Journal of Contemporary Issues in Business and Government Vol. 27, No. 2, 2021
https://cibg.org.au/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2021.27.02.035

Radiographic Evaluation of Permanent Canine Development Based on Nollas Stage of Tooth Development In 6–8-Year-Old Male Children

G. NITHYA KARPAGAM[1], DR. BHAGYA LAKSHMI T[2]*, DR. DINESH PRABU[3]

[1]Saveetha Dental College and Hospitals,Saveetha Institute Of Medical And Technical Science Saveetha University ,162,Poonamallee High Road, Chennai, India
[2]Senior Lecturer, Department Of Pediatric and Preventive Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute Of Medical And Technical Science, Saveetha University, 162,Poonamallee High Road, Chennai, India
[3]Senior Lecturer, Department Of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals,Saveetha Institute Of Medical And Technical Science, Saveetha University, 162,Poonamallee High Road, Chennai, India
*Corresponding Author
Email ID: 151501035.sdc@saveetha.com[1], bhagyalakshmit.sdc@saveetha.com[2], dineshprabum.sdc@saveetha.com[3]

Abstract: The aim of this study is to radiographically evaluate the permanent canine development based on nollas stage of tooth development in 6 to 8 year old male children. A total of about 400 orthopantamograhic (OPG) images were collected from the database record of the dental institution between June 2019-March 2020. Of these 51 OPGs were selected based on the age group between 6-8 years old male children. Dental age of developing permanent canine was calculated based on the nollas method. After data collection statistical analysis was done in SPSS software. Among the study population 47.1% were 8 years old, 45.10% were 7 years old and 7.84% were 6 years old. Considering the distribution of teeth assessed 31.37% were 13, 31.37% were 43, 21.57% were 33 and 15.69% were 23. Within the limitations of the study it was concluded that, majority of the canine teeth assessed among 6 to 8 years old children had canine almost completed (Stage 5) or crown completed (Stage 6) according to Nollas stage of tooth development. All the children in the age group of 6 years had 2/3rd crown completed in canine (Stage 4). Majority of the children in the age group of 7 years and 8 years had 'crown almost completed' (Stage 5).

Keywords: Calcification, Canine development, Dental Age, Maturation, Nollas stage., innovative technique

INTRODUCTION

Dental age assessment plays an important role in forensic medicine, Pediatric dentistry and orthodontic treatment planning.(Koshy and Tandon, 1998) Age determination pertains to many fields. It is also useful to identify individuals who provide inaccurate details of age as in case of illegal immigrants or a corpse with an unknown identity.(Sinha *et al.*, 2014) In the absence of the chronological age, a reliable method is needed for the assessment of the growth status of the child to plan different treatment modalities. The growth status can be assessed by height,weight,gender,chronological age, dental age, and skeletal age of a child.(Nolla and Others, 1952) Differences between chronological and biological age have led to the development of different indicators of maturity such as skeletal age, morphological, sexual and dental age.(Nolla and Others, 1952; Moorrees, Fanning and Hunt, 1963; Proffit, Fields and Sarver, 2014)

Dental age can be assessed by observing the degree of calcification of the teeth on radiographs. Tooth calcification is more reliable indicator of dental maturity than tooth eruption because it is not affected by local factors such as loss of primary teeth, lack of space, malnutrition, dental decay, ankylosis , orthodontic modalities, in addition to ge under genetic control.(Demirjian, Goldstein and Tanner, 1973)Maintenance of oral health has an important role in the general well being of an individual. (Christabel and Gurunathan, 2015; Gurunathan and Shanmugaavel, 2016; Packiri, Gurunathan and Selvarasu, 2017) The maintenance of primary dentition is essential to guide the eruption of permanent teeth.(Ravikumar, Jeevanandan and Subramanian, 2017; Subramanyam *et al.*, 2018)Pulpectomy is the treatment of choice for non vital primary teeth which will help in maintaining the teeth for a longer period of time in the oral cavity.(Govindaraju, Jeevanandan and E. M. G. Subramanian, 2017a, 2017b; Govindaraju, Jeevanandan and E. Subramanian, 2017; JeevananDan, 2017;

