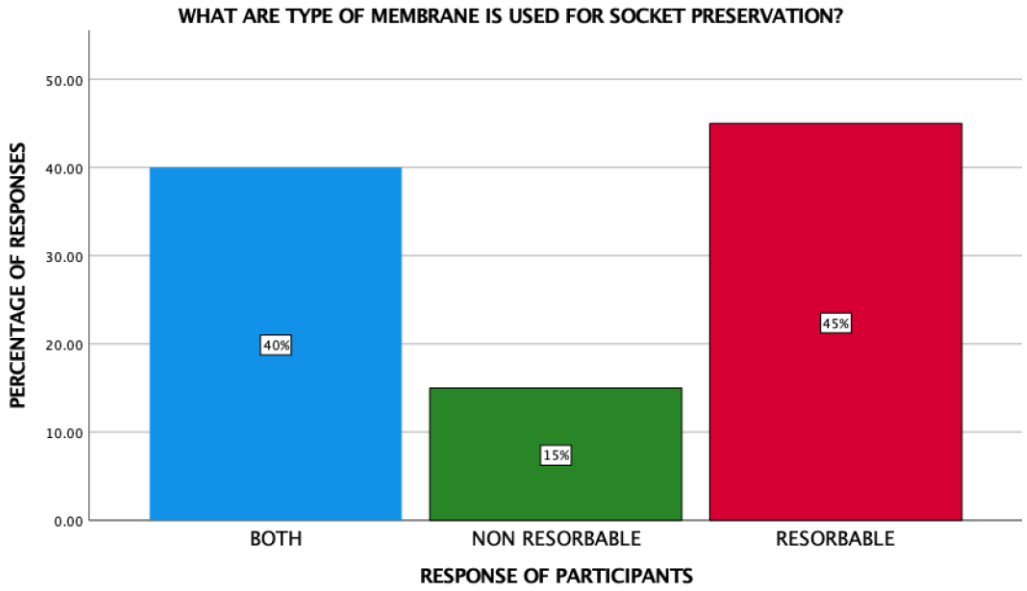

Figure 7: Bar chart showing responses to the question,"What are the types of membranes used for socket preservation?". X axis represents the response of the students. Y axis represents the percentage of responses in the study. The responses consisted of 45%of the participants responding resorbable denoted by the red bar followed by 40% of the respondents responding both as denoted blue bar and 15% responding as non resorbable as seen by the green bar.

