

## **Analysis of Periodontally Compromised Patients Undergoing Treatment Only for Subgingival Scaling with or without Periodontal Flap Surgery**

**Nur Qistina Binti Ahmad Fauzi\***

Saveetha Dental College and Hospitals,  
Saveetha Institute of Medical and Technical Sciences,  
Saveetha University  
151501098.sdc@saveetha.com

**Jaiganesh Ramamurthy**

Professor and Head,  
Department of Periodontics,  
Saveetha Dental College and Hospitals,  
Saveetha Institute of Medical and Technical Sciences,  
Saveetha University  
jaiganeshr@saveetha.com

**Deepa Gurunathan**

Professor and Head,  
Department of Pediatric and Preventive Dentistry  
Saveetha Dental College and Hospitals,  
Saveetha Institute of Medical and Technical Sciences,  
Saveetha University  
deepag@saveetha.com

**Corresponding author:**

**Jaiganesh Ramamurthy**

Professor and Head,  
Department of Periodontics,  
Saveetha Dental College and Hospitals,  
Saveetha Institute of Medical and Technical Sciences,  
Saveetha University  
jaiganeshr@saveetha.com

### **ABSTRACT**

The most important part in a periodontal therapy is the ability to completely remove the calculus from the tooth structure. In some cases, even after the completion of the periodontal therapy, a significant amount of calculus can still be present. With that in mind, the formation of a proper treatment plan should be based upon the patient's periodontal status would ultimately provide a better prognosis in the future. The aim of the study is to analyse periodontally compromised patients that are opting for subgingival scaling with or without

periodontal flap surgery. The sample size consists of 164 patients who were diagnosed with chronic periodontitis. Each patient's gender, age, periodontal status as well as treatment records was obtained through patient records from the institution between June 2019 to March 2020. Based on the severity of the periodontal disease, patients with highly severe periodontal status commonly undergo both subgingival scaling and flap surgery (55.8%) compared to patients with less severe periodontal status opting only for subgingival scaling only (44.2%). Chi-square test was one and there was a positive correlation between the mean attachment loss (mm) of the patient and the treatment being done ( $p=0.00$ ). Within the limits of our study, it was found that the severity of the periodontal disease determines the treatment option of the patients. Patients undergoing both subgingival scaling and flap surgery are more commonly associated with more severe periodontal status while those opting for only subgingival scaling have a less severe periodontal status.

**Keywords:** attachment loss, flap surgery, periodontitis, probing depth, subgingival scaling.

## INTRODUCTION

Periodontitis is a severe form of destructive inflammatory disease of the periodontium known to cause destruction of periodontal tissues namely the periodontal ligament, cementum, alveolar bone as well as the gingiva. [(1)] [(2)] This chronic inflammatory state of periodontal destruction is caused by a variety of aetiological and risk factors. [(3)] In cases of periodontitis, the main aim of doing a periodontal therapy is to regenerate the periodontal tissues lost as a result of this disease. [(4)] Periodontal therapy consists of both a nonsurgical and surgical approach. A nonsurgical approach includes patient motivation, oral hygiene instructions as well as the elimination of plaque and calculus deposits. [(5)] On the other hand, surgical procedures include treatments like subgingival curettage, gingivectomy, modified widman flap, and full- or split-thickness flap procedures with or without osseous recontouring. [(5,6)]

Scaling whether it be supragingival or subgingival is a method of instrumentation on the crown or root surface of the tooth with the primary aim of removing calculus, dental biofilm and extrinsic stains. Scaling directly removes both dental plaque and calculus present on the tooth surface. With that, there will be a reduction in gingival bleeding and inflammation which if left untreated will eventually lead to periodontitis [(7)] which is the most common reason for tooth loss. [(8)] In chronic periodontitis, *P. gingivalis* is described as the key pathogen. [(9)] When periodontal tissue destruction happens, scaling promotes periodontal regeneration which can help in restoring periodontal tissues to its original architecture and function. [(10)] This treatment option is practiced primarily as a form of preventive dental care in order to maintain the state of a healthy gingiva and prevent gingivitis. [(11)]

The basis of periodontal therapy has always been principally the elimination of disease with the simultaneous maintenance of a functional, healthy dentition and supporting tissues. [(12)] In spite of various appointments done by different clinicians to thoroughly scale and root plane the teeth, a significant amount of calculus may still be present even with the completion of such procedures and tooth surfaces proving visually to be clinically

smooth. In most cases, when there is an incomplete removal of subgingival plaque, it has been proven to be equivalent to having complete lack of plaque control in an individual. [(13)] In scenarios where a clinician is required to treat deep periodontal pockets, scaling was proven to be more difficult compared to shallow pockets. [(13)],[(14)]. In the end, due to improper treatment planning, the completed periodontal therapy in some instances ends in failure [(15)] as a result of the presence of remaining plaque and calculus after the therapy. [(16)]

Besides scaling, there are various treatments available to treat periodontal pockets. One of the most common methods is flap surgery, which aims to provide periodontal reattachment that promotes postoperative adaptation of mature, gingival connective tissue to the tooth surface. [(17)] Flap surgery is a significantly beneficial method that can be used in cases of deep periodontal pockets and severe attachment loss. Not only does it benefit in calculus removal, it also aids in the periodontal tissue regeneration. [(17)]

With these methods of periodontal therapy, some challenges that were faced included patient compliance in terms of the treatment suggestions. [(18)] Since subgingival scaling and flap surgery cannot be done in one sitting, it is proven that there is difficulty in recalling these patients. These future appointments are important especially for the purpose of future inspections of any residual calculus that remains in order to determine the effectiveness of the periodontal therapy. [(16)]

This study was done for the aim of analysing periodontally compromised patients opting only for sub gingival scaling with or without periodontal flap surgery. The main purpose being that dentists in the future can be more assured during their treatment planning in regard to periodontally compromised patients. Since periodontal disease has various aetiologies, the process of treatment planning has always been a challenge for the dentist. [(19)] Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (20)(15,21–42). With better understanding, it will ultimately lead to a better diagnosis and future prognosis of the disease.

