
Correlation of Lip Shape and Type of Smile in The Perception of Aesthetics in Patients Between 18-30 Years - A Photographic Study

SHA.S. HARIHARANA¹, SUBHASHREE R^{2*}, RAKSHAGAN V³

¹Dept Of Prosthodontics, Saveetha Dental College and Hospital, Saveetha Institute Of Medical and Technical Science, Saveetha University, Chennai

²Senior Lecturer, Dept Of Prosthodontics, Saveetha Dental College and Hospital, Saveetha Institute Of Medical and Technical Sciences, Saveetha University, Chennai

³Senior Lecturer, Dept Of Prosthodontics, Saveetha Dental College and Hospital, Saveetha Institute Of Medical and Technical Sciences, Saveetha University, Chennai

*Corresponding Author

Email ID: hariharan.asha00@gmail.com¹, subhashree.sdc@saveetha.com², rakshagan.sdc@saveetha.com³

Abstract: Smile is characterised by upward curving of the corners of the mouth, indicates pleasure and plays an important role in social interactions. The study was done to assess the relation between the shape of lips, type of smile and their effect in the perception of aesthetic between the age group of 18-30 years. The study was designed to be a photographic analysis of smiles of 70 subjects between 18-30 years. The study was done in Saveetha Dental College, Chennai, India during the time frame of March-April 2020. The study analysed the type of smile, the shape of the lips and the smile line and its influence on the smile esthetics. An esthetic score was given to the patient on a score from 1-5, five being excellent and 1 being poor. These results were correlated to understand their influence on each other. Descriptive statistics was used to measure frequency and Pearson's correlation was performed to analyse the correlation. Moderately arched lips(53%), medium smile line(66.7%) and both Cuspid and commissural type(40%) of smile showed association with the highest grade of smile esthetics. There is a negligible correlation between smile line and esthetic score, low positive correlation of type of smile with the perceived esthetics, and negative correlation between shape of smile and esthetics (-0.22). The esthetics of smile depends on the peri oral structures as much as it depends on the teeth and associated structures. Development of an index to incorporate the aspects of lips and face in the quantification of esthetic score would best enable to obtain a wholesome picture and also allows standardised comparisons. Further research is encouraged.

Keywords: Aesthetics, Innovation, Lip shape, Photographic analysis, Smile line, Type of smile

INTRODUCTION

Smile is one of the most important facial expressions allowing patients to express a range of emotions, helps to interact and from a social standpoint, making it one of the most important elements of the face that catches the eye(Pilkington, 1936). An attractive or pleasing smile enhances the acceptance of the individual in the society and makes a major difference in interpersonal relationships(Tjan, Miller and Josephine G. P. The, 1984). Smile is so important that any obvious defects in it could be considered a handicap(Goldstein, 1969). With awareness regarding esthetic dentistry reaching on to more and more people, the increase in patients opting for elective smile rehabilitation is also seeing an all time high(Qualtrough, 2002).

To create a harmonious smile there needs to be a perfect amalgamation of dental and facial components(Venugopalan et al., 2014)(Ashok et al., 2014). While the facial components include the hard and soft tissues, the dental components consist of the teeth and associated structures(Vijayalakshmi and Ganapathy, 2016)(Davis, 2007). Of the extra oral features, lips constitute a major role. Lips define the esthetic zone of smile, complementing the teeth with their curvatures and contrasting colours. To better understand the influence of lips in smile, this study analyses three different components.

- Lip shape
- Smile curve
- Type Of smile

Lip shape classified by Goldstein and Garber are of three main phenotypes(Garber and Salama, 1996; Goldstein and Patzer, 2018) :

- Straight lips
- Moderately arched

- Maximally arched lips

The shape of the lips plays a major role in the exposure of teeth during repose and active smile (Ahmad, 2005) (Ariga et al., 2018). They also form a major element in deciding the smile curve.

The smile curve may be defined as the relationship of the incisal edges of the maxillary anterior teeth in relation to the curvature of lower lip during smiling (Kuhlberg and Nanda, 2005). They are:

- High smile line: Complete cervico- incisal length of the teeth and a band of gingival tissue visible above it.
- Medium smile line: 75-100% of maxillary incisors are visible
- Low smile line: Less than 75% of maxillary incisors are visible.

