ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.ijrps.com

Prevalence of Gingival Black Triangles in Young Adults in Chennai Population - A Retrospective Study

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Article History:

Received on: 30 Sep 2020
Revised on: 14 Nov 2020
Accepted on: 20 Dec 2020

Keywords:

Gingival black triangle, Chennai population, black triangle, gingival recession, papilla reconstruction

ABSTRACT

Aim of the study is to determine the prevalence of gingival black triangles (GBT's) and its correlations with the morphology of tooth, labial frenum and probing depth in young adults in the Chennai population. The study was carried out in a university based study setting in Saveetha dental college and hospital among the Chennai population. We have reviewed patient records and analysed the data from 86000 patient records between June 2019 and March 2020. 149 samples were randomly selected for the study (18 – 30 yrs) and photographic analysis from the patient record was carried out to determine the presence of GBT. Prevalence of GBT was found to be 20.8% in the selected population. Within the limits of the study prevalence of GBT was found to be 20.8% there should be more emphasis given on creating awareness about the condition and its possible treatment modalities.

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ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11iSPL4.4015

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INTRODUCTION

Gingival black triangle (GBT) results from loss of interdental papilla and it is a very important component in an aesthetic and ideal smile (Takei *et al.*, 1989; Burke *et al.*, 1994; Cho *et al.*, 2006). GBT does not only play a role in aesthetic concerns but also may cause plaque accumulation and phonetic problems (Takei, 1980).

It was found in a study done by Kokich *et al.* (1999) that people with GBT more than 3mm were found to be less attractive (Tarnow, 2003; Cho *et al.*, 2006). According to a survey done, it was found that GBT is the most disliked aesthetic concern after caries and exposed crown margins. There are many studies showing the occurrence of GBT post orthodontic treatment in the upper anterior teeth, mainly central incisions (Houston, 1984; Newman *et al.*, 2011).

Also previously published studies state that prevalence of black triangle amongst adults over 20 years of age was found to be 67% and that of the individuals below 20% of age was 18% (Ko-Kimura *et al.*, 2003; Ahmad, 2005; Zetu and Wang, 2005).

Major difficulties in the management of GBT's are because of the limited blood supply to the papilla. (Cunliffe and Pretty, 2009; Ramesh *et al.*, 2017; Ravi, 2017) This is the reason for inconsistencies in the management of GBT's in clinicians.

The outcome of the GBT management is highly unpredictable due to the limited blood supply; also, the procedure requires a high skill set; there is also a high chance of recession post-treatment. (Varghese, 2015; Mahendran *et al.*, 2017).

The aim of the study was to calculate the prevalence of Gingival Black Triangles (GBT's) in Young Adults in the Chennai Population and correlating with the other causative factors.

MATERIALS AND METHODS

This is a single university based assessment study which was carried out in saveetha dental college and hospital Chennai. Patient records were reviewed for the period between June 2019 to March 2020, and 149 case records were randomly selected. A retrospective analysis was done for the randomly collected data records. Inclusion exclusion criteria were strictly followed during data selection. Inclusion and exclusion criteria were as follows.

Inclusion criteria

1. Complete dias record/case history
2. Patient with informed consent
3. Patients with HD photographic records
4. Systematically healthy patients
5. Patients with no history of any procedure which might cause gingival recession, e.g. periodontal flap surgery
6. Patients without any history of GBT correction procedures.
7. Patients with periodontal chart and records

Exclusion criteria

1. Incomplete photographic record.
2. Patients on medications mentioned above.
3. Patients with the systemic condition.

Parameters Assessed

Primary parameter

Gingival Black triangle (Presence or absence)

Secondary parameters

1. Morphology of the tooth
2. Labial frenal attachment
3. Probing depth

Aetiology of GBT's

Detailed and well-documented studies are available to prove that aetiology of GBT is multifactorial rather than being caused by a single abnormality. Some of the factors are as follows, (Velden, 1984; Nemcovsky, 2001; Chang, 2007)