Jeevanandan and Govindaraju, 2018; Nair *et al.*, 2018; Panchal *et al.*, 2019) Fluoride when present in optimal amounts also helps prevent caries. (Somasundaram *et al.*, 2015; Govindaraju and Gurunathan, 2017; 'Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', 2018)Dental age estimation is based upon the rate of the development and calcification of both buds and the progressive requires of their eruption in the oral cavity(Sachan, Sharma and Tandon, 2013)

Various skeletal and dental methods are available for age assessment of the child. Different dental age assessment methods are described by Nolla, Demirjian and Willem where tooth formation at different age groups were assessed. Calcification of the tooth at different age, the tooth formation is a more accurate way to determine the dental age(Sardana *et al.*, 2019)Dental age is of particular interest to the pediatric dentist and orthodontic in planning the treatment of different types of malocclusion in relation to maxillofacial growth(Falkner, 1957)]In patients with delayed maturity, orthodontic treatment may be started at a later stage thus leading to the shorter treatment duration and more stable result. In case of over-retained deciduous teeth, the method facilitates determination of the right time for starting the treatment. The correlation between dental and chronological age is also useful in the forensic dentistry as well to infuriate the age or to identify the child(Williams, 2001)

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). The aim of the study was to evaluate the development of permanent canine based on the Nollas stage of tooth development in 6-8 years old male children.

MATERIALS AND METHOD

Study Setting:

The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

Study Design:

The study was designed to include all children aged between 6-8 years male children and only permanent canine were included. The children who did not fall under this inclusion criteria were excluded.

Sampling technique:

The study was based on Random sampling method .To minimise the sampling bias, all the cases were reviewed priorly and included.

Data Collection And Tabulation

Data collection was done using the patient database with the timeframe work of 1st June 2019 to 31st th March 2020. About 400 OPGs were reviewed and those fitting under the inclusion criteria were included. Cross verification of data was done by a reviewer. The collected data was tabulated based on the following parameters:

- Patients demographic details
- Tooth number(teeth were included which showed maximum maturation)
- Nollas stage of tooth development

Statistical Analysis: The variables were coded and the data was imported to SPSS. Using SPSS Version 20.0 categorical variables were expressed in terms of frequency and percentage and bar graphs were plotted.The statistical significance of the associations were tested using the Chi-square test.

RESULT AND DISCUSSION

The dental system is considered as an integral part of the human body, its growth and development can be studied in comparison with other physiological maturity indicators. Nollas method is based on 10 stages of tooth development. It is accepted as the gold standard method over years.(Nolla and Others, 1952) Stage 0-absence of crypt, stage 1-presence of crypt, stage 2- initial calcification, stage 3- one third crown completed, stage 4-two third crown completed, stage 5-crown almost completed, stage 6-crown completed, stage 7- one third of the root

completed,stage 8-two third of the root completed, stage 9-root completed apex open, stage 10-apical foramen closed.

A total of 51 OPGs were examined aged between 6-8 years old male children. Among the study population 47.1% were 8 years old, 45.10% were 7 years old and 7.84% were 6 years old. [Figure 1]

[Figure 2] Shows the distribution of the tooth that is taken in the study. Among the study population 31.37% were 13 and 43, 21.57% were 33 and 15.69% were 23. Previous study shows that the maturity rate was faster in mandibular canine and females showed a faster maturity rate (Svanholt and Kjaer, 2008). [Figure 3] shows the distribution of the Nollas stage. It included 10 stages, out of which stage 4, 5,7 and 8 were noted in the development of permanent canine. Majority of the teeth attained maximum development at stage 5 (35.29%) , and least assessed at stage 8 (1.96%). [Figure 4]Shows the association between the age and nollas stage of tooth development.All the children in the 6 years of age group attained stage 4 maturity of canine development.Majority of the children in age group of 7 and 8 attained stage 5 who had crown formation completed. However, the difference is statistically significant as the chi square test, p-value is 0.017($p<0.05$).