Finally coming to the type of smiles, they may be classified as (Rubin, 1974) :

- Commissural smile: Cupid bow shape of lips, corners of the mouth pulled up followed by levators of the upper lip revealing the lip (fig4)
- Cuspid Smile: Shape of lips visualised as a diamond (fig5)
- Complex lips: Shape of the lips are visualised as two parallel chevrons. (fig 6)

The interaction of all these elements are crucial in the aesthetics of smile. Majority of the existing literature are reviews or are regarding any one of these parameters (Subasree, Murthykumar and Dhanraj, 2016) (Basha, Ganapathy and Venugopalan, 2018) (Kannan and Venugopalan, 2018). A review of literature by Hulsey CM et al (Hulsey, 1970) spoke about the esthetic relation between lips and teeth. Many studies in conjunction with orthodontics were done in relation to the smile line (Sapkota et al., 2017) (Bhuvaneshwaran, 2010; Sharma and Sharma, 2012) (Jain, Ranganathan and Ganapathy, 2017). There is limited literature on the evaluation of these elements of smile in patient scenarios especially in conjunction with assessment of aesthetics.

Our department is passionate about research we have published numerous high quality articles in this domain over the past years ((Kavitha et al., 2014) , (Praveen et al., 2001), (Devi and Gnanavel, 2014), (Putchala et al., 2013), (Vijayakumar et al., 2010), (Lekha et al., 2014a, 2014b) (Danda, 2010) (Danda, 2010) (Parthasarathy et al., 2016) (Gopalakannan, Senthilvelan and Ranganathan, 2012), , (Govindaraju, Neelakantan and Gutmann, 2017), (P. Neelakantan et al., 2015), (PradeepKumar et al., 2016), (Sajan et al., 2011), (Lekha et al., 2014a), (Neelakantan, Grotra and Sharma, 2013), (Patil et al., 2017), (Jeevanandan and Govindaraju, 2018), (Abdul Wahab et al., 2017), (Eapen, Baig and Avinash, 2017), (Menon et al., 2018), (Wahab et al., 2018), (Vishnu Prasad et al., 2018), (Uthrakumar et al., 2010), (Ashok, Ajith and Sivanesan, 2017), (Prasanna Neelakantan et al., 2015). This study hence aims to assess the type of smile, the shape of lips, and the smile arc in patients and associate them with the element of aesthetics.

MATERIALS AND METHODS

The current study was designed to be a photographic analysis of smiles. The study was conducted in the month of march 2020 in Saveetha Dental College, Chennai, India. 70 photographs were selected based on inclusion and exclusion criteria. The photographs were obtained from the database of the college consisting of over 26000 case sheets.

Inclusion Criteria

Patients between the age group of 18-35 years
Good oral hygiene
All the maxillary anteriors present
No gross facial deformities

Exclusion criteria

Patients having anterior crowns or restoration
Caries in the anteriors
Broken or fractured anterior teeth

The study was presented before the institutional review board and ethical clearance was obtained. Consent was obtained from the patients and confidentiality was maintained.

The smile line, Type of smile and the shape of lips were assessed for individual patients and the obtained results were tabulated. An Esthetic score was given to the patients on a scale of 1-5, where 5 being excellent esthetics and 1 being poor esthetics, and this score was correlated with the properties of the lips, to derive a relation of which factors contribute to creating an esthetic smile. Descriptive statistics was performed to analyse the frequency and percentages, Pearson's correlation analysis was performed to derive at the relation between the factors.

RESULTS AND DISCUSSION:

Moderately arched lips (53%), medium smile line (66.7%) and both Cuspid and commissural type (40%) of smile showed association with the highest grade of smile esthetics (Table 1). There is a negligible correlation between

smile line and perceived esthetics (0.151), a low positive correlation between type of smile with the perceived esthetics (0.48) and negative correlation between shape of lips and esthetics (-0.31)

Esthetics has become a major part of modern day restorative and reconstructive dentistry, aiming to achieve a natural and harmonious smile (Jyothi et al., 2017; Han, Lee and Choi, 2018) (Dhanraj et al., 2014; Ganapathy et al., 2016). The idea of beauty and harmony is not constant and varies between nationalities and populations, let alone from person to person (Jahanbin and Pezeshkiran, 2008). So to assess and quantify the relation between different factors that influence the balance of smiles comes off as tricky. The current study aims to assess the factors of lips and its role in the perception of smile.