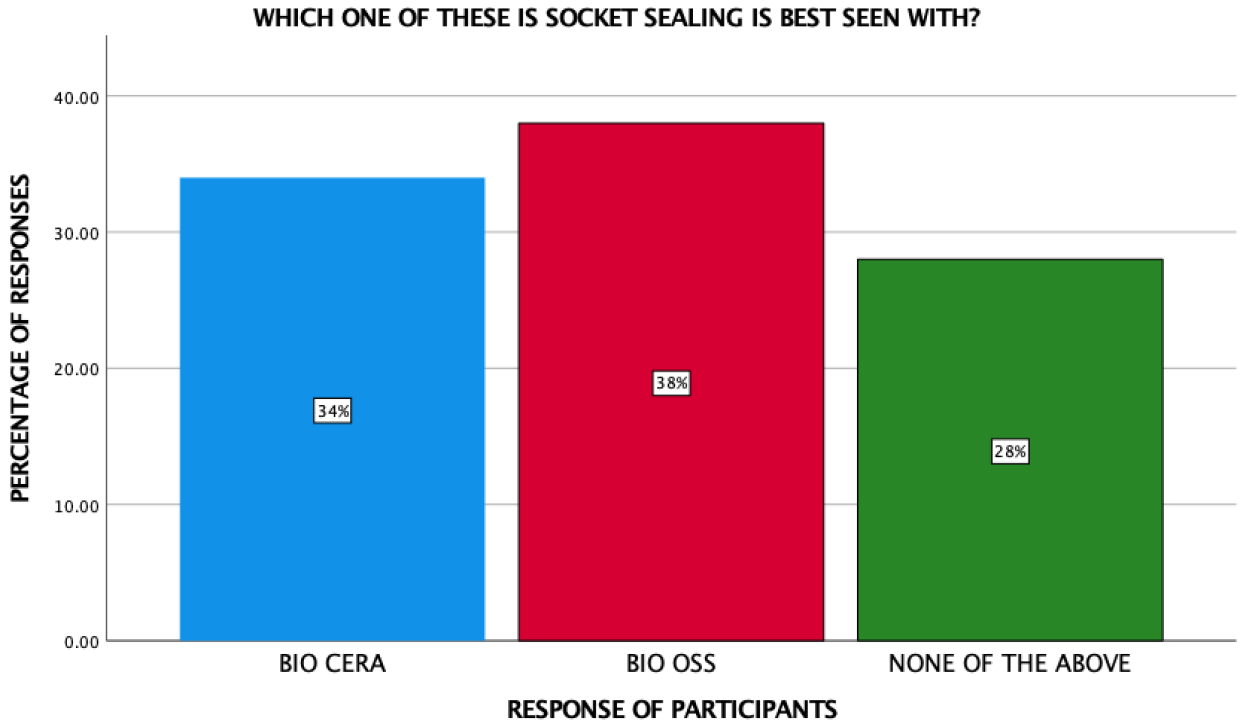

Figure 8: This graph shows responses to the question,"Which one of these is socket sealing best seen with?". X axis represents the response of the students. Y axis represents the percentage of responses in the study. The responses consisted of 38% Bio oss as denoted by the red bar followed by 34% Bio cera as denoted by the blue bar and 28% none of the above as denoted by the green bar.

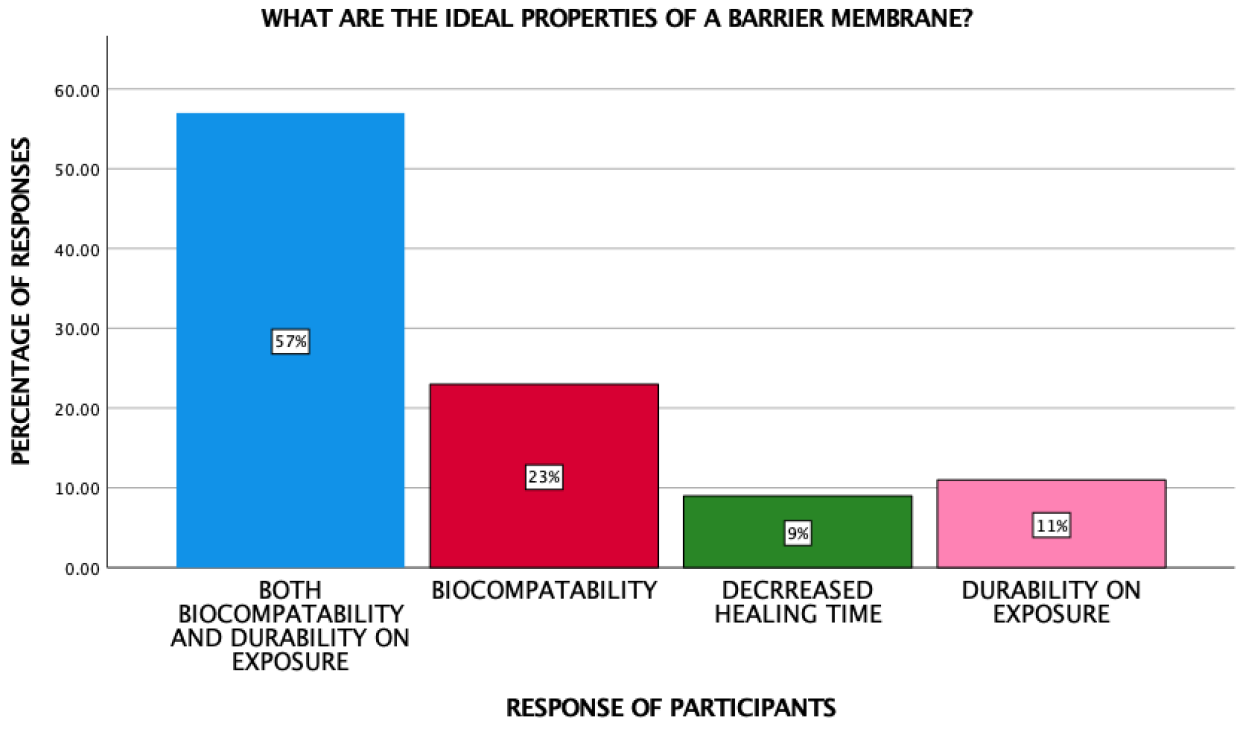

Figure 9: This graph shows responses to the question,"What are the ideal properties of a barrier membrane?". X axis represents the response of the students. Y axis represents the percentage of responses in the study. The responses consisted of 57% of the respondents responding to both biocompatibility and durability as denoted by the blue bar followed by 23% responding as biocompatibility denoted by the red bar, 11% of the respondents responding to durability on exposure as denoted by the pink bar and 9% of the respondents responding to decreased healing time as denoted by the green bar.