## **MATERIALS AND METHODS**

A single centre retrospective study was done in an institutional setting. The ethical approval was received from the institution's ethical committee. The study involved selected patients data who were diagnosed with chronic periodontitis and had undergone subgingival scaling as well as flap surgery. The necessary approvals in gaining the datas were obtained from the institutional ethical committee (SDC/SIHEC/2020/DIASDATA/0619-0320). The number of people involved in this study included 3 people (guide, reviewer and researcher).

### **Selection of Subjects:**

A total sample size of 164 chronic periodontitis patients who have undergone subgingival scaling and flap surgery from the period of June 2019 to April 2020 were selected for this study. There were three people involved in this study (guide, reviewer, and researcher). All available data were taken into consideration.

### **Data Collection:**

The patient's details were retrieved from the institution's patient record management software (Dental Information Archiving Software). Data regarding patients age, gender, mean probing depth (mm), mean attachment loss (mm) and the treatment done were taken into consideration for this study. Cross verification of the data was done with the help of photographs. The data was manually verified, tabulated and sorted.

### **Inclusion Criteria:**

All patients who were diagnosed with chronic periodontitis. All patients who had undergone subgingival scaling and flap surgery. All age groups were taken into account.

### **Exclusion Criteria:**

All patients with systemic illnesses. Repetitive records were excluded as well.

### **Statistical Analysis:**

The tabulation of data was analysed using SPSS software (IBM SPSS Statistics 26.0). The method of statistical analysis that was used in this study was the Chi-square test to compare two proportions. The analysis was done for: age, gender, mean probing depth (mm), mean attachment loss (mm) and the treatment done.

## **RESULTS**

In regard to the age group, the most cases was seen in the age group of 36-55 years old (55.5%) followed by 16-35 years old age group (27.4%) and the least was seen in 56-75 years old age group.(Figure 1)

Out of all the 164 patients obtained for this study, 85 (51.8%) patients were males while the other 79 (48.2%) patients were females. (Figure 2)

### **Treatment Done**

Based on the treatment done, a higher prevalence was seen in patients opting for both subgingival scaling and flap surgery (56.1%) compared to patients who opted only for subgingival scaling (43.9%). (Figure 3)

### **Mean Probing Depth and Treatment Done**

In terms of patients only opting for subgingival scaling, the highest prevalence was seen in patients with a mean probing depth of 3mm (34.7%) followed closely with patients with a mean probing depth of 5mm (30.6%) while the lowest prevalence was seen in patients with a mean probing depth of both 6mm (1.2%) and 7mm (1.2%).

In regard to patients opting for both subgingival scaling and flap surgery, it is most commonly seen in patients with a mean probing depth of 5mm (37.0%) and the least common in patients with a mean probing depth of 2mm (0.6%). (Figure 4)

When the chi-square test was done, there is a positive correlation between the mean probing depth (mm) of the patient and the treatment being done. A p-value of 0.000 shows a significant correlation between these two factors.

### **Mean Attachment Loss and Treatment Done**

In regard to patients only opting for subgingival scaling, the highest prevalence was seen in patients with a mean attachment loss of 3mm (37.5%) followed closely with patients with a mean probing depth of 4mm (27.8%) while the lowest prevalence was seen in patients with a mean attachment loss of both 6mm (1.2%)

In terms of patients opting for both subgingival scaling and flap surgery, it is most commonly seen in patients with a mean attachment loss of 6mm (37.0%) and the least common in patients with a mean attachment loss of 1mm (0.6%). (Figure 5)

When the chi-square test was done, there is a positive correlation between the mean attachment loss (mm) of the patient and the treatment being done. A p-value of 0.000 shows a significant correlation between these two factors.

### **Age Group and Mean Probing Depth**

Within an age group of 16-35 years old, the most common mean probing depth was seen in 3mm (42.2%) compared to least common mean probing depth which was 2mm (2.2%).

In the age group of 36-55 years old, the highest prevalence is seen with a mean probing depth of 3mm (34.0%) while the lowest prevalence is seen with a mean probing depth of 4mm and 7mm (3.3%).

Based on the age group of 56-75 years old, the most common probing depth seen is 6mm (35.7%) and the least common probing depth seen is 2mm & 8mm (10.7%). (Figure 6)

When the chi-square test was done, there is a positive correlation between the age group and the mean probing depth (mm) of the patients. A p-value of 0.00 shows a significant correlation between these two factors.

### **Age Group and Mean Attachment Loss**

Within an age group of 16-35 years old, the most common mean attachment loss was seen in 3mm (40.0%) compared to least common mean probing depth which was 1mm (2.2%).

In the age group of 36-55 years old, the highest prevalence is seen with a mean attachment loss of 5mm and 6mm (24.2%) while the lowest prevalence is seen with a mean attachment loss of 8mm (1.1%).

Based on the age group of 56-75 years old, the most common probing depth seen is 7mm (32.1%) and the least common probing depth seen is 4mm (7.1%).(Figure 7)

When the chi-square test was done, there is a positive correlation between the age group and the mean attachment loss (mm) of the patients. A p-value of 0.00 shows a significant correlation between these two factors.

## DISCUSSION

Periodontitis is the second largest oral health problem. This highly prevalent disease can interfere with an individual's quality of life in many ways, including the physical aspect, masticatory function, appearance as well as personal relationships.