The relation between lips and teeth as currently existing in the literature is quite vast and varied based mainly on the specialisation of the author (Ajay et al., 2017) (Selvan and Ganapathy, 2016) (Duraishamy et al., 2019). According to Stallard et al (Stallard, 1964), an orthodontist, reported in his study the lip-teeth relation to be important for three reasons; (1) Forces associated with lips play a role in alignment and position of the upper incisors (2) position of the lower lip is essential as it helps in carrying the food between the incisor (3) the lip closure should be unstrained and graceful. He stressed on these factors to be present after completion of an orthodontic treatment (Ashok and Suvitha, 2016). According to the 'Dyesthetic Concept' of Frush and Fisher (Frush and Fisher, 1958) there are three major considerations: Age, Gender and Personality. This theory stressed mainly on the concept of a smile curve. Authors like Brodie and Howell (Brodie, 1950; Frush and Fisher, 1958; Tomoyasu, Yamaguchi and Maki, 2011) discussed the importance of lips in positioning of the teeth and emphasized how the musculature can guide the teeth into occlusion.

In the current study we tried to evaluate three aspects of the lips influence in smile, pertaining to the population of south India. The results from the study revealed that the most commonly seen lip shape is straight lip, and the highest score of esthetics was associated with moderately arched lips, resulting in a negative correlation (-0.31) between the association. The shape of the lips play a major role in assessing the cervico-incisal height of the anterior teeth and decide how much exposure is too much (Morgan and Haug, 2002). In terms of smile line, Medium smile line was the most frequently seen and it also showed association with highest esthetic score graded. A similar study by Kaya B et al (Kaya and Uyar, 2013), revealed that gingival exposure had a negative correlation with esthetics of smile and they preferred flat smiles with minimal gingival display. In another study by Taki AA et al (Taki et al., 2017) correlation was made between smile line and the length of the face, and they reported that both high smile line and low smile were perceived to be unattractive as compared to the Medium smile line.

We also assessed the popularly seen types of smile and their correlation with esthetics. Commissural type of smile was predominantly reported, and both commissural and cuspid smiles showed correlation with the highest scores of esthetics. The Complex smile epidemiologically is also quite rare and is believed to be seen in 2% of the population (Philips, 1999; Taki et al., 2017).

With the necessity for 'Smile Therapy' at an all time high it is of high importance to understand the influence of perioral structures in the perception of smile. The results of this study were limited by the fact that there was only 1 observer evaluating the scores, which could potentially be a bias. Further research with larger sample size and a multi centric approach to this is encouraged.

CONCLUSION

With the limitations of the study it was found that moderately arched lips and medium smile lines were associated with higher esthetic scores. It was also found that cuspid and commissural types of smiles were also associated with higher esthetics. Incorporating these elements into standardised indices could help the evaluator to assess and quantify the elements contributing to a harmonious smile. This could even make communication easier between the dentists as well as between the dentist and the patient. Further research is encouraged with a larger sample size and a more multi centric approach.

Author Contributions

The primary author contributed to establish the materials and methods and analysed the results followed by manuscript writing.

The co-author verified the results and manuscript before submission.

Conflict of Interest

There is no conflict of interests.

REFERENCES

1. Abdul Wahab, P. U. et al. (2017) 'Risk Factors for Post-operative Infection Following Single Piece Osteotomy', *Journal of maxillofacial and oral surgery*, 16(3), pp. 328–332.
2. Ahmad, I. (2005) 'Anterior dental aesthetics: Dentofacial perspective', *British Dental Journal*, pp. 81–88. doi: 10.1038/sj.bdj.4812521.

