Working Length Determination During Pulpectomy In Primary Molars - An Institutional Radiographic Analysis

Vigneshwaran Ravichandran[1], Mahesh Ramakrishnan[2], Dhanraj Ganapathy[3*]

[1]Saveetha dental college, Saveetha Institute of Medical and Technical sciences (SIMATS),Saveetha University, Chennai , India , Email : 151701038.sdc@saveetha.com

[2]Department of Pedodontics , Saveetha dental college, Saveetha Institute of Medical and Technical sciences (SIMATS), Saveetha University, Chennai , India, Email : mahesh@saveetha.com

[3]Professor & HOD, Department of Prosthodontics , Saveetha dental college, Saveetha Institute of Medical and Technical sciences (SIMATS), Saveetha university, Chennai , India , No.162, Poonamallee High Road,Chennai-600077 , India , Email: dhanraj@saveetha.com

Abstract

Introduction : Endodontic working length determination requires an understanding of anatomy, the degree of root curvature, and the interaction between the tooth and its surrounding structures. Endodontic instruments may penetrate beyond the apical foramen due to errors in determining the tooth length, resulting in extravasation of irrigating solutions and restorative material into the periradicular tissues. Root canal instrumentation in primary teeth is risky because it can harm the tooth germ of the permanent tooth. The aim of this study is to analyse the working length determination in primary molars during pulpectomy.

Materials and methods : The case sheet records (DIAS data) of Pulpectomy in Primary molars were extracted. The data were analysed and transferred to MS Excel. Descriptive statistics (Percentage , Mean , Standard deviation) and Inferential test (Chi square test) were performed.

Results : Among the 1844 patients who underwent pulpectomy , 29.5 % of males and 20% of females have a working length of 11-15 mm. Most common working length in primary molars is 11-15 mm irrespective of quadrant (teeth number) and age. 20% of males and 15.6% of females had undergone pulpectomy in quadrant 4 followed by quadrant 3.

Conclusion : Within the limitations of the study, we can conclude that there was no statistical significance found between age and working length, gender and working length, tooth number and working length. Working length of 11 to 15 mm was more prevalent than working length less than 10.

Keywords: Working length ; Pulpectomy ; Primary molars ; Innovative technique

DOI: 10.47750/pnr.2022.13.S04.132

INTRODUCTION

Endodontic working length determination requires an understanding of anatomy, the degree of root curvature, and the interaction between the tooth and its surrounding structures. Endodontic instruments may penetrate beyond the apical foramen due to errors in determining the tooth length, resulting in extravasation of irrigating solutions and restorative material into the periradicular tissues. Root canal instrumentation in primary teeth is risky because it can harm the tooth germ of the permanent tooth. The aim of this study is to analyse the working length determination in primary molars during pulpectomy. [1]

A good endodontic treatment in deciduous teeth is critical for dentition maintenance until the physiological exfoliation process is completed [2]. Anatomical differences of the root canals produced by irregularly occurring reabsorption, as well as children's conduct during treatment, have been shown to reduce the efficacy of endodontic therapies [3–6]. Radiographic examination is the usual approach for determining working length, although it might be challenging to acquire due to limited access to children's mouths and their behaviour [7, 8] . Determining the length of the canal is essential to a successful endodontic treatment, especially in deciduous teeth. The exact determination of the canal's patent length will guarantee that it is adequately instrumented and filled with obturator material, preventing any harm to the periradicular tissues and the permanent tooth's germ [9–13] .

However, due to anatomical changes in the apical foramen, which are not visible on the radiograph, it is not always possible to precisely determine the radiographic tooth length. Furthermore, roots frequently exhibit varying degrees of curvature or the superposition of anatomical features [14, 15] . Working length estimation of primary teeth is also complicated by the presence

of periapical disease, the degree of pathological or physiological resorption, and the presence of a permanent successor tooth [4][3]. The apex locator has been proposed as a promising tool for determining the length of root canals, not only in permanent but also in deciduous teeth [16–20][15-19], despite the fact that radiographic inspection is still the preferred method.

Our team has extensive knowledge and research experience that has translate into high quality publications[21–33][34–40]

The aim of this study is to analyse the working length determination during pulpectomy in primary molars.

