IJBPAS, August, Special Issue, 2021, 10(8): 1356-1367

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

ASSESSMENT OF VERTICAL BONE LOSS SITES IN HYPERTENSIVE PATIENTS WITH CHRONIC PERIODONTITIS - A RETROSPECTIVE STUDY

KARTHIK EVG[1], BALAJI GANESH S[2*] AND UMA MAHESHWARI TN[3]

1: Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India

2: Senior Lecturer, Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600077, India

3: Professor, Head of Admin Dept. of Oral Medicine, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600077, India

***Corresponding Author: E Mail: Dr. Balaji Ganesh S: balajiganeshs.sdc@saveetha.com**

Received 20th March 2021; Revised 26th April. 2021; Accepted 24th May 2021; Available online 1st Aug. 2021

https://doi.org/10.31032/IJBPAS/2021/10.8.1094

ABSTRACT

Aim: The aim of the study is to assess the vertical bone loss sites in hypertensive patients with chronic periodontitis.

Background: A global burden of periodontal disease can have a negative impact on the overall quality of life of the affected individuals. Hence, studying the patterns of vertical bone loss in periodontitis patients and effective early treatment for periodontitis in patients with systemic diseases is the need of the hour.

Materials and methods: The present retrospective study was a hospital based study conducted in Saveetha Dental College, Chennai. A total of 200 subjects who were found to have hypertension and chronic periodontitis were taken into the study. Data collection includes various parameters such as age (21 to 90 years), gender (male or female), vertical bone loss sites in hypertensive patients with chronic periodontitis which was divided as the maxillary anterior or posterior region and mandibular anterior or posterior region. Statistical tests were done using SPSS Version 23.0

Results: A total number of 200 patients data were analyzed, out of which 52.50% were male patients and 47.50% were female patients. Majority of the patients were in the age group of 51-60 years (37.50%). The most commonly affected site was the mandibular posterior region (39.50%). The association between age groups and vertical bone loss sites in hypertensive patients was found to be statistically significant (p value=0.00).

Conclusion: Within the limitations of the study it can be concluded that vertical bone loss was found more prevalently in the mandibular posterior tooth region among hypertensive patients with chronic periodontitis. It was common in the age group of 51-60years, with a male predilection.

Keywords: Hypertension; Chronic periodontitis; Retrospective study; Vertical Bone Loss

INTRODUCTION

Periodontitis is defined as a chronic inflammatory disease of supporting tissue of teeth caused by groups of specific microorganisms, leading to progressive destruction of the periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession, bone loss and tooth loss in severe cases **[1]**. There are various studies reporting the nature, pattern, risk factors, aetiological factors and underlying microbiology of periodontal diseases **[1, 2]**. Recent literature suggests that progression of periodontitis is categorised into two, based on linear and episodic burst theories. Periodontitis was ranked as the sixth most prevalent condition affecting about 744 million people globally **[3]**. Several research studies conclude that the most affected age group is older people even though periodontitis can occur in all age groups **[4]**. Ethnicity and race also plays an important role in individual susceptibility to periodontitis, with African Americans more susceptible to periodontitis **[5]**. Many studies have also proven that men are more susceptible to periodontal disease than women and low socioeconomic status has been associated with the greater risk of periodontitis **[6]**. Personal poor oral hygiene status, smoking and alcoholism have known to cause periodontitis **[7]**. The global burden of periodontal diseases can definitely have a negative impact on productivity, health and overall quality of life of the affected individuals **[8]**.

Systemic risk factors associated with periodontitis include hypertension, diabetes mellitus, cardiovascular diseases. Hypertension is a multifactorial disease, with mechanisms such as inflammation, oxidative stress and endothelial dysfunction being implicated in the development of increase in the blood pressure of the individuals. Several studies support a relationship between periodontitis

and hypertension and it is also found that a proper periodontal treatment could improve the patient's arterial blood pressure levels **[9]**. Chronic bacterial infections including chronic periodontitis has been associated with a greater risk of development of atherosclerosis and coronary heart disease. Hence, studying the patterns of periodontitis and effective early treatment for periodontitis in patients with associated systemic diseases is the need of the hour.

