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## Nasolabial Angle in Patients with Maxillary Incisor Proclination- A Retrospective study

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**Abstract:** Nasolabial angle is a key indicator of facial esthetics and plays an important role in orthodontic diagnosis and treatment planning. Nasolabial angle is formed between a tangent to the lower border of the nose and a line joining the subnasale with the labial portion of the upper lip. Normal range of the nasolabial angle is 90 to 110 degrees. The aim of this study was to evaluate the gender association of various forms of nasolabial angle in patients with the maxillary incisor proclination. A total of six hundred and thirty five patients between the age group of 18 to 30 years were taken into study. Their cases reports were reviewed and retrieved from dental records and the data related to the correlation of nasolabial angle with the proclination of maxillary incisor were retrieved and tabulated. The correlation of nasolabial angle with age and gender distribution of patients with proclination of maxillary incisor was found using chi square test analysis in which P value was < 0.05 and this study is statistically significant. It is thus, important to record the soft tissue details and utilize them during diagnosis and treatment planning, so that both functional and esthetic harmony could be obtained.

**Keywords:** Correlation; Maxillary incisors; Orthodontic treatment; Proclination, innovation.

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### INTRODUCTION

Nasolabial angle is one of the factors which depicts the esthetics. Esthetic concern is the common reason behind many patients seeking orthodontic treatment. Traditionally ideal occlusion was planned as the only final outcome to attain the best esthetic results for the patients (Linjawi, 2016). Knowledge of facial structures is crucial to achieve an ideal facial profile with esthetic harmony (Felicita, 2017a). Social acceptance, psychological well-being, and self-esteem of an individual are related to physical appearance. It has been established that self-esteem is strongly dependent on facial appearance (Krishnan, Pandian and Kumar, 2018). Both hard and soft tissue landmarks on the face play an important role in planning for ideal orthodontic diagnosis and treatment.

The complexity of predicting changes in the soft tissue profile over time is difficult. A frequently used soft tissue profile parameter over years to determine facial harmony is the nasolabial angle, as it determines the position of maxilla, dentition and the inclination of alar border of the nose (Felicita, Shanthasundari and Chandrasekar, 2012).

Nasolabial angle is formed between a tangent to the lower border of the nose and a line joining the subnasale with the lip of the upper lip. Normal range of nasolabial angle was given by Owen et al, as 90 to 110 degree. Capelozza showed that nasolabial angle indicates the actual sagittal position of maxilla. Various intraoral and extraoral forces and factors could affect proclination of the teeth and maxillary position. This position and proclination of teeth can affect the lip position and henceforth, the rest and dynamic smile esthetics (Capelozza et al., 1989), (Kumar et al., 2011).

Nasolabial angle is greatly influenced by the proclination of maxillary incisor. It is used in orthodontic management like extraction, non extraction, maxillary advancement and setback which usually depends upon the assessment of nasolabial angle (Park, Bowman and Klapper, 1989), (Dinesh et al., 2013). Fitzgerald suggested that measurement of this angle alone provides inadequate information as it does not reveal which component is responsible for the variability (Fitzgerald, Nanda and Currier, 1992), (Felicita and Sumathi Felicita, 2018). 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), (Rajendran *et al.*, 2019), (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). Therefore , The aim of this study was to evaluate the gender association of various forms of nasolabial angle in patients with the maxillary incisor proclination.

## MATERIALS AND METHODS

This retrospective study was conducted in Saveetha dental College, Chennai. The study proposal was approved by the institutional ethical committee. A total of 635 patients with proclination of maxilla were taken into the study. The ethical approval number is SDC/SIHEC/2020/DIASDATA/0619-0320

### Data collection

Case reports including their dental records of each patient were retrieved from the archives of Saveetha dental college and hospitals . Incomplete case reports were excluded from this study.Study was proceeded based upon the available dental records from June 2019 to March 2020 were retrieved.Details like age ,gender.patients with proclination of maxillary incisor and their nasolabial angle.

### Inclusion and Exclusion criteria

Inclusion criteria involved the patients with proclination of the maxillary incisors . Dental records about their nasolabial angle with photographs and radiographs were assessed . Patients between 18-30 years were taken into study. Whereas, exclusion criteria includes poor quality photographs and radiographs, incomplete dental records, previous history of orthodontic treatment.