In the present discussion, it is observed that the deeper probing depths are treated with both subgingival scaling and flap surgery while shallower probing depths are treated with only subgingival scaling. Similar to that of a study done by Caffesse RG et al, probing depths more than 3 mm required both scaling as well as flap surgery to be completed. In 4 to 6 mm pockets, only 43% of all surfaces were completely cleaned of all deposits on teeth which were scaled only, while 76% of all surfaces were completely cleaned in the teeth with flap surgery. [(18)]

When the mean attachment loss is analysed, it showed a similar finding to that of the mean probing depth. A higher mean of attachment loss will commonly undergo both subgingival and flap surgery. Caffese RG et al also supported this finding with his own; one of the main rationale for periodontal flap surgery is to improve healing by facilitating access for, and subsequently achieving, a more thorough root planing. [(18)] Moreover, according to Roshna T et al; showing that patients with a generalised loss of attachment more than 5mm, subgingival scaling was performed after which the patients was advised to continue the chlorhexidine mouthwashes as well as a quadrant-wise full-mouth flap surgery. [(43)] Mouthwashes are used in this case since it helps maintain an effective oral hygiene alongside the mechanical plaque removal that these patients have been subjected to. [(44)]

In regards to both the mean probing depth and the mean attachment loss and its association with the age group, a higher value of both was seen particularly in the age group 56-75 years old. According to Aljateeli et al, at a mean age of 51.5 years old, their mean probing depth and mean attachment loss is both 7.42mm and 7.25mm respectively. [(45)]

As a whole, in this study, more periodontally compromised patients have undergone both scaling and flap surgery compared to just subgingival scaling. Caffese RG et al also found similar results in which a higher percentage of patients from their sample size have commonly undergone both the procedures during their periodontal therapy. [(18)] Our institution is passionate about high quality evidence based research and has excelled in various fields ( 37,38,46-54). In the future, instead of solely focusing on the clinical and radiographic parameters, microbiological assessments like of saliva can be practiced as they are readily available and contain serum markers that have significant diagnostic importance. [(55)] With radiographic diagnosis there could be a possibility of inaccurate assessment by the operator especially when using conventional radiographs. [(25)]

During the duration of this study, there were some limitations that were encountered; which includes a limited research time frame of 10 months. The study demographic that was focused on was also limited to only the city population. It may also be subjected to various errors or bias.

In future studies, instead of focusing broadly only on chronic periodontitis, adding more groups with varying degrees of periodontal diseases such as gingivitis and aggressive periodontitis can further widen the scope. [(56)],[(57)] At the same time, an increase of the

study duration should be done, and an even bigger demographic population should be included to properly analyse the selected variables.

## CONCLUSION

Within the limits of our study, it was found that the severity of the periodontal disease determines the treatment option of the patients. Patients undergoing both subgingival scaling and flap surgery are more commonly associated with more severe periodontal status while those opting for only subgingival scaling have a less severe periodontal status.

## AUTHOR CONTRIBUTIONS

All authors have equal contribution in bringing out this research work.

## ACKNOWLEDGEMENT

I would like to convey my thanks to Dean and the Institution to grant permission to use the patients records for the study.

## CONFLICT OF INTEREST

Nil

## REFERENCES

1. Avinash K, Malaippan S, Dooraiswamy JN. Methods of Isolation and Characterization of Stem Cells from Different Regions of Oral Cavity Using Markers: A Systematic Review. *Int J Stem Cells*. 2017 May 30;10(1):12–20.
2. Ramesh A, Varghese SS, Jayakumar ND, Malaiappan S. Chronic obstructive pulmonary disease and periodontitis – unwinding their linking mechanisms. *J Oral Biosci*. 2016 Feb;58(1):23–6.
3. Priyanka S, Kaarthikeyan G, Nadathur JD, Mohanraj A, Kavarthapu A. Detection of cytomegalovirus, Epstein-Barr virus, and Torque Teno virus in subgingival and atheromatous plaques of cardiac patients with chronic periodontitis. *J Indian Soc Periodontol*. 2017 Nov;21(6):456–60.
4. Panda S, Jayakumar ND, Sankari M, Varghese SS, Kumar DS. Platelet rich fibrin and xenograft in treatment of intrabony defect. *Contemp Clin Dent*. 2014 Oct;5(4):550–4.
5. Plessas A. Nonsurgical periodontal treatment: review of the evidence. *Oral Health Dent Manag*. 2014 Mar;13(1):71–80.
6. Heitz-Mayfield LJA, Lang NP. Surgical and nonsurgical periodontal therapy. *Learned and unlearned concepts*. *Periodontol 2000*. 2013 Jun;62(1):218–31.
7. Lee GY, Koh SB, Kim NH. Regular dental scaling associated with decreased tooth loss in the middle-aged and elderly in Korea: A 3-year prospective longitudinal study. *Indian J Dent Res*. 2019 Mar;30(2):231–7.
8. Mootha A, Malaiappan S, Jayakumar ND, Varghese SS, Toby Thomas J. The Effect of Periodontitis on Expression of Interleukin-21: A Systematic Review. *Int J Inflam*. 2016 Feb 22;2016:3507503.
9. Khalid W, Vargheese SS, Lakshmanan R, Sankari M, Jayakumar ND. Role of

endothelin-1 in periodontal diseases: A structured review. *Indian J Dent Res.* 2016 May;27(3):323–33.

10. Ravi S, Malaiappan S, Varghese S, Jayakumar ND, Prakasam G. Additive Effect of Plasma Rich in Growth Factors With Guided Tissue Regeneration in Treatment of Intrabony Defects in Patients With Chronic Periodontitis: A Split-Mouth Randomized Controlled Clinical Trial. *J Periodontol.* 2017 Sep;88(9):839–45.

11. Sanz M, Bäumer A, Buduneli N, Dommisch H, Farina R, Kononen E, et al. Effect of professional mechanical plaque removal on secondary prevention of periodontitis and the complications of gingival and periodontal preventive measures: consensus report of group 4 of the 11th European Workshop on Periodontology on effective prevention of periodontal and peri-implant diseases. *J Clin Periodontol.* 2015 Apr;42 Suppl 16:S214–20.

12. Thamaraiselvan M, Elavarasu S, Thangakumaran S, Gadagi JS, Arthie T. Comparative clinical evaluation of coronally advanced flap with or without platelet rich fibrin membrane in the treatment of isolated gingival recession. *J Indian Soc Periodontol.* 2015 Jan;19(1):66–71.

13. Waerhaug J. Healing of the dento-epithelial junction following subgingival plaque control. II: As observed on extracted teeth. *J Periodontol.* 1978 Mar;49(3):119–34.