3. Ajay, R. et al. (2017) 'Effect of surface modifications on the retention of cement-retained implant crowns under fatigue loads: An In vitro study', *Journal of Pharmacy And Bioallied Sciences*, p. 154. doi: 10.4103/jpbs.jpbs_146_17.
4. Ariga, P. et al. (2018) 'Determination of Correlation of Width of Maxillary Anterior Teeth using Extraoral and Intraoral Factors in Indian Population: A Systematic Review', *World Journal of Dentistry*, pp. 68–75. doi: 10.5005/jp-journals-10015-1509.
5. Ashok, B. S., Ajith, T. A. and Sivanesan, S. (2017) 'Hypoxia-inducible factors as neuroprotective agent in Alzheimer's disease', *Clinical and experimental pharmacology & physiology*, 44(3), pp. 327–334.
6. Ashok, V. et al. (2014) 'Lip Bumper Prosthesis for an Acromegaly Patient: A Clinical Report', *The Journal of Indian Prosthodontic Society*, pp. 279–282. doi: 10.1007/s13191-013-0339-6.
7. Ashok, V. and Suvitha, S. (2016) 'Awareness of all ceramic restoration in rural population', *Research Journal of Pharmacy and Technology*, p. 1691. doi: 10.5958/0974-360x.2016.00340.1.
8. Basha, F. Y. S., Ganapathy, D. and Venugopalan, S. (2018) 'Oral Hygiene Status among Pregnant Women', *Research Journal of Pharmacy and Technology*, p. 3099. doi: 10.5958/0974-360x.2018.00569.3.
9. Bhuvaneshwaran, M. (2010) 'Principles of smile design', *Journal of conservative dentistry: JCD*, 13(4), pp. 225–232.
10. Brodie, A. G. (1950) 'Anatomy and physiology of head and neck musculature', *American Journal of Orthodontics*, pp. 831–844. doi: 10.1016/0002-9416(50)90038-8.
11. Danda, A. K. (2010) 'Comparison of a single noncompression miniplate versus 2 noncompression miniplates in the treatment of mandibular angle fractures: a prospective, randomized clinical trial', *Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons*, 68(7), pp. 1565–1567.
12. Davis, N. C. (2007) 'Smile Design', *Dental Clinics of North America*, pp. 299–318. doi: 10.1016/j.cden.2006.12.006.
13. Devi, V. S. and Gnanavel, B. K. (2014) 'Properties of Concrete Manufactured Using Steel Slag', *Procedia Engineering*, 97, pp. 95–104.
14. Dhanraj, D. et al. (2014) 'Effect of Marginal Discrepancy induced by CAD/CAM and Conventional Ceramic Processing Techniques in All Ceramic Complete Veneer Retainers - A Systematic Review', *IOSR Journal of Dental and Medical Sciences*, pp. 74–85. doi: 10.9790/0853-13327485.
15. Duraisamy, R. et al. (2019) 'Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments', *Implant dentistry*, 28(3), pp. 289–295.
16. Eapen, B. V., Baig, M. F. and Avinash, S. (2017) 'An Assessment of the Incidence of Prolonged Postoperative Bleeding After Dental Extraction Among Patients on Uninterrupted Low Dose Aspirin Therapy and to Evaluate the Need to Stop Such Medication Prior to Dental Extractions', *Journal of maxillofacial and oral surgery*, 16(1), pp. 48–52.
17. Frush, J. P. and Fisher, R. D. (1958) 'The dynesthetic interpretation of the dentogenic concept', *The Journal of Prosthetic Dentistry*, pp. 558–581. doi: 10.1016/0022-3913(58)90043-x.
18. Ganapathy, D. et al. (2016) 'Effect of Resin Bonded Luting Agents Influencing Marginal Discrepancy in All Ceramic Complete Veneer Crowns', *Journal of clinical and diagnostic research: JCDR*, 10(12), pp. ZC67–ZC70.
19. Garber, D. A. and Salama, M. A. (1996) 'The aesthetic smile: diagnosis and treatment', *Periodontology* 2000, 11, pp. 18–28.
20. Goldstein, R. E. (1969) 'Study of need for esthetics in dentistry', *The Journal of Prosthetic Dentistry*, pp. 589–598. doi: 10.1016/0022-3913(69)90005-5.
21. Goldstein, R. E. and Patzer, G. (2018) 'Concepts of Dental Esthetics', *Ronald E. Goldstein's Esthetics in Dentistry*, pp. 1–22. doi: 10.1002/9781119272946.ch1.
22. Gopalakannan, S., Senthilvelan, T. and Ranganathan, S. (2012) 'Modeling and Optimization of EDM Process Parameters on Machining of Al 7075-B4C MMC Using RSM', *Procedia Engineering*, 38, pp. 685–690.
23. Govindaraju, L., Neelakantan, P. and Gutmann, J. L. (2017) 'Effect of root canal irrigating solutions on the compressive strength of tricalcium silicate cements', *Clinical oral investigations*, 21(2), pp. 567–571.
24. Han, S. Y., Lee, J. and Choi, S. Y. (2018) 'Anterior esthetic restoration accompanied by gingivectomy of patient with unesthetic tooth proportion of maxillary anterior teeth: a case report', *Journal of Dental Rehabilitation and Applied Science*, pp. 208–217. doi: 10.14368/jdras.2018.34.3.208.
25. Hulsey, C. M. (1970) 'An esthetic evaluation of lip-teeth relationships present in the smile', *American Journal of Orthodontics*, pp. 132–144. doi: 10.1016/0002-9416(70)90260-5.
26. Jahanbin, A. and Pezeshkirad, H. (2008) 'The effects of upper lip height on smile esthetics perception in normal occlusion and nonextraction, orthodontically treated females', *Indian Journal of Dental Research*, p. 204. doi: 10.4103/0970-9290.42951.