[Figure 5] Shows the association between the tooth number and nollas stage of tooth development.It is assessed that 43 showed maximum development at stage 5, 33 showed almost equal development in stage 4, stage 5 and stage 7, 23 showed maximum development in stage 5 and 13 shows almost equal maturation in stage 4, stage 5 and stage 6. Chi square test, p value-0.776,$p(>0.05)$, statistically insignificant.Based on this analysis there is no association between tooth number and nollas stage. The limitation of the study is that only male gender was taken in this study and also limited sample size.

CONCLUSION

Within the limitations of the study it was concluded that, majority of the canine teeth assessed among 6 to 8 years old male children had canine almost completed (Stage 5) or crown completed (Stage 6) according to Nollas stage of tooth development. All the children in the age group of 6 years had 2/3rd crown completed in canine (Stage 4). Majority of the children in the age group of 7 years and 8 years had ‘crown almost completed’ (Stage 5).

ACKNOWLEDGMENT

The authors are thankful to the Director of Saveetha Dental College And Hospital, Chennai.

Authors Contribution

G.Nithya karpagam has contributed to data collection,study design,data analysis,results,tables and manuscript preparation.

Dr. Bhagyalakshmi has contributed to the manuscript preparation,proof heading of the manuscript and reviewing the manuscript.

Dr Dinesh Prabu has contributed to reviewing the manuscript.

Conflict of Interest

There is no conflict of interest

REFERENCE

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. Christabel, S. L. and Gurunathan, D. (2015) ‘Prevalence of type of frenal attachment and morphology of frenum in children, Chennai, Tamil Nadu’, *World J Dent*, 6(4), pp. 203–207.
4. 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.
5. Demirjian, A., Goldstein, H. and Tanner, J. M. (1973) ‘A new system of dental age assessment’, *Human biology*, 45(2), pp. 211–227.
6. Devi, V. S. and Gnanavel, B. K. (2014) ‘Properties of Concrete Manufactured Using Steel Slag’, *Procedia Engineering*, 97, pp. 95–104.
7. 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.
8. Falkner, F. (1957) ‘Deciduous tooth eruption’, *Archives of disease in childhood*, 32(165), pp. 386–391.