1. Morphology of teeth. (Sharma and Park, 2010; Alani *et al.*, 2011; Lee, 2016)
2. Patients age
3. Gingival biotype
4. Improper tissue handling
5. Bone loss
6. Divergent roots which follow orthodontic treatment.
7. Inter proximal space etc. Arellano and Buendía (2018)

Amount of interproximal space is directly related to viability and blood supply of the papilla. On the one hand, wider space may facilitate increased blood supply, but it can also cause GBT due to stretching out the papilla. Martegani *et al.* (2007) studied the measurement of interproximal width with periapical radiographs; (Ramesh, 2019) The statistical analysis concluded that when inter radicular distance is more than 2.4 mm the presence of a complete viable papilla without a GBT becomes less likely. (Priyanka *et al.*, 2017; Kavarthapu and Thamaraiselvan, 2018; Ramamurthy and MG, 2018)

Classification

GBT's Classifications were given by 1) Nordland and Tanrow et al. 2) Nemcousky (a) Photographic data of all the patients who were included in the study was acquired and only the intraoral frontal photos (high definition clicked with DSLR) were assessed for the presence of gingival black triangle this study was done after getting approval from ethical comily of SDC.

STATISTICAL ANALYSIS

IBM SPSS version 20 was used to statistically analyse the collected data for the prevalence of Gingival black triangles (GBT's). Chi-square test and Pearson correlations for tooth morphology, labial frenal attachment and probing depth in the occurrence of GBT's were also analysed in the study population.

RESULTS AND DISCUSSION

After assessment of 149 selected samples, it was found that prevalence of gingival black triangles (GBT's) in the young population (18-30 yrs) in the selected study population is 20.8% 31 out of 149 selected subjects had gingival black triangle (Figure 1). No statistical significance was found between the subsets of the tooth morphology, labial frenal attachment and probing depth in the occurrence of GBT's in the study population.

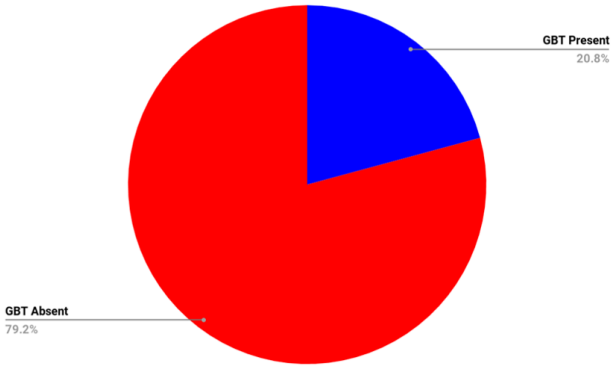

Figure 1: Pie chart depicting the prevalence of Gingival Black Triangles (GBT's) in Young Adults accounting for 20.8% in the Chennai Population

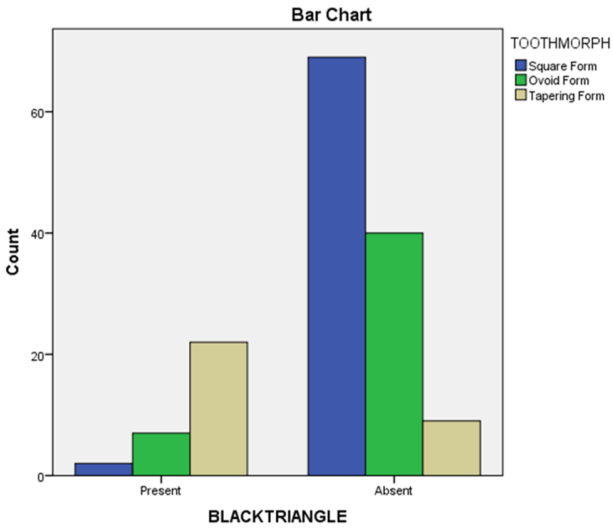

Figure 2: Bar graph depicting the influence of tooth morphology on the prevalence of Gingival Black Triangle in the study population.