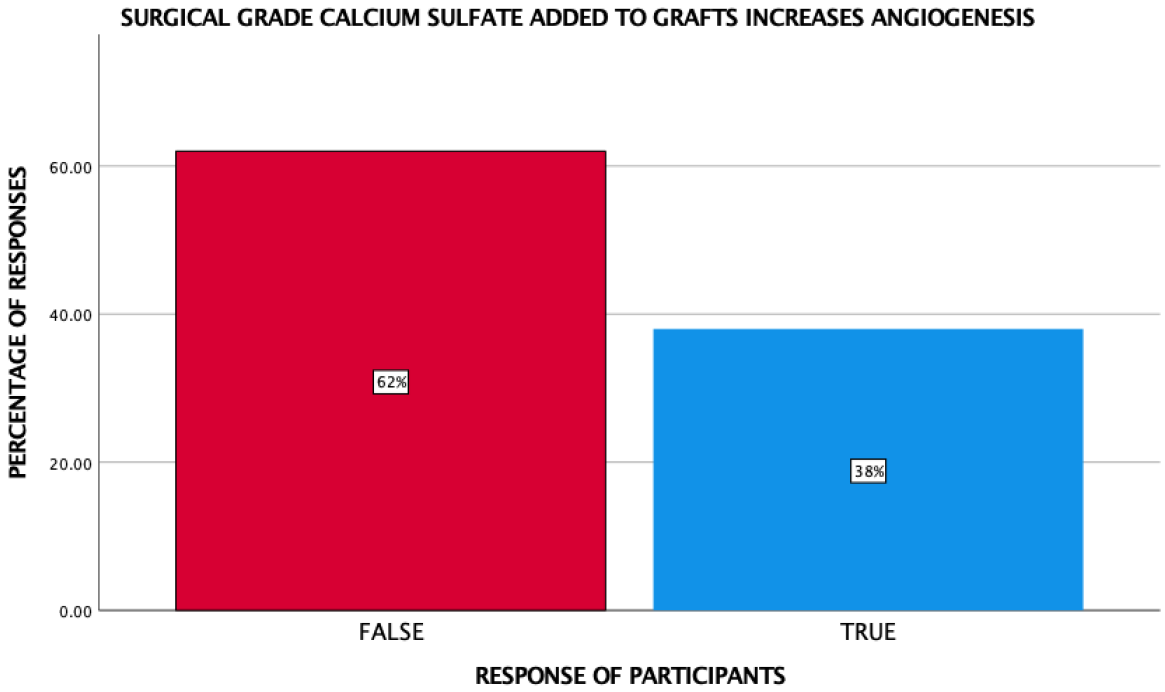

Figure 10: This graph shows responses to the statement,"Surgical grade calcium sulfate added to grafts increases angiogenesis". X axis represents the response of the students. Y axis represents the percentage of responses in the study. The responses consisted of 62% of the participants responding as false as denoted by the red bar and 38% true as denoted by the blue bar.

4. DISCUSSION

In preparation for the dental implants or the pontic site for fixed partial dentures, socket preservation maintains bone volume after extraction. This surgery aids in making up for the loss of facial bone tissue. When implant placement must be postponed due to patient- or site-related issues, socket preservation should be taken into account. In our study, as shown in Figure 2, 66% of respondents were unaware of the usage of socket preservation. Bioactive chemicals that control the process of MSC development were also looked at in a study of the literature. The bone morphogenetic proteins, specifically BMP-2, which are part of the transforming growth factor-ß class, are the growth factor that has undergone the most analysis [9]. BMPs can trigger chondrogenesis, osteogenesis, extracellular matrix formation, and angiogenesis. The most effective inductor of bone growth is likely BMP-2 [10,11].

Ideally the use of both BMP-2 and MSC is considered and recommended. This is in accordance with our study where 56% of the respondents answer that both BMP-2 and MSC are used for socket preservation which has been depicted using Figure 3. When compared to tooth extraction alone, guided bone regeneration (GBR) socket preservation has been demonstrated to improve ridge height and width dimensions. This is in accordance with our study where 33% of the participants thought this fact to be true as compared to 67% which were not aware of this fact as depicted by Figure 4. Biomaterials for socket grafting includes auto/allo/xenograft and alloplast. A bone substitute with a low substitution rate is recommended [12]. This is in accordance with our study where 56% of the participants were aware that autograft is the gold standard when compared to other grafts as depicted by Figure 5. One more method of socket preservation includes ridge grafting using biomaterials. The material for the bone graft should be chosen with the long-term stability of the bone volume in mind, and it should be supported by thorough research in the literature [13]. Regardless of the grafting methodology used, it is impossible to dependably achieve the entire regeneration of dehiscence and fenestration-type defects [14,15].

