Correlation Of Lip Shape And Type Of Smile In The Perception Of Aesthetics In Patients Between 18-30 Years - A Photographic Study

Type of article: Original Research

sha.S.HariharanA Dept Of Prosthodontics Saveetha Dental College and Hospital, Saveetha Institute Of Medical and Technical Science Saveetha University Chennai
Email - :hariharan.asha00@gmail.com
Subhashree R Senior Lecturer Dept Of Prosthodontics Saveetha Dental College and Hospital, Saveetha Institute Of Medical and Technical Sciences Saveetha University Chennai
Email - subhashree .sdc@saveetha.com
Rakshagan V Senior Lecturer Dept Of Prosthodontics Saveetha Dental College and Hospital,
Saveetha Institute Of Medical and Technical Sciences Saveetha University Chennai
Email - rakshagan.sdc@saveetha.com
Corresponding Author:
Subhashree R Senior Lecturer Dept Of Prosthodontics Saveetha Dental College and Hospital,
Saveetha Institute Of Medical and Technical Sciences Saveetha University 162,PH Road, Chennai 600077 Tamil Nadu,India
Email - Subhashreer.sdc@saveetha.com

Abstract:
Smile is characterized 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 analyzed 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 analyses 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 standardized comparisons. Further research is encouraged.

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

I. 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)(Bhuvaneswaran, 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 conjugation with assessment of aesthetics.

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.

II. 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.

III. 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 Pezeshkirad, 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)(Duraisamy *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 'Dynesthetic 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.

IV. TABLES AND GRAPHS:

	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%)	
Female	0(0%)	4(30.8%)	10(45.5%)	12(63.2%)	5(33.3%)	0.52
Type Of Smile Cuspid smile	0(0%)	6(46.2%)	7(31.8%)	7(36.8%)	6(40%)	
Commissural smile	0(0%)	6(46.2%)	11(50%)	9(47.4%)	6(40%)	0.48
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%)	
Medium	0(0%)	8 (61.5%)	14(63.6%)	11(57.9%)	10(66.7%)	0.151
High	0(0%)	1 (7.7%)	6(27.3%	4(15.8%)	4(26.7%)	
Lip shape 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%)	-0.31
Maximally arched	0(0%)	2(15.4%)	4(18.2%)	4(63.2%)	2(13.3%)	

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

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

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).

Figure 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)
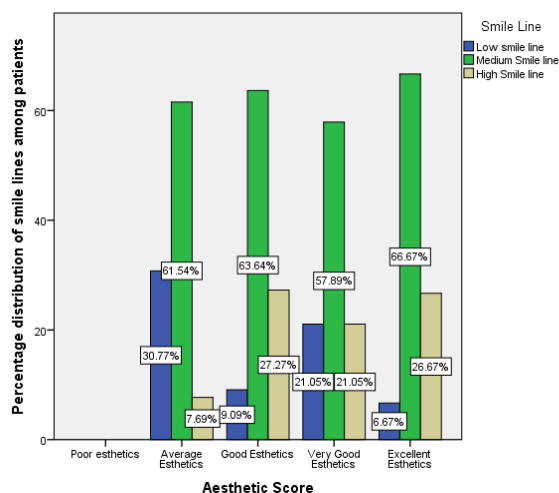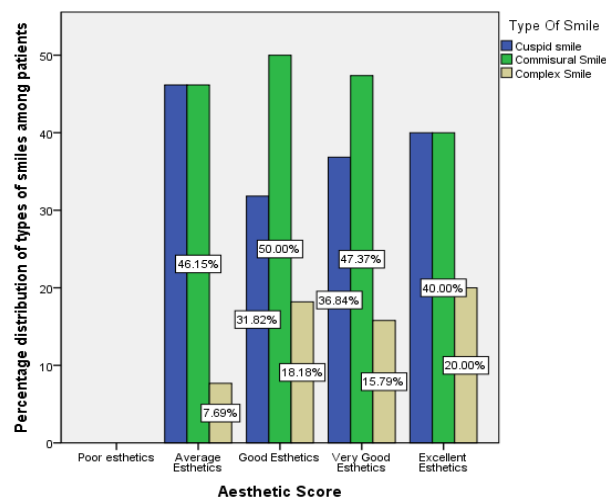