Vertical bone loss is associated with the intrabony pocket formation and usually localized to a site and related to factors such as trauma from occlusion, subgingival calculus, overhanging restorations and food impaction **[10]**. The response of alveolar bone to inflammation includes formation of bone as well as resorption. Hence, alveolar bone loss in various periodontal diseases is not simply a destructive process, but it results from the predominance of bone resorption over formation. There are various terminologies used to describe bony defects such as intra bony defect, circumferential defect, interdental crater, horizontal bone defect, vertical bone defect, hemiseptal defect, one walled, two walled, three walled, trench shaped defects and funnel shaped defects. Vertical or angular bony defects are those that occur in an oblique direction **[8, 11]**. Therefore, the main aim of this study is to assess the vertical bone loss sites in hypertensive patients with chronic periodontitis.

MATERIALS AND METHODS

Study Design

The present retrospective study was a hospital based study conducted in Saveetha Dental College, Chennai. A total of 200 subjects who were found to have hypertension and chronic periodontitis were taken into the study.

Ethical approval

Prior to starting study, the ethical approval number (SDC/SIHEC/2020/DIASDATA/0619-0320) was obtained from Scientific Review Board, Saveetha Dental College, SIMATS University.

Data collection

The study population consists of patients reporting to the Department of Periodontics at a Dental College. The study was conducted between July 2019 - March 2020. Inclusion criteria involved both males and females who are hypertensive and also had chronic periodontitis. Patients aged 21 years and above were included. Presence of angular or vertical bone loss. Exclusion criteria were patients not willing to take part in the study procedure and patients who had

previously undergone periodontal treatment. Vertical bone loss among each patient was assessed from the intraoral periapical radiographs data retrieved from the dental records. Data collection includes various parameters such as age (21 to 90 years), gender (male or female), vertical bone loss sites in hypertensive patients with chronic periodontitis which was divided as the maxillary anterior or posterior region and mandibular anterior or posterior region.

Statistical Analysis

Data collection was done using microsoft excel and statistical tests were done using SPSS Version 23.0. Descriptive statistics were used. Age, gender and area/sites of vertical bone loss were compared using the Chi Square test. The association between the age groups and vertical bone loss sites in maxilla and mandible, association between the gender and vertical bone loss sites in maxilla and mandible was evaluated. Statistical significance was set at p value <0.05. The results were demonstrated in the form of bar graphs.

RESULTS AND DISCUSSION

A total of 200 patients who were found to have hypertension and chronic periodontitis were included in this retrospective analysis. In the current study, we used intraoral periapical radiographs to assess the sites of vertical bone loss. The age group of study population was from 21-90 years. The patients were divided into 7 groups according to their age. 21-30 years (1%), 31-40 years (5%), 41-50 years(21%), 51-60 years (37.50%), 61-70 years (26.50%), 71-80 years (8%) and 81-90 years (1%). This is shown in **Figure 1**. A total number of 200 patients data were analyzed, out of which 52.50% were male patients and 47.50% were female patients. This is represented in **Figure 2, Figure 3** shows that 2% of the patients had no vertical bone loss, 21.50% reported of vertical bone loss in the maxillary anterior region, 16% reported of vertical bone loss in the maxillary posterior region, 21% reported of vertical bone loss in the mandibular anterior region and 39.5% reported of vertical bone loss in the mandibular posterior region.

The association between age groups and vertical bone loss sites in hypertensive patients was found to be statistically significant (p value = 0.00). The highest area of bone loss was observed in age groups between 51-60 years, which is 15.5% in the mandibular posteriors, 10% in the maxillary anteriors, and 5.50% in the maxillary posteriors. Age group between 41-50 years showed the highest bone loss of 7% in the mandibular anteriors **(Figure 4)**.

Male group displayed 20% of bone loss in the mandibular posterior region, 13% in the maxillary anteriors region, 11% in the mandibular anterior region and 7.50% in the maxillary posterior region. Female group displayed 19.5% of bone loss in the mandibular posterior region, 10% in the mandibular anterior region, 8.50% in both maxillary anterior and posterior region **(Figure 5)**. Bone loss was more commonly presented in males than females. However, the association between gender and vertical bone loss sites in hypertensive patients was found to be statistically insignificant. (p value = 0.8).