Primary closure after elevating and mobilising a full-thickness mucoperiosteal flap, free autogenous gingival graft, dermal allografts, and collagen matrix xenografts are some of the different techniques for socket sealing. Studies have shown that socket sealing improves soft tissue healing compared to extraction alone [16,17]. This is in accordance with our study where 45% of the participants were aware that socket sealing aids better tissue healing as seen in Figure 6. In a study by Lekovic et al, they found that bone resorption was less when resorbable or non resorbable membranes were used as opposed to assisted socket healing. When used in combination with bone grafts, resorbable and non-resorbable membranes have shown positive results in ridge preservation. This is in accordance with our study where 40% of the participants were aware of the use of the both resorbable and non resorbable membranes for socket preservation as depicted by Figure 7.

When applied with Bio-Oss collagen, socket sealing has demonstrated reduced horizontal and vertical bone resorption [18]. Where connective tissue opposes connective tissue, tension-free closure is crucial to prevent infection of the graft or exposing of barrier membranes. This is in accordance with our study where 38% responded that Bio-Oss collagen is the most effective with socket sealing as depicted by Figure 8. In 1992, Scantlebury outlined five key requirements that membranes should meet: biocompatibility, the capacity to produce space, cell occlusiveness, tissue integration, and ease of handling [19,20]. Therefore, the optimal membrane for bone regeneration should be synthetic, biocompatible, manageable, resistant to exposure, and resorbable [21]. To increase significant bone volume, we also need to consider the biological stability, morphological structure, and capacity to activate growth factors. This is in accordance with our study where 57% of the participants were aware that biocompatibility and durability to exposure were some of the ideal properties of an ideal membrane.

Autogenous grafts with surgical grade calcium sulphate have improved angiogenesis and formed important bone more quickly [22]. In a study by Vance et al., they compared an organic bovine hydroxyapatite to a putty of DFDBA plus calcium sulphate with carboxymethylcellulose and discovered that the DFDBA plus calcium sulphate demonstrated more significant bone growth [23]. This is in accordance with our study where 38% of the participants were aware of this fact as depicted in Figure 10. Although socket preservation has many advantages, it does have its own limitations which include intermediate success rate, inflammatory response of tissues, failure of grafts among others. It still requires advancement in technology and further research for it to be used in day to day practice. Since it is studied scarcely, more knowledge, awareness and research is required for it to be a well known practice among clinicians and dental students.

5. CONCLUSION

This research gives collective knowledge regarding the socket preservation among dental students. Further this can also be expanded to a wider horizon involving a wider population of study. In conclusion, we realized that the awareness among the dental students was not satisfactory, their knowledge needs to be reinforced by conducting oral health and various treatment technique seminars to improve the awareness.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest in the present study.

REFERENCES

[1] Pranskunas M, Galindo-Moreno P, Padial-Molina M. Extraction Socket Preservation Using Growth Factors and Stem Cells: a Systematic Review. J Oral Maxillofac Res. 2019 Jul;10(3):e7.

[2] Stella B, Rajasekar A. Therapeutic Impact of Systemic Probiotics Combined with Mechanical Debridement in Peri-Implant Disease: A Clinical and Microbiological Evaluation. Journal of Long-Term Effects of Medical Implants. 2026;36.

[3] Patil A, Rajasekar A. Peri-Implant Marginal and Buccal Bone Changes Following Immediate versus Delayed Implant Placement with GBR in Maxillary Central Incisors: 12-Month Prospective clinical study. Journal of Long-Term Effects of Medical Implants.

[4] Yuwanati M, Babalola AE, Apolônio AC, ÜNSAL BK, Liu Y, Corral MA, Faquim CJ, Thomas JT, Gatarayiha A, Chaurasia A. Correlation of Growth Factors in Platelet-Rich Plasma with Clinical Outcomes and Hematological Parameters in Regenerative Dentistry: A Systematic Review and Meta-Analysis.

[5] De Pascale MR, Sommese L, Casamassimi A, Napoli C. Platelet derivatives in regenerative medicine: an update. Transfus Med Rev. 2015 Jan;29(1):52–61.

[6] Pignalosa O, Martusciello D, De Pascale MR, Sommese L, Nicoletti GF, Itro A, et al. Platelet Gel in a Non-Regenerating Cryosurgery-Induced Skin Wound in an Old Patient: A Case Report. Med Princ Pract. 2016 May 10;25(4):388–90.

[7] Lekovic V, Kenney EB, Weinlaender M, Han T, Klokkevold P, Nedic M, et al. A bone regenerative approach to alveolar ridge maintenance following tooth extraction. Report of 10 cases. J Periodontol. 1997 Jun;68(6):563–70.