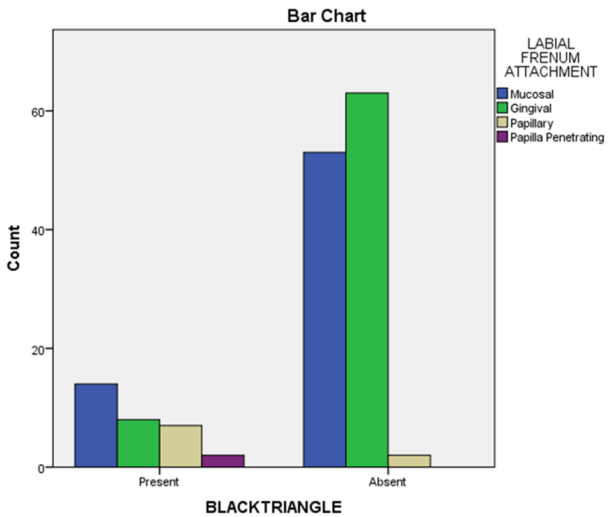

Figure 3: Bar graph depicting the influence of labial frenal attachment on the prevalence of Gingival Black Triangle in the study population.

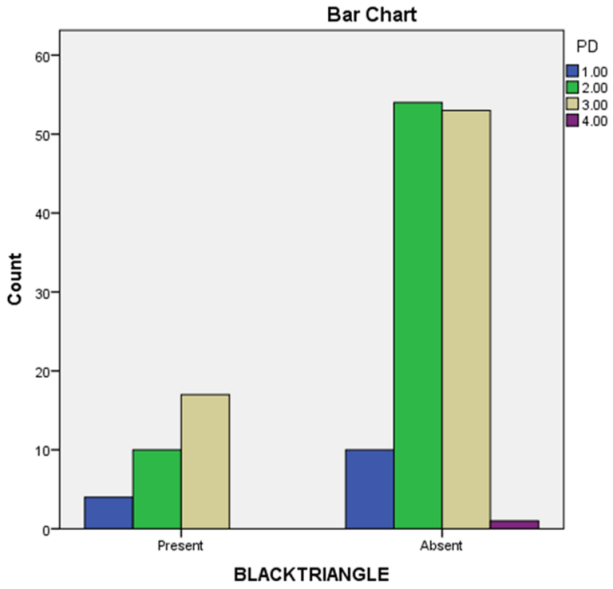

Figure 4: Bar graph depicting the influence of Probing Depth (PD) on the prevalence of Gingival Black Triangle in the study population.

From Figure 2, The X-axis represents groups where the gingival black triangle is Present and Absent. Y-axis represents the number of individuals falling into each group based on tooth morphology. The subsets of Tooth Morphology categories whose proportions do not differ significantly from each other at the .05 level (Pearson Chi-Square Value - 62.283).

From Figure 3, The X-axis represents groups where the gingival black triangle is Present and Absent. Y-axis represents the number of individuals falling into each group based on the level of frenal attachment. The subsets of Frenal Attachment Level categories whose proportions do not differ significantly from each other at the .05 level (Pearson Chi-Square Value - 29.263).

From Figure 4, The X-axis represents groups where the gingival black triangle is Present and Absent. Y-axis represents the number of individuals falling into each group based on probing depth at the mesial line angle of central incisors (tooth numbers -11, 21). The subsets of Probing Depth categories whose proportions do not differ significantly from each other at the .05 level (Pearson Chi-Square Value - 2.332).

Gingiva follows the underlying bone level to maintain the biological width of the structure. Reduction in the bone level is followed by the gingival recession, which in turn results in an open embrasure space. In periodontal conditions where the bone level is lost in at the line angles of anterior teeth the interdental papilla tends to recede to the new bone level this can be related to increased probing depth

causing open embrasure space. No significance was found in the present study between probing depth and presence of gingival black triangle as most of the screened patients were found to be periodontally healthy as there was no increased probing depth.