### Statistical analysis

The Data collected was tabulated in Excel sheets and were copied to SPSS (version 26.0). Data was analysed using Pearson chi square test which was used to reveal the association between the proclination of maxillary incisor and the nasolabial angle.

## RESULTS AND DISCUSSION

Frequency distribution of maxillary incisor proclination was higher among males (50.24%) than females(49.76%) (Figure 1). Frequency distribution of different nasolabial angles were assessed . Among the total of 635 patients with proclination of maxillary incisors under the age group of 18 to 30 years, 456 patients (71.8%) had straight nasolabial angle , 160 patients (25.2%) had acute nasolabial angle and 19 patients (3%) had obtuse nasolabial angle (Figure 2).

Among males, 10.39% of the patients with proclination of maxillary incisors had acute nasolabial angle , 1.73% had obtuse nasolabial angle and 38.11% of them had straight nasolabial angle .Therefore , straight nasolabial angle was more prevalent among females with proclination of maxillary incisors. Chi square analysis used and  $P = 0.029 (< 0.05)$  is statistically significant (Figure 3).

Among females, 14.80% of the patients with proclination of maxillary incisors had acute nasolabial angle , 1.26% had obtuse nasolabial angle and 33.70% of them had straight nasolabial angle Therefore , straight nasolabial angle was more prevalent among females with proclination of maxillary incisors . Chi square analysis used and  $P = 0.029 (< 0.05)$  is statistically significant (Figure 3).

Thus, the ranges of straight nasolabial angle seems to be higher than others comparatively in proclination of maxillary incisors ( $P < 0.05$ ) in all the above cases.Thus , it can be said that the study conducted indicates that there is a significant association between the nasolabial angle and the maxillary incisor proclination. Furthermore ,  $P < 0.05$  shows that there is a significant relationship between nasolabial angle and proclination of maxillary incisor.

Various studies assessed the prevalence rate of congenitally missing teeth and missing lateral incisors among different study populations . There are several studies in which researchers have attempted various clinical trials for advanced orthodontic diagnosis, treatment planning and in vitro studies were done and assessed based on various recent advances in orthodontic management (Krishnan, Pandian and Kumar S, 2015),(Vikram *et al.*, 2017).

Nasolabial angle has been taken as an important tool for the measurement of facial aesthetics.Planning for an optimum nasolabial angle is important in clinical orthodontics (Jain, 2014),(Rubika, Sumathi Felicita and Sivambiga, 2015).In this study nasolabial angle is correlated among patients with proclination of maxillary incisor.

The mean nasolabial angle was straight nasolabial angle (90 degree) in the present study, whereas higher values for nasolabial angle greater than 100 degree were reported in two studies on the Pakistan population. The difference in nasolabial fold from these two studies can be done to different types of sample size selected. Acute NLA was 25.2%, there were no similar studies determining value of acute NLA.

In the present study only patients with proclination of maxillary incisors were taken, whereas in the study given by Ayesha Ashraf et al had taken skeletal Class 1 patients, whereas many other studies had inclined all types of skeletal relations randomly into their study (Ashraf, Khan and Iqbal, 2018), (Felicita, 2017b), (Viswanath et al., 2015).

In this study, obtuse nasolabial angle in association with proclination of maxillary incisor was lesser (3%) whereas Oliver et al reported the skeletal and dental characteristic showed increased value of maxillary proclination in obtuse nasolabial angle (118 degree) (Oliver, 1982), (Kamisetty et al., 2015), (Samantha et al., 2017).

In the present study, straight nasolabial angle in association with patients with proclination of maxillary incisors was higher (71%), whereas similarly, Dua et al and Magnani et al reported similar results (Dua, Gupta and Singh, 2010), (Magnani et al., 2004), (Sivamurthy and Sundari, 2016). There are certain limitations in this study, which includes that the patients selected as the sample did not go through any orthodontic treatment.

Still this study has limitations as it is a retrospective study, and only representatives of the patient pool at one institution in Chennai were taken. Wider population groups should be studied in Chennai in order to draw more accurate results like several other studies which had taken and assessed larger study samples in their researches (Zylinski, Nanda and Kapila, 1992).