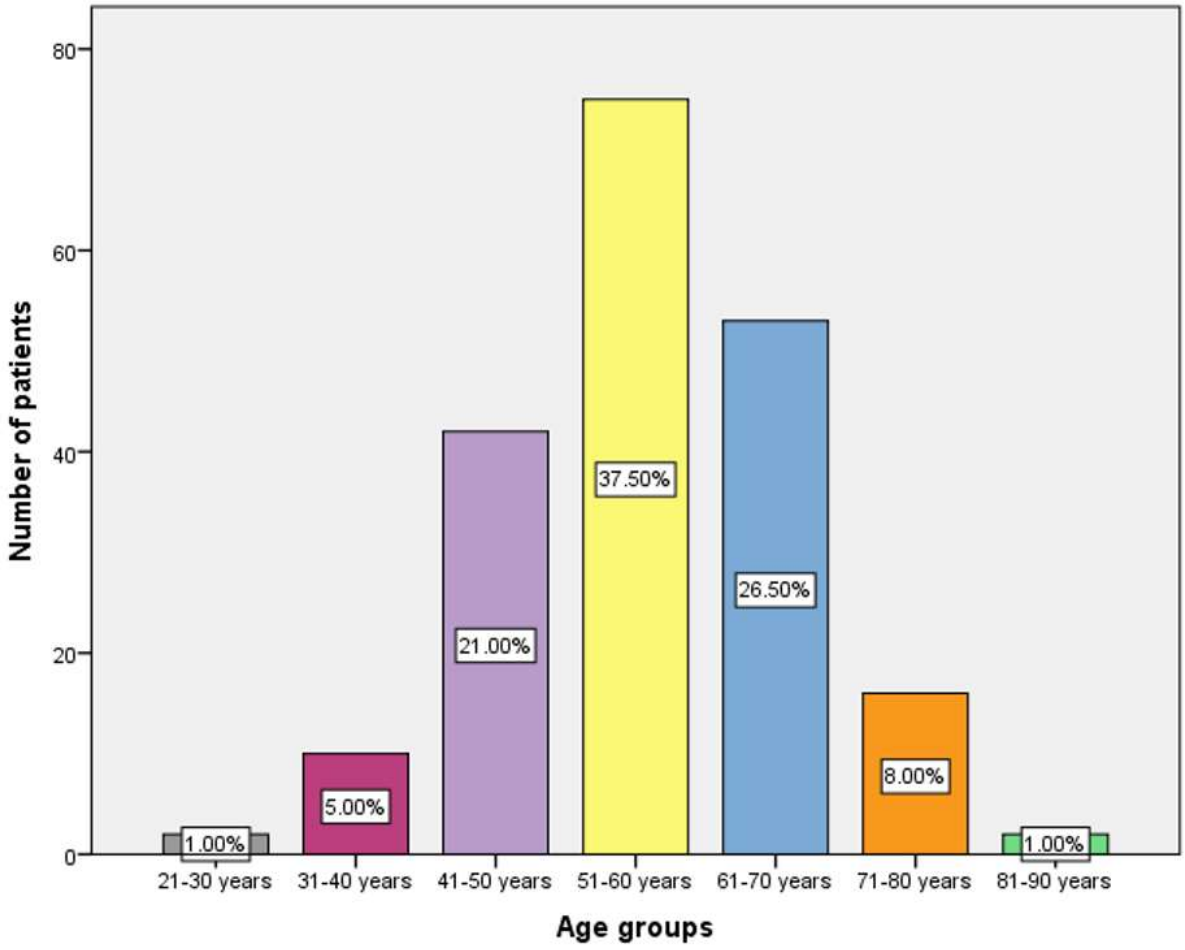

Figure 1: shows the frequencies of age groups affected with hypertension and vertical bone loss. X axis represents the age groups and Y axis represents the number of patients. 21-30 years of age group (Grey), 31-40 years of age (pink), 41-50 years of age (purple), 51-60 years of age(yellow) , 61-70 years of age(blue) ,71-80 years of age (mustard),81-90 years of age(green).Majority of the patients were in the age group of 51-60 years (yellow).