Loss of interdental papilla causes the condition known as Gingival black triangle. It is one of the most important features which patients and clinicians should pay attention specially because it plays an important role in aesthetics and ideal smile. The labial frenum is the ligament found it attached to the gingiva between two upper central incisors, and its attachment level can be variable. Even though not a prompt causative factor but labial frenum when attached at a lower lever (papillary and papilla penetrating) definitely worsens the condition due to continuous pressure on the papilla. (McCoy, 1935) Level of frenal attachment is not considered as an absolute cause for the condition, results of the correlation between gingival frenal attachment and present of the gingival black triangle were found non-significant (Figure 3). Tooth morphology plays an important role in the presence of probing depth. Central incisors falling into the category of tapering morphological form have a higher prevalence of gingival black triangle as the contact point is more coronal and embrasure space is wider. (Dibiase *et al.*, 2006)

The gingival black triangle is a multifactorial condition. The use of molecular biomarkers to diagnose periodontal disease is evident in periodontal research; however, there is a lack of evidence pertaining to the role of the prevalence of gingival black triangles and periodontal disease. Tooth morphology was also one of the causative agents of the gingival black triangles. Square, tapering or Ovoid shaped teeth result in a shift of the contact area towards the incisal or occlusal surface which results in broadening of the contact area and can be a cause for the black triangle occurrence. These cases are treated orthodontically along with IPR- interproximal stripping (W Khalid et al., 2016; Khalid *et al.*, 2017; Mootha *et al.*, 2016). There was no statistically significant difference found in the results of the distribution of different tooth morphology in the cause of black triangles (Figure 2). (Panda *et al.*, 2014; Thamaraiselvan *et al.*, 2015; Avinash *et al.*, 2017).

When assessing a case of GBT's for papillary reconstruction procedure, it is very important to not only to assess the etiology of the GBT but also to observe crest of the bone and apical point of the immediate contact area, along with soft tissue height in the contact area. (Hawkins *et al.*, 2013).

A study done by tanrow has become the gold standard to calculate the distance between the crestal bone contact point. His study based on 288 patients showed that when the contact area was within 5mm from the crest of the alveolar bone, the papilla was present in 100% of the patients. However, when the distance was 7mm, the papilla was only present in 27% of the patients. Wa YJ et al. also found similar results in his study. (Murthykumar *et al.*, 2015; Jesylne *et al.*, 2016; Singh *et al.*, 2013)

According to a study done by Kurth and Kokich et al., the prevalence of gingival black triangles was found to be one-third of the selected population. Findings of the current study show similar results. (Kurth and Kokich, 2001; Ramesh *et al.*, 2016)

Very few studies have been done to calculate the prevalence of gingival black triangles in any selected population, hence this study enables us to calculate the prevalence of GBT'S in the selected population and will allow us to spread awareness of possible treatment modalities in the areas of high density. (A Ramesh et al., 2016)

LIMITATIONS

Limitations of the study are as follows:

1. As it is a single university based sampling study setting infers that patients from only specific regions in Chennai.
2. It was a convenience sampling also selection and assessment bias had to be taken into consideration as it.
3. All the samples were assessed by a single operator.

FUTURE SCOPE OF THE STUDY

As proven in many of the studies, GBT is one of the most important criteria in gingival aesthetics, and most of the patients are unaware of its causes, presence or possible treatment modalities to treat them. With the help of such studies, we can find out areas of a high prevalence of the GBTS's and spread awareness in such areas.

CONCLUSION

Within the limits of this study, it was found that prevalence of gingival black triangles in a young adult population in Chennai population is 20.8 % further studies with higher sample size and wider screening zones have to be done.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

Funding Support

The authors declare that they have no funding support for this study.

REFERENCES

A Ramesh et al. 2016. Herbs as an antioxidant arsenal for periodontal diseases. *Journal of intercultural ethnopharmacology*, 5(1):92–96.

Ahmad, I. 2005. Anterior dental aesthetics: Gingival perspective. *British Dental Journal*, 199(4):195–202.

Alani, A., Maglad, A., Nohl, F. 2011. The prosthetic management of gingival aesthetics. *British Dental Journal*, 210(2):63–69.