[8] Iasella JM, Greenwell H, Miller RL, Hill M. Ridge preservation with freeze-dried bone allograft and a collagen membrane compared to extraction alone for implant site development: A clinical and histologic …. Journal of [Internet]. 2003; Available from: https://aap.onlinelibrary.wiley.com/doi/abs/10.1902/jop.2003.74.7.990

[9] Ortega-Oller I, Padial-Molina M, Galindo-Moreno P, O'Valle F, Jódar-Reyes AB, Peula-García JM. Bone Regeneration from PLGA Micro-Nanoparticles [Internet]. Vol. 2015, BioMed Research International. 2015. p. 1–18. Available from: http://dx.doi.org/10.1155/2015/415289

[10] Chen G, Deng C, Li Y-P. TGF-β and BMP signaling in osteoblast differentiation and bone formation. Int J Biol Sci. 2012 Jan 21;8(2):272–88.

[11] Supraja G, Ganesh SB, Kumar R, Kaarthikeyan G. In-vitro evaluation of multicomponent scaffold with kappa carrageenan, tendon extracellular matrix and calcium-magnesium silicate for periodontal bone regeneration. Journal of Oral Biology and Craniofacial Research. 2025 Nov 1;15(6):1260-5.

[12] Fee L. Retraction Note: Socket preservation. Br Dent J. 2017 Nov 10;223(9):741.

[13] Bornstein MM, Al-Nawas B, Kuchler U, Tahmaseb A. Consensus statements and recommended clinical procedures regarding contemporary surgical and radiographic techniques in implant dentistry. Int J Oral Maxillofac Implants. 2014;29 Suppl:78–82.

[14] Akshayaa L, Ganesh BS. Preparation of a Carrageenan and Fucoidan Silica Nanoparticle-Based Membrane for Guided Bone Regeneration in Dental Implant Sites. J Long Term Eff Med Implants. 2025;35(2):25-32. doi: 10.1615/JLongTermEffMedImplants.2024049789. PMID: 40300138.

[15] Boyan BD, Ranly DM, McMillan J, Sunwoo M, Roche K, Schwartz Z. Osteoinductive ability of human allograft formulations. J Periodontol. 2006 Sep;77(9):1555–63.

[16] Jensen SS, Broggini N, Hjorting-Hansen E, Schenk R, Buser D. Bone healing and graft resorption of autograft, anorganic bovine bone and beta-tricalcium phosphate. A histologic and histomorphometric study in the mandibles of minipigs [Internet]. Vol. 17, Clinical Oral Implants Research. 2006. p. 237–43. Available from: http://dx.doi.org/10.1111/j.1600-0501.2005.01257.x

[17] Thalmair T, Hinze M, Bolz W, Wachtel H. The Healing of Free Gingival Autografts for Socket-seal Surgery: a Case Report. Eur J Esthet Dent. 2010 Winter;5(4):358–68.

[18] Jung RE, Hürzeler MB, Thoma DS, Khraisat A, Hämmerle CHF. Local tolerance and efficiency of two prototype collagen matrices to increase the width of keratinized tissue. J Clin Periodontol. 2011 Feb;38(2):173–9.

[19] Rakhmatia YD, Ayukawa Y, Furuhashi A, Koyano K. Current barrier membranes: titanium mesh and other membranes for guided bone regeneration in dental applications. J Prosthodont Res. 2013 Jan;57(1):3–14.

[20] Caballé-Serrano J, Munar-Frau A, Ortiz-Puigpelat O, Soto-Penaloza D, Peñarrocha M, Hernández-Alfaro F. On the search of the ideal barrier membrane for guided bone regeneration. J Clin Exp Dent. 2018 May;10(5):e477–83.

[21] Hoornaert A, d'Arros C, Heymann M-F, Layrolle P. Biocompatibility, resorption and biofunctionality of a new synthetic biodegradable membrane for guided bone regeneration. Biomed Mater. 2016 Aug 10;11(4):045012.

[22] Strocchi R, Orsini G, Iezzi G, Scarano A, Rubini C, Pecora G, et al. Bone regeneration with calcium sulfate: evidence for increased angiogenesis in rabbits. J Oral Implantol. 2002;28(6):273–8.

[23] Vance GS, Greenwell H, Miller RL, Hill M, Johnston H, Scheetz JP. Comparison of an allograft in an experimental

putty carrier and a bovine-derived xenograft used in ridge preservation: a clinical and histologic study in humans. Int J Oral Maxillofac Implants. 2004 Jul;19(4):491–7.