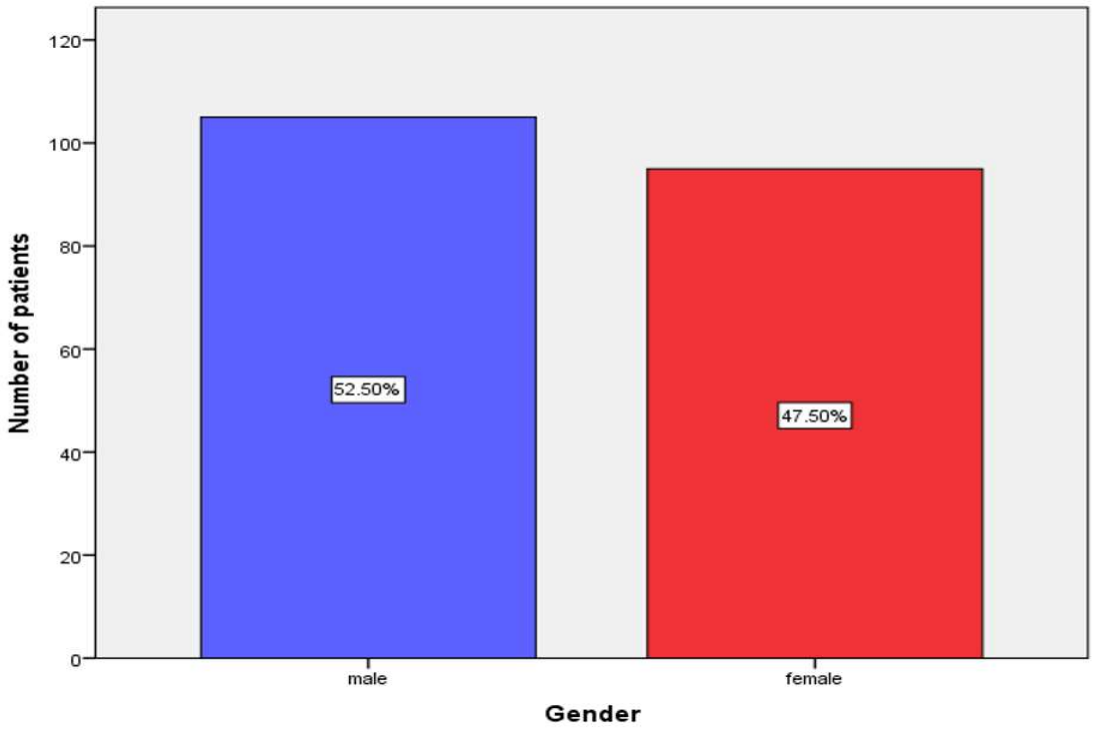

Figure 2: shows the frequencies of gender groups affected with hypertension and bone loss. X axis represents the gender and Y axis represents the number of patients. Males (blue) were predominantly affected with vertical bone loss than females (red)