## CONCLUSION

Within the limits of the study, in patients with maxillary incisor proclination, straight nasolabial angle was commonly seen. Gender association showed no difference among both male and female population. Soft tissue variations exist among different populations. Knowledge on the norms for a population can help the clinician devise an ideal treatment protocol.

## Authors Contributions

Aparna .M: Literature search, data collection, analysis, manuscript writing Dr Nivethigaa B: Study design, data verification, manuscript drafting

## Conflict of Interest

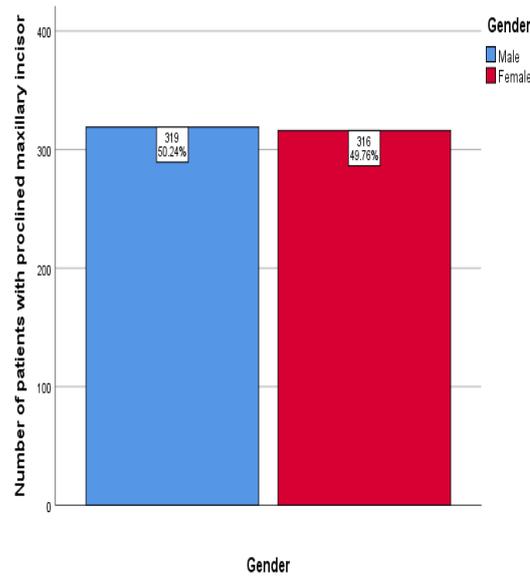
The authors declare that there were no conflicts of interest in the present study.

## REFERENCES

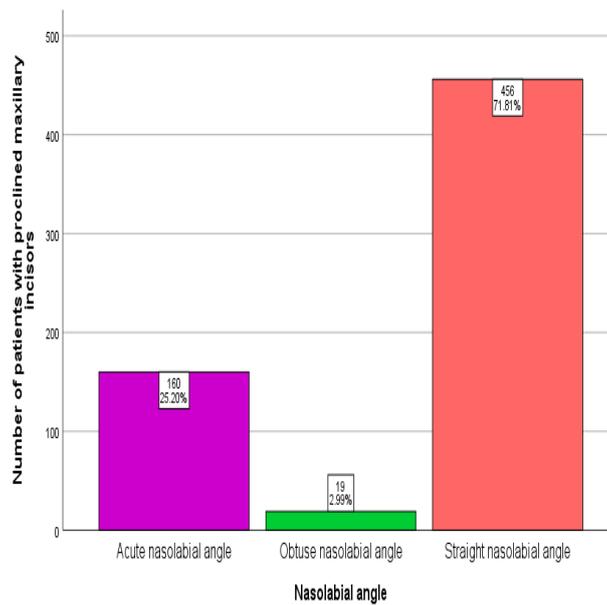
1. Abdul Wahab, P. U. et al. (2017) 'Risk Factors for Post-operative Infection Following Single Piece Osteotomy', *Journal of maxillofacial and oral surgery*, 16(3), pp. 328–332.
2. Ashok, B. S., Ajith, T. A. and Sivanesan, S. (2017) 'Hypoxia-inducible factors as neuroprotective agent in Alzheimer's disease', *Clinical and experimental pharmacology & physiology*, 44(3), pp. 327–334.
3. Ashraf, A., Khan, H. and Iqbal, N. (2018) 'CORRELATION OF NASOLABIAL ANGLE WITH MAXILLARY INCISOR INCLINATION AND UPPER LIP THICKNESS', *Pakistan Oral & Dental Journal*, 38(3), pp. 317–319.
4. Capelozza, L. et al. (1989) 'Maxillomandibular relationships in patients with dentofacial deformities: diagnostic criteria utilizing three cephalometric analyses', *The International journal of adult orthodontics and orthognathic surgery*, 4(1), pp. 13–26.
5. 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.
6. Devi, V. S. and Gnanavel, B. K. (2014) 'Properties of Concrete Manufactured Using Steel Slag', *Procedia Engineering*, 97, pp. 95–104.
7. Dinesh, S. P. S. et al. (2013) 'An indigenously designed apparatus for measuring orthodontic force', *Journal of clinical and diagnostic research: JCDR*, 7(11), pp. 2623–2626.
8. Dua, V., Gupta, S. and Singh, C. (2010) 'Evaluation of the nasolabial angle in the Indian population', *Contemporary clinical dentistry*, 1(2), pp. 79–82.
9. 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.
10. Felicita, A. S. (2017a) 'Orthodontic management of a dilacerated central incisor and partially impacted