27. Jain, A., Ranganathan, H. and Ganapathy, D. (2017) 'Cervical and incisal marginal discrepancy in ceramic laminate veneering materials: A SEM analysis', *Contemporary Clinical Dentistry*, p. 272. doi: 10.4103/ccd.ccd_156_17.
28. Jeevanandan, G. and Govindaraju, L. (2018) 'Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial', *European Archives of Paediatric Dentistry*, pp. 273–278. doi: 10.1007/s40368-018-0356-6.
29. Jyothi, S. et al. (2017) 'Periodontal Health Status of Three Different Groups Wearing Temporary Partial Denture', *Research Journal of Pharmacy and Technology*, p. 4339. doi: 10.5958/0974-360x.2017.00795.8.
30. Kannan, A. and Venugopalan, S. (2018) 'A systematic review on the effect of use of impregnated retraction cords on gingiva', *Research Journal of Pharmacy and Technology*, p. 2121. doi: 10.5958/0974-360x.2018.00393.1.
31. Kavitha, M. et al. (2014) 'Solution combustion synthesis and characterization of strontium substituted hydroxyapatite nanocrystals', *Powder Technology*, 253, pp. 129–137.
32. Kaya, B. and Uyar, R. (2013) 'Influence on smile attractiveness of the smile arc in conjunction with gingival display', *American Journal of Orthodontics and Dentofacial Orthopedics*, pp. 541–547. doi: 10.1016/j.ajodo.2013.05.006.
33. Kuhlberg, A. and Nanda, R. (2005) 'Principles of Biomechanics', *Biomechanics and Esthetic Strategies in Clinical Orthodontics*, pp. 1–16. doi: 10.1016/b978-0-7216-0196-0.50006-0.
34. Lekha, L. et al. (2014a) 'Schiff base complexes of rare earth metal ions: Synthesis, characterization and catalytic activity for the oxidation of aniline and substituted anilines', *Journal of organometallic chemistry*, 753, pp. 72–80.
35. Lekha, L. et al. (2014b) 'Synthesis, spectroscopic characterization and antibacterial studies of lanthanide(III) Schiff base complexes containing N, O donor atoms', *Journal of Molecular Structure*, pp. 307–313. doi: 10.1016/j.molstruc.2013.10.014.
36. Menon, S. et al. (2018) 'Selenium nanoparticles: A potent chemotherapeutic agent and an elucidation of its mechanism', *Colloids and surfaces. B, Biointerfaces*, 170, pp. 280–292.
37. Morgan, J. P. and Haug, R. H. (2002) 'Evaluation of the Craniomaxillofacial Deformity Patient', *Craniomaxillofacial Reconstructive and Corrective Bone Surgery*, pp. 5–21. doi: 10.1007/978-0-387-22427-5_2.
38. Neelakantan, P. et al. (2015) 'Antibiofilm activity of three irrigation protocols activated by ultrasonic, diode laser or Er:YAG laser in vitro', *International endodontic journal*, 48(6), pp. 602–610.
39. Neelakantan, P. et al. (2015) 'Influence of Irrigation Sequence on the Adhesion of Root Canal Sealers to Dentin: A Fourier Transform Infrared Spectroscopy and Push-out Bond Strength Analysis', *Journal of endodontia*, 41(7), pp. 1108–1111.
40. Neelakantan, P., Grotra, D. and Sharma, S. (2013) 'Retreatability of 2 mineral trioxide aggregate-based root canal sealers: a cone-beam computed tomography analysis', *Journal of endodontia*, 39(7), pp. 893–896.
41. Parthasarathy, M. et al. (2016) 'Effect of hydrogen on ethanol-biodiesel blend on performance and emission characteristics of a direct injection diesel engine', *Ecotoxicology and environmental safety*, 134(Pt 2), pp. 433–439.
42. Patil, S. B. et al. (2017) 'Comparison of Extended Nasolabial Flap Versus Buccal Fat Pad Graft in the Surgical Management of Oral Submucous Fibrosis: A Prospective Pilot Study', *Journal of maxillofacial and oral surgery*, 16(3), pp. 312–321.
43. Philips, E. (1999) 'The classification of smile patterns', *Journal*, 65(5), pp. 252–254.
44. Pilkington, E. L. (1936) 'Esthetics and Optical Illusions in Dentistry**Read before the Section on Operative Dentistry at the Seventy-First Annual Midwinter Clinic of the Chicago Dental Society, Feb. 19, 1935', *The Journal of the American Dental Association* (1922), pp. 641–651. doi: 10.14219/jada.archive.1936.0105.
45. PradeepKumar, A. R. et al. (2016) 'Diagnosis of Vertical Root Fractures in Restored Endodontically Treated Teeth: A Time-dependent Retrospective Cohort Study', *Journal of endodontia*, 42(8), pp. 1175–1180.
46. Praveen, K. et al. (2001) 'Hypotensive anaesthesia and blood loss in orthognathic surgery: a clinical study', *The British journal of oral & maxillofacial surgery*, 39(2), pp. 138–140.
47. Putchala, M. C. et al. (2013) 'Ascorbic acid and its pro-oxidant activity as a therapy for tumours of oral cavity – A systematic review', *Archives of Oral Biology*, pp. 563–574. doi: 10.1016/j.archoralbio.2013.01.016.
48. Qualtrough, A. (2002) 'Book Review', *Dental Update*, pp. 402–402. doi: 10.12968/denu.2002.29.8.402.
49. Rubin, L. R. (1974) 'The anatomy of a smile: its importance in the treatment of facial paralysis', *Plastic and reconstructive surgery*, 53(4), pp. 384–387.
50. Sajan, D. et al. (2011) 'Molecular structure and vibrational spectra of 2,6-bis(benzylidene)cyclohexanone: a density functional theoretical study', *Spectrochimica acta. Part A, Molecular and biomolecular*