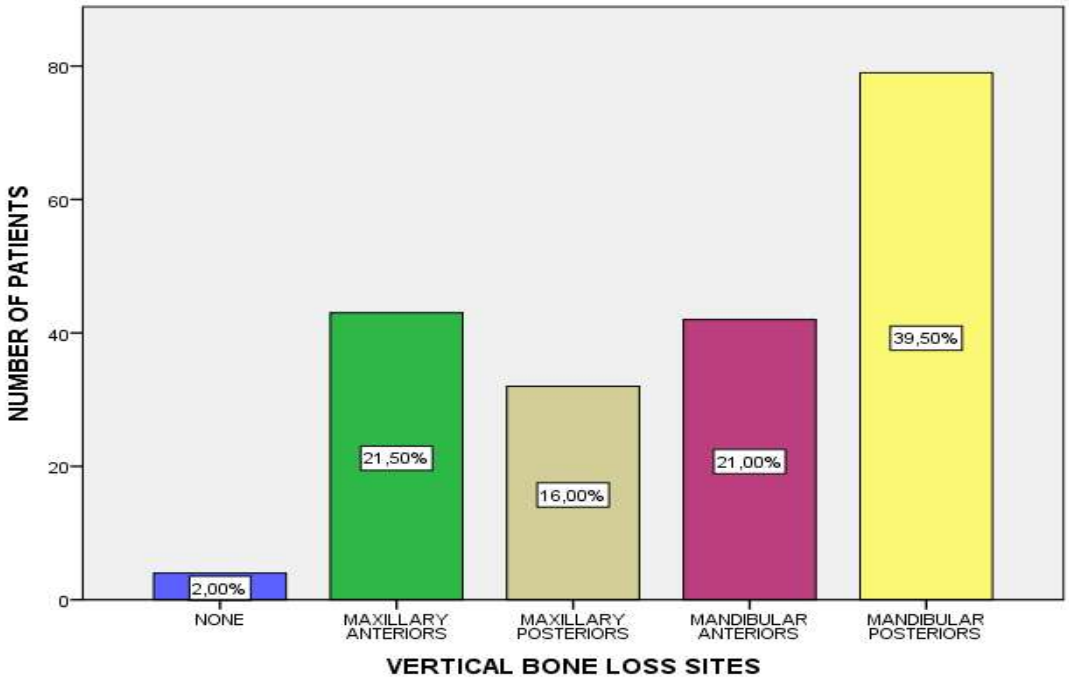

Figure 3: Shows the area of vertical bone loss sites due to chronic periodontitis in hypertensive patients. X axis denotes the vertical bone loss sites and the Y axis denotes the number of patients. No bone loss(blue), bone loss in maxillary anteriors(green), bone loss in maxillary posteriors(cream), bone loss in mandibular anteriors(pink),bone loss in mandibular posteriors(yellow). The most commonly affected site was the mandibular posterior region (yellow)

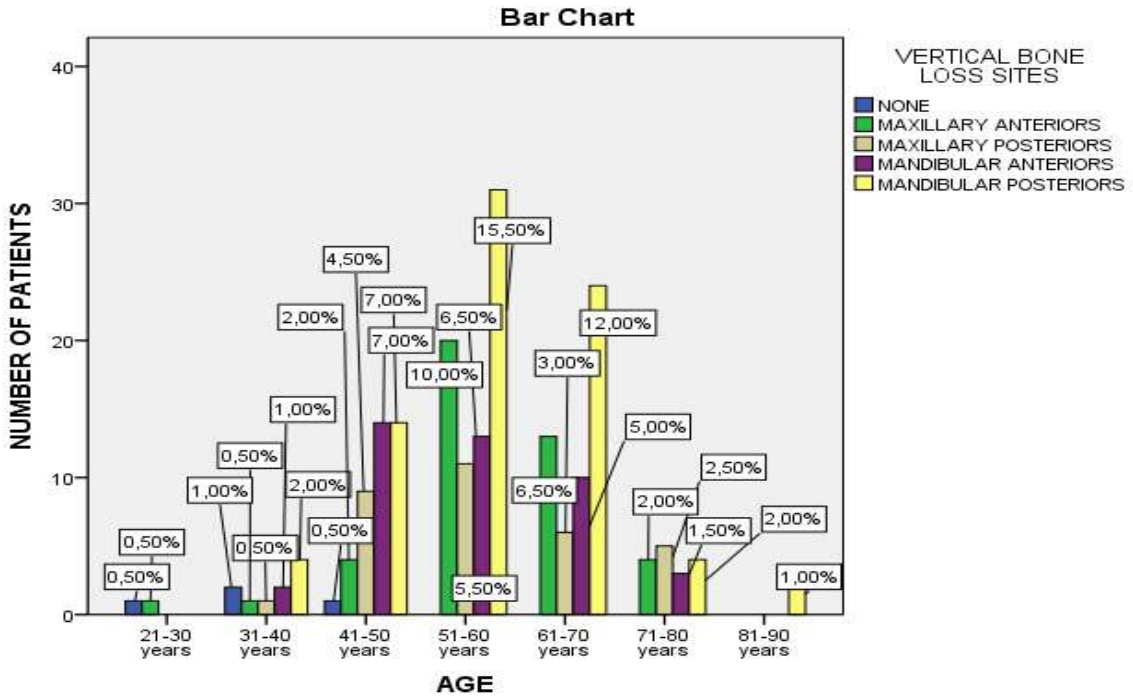

Figure 4: shows the association between age groups and vertical bone loss sites. X axis represents the age groups and the Y axis represents the number of patients. Vertical bone loss was more commonly seen in the mandibular posterior region (15.5%) of the 51-60years age group. Chi-square test done, P-value = 0.00(<0.05), hence statistically significant.