Figure 1: Bar Graph shows correlation of perceived aesthetic score (X-axis) with the percentage distribution of smile lines among patients (Y-axis). The graph shows the correlation of medium smile
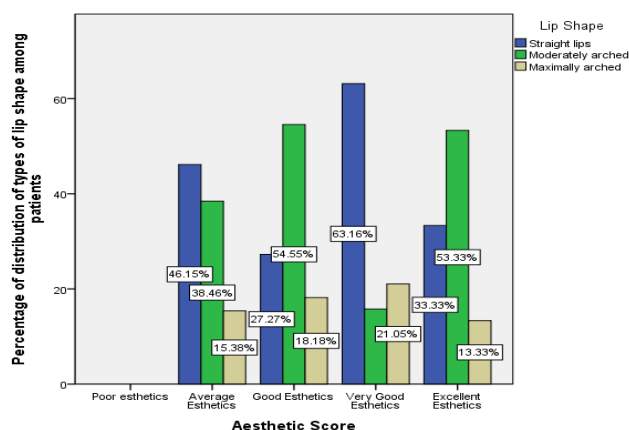
Figure 3: Bar graph depicting the correlation between the perceived esthetic score (X-axis) and the frequency distribution of percentage of the lip shapes (Y-axis) seen among the subjects. The graph shows that Straight lips (blue) were correlated with very good esthetics and Moderately arched lips (green) were correlated with good to excellent esthetics. This relation showed a low negative correlation when assessed using Pearson's correlation. (-0.31)

Fig5: Image interpreted as Patient with characteristic "cupid" or "diamond" shaped smile; moderately arched lips and medium smile line.

Fig 4 : Image interpreted as Patient with characteristic "commissural" or "cupid bow" 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.

V. 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.

VI. 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.

VII. CONFLICT OF INTEREST :

There is no conflict of interests.

VIII. REFERENCES:

[1]. Ahmad, I. (2005) 'Anterior dental aesthetics: Dentofacial perspective', *British Dental Journal*, pp. 81–88. doi: 10.1038/sj.bdj.4812521.

[2]. 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.

[3]. 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.

[4]. 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.

[5]. 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.

[6]. 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.

[7]. Bhuvaneswaran, M. (2010) 'Principles of smile design', *Journal of conservative dentistry: JCD*, 13(4), pp. 225–232.

[8]. 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.

[9]. Davis, N. C. (2007) 'Smile Design', *Dental Clinics of North America*, pp. 299–318. doi: 10.1016/j.cden.2006.12.006.

[10]. 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.

[11]. 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.

[12]. 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.

[13]. 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.

[14]. Garber, D. A. and Salama, M. A. (1996) 'The aesthetic smile: diagnosis and treatment', *Periodontology 2000*, 11, pp. 18–28.

[15]. 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.

6781

[16]. 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.

[17]. 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.

[18]. 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.

[19]. 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.

[20]. 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.

[21]. 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.

[22]. 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.

[23]. 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.

[24]. 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.

[25]. 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.

[26]. Philips, E. (1999) 'The classification of smile patterns', *Journal* , 65(5), pp. 252–254.

[27]. 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.

[28]. Qualtrough, A. (2002) 'Book Review', *Dental Update*, pp. 402–402. doi: 10.12968/denu.2002.29.8.402.

[29]. 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.

[30]. 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.

[31]. 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.

[32]. 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.

[33]. Stallard, H. (1964) 'Survival of the periodontium during and after orthodontic

6782

treatment', *American Journal of Orthodontics*, pp. 584–592. doi: 10.1016/0002-9416(64)90054-5.

[34]. 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.

[35]. 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.

[36]. 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.

[37]. Tomoyasu, Y., Yamaguchi, T. and Maki, K. (2011) 'Recent Advances in the Genetics of Orthodontics', *Principles in Contemporary Orthodontics*. doi: 10.5772/22043.

[38]. Venugopalan, S. *et al.* (2014) 'Magnetically retained silicone facial prosthesis', *Nigerian journal of clinical practice*, 17(2), pp. 260–264.

[39]. 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.