spectroscopy, 78(1), pp. 113–121.

51. Sapkota, B. et al. (2017) 'Evaluation of Smile Line in Natural and Forced Smile Position: An Institution-based Study', *Orthodontic Journal of Nepal*, pp. 27–32. doi: 10.3126/ojn.v7i1.18898.
52. Selvan, S. R. and Ganapathy, D. (2016) 'Efficacy of fifth generation cephalosporins against methicillin-resistant *Staphylococcus aureus*-A review', *Research Journal of Pharmacy and Technology*, p. 1815. doi: 10.5958/0974-360x.2016.00369.3.
53. Sharma, P. K. and Sharma, P. (2012) 'Dental Smile Esthetics: The Assessment and Creation of the Ideal Smile', *Seminars in Orthodontics*, pp. 193–201. doi: 10.1053/j.sodo.2012.04.004.
54. Stallard, H. (1964) 'Survival of the periodontium during and after orthodontic treatment', *American Journal of Orthodontics*, pp. 584–592. doi: 10.1016/0002-9416(64)90054-5.
55. Subasree, S., Murthykumar, K. and Dhanraj (2016) 'Effect of Aloe Vera in Oral Health-A Review', *Research Journal of Pharmacy and Technology*, p. 609. doi: 10.5958/0974-360x.2016.00116.5.
56. Taki, A. A. et al. (2017) 'Influence of the Smile Line on Smile Attractiveness in Short and Long Face Individuals', *International Journal of Dentistry*, pp. 1–7. doi: 10.1155/2017/2637148.
57. Tjan, A. H. L., Miller, G. D. and Josephine G. P. The (1984) 'Some esthetic factors in a smile', *The Journal of Prosthetic Dentistry*, pp. 24–28. doi: 10.1016/s0022-3913(84)80097-9.
58. Tomoyasu, Y., Yamaguchi, T. and Maki, K. (2011) 'Recent Advances in the Genetics of Orthodontics', *Principles in Contemporary Orthodontics*. doi: 10.5772/22043.
59. Uthrakumar, R. et al. (2010) 'Bulk crystal growth and characterization of non-linear optical bishthiourea zinc chloride single crystal by unidirectional growth method', *Current applied physics: the official journal of the Korean Physical Society*, 10(2), pp. 548–552.
60. Venugopalan, S. et al. (2014) 'Magnetically retained silicone facial prosthesis', *Nigerian journal of clinical practice*, 17(2), pp. 260–264.
61. Vijayakumar, G. N. S. et al. (2010) 'Synthesis of electrospun ZnO/CuO nanocomposite fibers and their dielectric and non-linear optic studies', *Journal of alloys and compounds*, 507(1), pp. 225–229.
62. Vijayalakshmi, B. and Ganapathy, D. (2016) 'Medical management of cellulitis', *Research Journal of Pharmacy and Technology*, p. 2067. doi: 10.5958/0974-360x.2016.00422.4.
63. Vishnu Prasad, S. et al. (2018) 'Report on oral health status and treatment needs of 5-15 years old children with sensory deficits in Chennai, India', *Special care in dentistry: official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry*, 38(1), pp. 58–59.
64. Wahab, P. U. A. et al. (2018) 'Scalpel Versus Diathermy in Wound Healing After Mucosal Incisions: A Split-Mouth Study', *Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons*, 76(6), pp. 1160–1164.