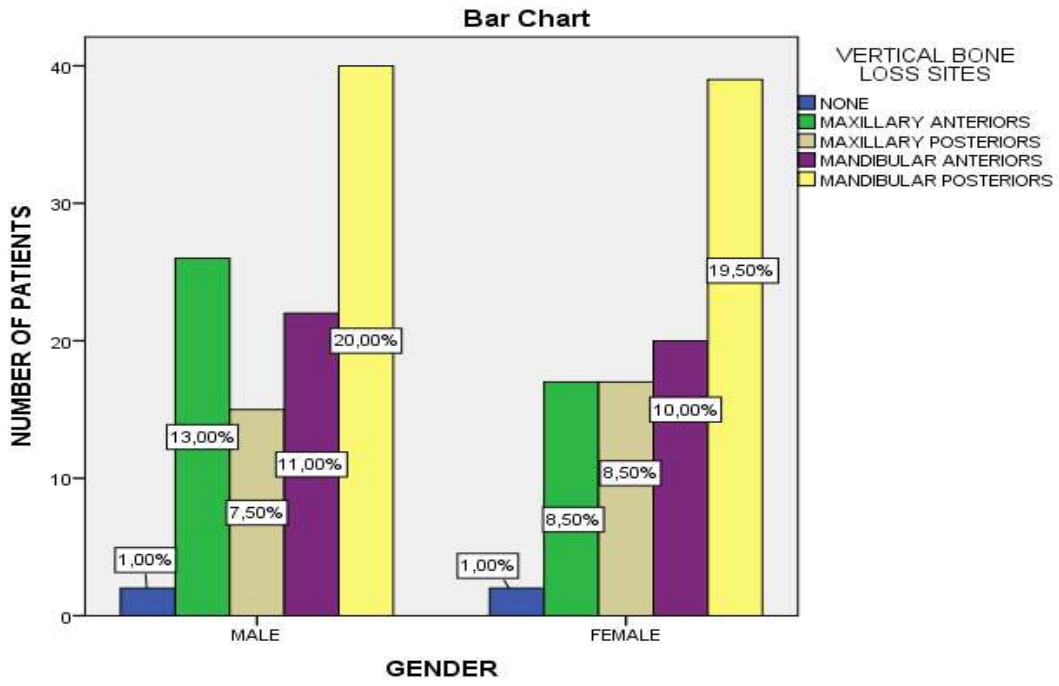

Figure 5: shows the association between gender and vertical bone loss sites. X axis represents the gender and the Y axis represents the number of patients. Chi-square test done, P-value = 0.8(>0.05), hence statistically insignificant, however vertical bone loss was more commonly presented in males than females.

The present study helps in analysing about the different sites of vertical bone loss among hypertensive patients. Previously our team had conducted various studies on treatment modalities for periodontal diseases and novel periodontal procedures **[12-15]**, studies correlating various diseases and factors related to periodontal diseases **[16, 17]** and in-vitro & radiological studies **[18]** and reviews **[19]**; over the past 5 years. Now we are focusing on the various other conditions that will guide us and give a deeper understanding in managing periodontal problems.

On assessing the distribution of vertical bone loss among gender, it can be noted that males had higher sites of vertical bone loss when compared to females and this indicates that males were more commonly affected with severe periodontal disease than females. Grassos *et al* also found that male hypertensive patients had severe chronic periodontitis **[20]**. Contradictory to this, Ahn *et al* found an significant association between hypertension and chronic periodontitis in female patients aged 30–59 years **[21]**. In present study, the majority of the patients who had vertical bone loss were in the age group of 51-60 years. A study performed by dhadse et.al on alveolar bone loss and ageing suggest that the most commonly affected age group with alveolar bone loss in chronic periodontitis patients is 40 to 60 years **[22, 23]**.

The most commonly affected site was the mandibular posterior region, followed by maxillary anteriors, mandibular anteriors and finally the maxillary posteriors. Alveolar bone destruction adjacent to furcations of posterior teeth, especially molars has been considered to affect the prognosis of the involved teeth **[22, 23]**. Hence, vertical bone loss around molars leads to unfavourable prognosis and in severe cases leads to tooth loss. In present study, a statistically significant association between age groups and sites of vertical bone loss was found. Vertical bone loss was most commonly seen in the age group of 51-60years in the mandibular posterior region. Males showed a higher incidence of vertical bone loss than females. However, the association between gender and sites of vertical bone loss was found to be statistically insignificant.