14. Lovdal A, Arno A, Schei O, Waerhaug J. Combined effect of subgingival scaling and controlled oral hygiene on the incidence of gingivitis. *Acta Odontol Scand.* 1961 Dec;19:537–55.

15. Ramesh A, Vellayappan R, Ravi S, Gurumoorthy K. Esthetic lip repositioning: A cosmetic approach for correction of gummy smile - A case series. *J Indian Soc Periodontol.* 2019 May;23(3):290–4.

16. Rabbani GM, Ash MM Jr, Caffesse RG. The effectiveness of subgingival scaling and root planing in calculus removal. *J Periodontol.* 1981 Mar;52(3):119–23.

17. Matthews DC, McCulloch CA. Evaluating patient perceptions as short-term outcomes of periodontal treatment: a comparison of surgical and non-surgical therapy. *J Periodontol.* 1993 Oct;64(10):990–7.

18. Caffesse RG, Sweeney PL, Smith BA. Scaling and root planing with and without periodontal flap surgery. *J Clin Periodontol.* 1986 Mar;13(3):205–10.

19. Ramesh A, Varghese SS, Doraiswamy JN, Malaiappan S. Herbs as an antioxidant arsenal for periodontal diseases. *J Intercult Ethnopharmacol.* 2016 Jan;5(1):92–6.

20. Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *Eur J Dent.* 2018 Jan;12(1):67–70.

21. 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 Jan;37(1):75–9.

22. Rajeshkumar S, Kumar SV, Ramaiah A, Agarwal H, Lakshmi T, Roopan SM. Biosynthesis of zinc oxide nanoparticles using *Mangifera indica* leaves and evaluation of their antioxidant and cytotoxic properties in lung cancer (A549) cells. *Enzyme Microb Technol.* 2018 Oct;117:91–5.

23. Abhinav RP, Selvarasu K, Maheswari GU, Taltia AA. The Patterns and Etiology of

Maxillofacial Trauma in South India. *Ann Maxillofac Surg.* 2019 Jan;9(1):114–7.

24. Marimuthu M, Andiappan M, Wahab A, Muthusekhar MR, Balakrishnan A, Shanmugam S. Canonical Wnt pathway gene expression and their clinical correlation in oral squamous cell carcinoma. *Indian J Dent Res.* 2018 May;29(3):291–7.
25. Kavarthapu A, Thamaraiselvan M. Assessing the variation in course and position of inferior alveolar nerve among south Indian population: A cone beam computed tomographic study. *Indian J Dent Res.* 2018 Jul;29(4):405–9.
26. Sweta VR, Abhinav RP, Ramesh A. Role of virtual reality in pain perception of patients following the administration of local anesthesia. *Ann Maxillofac Surg.* 2019 Jan;9(1):110–3.
27. Felicita AS. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The sling shot method. *Saudi Dent J.* 2018 Jul;30(3):265–9.
28. Rao TD, Kumar MPS. Analgesic efficacy of paracetamol vs ketorolac after dental extractions. *J Adv Pharm Technol Res.* 2018;11(8):3375.
29. Fluoride, fluoridated toothpaste efficacy and its safety in children - review. *Int J Pharm Res* [Internet]. 2018 Oct 1;10(04). Available from: <http://www.ijpronline.com/ViewArticleDetail.aspx?ID=7041>
30. Ponnulakshmi R, Shyamaladevi B, Vijayalakshmi P, Selvaraj J. In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats. *Toxicol Mech Methods.* 2019 May;29(4):276–90.
31. Paramasivam A, Vijayashree Priyadharsini J, Raghunandhakumar S. N6-adenosine methylation (m6A): a promising new molecular target in hypertension and cardiovascular diseases. *Hypertens Res.* 2020 Feb;43(2):153–4.
32. Mehta M, Deeksha, Tewari D, Gupta G, Awasthi R, Singh H, et al. Oligonucleotide therapy: An emerging focus area for drug delivery in chronic inflammatory respiratory diseases. *Chem Biol Interact.* 2019 Aug 1;308:206–15.
33. Padavala S, Sukumaran G. Molar Incisor Hypomineralization and Its Prevalence. *Contemp Clin Dent.* 2018 Sep;9(Suppl 2):S246–50.
34. Pandian KS, Krishnan S, Kumar SA. Angular photogrammetric analysis of the soft-tissue facial profile of Indian adults. *Indian J Dent Res.* 2018 Mar;29(2):137–43.
35. Nair M, Jeevanandan G, R V, Emg S. 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 Sci.* 2018 Oct 24;21(4):411.
36. Ke Y, Al Aboody MS, Alturaiki W, Alsagaby SA, Alfaiz FA, Veeraraghavan VP, et al. Photosynthesized gold nanoparticles from *Catharanthus roseus* induces caspase-mediated apoptosis in cervical cancer cells (HeLa). *Artif Cells Nanomed Biotechnol.* 2019 Dec;47(1):1938–46.
37. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. *J Oral Pathol Med.* 2019 Apr;48(4):299–306.
38. Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species. *Arch Oral Biol.* 2018 Oct;94:93–8.