Arellano, M. F. V., Buendía, M. L. 2018. Surgical treatment options for Excessive Gingival Display, based on current classification system. *Journal of Clinical Periodontology*, 45(S19):413.

Avinash, K., Malaippan, S., Dooraiswamy, J. N. 2017. Methods of Isolation and Characterization of Stem Cells from Different Regions of Oral Cavity Using Markers: A Systematic Review. *International Journal of Stem Cells*, 10(1):12–20.

Burke, S., Burch, J. G., Tetz, J. A. 1994. Incidence and size of pretreatment overlap and posttreatment gingival embrasure space between maxillary central incisors. *American Journal of Orthodontics and Dentofacial Orthopedics*, 105(5):506–511.

Chang, L. C. 2007. The association between embrasure morphology and central papilla recession. *Journal of clinical periodontology*, 34(5):432–436.

Cho, H. S., *et al.* 2006. The effects of interproximal distance between roots on the existence of interdental papillae according to the distance from the contact point to the alveolar crest. *Journal of periodontology*, 77(10):1651–1657.

Cunliffe, J., Pretty, I. 2009. Patients' ranking of interdental "black triangles" against other common aesthetic problems. *The European journal of prosthodontics and restorative dentistry*, 17(4):177–181.

Dibiase, A. T., *et al.* 2006. A new technique for symmetry determination in tooth morphology using image analysis: application in the diagnosis of solitary maxillary median central incisor. *Archives of oral biology*, 51(10):870–875.

Hawkins, N. M., Virani, S., Ceconi, C. 2013. Heart failure and chronic obstructive pulmonary disease: the challenges facing physicians and health services. *European Heart Journal*, 34(36):2795–2803.

Houston, W. J. B. 1984. Textbook of clinical periodontology. Author: Jan Lindhe. Publisher: Munksgaard International Publishers Ltd., Price: D.kr. 460.00. *The European Journal of Orthodontics*, 6(3):234–234.

Jesylne, P., Soundarajan, S., Murthykumar, K., Meenakshi, M. 2016. The Role of Cardamom Oil in Oral Health: A Short Review. *Research Journal of Pharmacy and Technology*, 9(3):272–274.

Kavarthapu, A., Thamaraiselvan, M. 2018. Assessing the variation in course and position of inferior alveolar nerve among south Indian population: A cone beam computed tomographic study. *Indian Journal of Dental Research*, 29(4):405–409.

Khalid, W., *et al.* 2017. Comparison of Serum Levels of Endothelin-1 in Chronic Periodontitis Patients Before and After Treatment. *Journal of clinical and diagnostic research: JCDR*, 11(4):78–81.

Ko-Kimura, N., *et al.* 2003. Some factors associated with open gingival embrasures following orthodontic treatment. *Australian orthodontic journal*, 19(1):19–24.

Kokich, V. O., *et al.* 1999. Comparing the Perception of Dentists and Lay People to Altered Dental Esthetics. *Journal of Esthetic and Restorative Dentistry*, 11(6):311–324.

Kurth, J. R., Kokich, V. G. 2001. Open gingival embrasures after orthodontic treatment in adults: Prevalence and etiology. *American Journal of Orthodontics and Dentofacial Orthopedics*, 120(2):116–123.

Lee, W. P. 2016. Six Month Clinical Evaluation of Interdental Papilla Reconstruction with Injectable Hyaluronic Acid Gel Using an Image Analysis System. *Journal of esthetic*, 28(4):221–230.

Mahendran, S., *et al.* 2017. Status of malocclusion among adults in rural areas. *International Journal of Current Advanced Research*, 6(3):2958–2960.

Martegani, P., Silvestri, M., Mascarello, F., Scipioni, T., Ghezzi, C., Rota, C., Cattaneo, V. 2007. Morphometric Study of the Interproximal Unit in the Esthetic Region to Correlate Anatomic Variables Affecting the Aspect of Soft Tissue Embrasure Space. *Journal of Periodontology*, 78(12):2260–2265.