- canine with unilateral extraction - A case report', *The Saudi dental journal*, 29(4), pp. 185–193.
11. Felicita, A. S. (2017b) 'Quantification of intrusive/retraction force and moment generated during en-masse retraction of maxillary anterior teeth using mini-implants: A conceptual approach', *Dental press journal of orthodontics*, 22(5), pp. 47–55.
  12. Felicita, A., Shanthasundari, K. K. and Chandrasekar, S. (2012) 'Determination of craniofacial relation among the subethnic Indian population: A modified approach - (Sagittal relation)', *Indian Journal of Dental Research*, p. 305. doi: 10.4103/0970-9290.102210.
  13. Felicita, A. S. and Sumathi Felicita, A. (2018) 'Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor – The sling shot method', *The Saudi Dental Journal*, pp. 265–269. doi: 10.1016/j.sdentj.2018.05.001.
  14. Fitzgerald, J. P., Nanda, R. S. and Currier, G. F. (1992) 'An evaluation of the nasolabial angle and the relative inclinations of the nose and upper lip', *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 102(4), pp. 328–334.
  15. 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.
  16. 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.
  17. Jain, R. K. (2014) 'Comparison of Intrusion Effects on Maxillary Incisors Among Mini Implant Anchorage, J-Hook Headgear and Utility Arch', *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH*. doi: 10.7860/jcdr/2014/8339.4554.
  18. 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.
  19. Kamisetty, S. K. et al. (2015) 'SBS vs Inhouse Recycling Methods-An Invitro Evaluation', *Journal of clinical and diagnostic research: JCDR*, 9(9), pp. ZC04–8.
  20. Kavitha, M. et al. (2014) 'Solution combustion synthesis and characterization of strontium substituted hydroxyapatite nanocrystals', *Powder Technology*, 253, pp. 129–137.
  21. Krishnan, S., Pandian, K. and Kumar, S. (2018) 'Angular photogrammetric analysis of the soft-tissue facial profile of Indian adults', *Indian Journal of Dental Research*, p. 137. doi: 10.4103/ijdr.ijdr\_496\_16.
  22. Krishnan, S., Pandian, S. and Kumar S, A. (2015) 'Effect of bisphosphonates on orthodontic tooth movement-an update', *Journal of clinical and diagnostic research: JCDR*, 9(4), pp. ZE01–5.
  23. Kumar, K. R. R. et al. (2011) 'Depth of resin penetration into enamel with 3 types of enamel conditioning methods: A confocal microscopic study', *American Journal of Orthodontics and Dentofacial Orthopedics*, pp. 479–485. doi: 10.1016/j.ajodo.2010.10.022.
  24. 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.
  25. 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.
  26. Linjawi, A. I. (2016) 'Age- and gender-related incisor changes in different vertical craniofacial relationships', *Journal of orthodontic science*, 5(4), pp. 132–137.
  27. Magnani, M. B. B. de A. et al. (2004) 'Assessment of the nasolabial angle in young Brazilian black subjects with normal occlusion', *Brazilian oral research*, 18(3), pp. 233–237.
  28. 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.
  29. 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.
  30. 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.
  31. 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.
  32. Oliver, B. M. (1982) 'The influence of lip thickness and strain on upper lip response to incisor retraction', *American Journal of Orthodontics*, pp. 141–149. doi: 10.1016/0002-9416(82)90492-4.
  33. Park, I. C., Bowman, D. and Klapper, L. (1989) 'A cephalometric study of Korean adults', *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 96(1), pp. 54–59.