39. Krishnan RP, Ramani P, Sherlin HJ, Sukumaran G, Ramasubramanian A, Jayaraj G, et al. Surgical Specimen Handover from Operation Theater to Laboratory: A Survey. *Ann Maxillofac Surg*. 2018 Jul;8(2):234–8.
40. Ezhilarasan D. Oxidative stress is bane in chronic liver diseases: Clinical and experimental perspective. *Arab J Gastroenterol*. 2018 Jun;19(2):56–64.
41. Palati S, Ramani P, Shrelin HJ, Sukumaran G, Ramasubramanian A, Don KR, et al. Knowledge, Attitude and practice survey on the perspective of oral lesions and dental health in geriatric patients residing in old age homes. *Indian J Dent Res*. 2020 Jan;31(1):22–5.
42. Wu F, Zhu J, Li G, Wang J, Veeraraghavan VP, Krishna Mohan S, et al. Biologically synthesized green gold nanoparticles from induce growth-inhibitory effect on melanoma cells (B16). *Artif Cells Nanomed Biotechnol*. 2019 Dec;47(1):3297–305.
43. Roshna T, Nandakumar K. Generalized aggressive periodontitis and its treatment options: case reports and review of the literature. *Case Rep Med*. 2012 Jan 12;2012:535321.
44. Ramamurthy J, Mg V. COMPARISON OF EFFECT OF HIORA MOUTHWASH VERSUS CHLORHEXIDINE MOUTHWASH IN GINGIVITIS PATIENTS: A CLINICAL TRIAL. *Asian J Pharm Clin Res*. 2018 Jul 7;11(7):84.
45. Aljateeli M, Koticha T, Bashutski J, Sugai JV, Braun TM, Giannobile WV, et al. Surgical periodontal therapy with and without initial scaling and root planing in the management of chronic periodontitis: a randomized clinical trial. *J Clin Periodontol*. 2014 Jul;41(7):693–700.
46. Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol*. 2019 Dec;90(12):1441–8.
47. Pc J, Marimuthu T, Devadoss P. Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study. *Clin Implant Dent Relat Res* [Internet]. 2018; Available from: <https://europepmc.org/article/med/29624863>
48. Ramesh A, Varghese S, Jayakumar ND, Malaiappan S. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. *J Periodontol*. 2018 Oct;89(10):1241–8.
49. Ramadurai N, Gurunathan D, Samuel AV, Subramanian E, Rodrigues SJL. Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. *Clin Oral Investig*. 2019 Sep;23(9):3543–50.
50. Ezhilarasan D, Apoorva VS, Ashok Vardhan N. Syzygium cumini extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells. *J Oral Pathol Med*. 2019 Feb;48(2):115–21.
51. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: Randomized controlled trial. *Clin Oral Investig*. 2020;1–6.
52. Samuel SR. Can 5-year-olds sensibly self-report the impact of developmental enamel defects on their quality of life? *Int J Paediatr Dent*. 2021 Mar;31(2):285–6.
53. R H, Hannah R, Ramani P, Ramanathan A, R JM, Gheena S, et al. CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene [Internet]. Vol. 130, *Oral Surgery, Oral Medicine, Oral*

Pathology and Oral Radiology. 2020. p. 306–12. Available from: <http://dx.doi.org/10.1016/j.oooo.2020.06.021>

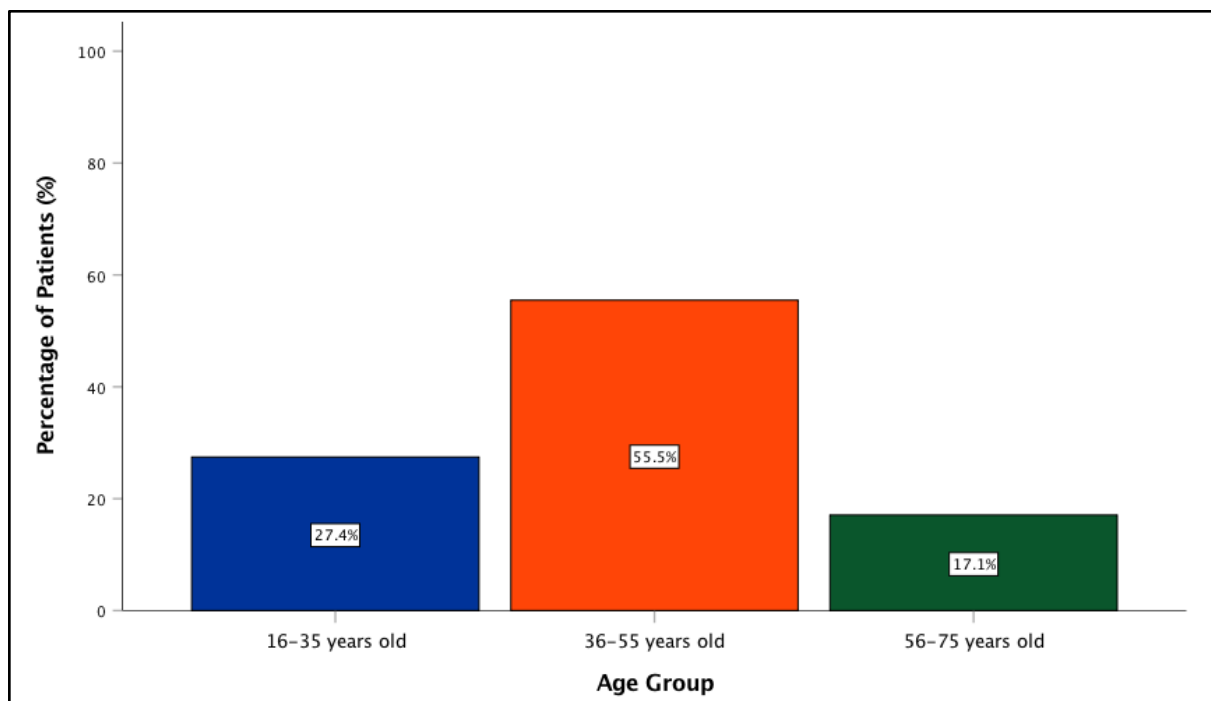
54. Chandrasekar R, Chandrasekhar S, Sundari KKS, Ravi P. Development and validation of a formula for objective assessment of cervical vertebral bone age. *Prog Orthod*. 2020 Oct 12;21(1):38.

55. Varghese SS, Thomas H, Jayakumar ND, Sankari M, Lakshmanan R. Estimation of salivary tumor necrosis factor-alpha in chronic and aggressive periodontitis patients. *Contemp Clin Dent*. 2015 Sep;6(Suppl 1):S152–6.