McCoy, J. D. 1935. Applied orthodontics: an introductory text for students and practitioners of dentistry. *Lea & Febiger.*

Mootha, A., Malaiappan, S., Jayakumar, N. D., Varghese, S. S., Thomas, J. T. 2016. The Effect of Periodontitis on Expression of Interleukin-21: A Sys-

tematic Review. *International Journal of Inflammation*, 2016:1–8.

Murthykumar, K., *et al.* 2015. Impact of Video Based Learning on the Perfomance of Post Graduate Students in Biostatistics: A Retrospective Study. *Journal of Clinical and Diagnostic Research*, 9(12):51–53.

Nemcovsky, C. E. 2001. Interproximal papilla augmentation procedure: a novel surgical approach and clinical evaluation of 10 consecutive procedures. *The International journal of periodontics & restorative dentistry*, 21(6):553–559.

Newman, M. G., *et al.* 2011. Clinical Periodontology. 11th Edition. *Elsevier Health Sciences*, page 872. ISBN 9781455706389.

Panda, S., *et al.* 2014. Platelet-rich fibrin and xenograft in treatment of intrabony defect. *Contemporary clinical dentistry*, 5(4):550–554.

Priyanka, S., *et al.* 2017. Detection of cytomegalovirus, Epstein-Barr virus, and Torque Teno virus in subgingival and atheromatous plaques of cardiac patients with chronic periodontitis. *Journal of Indian Society of Periodontology*, 21(6):456–460.

Ramamurthy, J., MG, V. 2018. Comparison of Effect of Hiora Mouthwash versus Chlorhexidine Mouthwash in Gingivitis Patient's: A Clinical Trial. *Asian Journal of Pharmaceutical and Clinical Research*, 11(7):84–88.

Ramesh, A. 2019. Esthetic lip repositioning: A cosmetic approach for correction of gummy smile - A case series. *Journal of Indian Society of Periodontology*, 23(3):290–294.

Ramesh, A., Ravi, S., Kaarthikeyan, G. 2017. Comprehensive rehabilitation using dental implants in generalized aggressive periodontitis. *Journal of Indian Society of Periodontology*, 21(2):160–163.

Ramesh, A., Varghese, S. S., Jayakumar, N. D., Malaiappan, S. 2016. Chronic obstructive pulmonary disease and periodontitis – unwinding their linking mechanisms. *Journal of Oral Biosciences*, 58(1):23–26.

Ravi, S. 2017. 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. *Journal of periodontology*, 88(9):839–845.

Sharma, A. A., Park, J. H. 2010. Esthetic Considerations in Interdental Papilla: Remediation and Regeneration. *Journal of Esthetic and Restorative Dentistry*, pages 18–28.

Singh, V. P., Uppoor, A. S., Nayak, D. G. 2013. Black triangle dilemma and its management in esthetic dentistry. *Dental research journal*, 10(3):296–301.

Takei, H., Yamada, H., Hau, T. 1989. Maxillary anterior esthetics. Preservation of the interdental papilla. *Dental clinics of North America*, 33(2):263–273.

Takei, H. H. 1980. The interdental space. *Dental clinics of North America*, 24(2):169–176.

Tarnow, D. 2003. Vertical distance from the crest of bone to the height of the interproximal papilla between adjacent implants. *Journal of periodontology*, 74(12):1785–1788.

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

Varghese, S. S. 2015. Estimation of salivary tumor necrosis factor-alpha in chronic and aggressive periodontitis patients. *Contemporary clinical dentistry*, 6(Supple 1):152–156.

Velden, U. 1984. Effect of age on the periodontium. *Journal of Clinical Periodontology*, 11(5):281–294.

W Khalid et al. 2016. Role of endothelin-1 in periodontal diseases: A structured review. *Indian journal of dental research: official publication of Indian Society for Dental Research*, 27(3):323–333.

Zetu, L., Wang, H.-L. 2005. Management of interdental/inter-implant papilla. *Journal of Clinical Periodontology*, 32(7):831–839.