9. 'Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review' (2018) *International Journal of Pharmaceutical Research*, 10(04). doi: 10.31838/ijpr/2018.10.04.017.
10. 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.
11. Govindaraju, L. and Gurunathan, D. (2017) 'Effectiveness of Chewable Tooth Brush in Children-A Prospective Clinical Study', *Journal of clinical and diagnostic research: JCDR*, 11(3), pp. ZC31–ZC34.
12. Govindaraju, L., Jeevanandan, G. and Subramanian, E. (2017) 'Clinical Evaluation of Quality of Obturation and Instrumentation Time using Two Modified Rotary File Systems with Manual Instrumentation in Primary Teeth', *Journal of clinical and diagnostic research: JCDR*, 11(9), pp. ZC55–ZC58.
13. Govindaraju, L., Jeevanandan, G. and Subramanian, E. M. G. (2017a) 'Comparison of quality of obturation and instrumentation time using hand files and two rotary file systems in primary molars: A single-blinded randomized controlled trial', *European journal of dentistry*, 11(03), pp. 376–379.
14. Govindaraju, L., Jeevanandan, G. and Subramanian, E. M. G. (2017b) 'Knowledge and practice of rotary instrumentation in primary teeth among indian dentists: A questionnaire survey', *Journal of International Oral Health*, 9(2), p. 45.
15. 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.
16. Gurunathan, D. and Shanmugaavel, A. K. (2016) 'Dental neglect among children in Chennai', *Journal of the Indian Society of Pedodontics and Preventive Dentistry*, 34(4), pp. 364–369.
17. 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.
18. JeevananDan, G. S. (2017) 'Kedo-S paediatric rotary files for root canal preparation in primary teeth–Case report', *Journal of clinical and diagnostic research: JCDR*. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5427458/.
19. Kavitha, M. *et al.* (2014) 'Solution combustion synthesis and characterization of strontium substituted hydroxyapatite nanocrystals', *Powder Technology*, 253, pp. 129–137.
20. Koshy, S. and Tandon, S. (1998) 'Dental age assessment: the applicability of Demirjian's method in south Indian children', *Forensic science international*, 94(1-2), pp. 73–85.
21. 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.
22. 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.
23. 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.
24. Moorrees, C. F., Fanning, E. A. and Hunt, E. E., Jr (1963) 'FORMATION AND RESORPTION OF THREE DECIDUOUS TEETH IN CHILDREN', *American journal of physical anthropology*, 21(2), pp. 205–213.
25. Nair, M. *et al.* (2018) 'Comparative evaluation of post-operative pain after pulpectomy with k-files, kedo-s files and mtwo files in deciduous molars-a randomized clinical trial', *Brazilian Dental Science*, 21(4), pp. 411–417.
26. 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.
27. 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.
28. 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.
29. Nolla, C. M. and Others (1952) *The development of permanent teeth*. University of Michigan. Available at: https://www.dentalage.co.uk/wp-content/uploads/2014/09/nolla_cm_1960_development_perm_teeth.pdf.
30. Packiri, S., Gurunathan, D. and Selvarasu, K. (2017) 'Management of Paediatric Oral Ranula: A Systematic Review', *Journal of clinical and diagnostic research: JCDR*, 11(9), p. ZE06.
31. Panchal, V. *et al.* (2019) 'Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial', *Journal of the Indian Society of Pedodontics and Preventive Dentistry*, 37(1), p. 75.
32. 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.
33. 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.
34. 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.
35. 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.
36. Proffit, W. R., Fields, H. W., Jr. and Sarver, D. M. (2014) *Contemporary Orthodontics - E-Book*. Elsevier Health Sciences.
37. 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.
38. 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.
39. Ravikumar, D., Jeevanandan, G. and Subramanian, E. M. G. (2017) 'Evaluation of knowledge among general dentists in treatment of traumatic injuries in primary teeth: A cross-sectional questionnaire study', *European journal of dentistry*, 11(2), pp. 232–237.
40. Sachan, K., Sharma, V. P. and Tandon, P. (2013) 'Reliability of Nolla's dental age assessment method for Lucknow population', *The Journal of clinical pediatric dentistry*, 1(1), p. 8.
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. Sardana, D. *et al.* (2019) 'Comparative assessment of chronological, dental, and skeletal age in children', *Indian Journal of Dental Research*, p. 687. doi: 10.4103/ijdr.ijdr_698_17.
43. Sinha, S. *et al.* (2014) 'Dental age estimation by Demirjian's and Nolla's method: A comparative study among children attending a dental college in Lucknow (UP)', *Journal of Indian Academy of Oral Medicine and Radiology*, 26(3), p. 279.
44. Somasundaram, S. *et al.* (2015) 'Fluoride Content of Bottled Drinking Water in Chennai, Tamilnadu', *Journal of clinical and diagnostic research: JCDR*, 9(10), pp. ZC32–4.
45. Subramanyam, D. *et al.* (2018) 'Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries', *European journal of dentistry*, 12(1), pp. 67–70.
46. Svanholt, M. and Kjaer, I. (2008) 'Developmental stages of permanent canines, premolars, and 2nd molars in 244 Danish children', *Acta odontologica Scandinavica*, 66(6), pp. 342–350.
47. Uthrakumar, R. *et al.* (2010) 'Bulk crystal growth and characterization of non-linear optical bisthiourea zinc chloride single crystal by unidirectional growth method', *Current applied physics: the official journal of the Korean Physical Society*, 10(2), pp. 548–552.
48. 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.
49. 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.
50. 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.
51. Williams, G. (2001) 'A review of the most commonly used dental age estimation techniques', *The Journal of forensic odonto-stomatology*, 19(1), pp. 9–17.