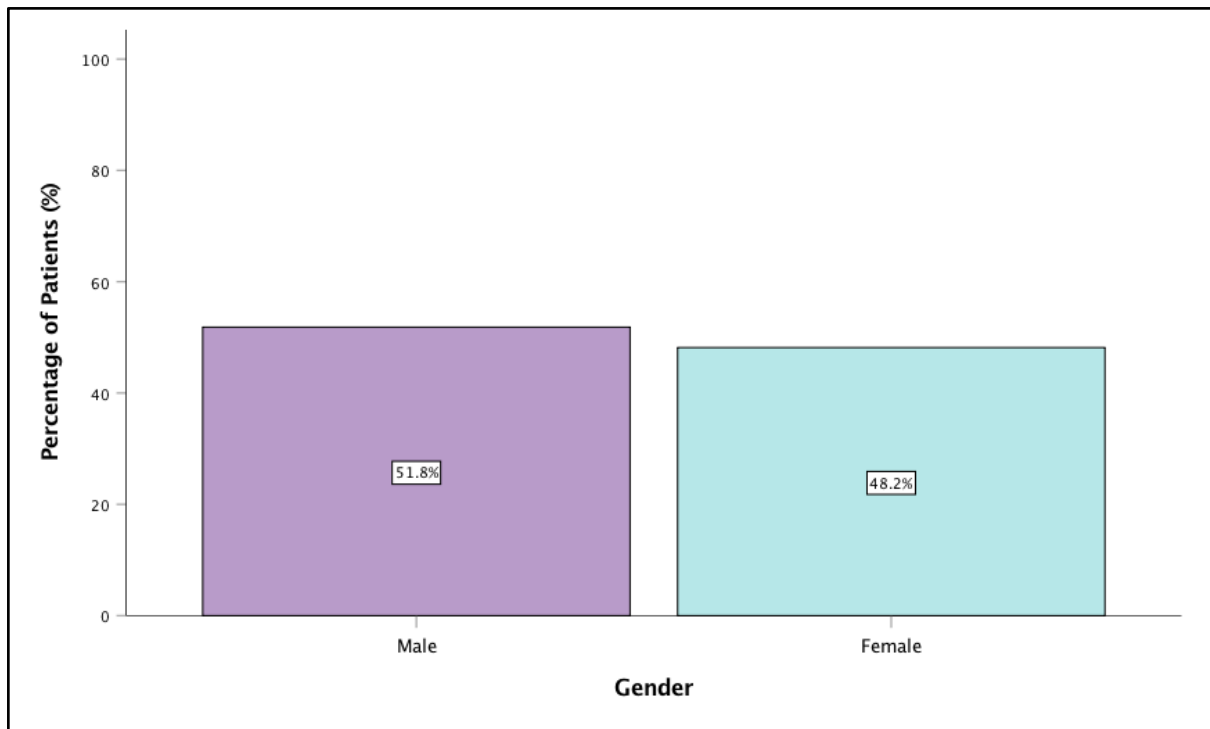
56. Khalid W, Varghese SS, Sankari M, Jayakumar ND. Comparison of Serum Levels of Endothelin-1 in Chronic Periodontitis Patients Before and After Treatment. *J Clin Diagn Res*. 2017 Apr;11(4):ZC78–81.

57. Ramesh A, Ravi S, Kaarthikeyan G. Comprehensive rehabilitation using dental implants in generalized aggressive periodontitis. *J Indian Soc Periodontol*. 2017 Mar;21(2):160–3.