Table 1: The table describes the frequency distribution of the esthetic score with respect to the various parameters of the lips, and the correlation coefficient. Both cuspid and commissural smiles showed correlation with the highest esthetic grade. Medium smile line and moderately arched lips were also associated with highest esthetic scores. While the lip shape showed a negative correlation with the aesthetic score, the other parameters; smile line and type of smile showed positive correlation.

		Aesthetic Score					Correlation coefficient
		Poor	Average	Good	Very Good	Excellent	
Gender	Male	0(0%)	9(69.2%)	12(54.5%)	7(36.8%)	10(66.7%)	0.52
	Female	0(0%)	4(30.8%)	10(45.5%)	12(63.2%)	5(33.3%)	
Type Of Smile	Cuspid smile	0(0%)	6(46.2%)	7(31.8%)	7(36.8%)	6(40%)	0.48
	Commissural smile	0(0%)	6(46.2%)	11(50%)	9(47.4%)	6(40%)	
	Complex smile	0(0%)	1(7.7%)	4(18.2%)	3(15.8%)	3(20%)	
Smile Line							

Low	0(0%)	4 (30.8%)	2(9.1%)	4(21.1%)	1(6.7%)	0.151
Medium	0(0%)	8 (61.5%)	14(63.6%)	11(57.9%)	10(66.7%)	
High	0(0%)	1 (7.7%)	6(27.3%)	4(15.8%)	4(26.7%)	
Lip shape						-0.31
Straight Lips	0(0%)	6 (46.2%)	6(27.3%)	12(21.1%)	5(33.3%)	
Moderately arched	0(0%)	5(38.5%)	12(54.5%)	3(21.1%)	8(53.3%)	
Maximally arched	0(0%)	2(15.4%)	4(18.2%)	4(63.2%)	2(13.3%)	

Table 2: Table shows the frequency distribution of Aesthetic scores.

Aesthetic scores	Frequency	Percent
Average Aesthetics	13	18.8
Good Aesthetics	22	31.9
Very Good Aesthetics	19	27.5
Excellent Aesthetics	15	21.7