Hypertension and periodontal diseases are more common worldwide. Progression of bone loss in hypertensive patients with chronic periodontitis is mainly due to changes in blood vessels, altered inflammatory responses, impaired neutrophil function, microbiological factors and genetic predisposition **[10, 24, 25]**. Lockhart *et al*

found that periodontal surgical interventions might reduce the load of systemic inflammation and endothelial dysfunction in hypertensive cases **[26]**. Therefore, periodontal treatment is necessary to prevent further progression of the disease **[27, 28]**. There are several studies in which researchers have attempted various clinical trials for treating intrabony defects through regenerative methods using platelet rich fibrin, growth factors and stem cells **[29-31]**. It is also found that periodontal therapy has reduced the plasma levels of inflammatory markers in hypertensive cases.

According to the author's knowledge, there is no significant research performed on the patterns of vertical bone loss in hypertensive patients with chronic periodontitis till date in the South Indian (Chennai) population. The limitations of the study was that the sample size was relatively small and single centered. Therefore in future, studies can be done by comparing the bone loss patterns between hypertensive and systemically healthy patients.

CONCLUSION

Within the limitations of the study it can be concluded that vertical bone loss was found more prevalently in the mandibular posterior tooth region among hypertensive patients with chronic periodontitis. It was common in the age group of 51-60years, with a male predilection. Vertical bone loss might have occured due to bone damage that developed in a long span of time period and without any proper treatment measures. Hence, proper early diagnosis and regenerative periodontal therapy for intrabony defects should be done to avoid tooth loss in affected patients.

REFERENCES

[1] Saini R, Saini S, Saini SR. Periodontitis and psychological stress: A dental view. Ind Psychiatry J. 2010 Jan;19(1):66–7.

[2] Neely AL, Holford TR, Loe H, Anerud A, Boysen H. The natural history of periodontal disease in humans: risk factors for tooth loss in caries-free subjects receiving no oral health care [Internet]. Vol. 32, Journal of Clinical Periodontology. 2005. p. 984–93. Available from: http://dx.doi.org/10.1111/j.1600-051x.2005.00797.x

[3] Arigbede A, Babatope B, Bamidele M. Periodontitis and systemic diseases: A literature review [Internet]. Vol. 16, Journal of Indian Society of Periodontology. 2012. p. 487. Available from: http://dx.doi.org/10.4103/0972-124x.106878

[4] Nomura Y, Morozumi T, Nakagawa T, Sugaya T, Kawanami M, Suzuki F, et al. Site-level progression of periodontal disease during a follow-up period. PLoS One. 2017 Dec 4;12(12):e0188670.

[5] Helmi MF, Huang H, Goodson JM, Hasturk H, Tavares M, Natto ZS. Prevalence of periodontitis and alveolar bone loss in a patient population at Harvard School of Dental Medicine. BMC Oral Health. 2019 Nov 21;19(1):254.

[6] Schulze A, Busse M. Gender Differences in Periodontal Status and Oral Hygiene of Non-Diabetic and Type 2 Diabetic Patients. Open Dent J. 2016 Jun 9;10:287–97.

[7] Saini GK, Gupta ND, Prabhat KC. Drug addiction and periodontal diseases. J Indian Soc Periodontol. 2013 Sep;17(5):587–91.

[8] Tonetti MS, Jepsen S, Jin L, Otomo-Corgel J. Impact of the global burden of periodontal diseases on health, nutrition and wellbeing of mankind: A call for global action [Internet]. Vol. 44, Journal of Clinical Periodontology. 2017. p. 456–62. Available from: http://dx.doi.org/10.1111/jcpe.12732

[9] Liccardo D, Cannavo A, Spagnuolo G, Ferrara N, Cittadini A, Rengo C, *et al.* Periodontal Disease: A Risk Factor for Diabetes and Cardiovascular Disease. Int J Mol Sci [Internet]. 2019 Mar 20;20(6). Available from: http://dx.doi.org/10.3390/ijms20061414

[10] Nainggolan LI, Gunasagaran L. Prevalence of alveolar bone deffect pattern in periodontitis patients with diabetes mellitus using bitewing radiography [Internet]. Vol. 3, Journal of Dentomaxillofacial Science. 2018. p. 88. Available from: http://dx.doi.org/10.15562/jdmfs.v3i2.739

[11] Cochran DL. Inflammation and Bone Loss in Periodontal Disease [Internet]. Vol. 79, Journal of Periodontology. 2008. p. 1569–76. Available from: http://dx.doi.org/10.1902/jop.2008.080233

[12] Ramesh A, Vellayappan R, Ravi S, Gurumoorthy K. Esthetic lip repositioning: A cosmetic approach for correction of gummy smile – A case series [Internet]. Vol. 23, Journal of Indian Society of Periodontology. 2019. p. 290. Available from: http://dx.doi.org/10.4103/jisp.jisp_548_18

[13] 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.