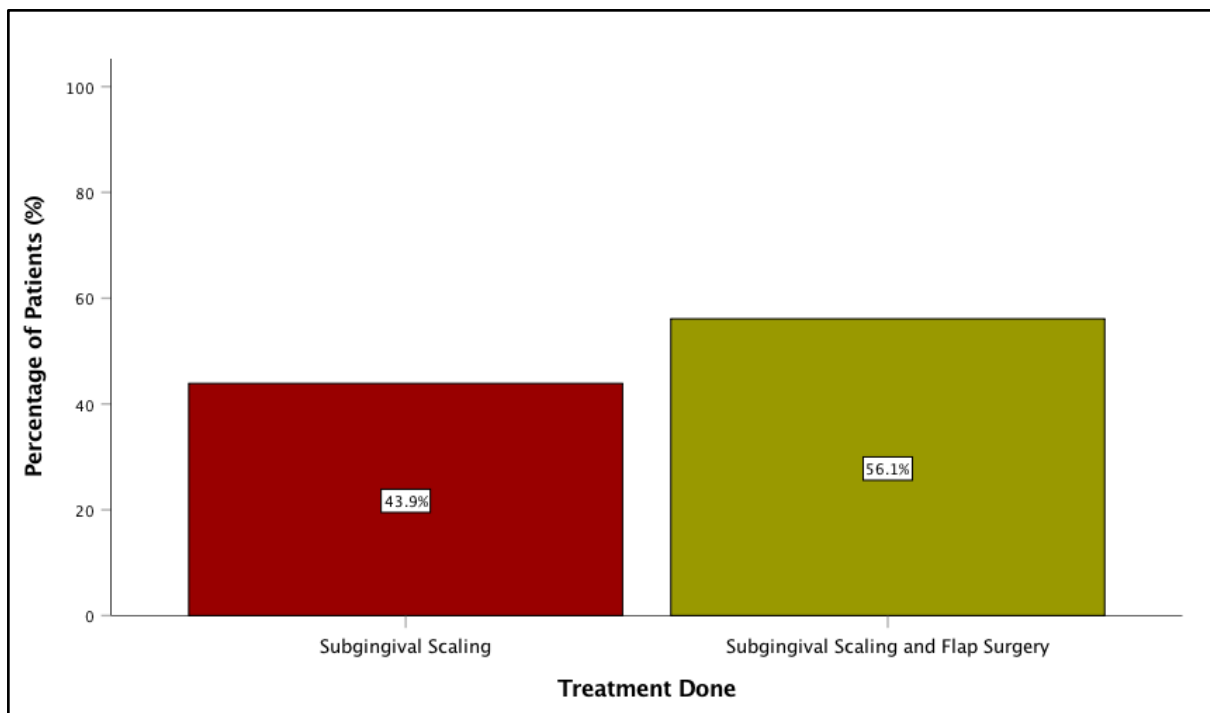
## GRAPHS



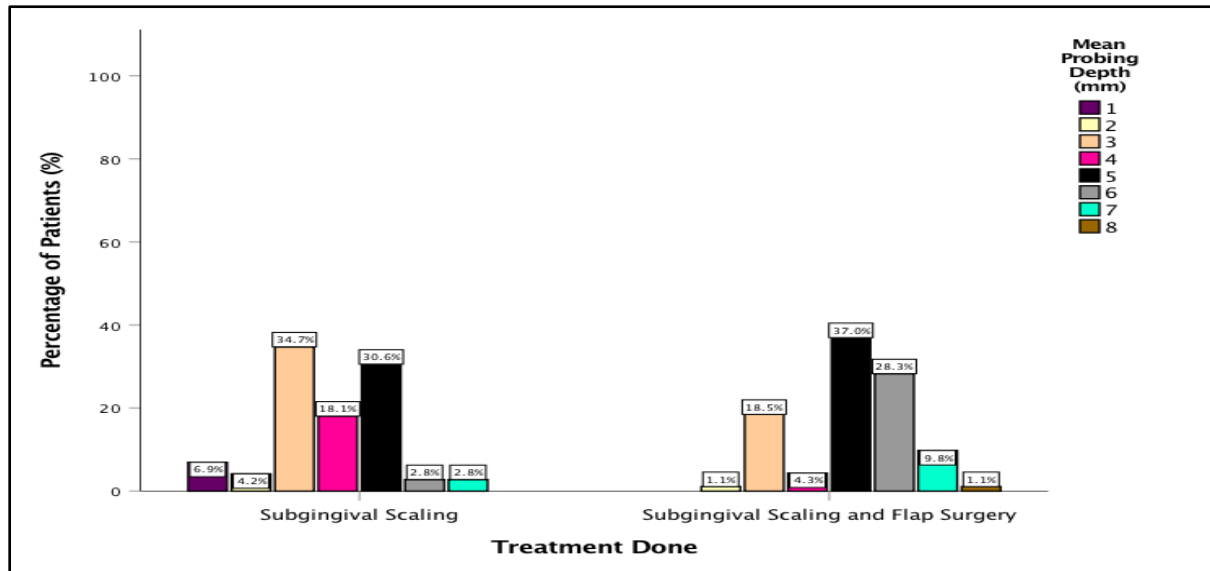
**Figure 1:** Bar chart represents the percentage distribution across age groups. The age group ranging from 36-55 years old (bright orange) showed a higher prevalence compared to the age groups ranging from 16-35 years old (dark blue) and 56-75 years old (dark green).



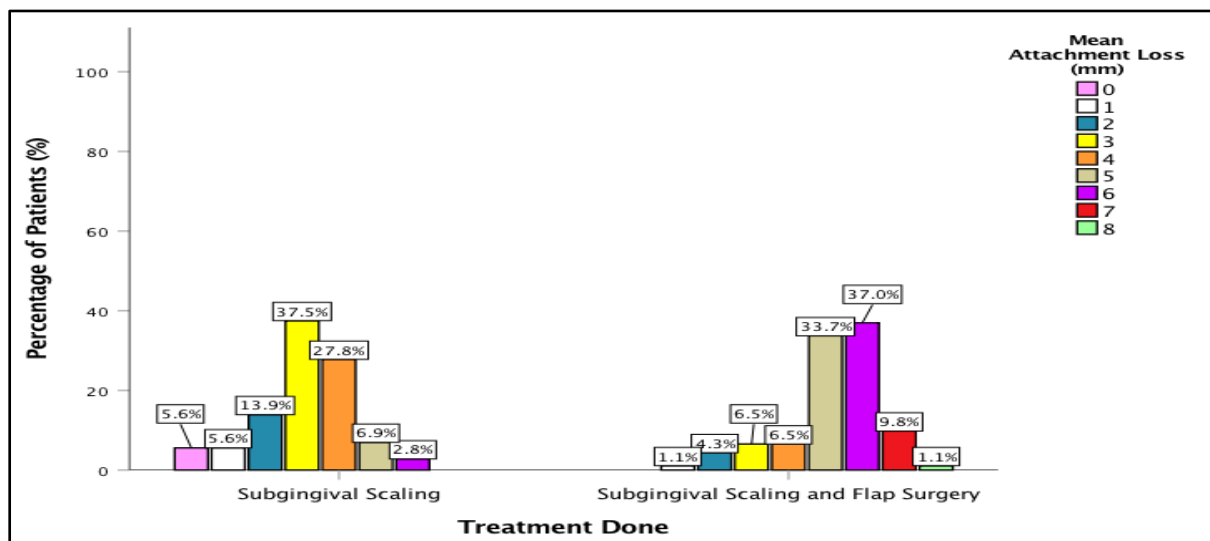
**Figure 2:** Bar chart represents the percentage distribution across the gender in periodontally compromised patients. Males (lavender) showed a higher prevalence compared to females (light blue).