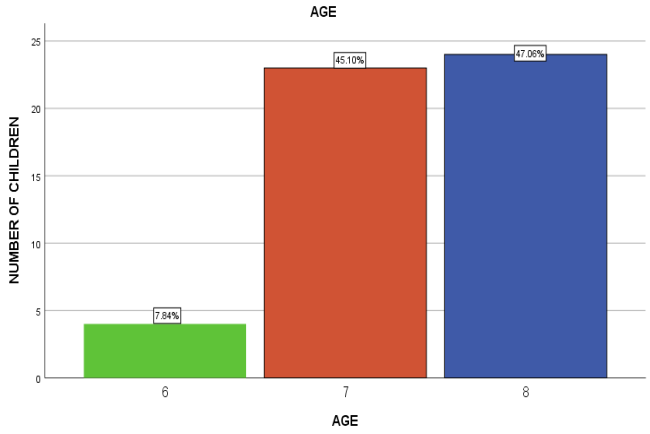

Fig.1: Shows the age distribution of male children assessed in this study; X axis - age of the male children between 6-8 years, Y axis - number of children. Among the study population 47.1% were 8 years old(blue), 45.10% were 7 years old(red) and 7.84% were 6 years old(green).

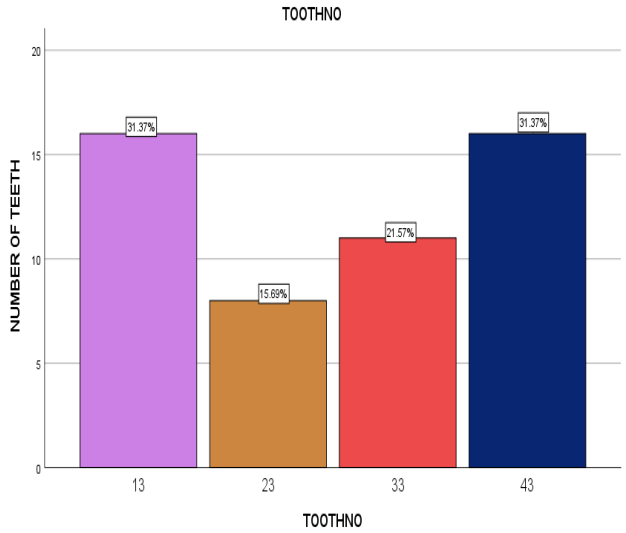

Fig.2: Shows the tooth distribution based on Nolla's stage of tooth development assessed in this study; X axis-distribution of tooth number, Y axis- number of teeth. Among the teeth assessed majority were right upper canine - 13 (31.37%)(violet) and right lower canine - 4 (331.37%)(blue)