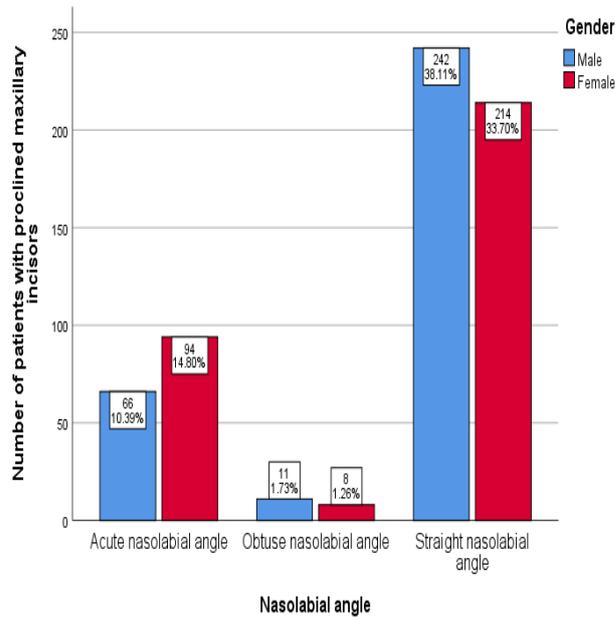
34. Parthasarathy, M. *et al.* (2016) 'Effect of hydrogen on ethanol-biodiesel blend on performance and emission characteristics of a direct injection diesel engine', *Ecotoxicology and environmental safety*, 134(Pt 2), pp. 433–439.
35. Patil, S. B. *et al.* (2017) 'Comparison of Extended Nasolabial 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.
36. 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.
37. 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.
38. 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.
39. Rajendran, R. *et al.* (2019) 'Comparative Evaluation of Remineralizing Potential of a Paste Containing Bioactive Glass and a Topical Cream Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study', *Pesquisa Brasileira em Odontopediatria e Clínica Integrada*, pp. 1–10. doi: 10.4034/pboci.2019.191.61.
40. Rubika, J., Sumathi Felicita, A. and Sivambiga, V. (2015) 'Gonial Angle as an Indicator for the Prediction of Growth Pattern', *World Journal of Dentistry*, pp. 161–163. doi: 10.5005/jp-journals-10015-1334.
41. 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.
42. Samantha, C. *et al.* (2017) 'Comparative Evaluation of Two Bis-GMA Based Orthodontic Bonding Adhesives - A Randomized Clinical Trial', *Journal of clinical and diagnostic research: JCDR*, 11(4), pp. ZC40–ZC44.
43. Sivamurthy, G. and Sundari, S. (2016) 'Stress distribution patterns at mini-implant site during retraction and intrusion—a three-dimensional finite element study', *Progress in orthodontics*, 17(1), p. 4.
44. Uthrakumar, R. *et al.* (2010) 'Bulk crystal growth and characterization of non-linear optical bistiourea zinc chloride single crystal by unidirectional growth method', *Current applied physics: the official journal of the Korean Physical Society*, 10(2), pp. 548–552.
45. 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.
46. Vikram, N. R. *et al.* (2017) 'Ball Headed Mini Implant', *Journal of clinical and diagnostic research: JCDR*, 11(1), pp. ZL02–ZL03.
47. 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.
48. Viswanath, A. *et al.* (2015) 'Obstructive sleep apnea: awakening the hidden truth', *Nigerian journal of clinical practice*, 18(1), pp. 1–7.
49. 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.
50. Zylinski, C. G., Nanda, R. S. and Kapila, S. (1992) 'Analysis of soft tissue facial profile in white males', *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 101(6), pp. 514–518.



**Fig.1:** Bar graph represents the gender distribution among the patients with maxillary incisor proclination. X axis represents the gender distribution. Y axis represents the number of patients with proclination of maxillary incisor. Proclination of maxillary incisor is higher among males (blue) than females (red).



**Fig.2:** Bar graph represents the frequency distribution of various forms of nasolabial angles among the patients with maxillary incisor proclination. X axis represents different forms of nasolabial angle. Y axis represents the patients with proclination of maxillary incisors. Straight nasolabial angle (peach) was more prevalent among patients with proclination of maxillary incisors than obtuse (green) and acute (purple) nasolabial angles.



**Fig.3: Bar graph represents association between gender distribution and nasolabial angle in patients with maxillary incisor proclination. X axis represents nasolabial angle, Y axis represents number of patients with maxillary incisor proclination. Straight nasolabial angles were more prevalent among both males (blue) and females (red) with proclined maxillary incisors. Chi square test was used ; P = 0.029. Gender association with nasolabial angle in patients with maxillary incisor proclination was found to be statistically significant.**