[14] Thamaraiselvan M, Elavarasu S, Thangakumaran S, Gadagi J, Arthie T. Comparative clinical evaluation of coronally advanced flap with or without platelet rich fibrin membrane in the treatment of isolated gingival recession [Internet]. Vol. 19, Journal of Indian Society of Periodontology. 2015. p. 66. Available from: http://dx.doi.org/10.4103/0972-124x.145790

[15] Varghese S, Thomas H, Jayakumar ND, Sankari M, Lakshmanan R. Estimation of salivary tumor necrosis factor-alpha in chronic and aggressive periodontitis

patients [Internet]. Vol. 6, Contemporary Clinical Dentistry. 2015. p. 152. Available from: http://dx.doi.org/10.4103/0976-237x.166816

[16] 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.

[17] 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.

[18] 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.

[19] 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.

[20] Grassos C, Gourlis D, Papaspyropoulos A, Spyropoulos A, Kranidis A, Almagout P, et al. Association Of Severity Of Hypertension And Periodontitis: PP.20.296 [Internet]. Vol. 28, Journal of Hypertension. 2010. p. e335–6. Available from: http://dx.doi.org/10.1097/01.hjh.0000379222.70938.e9

[21] Ahn Y-B, Shin M-S, Byun J-S, Kim H-D. The association of hypertension with periodontitis is highlighted in female adults: results from the Fourth Korea National Health and Nutrition Examination Survey [Internet]. Vol. 42, Journal of Clinical Periodontology. 2015. p. 998–1005. Available from: http://dx.doi.org/10.1111/jcpe.12471

[22] Dhadse P, Gattani D, Mishra R. The link between periodontal disease and cardiovascular disease: How far we have come in last two decades ? J Indian Soc Periodontol. 2010 Jul;14(3):148–54.

[23] Papapanou PN, Lindhe J, Sterrett JD, Eneroth L. Considerations on the contribution of ageing to loss of periodontal tissue support. J Clin Periodontol. 1991 Sep;18(8):611–5.

[24] Khalid W. Comparison of Serum Levels of Endothelin-1 in Chronic Periodontitis Patients Before and After Treatment [Internet]. Journal Of Clinical And Diagnostic Research. 2017. Available from: http://dx.doi.org/10.7860/jcdr/2017/24518.9698

[25] 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.

[26] Lockhart PB, Bolger AF, Papapanou PN, Osinbowale O, Trevisan M, Levison ME, *et al*. Periodontal Disease and Atherosclerotic

Vascular Disease: Does the Evidence Support an Independent Association? [Internet]. Vol. 125, Circulation. 2012. p. 2520–44. Available from: http://dx.doi.org/10.1161/cir.0b013e318257 19f3

[27] Ramesh A, Varghese SS, Jayakumar ND, Malaiappan S. Chronic obstructive pulmonary disease and periodontitis – unwinding their linking mechanisms [Internet]. Vol. 58, Journal of Oral Biosciences. 2016. p. 23–6. Available from: http://dx.doi.org/10.1016/j.job.2015.09.001

[28] Ramamurthy J, Mg V. Comparison Of Effect Of Hiora Mouthwash Versus Chlorhexidine Mouthwash In Gingivitis Patients: A Clinical Trial [Internet]. Vol. 11, Asian Journal of Pharmaceutical and Clinical Research. 2018. p. 84. Available from: http://dx.doi.org/10.22159/ajpcr.2018.v11i7 .24783

[29] 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.

[30] 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.

[31] 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 [Internet]. Vol. 88, Journal of Periodontology. 2017. p. 839–45. Available from: http://dx.doi.org/10.1902/jop.2017.160824