Materials And methods

This is a cross sectional study conducted in a university setting, Chennai. The total sample size of this study is 1844 subjects from a total of 2500 records. The pros of this study is the available data and similar ethnicity, whereas the cons of this study are the geographic limitations. The ethical approval was by the ethics board of SIMATS. Simple random technique of data collection and segregation was used to minimise the sampling bias. Internal validity is the working length determination in primary teeth and external validity is that the data is generalised.Data collection was from a case sheet record with a software. Data collected was transferred to MS Excel Sheet and coding was done based on the data collected. These data collected were then imported to SPSS IBM Version 20.0. The independent variables are gender and age. The dependent variables are the working length. Descriptive and Inferential statistics (chi-square test) were used. Data was transferred to the host computer and graphical illustration and tabular representation was done.

Results And Discussion

The distribution of gender and the working length were studied in that males had 21.38% of teeth with working length below 10, 29.5% of teeth with working length between 11-15mm, 6.08% of teeth with working length between 16-20mm and 0.05% of teeth with working length above 20 mm. Females had 18.72% of teeth with working length below 10, 20.18% of teeth with working length between 11-15mm, 3.96% of teeth with working length between 16-20 mm and 0.05% of teeth with working length above 20mm. There was no statistically significant association found (p=0.471). However, working length of 11 to 15mm was more prevalent in males and females. (figure 1)

The distribution of tooth number and the working length were studied in that the maxillary right primary molars had 6.2% of teeth with working length below 10 mm,9.3% of teeth with working length between 11-15 mm and 1.19% of teeth with working length between 16-20 mm. Maxillary left primary molars had 7.76% of teeth with working length below 10mm, 7.27% of teeth with working length between 11-15mm and 4.02% of teeth with working length between 16-20mm. Mandibular left primary molars had 12.5% of teeth with working length below 10 mm, 14.6% of teeth with working length between 11-15 mm, 4.02% of teeth with working length between 16-20mm and 0.05% of teeth with working length above 20mm. Mandibular right primary molars had 13.5% of teeth with working length below 10, 18.5% of teeth with working length between 11-15mm, 3.8% of teeth with working length between 16-20mm and 0.05% of teeth with working length above 20mm. There was no statistically significant association found (p=0.307). However, working length of 11 to 20 was more prevalent irrespective of quadrants (figure 2).

The distribution of age and the working length were studied in that individuals below 5 years had 24.9% of teeth with working length less than 10 , 25.3% of teeth with working length between 11 to 15 and 5.2% of teeth with working length between 16-20mm. Individuals of age group 6 to 10 had 14.8% of teeth with working length less than 10, 24.3% of teeth with working length between 11 to 15 ,4.7% of teeth with working length 16-20mm and 0.05% of teeth above 20. Individuals of age group above 11-15 had 0.33% of teeth with working length less than 10, 0.5% of teeth with working length between 11 to 15, 0.5% of teeth with working length between 16-20mm and 0.5% of teeth with working length more than 20mm. Individuals of age group 16 to18 had 0.05% of teeth with working length between 16-20mm.There was no statistically significant association found (p=0.471). However, working length of 11 to 15 mm was more prevalent irrespective of age. (figure 3).

The distribution of gender and the teeth number were studied in that 10.4% of males had done pulpectomy in quadrant 1, 9.2% had done pulpectomy in quadrant 2, 17.14% had done pulpectomy in quadrant 3 and 20.1% had done pulpectomy in quadrant 4. 6.3% of females had done pulpectomy in quadrant 1, 6.7% had done pulpectomy in quadrant 2, 14.15% had done pulpectomy in quadrant 3 and 15.67% had done pulpectomy in quadrant 4. There was no statistically significant association found (p=0.471). However, quadrant 4 is more prevalent for pulpectomy irrespective of gender (figure 4).

The outcome of endodontic treatment in deciduous teeth can be directly influenced by children's behaviour management, and in order to ensure proper compliance, the dentist must provide safety, comfort, and agility during treatment [4, 5]. Another problem in paediatric endodontics is root anatomy, which goes through natural reabsorption, which is abnormal in many

situations. Radiographic tests frequently fail to detect these resorptions, resulting in therapeutic failure [4, 9, 10, 41].

Because it will avoid overinstrumentation or treatment failures if the instrumentation is defective, determining the working length is a crucial step in avoiding probable injury to the germ of the permanent successors and the periradicular tissues [8, 41]. Conventional radiographs are currently the most common way for obtaining working lengths in paediatric dentistry. Other approaches, such as digital radiography and apex locators [4] , are available.

Limitations of this study include small sample size and subjective bias. Future study should be conducted with a wide range of population.

Conclusion

Within the limitations of the study, we can conclude that there was no statistical significance found between age and working length, gender and working length, tooth number and working length. Working length of 11 to 15 mm was more prevalent than working length less than 10, working length between 16 to 20 or above 21 irrespective of age, gender and tooth number.