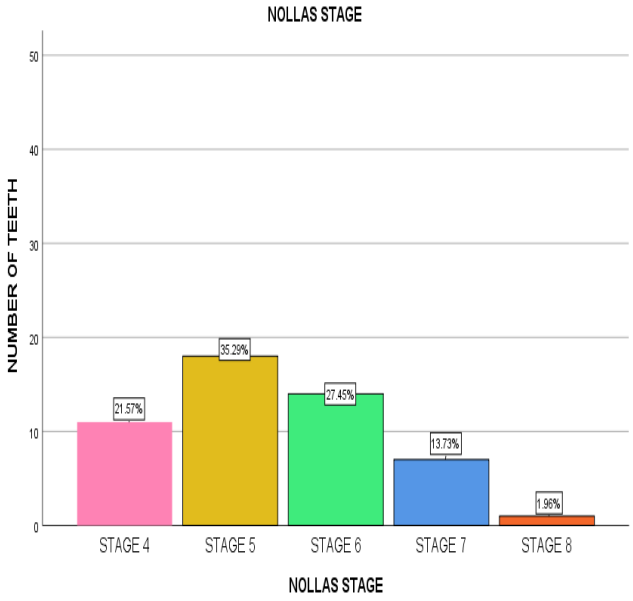

Fig.3: Shows the distribution of Nollas stage of tooth development assessed in this study. X axis - distribution of nollas stage of tooth development, Y axis- number of teeth. Majority of the teeth assessed were at Nollas stage 5 tooth development (crown almost completed)(35.29% - orange) followed by stage 6 (crown completed)(27.45% - green).

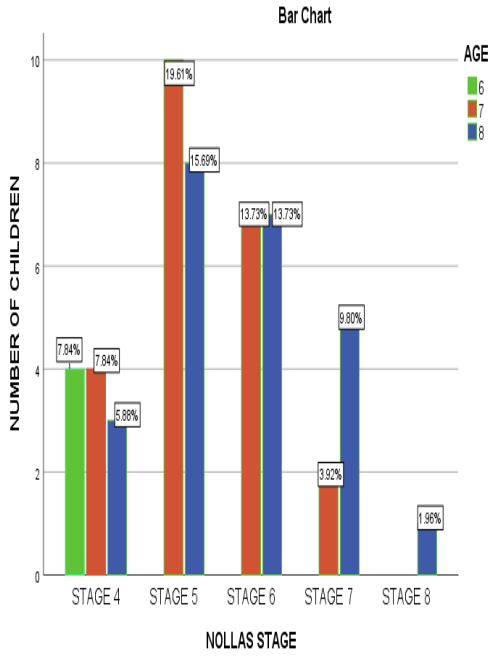

Fig.4: Shows the association between the age and nollas stage of tooth development. X axis- distribution of nollas stage of tooth development in canine,Y axis- number of children. All the children in 6 years of age group(green) attained stage 4 of canine development (2/3rd crown completed). Majority of the children in the age group of 7(brown) and 8(blue) attained stage 5 who had 'crown almost completed'. This association between the age and nollas stage of tooth development was statistically significant Chi square test, p-value is 0.017, p<0.05, statistically significant.

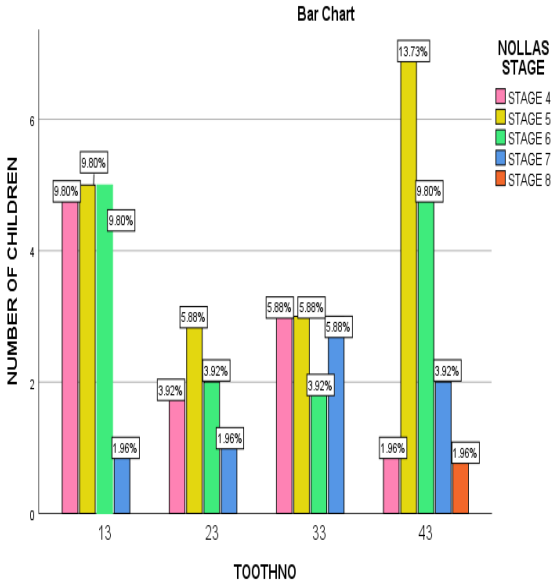

Fig.5: Shows the association between the tooth number and nollas stage of tooth development. X axis-distribution of tooth number,Y axis- number of children. Tooth number 13, 23 and 33 showed different stages of development from stage 4 (pink) to stage 7(blue). 43 presented with all five stages of development. Based on the statistical analysis it was inferred that the quadrant which the canine belonged to did not influence the stage of tooth development. Chi square test, p value-0.776,p(>0.05), statistically insignificant.