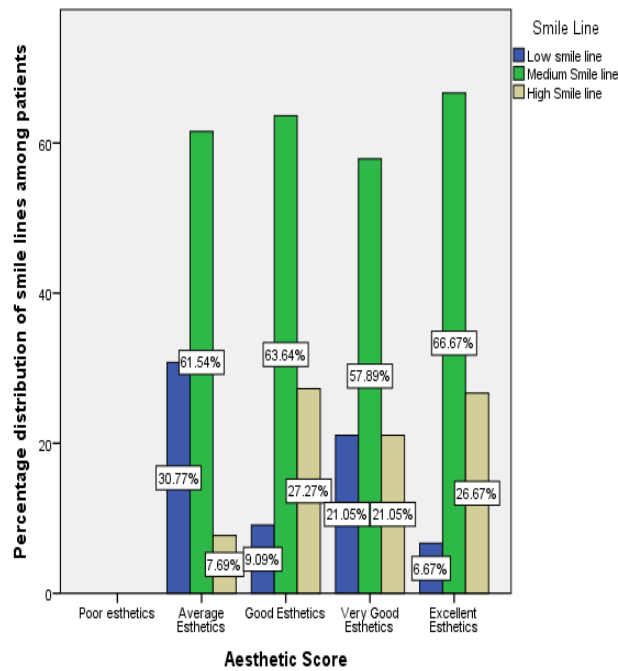


Fig.1: Bar Graph shows correlation of perceived aesthetic score (X-axis) with the percentage distribution of smile lines among patients (Y-axis). The graph shows the correlation of medium smile lines (green) is highest with excellent esthetics . Low smile line (blue) is correlated with average aesthetics. Pearson’s correlation was done and shows a negligible correlation (0.151).

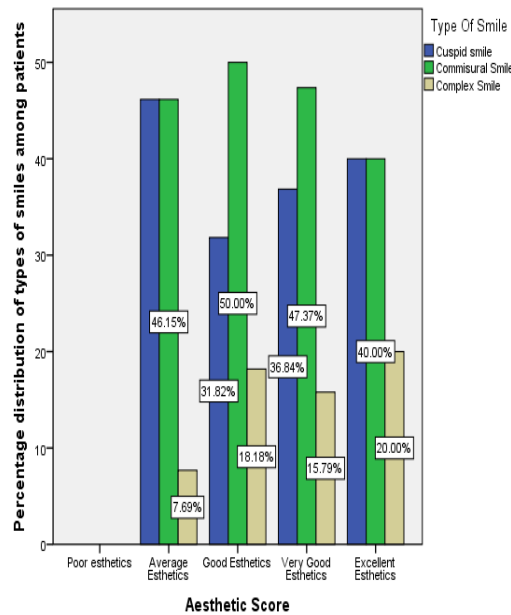


Fig.2: Bar graph depicts the correlation of the perceived esthetic scores (X-axis) with type of smile (Y-axis). Commissural smiles (blue) and cuspid smiles (green) showed greater correlation with higher perception of esthetics. This relation showed low positive correlation, 0.48. (Pearson's correlation)

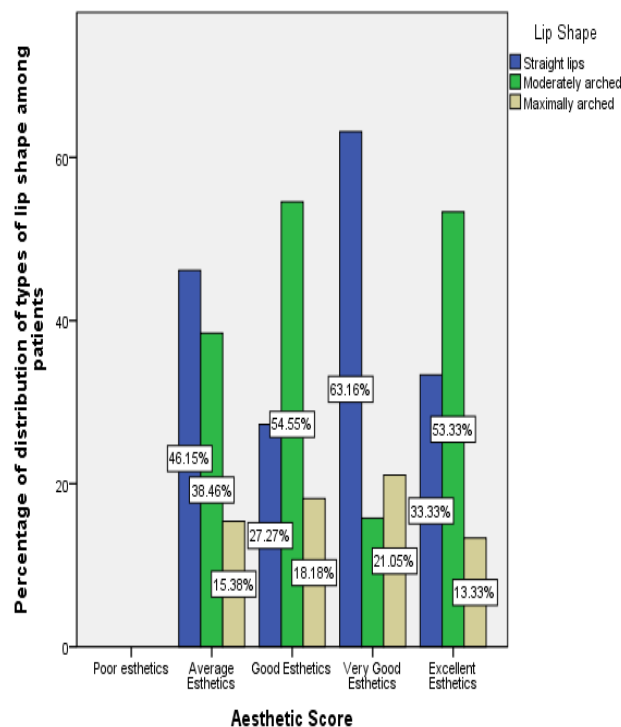


Fig.3: Bar graph depicting the correlation between the perceived esthetic score (X-axis) and the frequency distribution of percentage of the lip shapes (Y-axis) seen among the subjects. The graph shows that Straight lips (blue) were correlated with very good esthetics and Moderately arched lips (green) were correlated with good to excellent esthetics. This relation showed a low negative correlation when assessed using Pearson's correlation. (-0.31)



Fig. 4 : Image interpreted as Patient with characteristic “commissural” or “cupid bow” shaped smile; moderately arched lips and medium smile line.



Fig.5: Image interpreted as Patient with characteristic “cupid” or “diamond” shaped smile; moderately arched lips and medium smile line.



Fig.6: Image interpreted as Patient with characteristic “complex” or “parallel chevron” shaped smile; moderately arched lips and medium smile line.