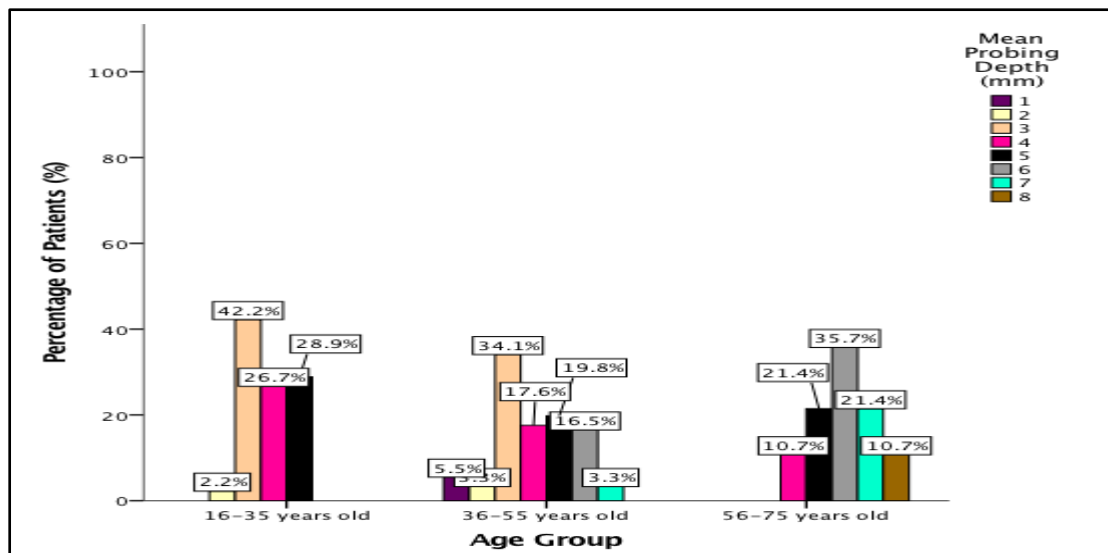
**Figure 3:** Bar chart represents the percentage distribution of the treatment done for patients with periodontally compromised patients. Patients who have undergone both subgingival scaling and flap surgery (olive) showed a higher prevalence compared to patients undergoing only subgingival scaling (maroon).



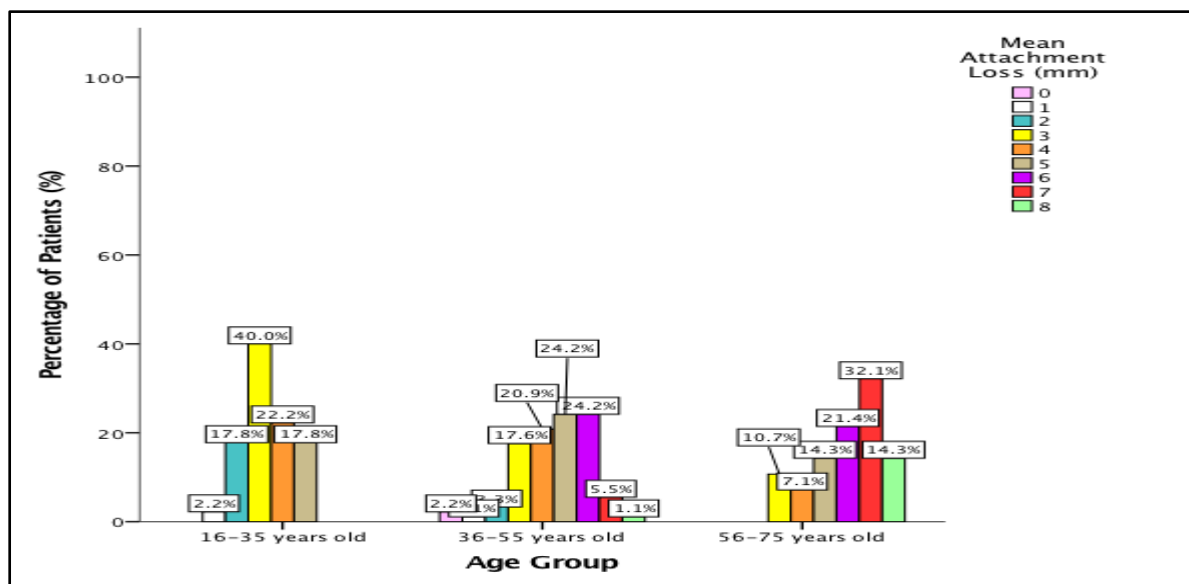
**Figure 4:** Bar chart represents the association between the treatment done and the mean probing depth (mm) of periodontally compromised patients. X-axis represents the treatment done and Y-axis represents the percentage of periodontally compromised patients. The mean probing depth of 5mm (black) is the most common in patients undergoing both subgingival scaling and flap surgery, 3mm (peach) in patients undergoing only subgingival scaling, which was statistically significant.(Chi-square test; p-value=0.00,  $P<0.05$ , significant).



**Figure 5:** Bar chart represents the association between the treatment done and the mean attachment loss (mm) of periodontally compromised patients. X-axis represents the treatment done and Y-axis represents the percentage of periodontally compromised patients. The mean attachment loss of 6mm (violet) was common in patients undergoing both subgingival scaling and flap surgery followed by 3mm (yellow) in patients undergoing only subgingival scaling, which was statistically significant.(Chi-square test; p-value=0.00,  $P<0.05$ , significant).



**Figure 6:** Bar chart represents the association between the age group and the mean probing depth (mm) of periodontally compromised patients. X-axis represents the age group and Y-axis represents the percentage of periodontally compromised patients. The mean probing depth of 6mm (grey) is the most common in patients in the age group 56-75 years old and 3mm (peach) in both age groups of 36-55 years old and 16-35 years old, which was statistically significant. (Chi-square test; p-value=0.00,  $P < 0.05$ , significant).



**Figure 7:** Bar chart represents the association between the age group and the mean attachment loss (mm) of periodontally compromised patients. X-axis represents the age group and Y-axis represents the percentage of periodontally compromised patients. The mean attachment loss of 7mm (purple) is the most common in patients in the age group 56-75 years old followed by loss of 5 mm (beige) and 6mm (violet) in the age group of 36-55 years old and loss of 1mm(white) in the age group of 16-35 years old, which was statistically significant. (Chi-square test; p-value=0.00,  $P < 0.05$ , significant)

## **LEGENDS**

Figure 1: Bar chart represents the percentage distribution across age groups.

Figure 2: Bar chart represents the percentage distribution across the gender in periodontally compromised patients.

Figure 3: Bar chart represents the percentage distribution of the treatment done for patients with periodontally compromised patients.

Figure 4: Bar chart represents the association between the treatment done and the mean probing depth (mm) of periodontally compromised patients.

Figure 5: Bar chart represents the association between the treatment done and the mean attachment loss (mm) of periodontally compromised patients.

Figure 6: Bar chart represents the association between the age group and the mean probing depth (mm) of periodontally compromised patients.

Figure 7: Bar chart represents the association between the age group and the mean attachment loss (mm) of periodontally compromised patients.