Acknowledgement

The authors would like to acknowledge the support rendered by the Department of Prosthodontics & Saveetha dental college and hospitals and the management.

Authors Contribution

All the authors contributed equally to the study

Source Of Funding

The present project is supported/funded/sponsored by

Saveetha Institute of Medical and Technical Sciences ,

Saveetha Dental College and Hospitals , Saveetha University

Kumaran TV center and Furnitures , Attur , Salem.

Conflict Of Interest

The author have no conflict of interest

REFERENCE

1. Fuks A, Peretz B. Pediatric Endodontics: Current Concepts in Pulp Therapy for Primary and Young Permanent Teeth. Springer, 2016.
2. Winters J, Cameron AC, Widmer RP. Pulp therapy for primary and immature permanent teeth. Handbook of Pediatric Dentistry 2013; 103–122.
3. Silveira A da C, da Costa Silveira A. Análise in vivo da redução bacteriana em dentes portadores de periodontite apical primária e sua correlação com o sucesso do tratamento endodôntico. DOI: 10.11606/d.23.2016.tde-25022016-160430.
4. Mello-Moura ACV, Santos AMA, Bonini GAV, et al. Pulp Calcification in Traumatized Primary Teeth – Classification, Clinical And Radiographic Aspects. Journal of Clinical Pediatric Dentistry 2017; 41: 467–471.
5. Goerig AC, Camp JH. Root canal treatment in primary teeth: a review. Pediatr Dent 1983; 5: 33–37.
6. Silva SFWG de P e., Silva, de P. e Silva FWG. Métodos de avaliação e mecanismos envolvidos no reparo apical e periapical após tratamento endodôntico em dentes com lesão induzida experimentalmente. DOI: 10.11606/t.58.2009.tde-19032010-111831.
7. Nelson-Filho P, Romualdo PC, Bonifácio KC, et al. Accuracy of the iPex multi-frequency electronic apex locator in primary molars: an ex vivo study. International Endodontic Journal 2011; 44: 303–306.
8. Silva EJNL, Herrera DR, Souza-Júnior EJ, et al. Evaluation of the multifrequency electronic apex locator Joypex 5 in primary teeth. Eur Arch Paediatr Dent 2014; 15: 51–54.
9. Mello-Moura ACV, Moura-Netto C, Araki AT, et al. Ex vivo performance of five methods for root canal length determination in primary anterior teeth. Int Endod J 2010; 43: 142–147.
10. Mente J, Seidel J, Buchalla W, et al. Electronic determination of root canal length in primary teeth with and without root resorption. Int Endod J 2002; 35: 447–452.
11. Angwaravong O, Panitvisai P. Accuracy of an electronic apex locator in primary teeth with root resorption. International Endodontic Journal 2009; 42: 115–121.
12. Beltrame APCA, Beltrame APC, Triches TC, et al. Electronic determination of root canal working length in primary molar teeth: an in vivo and ex vivo study. International Endodontic Journal 2011; 44: 402–406.

13. Saraf P, Ratnakar P, Patil T, et al. A comparative clinical evaluation of accuracy of six apex locators with intraoral periapical radiograph in multirooted teeth: An in vivo study. Journal of Conservative Dentistry 2017; 20: 264.
14. Katz A, Tamse A, Kaufman AY. Tooth length determination: a review. Oral Surg Oral Med Oral Pathol 1991; 72: 238–242.
15. Subramaniam P, Konde S, Mandanna DK. An in vitro comparison of root canal measurement in primary teeth. Journal of Indian Society of Pedodontics and Preventive Dentistry 2005; 23: 124.
16. Plotino G, Grande NM, Brigante L, et al. Ex vivo accuracy of three electronic apex locators: Root ZX, Elements Diagnostic Unit and Apex Locator and ProPex. Int Endod J 2006; 39: 408–414.
17. Tosun G, Erdemir A, Eldeniz AU, et al. Accuracy of two electronic apex locators in primary teeth with and without apical resorption: a laboratory study. Int Endod J 2008; 41: 436–441.
18. Kielbassa AM, Muller U, Munz I, et al. Clinical evaluation of the measuring accuracy of ROOT ZX in primary teeth. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2003; 95: 94–100.
19. Leonardo MR, Silva LAB, Nelson-Filho P, et al. Ex vivo evaluation of the accuracy of two electronic apex locators during root canal length determination in primary teeth. International Endodontic Journal 2008; 41: 317–321.
20. Katz A, Mass E, Kaufman AY. Electronic apex locator: a useful tool for root canal treatment in the primary dentition. ASDC J Dent Child 1996; 63: 414–417.
21. Subramanyam D, Gurunathan D, Gaayathri R, et al. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. Eur J Dent 2018; 12: 67–70.
22. Ramadurai N, Gurunathan D, Samuel AV, et al. Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. Clin Oral Investig 2019; 23: 3543–3550.
23. Ramakrishnan M, Dhanalakshmi R, Subramanian EMG. Survival rate of different fixed posterior space maintainers used in Paediatric Dentistry – A systematic review. The Saudi Dental Journal 2019; 31: 165–172.
24. Jeevanandan G, Thomas E. Volumetric analysis of hand, reciprocating and rotary instrumentation techniques in primary molars using spiral computed tomography: An in vitro comparative study. Eur J Dent 2018; 12: 21–26.
25. Princeton B, Santhakumar P, Prathap L. Awareness on Preventive Measures taken by Health Care Professionals Attending COVID-19 Patients among Dental Students. Eur J Dent 2020; 14: S105–S109.
26. Saravanakumar K, Park S, Mariadoss AVA, et al. Chemical composition, antioxidant, and anti-diabetic activities of ethyl acetate fraction of Stachys riederi var. japonica (Miq.) in streptozotocin-induced type 2 diabetic mice. Food Chem Toxicol 2021; 155: 112374.
27. Wei W, Li R, Liu Q, et al. Amelioration of oxidative stress, inflammation and tumor promotion by Tin oxide-Sodium alginate-Polyethylene glycol-Allyl isothiocyanate nanocomposites on the 1,2-Dimethylhydrazine induced colon carcinogenesis in rats. Arabian Journal of Chemistry 2021; 14: 103238.
28. Gothandam K, Ganesan VS, Ayyasamy T, et al. Antioxidant potential of theaflavin ameliorates the activities of key enzymes of glucose metabolism in high fat diet and streptozotocin - induced diabetic rats. Redox Rep 2019; 24: 41–50.
29. Su P, Veeraraghavan VP, Krishna Mohan S, et al. A ginger derivative, zingerone-a phenolic compound-induces ROS-mediated apoptosis in colon cancer cells (HCT-116). J Biochem Mol Toxicol 2019; 33: e22403.
30. Mathew MG, Samuel SR, Soni AJ, et al. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. Clinical Oral Investigations 2020; 24: 3275–3280.
31. Sekar D, Johnson J, Biruntha M, et al. Biological and Clinical Relevance of microRNAs in Mitochondrial Diseases/Dysfunctions. DNA Cell Biol 2020; 39: 1379–1384.
32. Velusamy R, Sakthinathan G, Vignesh R, et al. Tribological and thermal characterization of electron beam physical vapor deposited single layer thin film for TBC application. Surf Topogr: Metrol Prop 2021; 9: 025043.
33. Aldhuwayhi S, Mallineni SK, Sakhamuri S, et al. Covid-19 Knowledge and Perceptions Among Dental Specialists: A Cross-Sectional Online Questionnaire Survey. Risk Manag Healthc Policy 2021; 14: 2851–2861.
34. Sekar D, Nallaswamy D, Lakshmanan G. Decoding the functional role of long noncoding RNAs (lncRNAs) in hypertension progression. Hypertension research: official journal of the Japanese Society of Hypertension 2020; 43: 724–725.
35. Bai L, Li J, Panagal M, et al. Methylation dependent microRNA 1285-5p and sterol carrier proteins 2 in type 2 diabetes mellitus. Artif Cells Nanomed Biotechnol 2019; 47: 3417–3422.
36. Sekar D. Circular RNA: a new biomarker for different types of hypertension. Hypertension research: official journal of the Japanese Society of Hypertension 2019; 42: 1824–1825.
37. Sekar D, Mani P, Biruntha M, et al. Dissecting the functional role of microRNA 21 in osteosarcoma. Cancer Gene Ther 2019; 26: 179–182.
38. Duraisamy R, Krishnan CS, Ramasubramanian H, et al. Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments. Implant Dent 2019; 28: 289–295.
39. Indhulekha V, Ganapathy D, Jain AR. Knowledge and awareness on biomedical waste management among students of four dental colleges in Chennai, India. Drug Invention Today. 2018 Dec 1;10(12):32-41.
40. Jain AR, Dhanraj M. A clinical review of spacer design for conventional complete denture. Biology and Medicine. 2016;8(5):1.
41. Mjör IA. Pulp-dentin Biology in Restorative Dentistry. Quintessence Publishing Company, 2002.

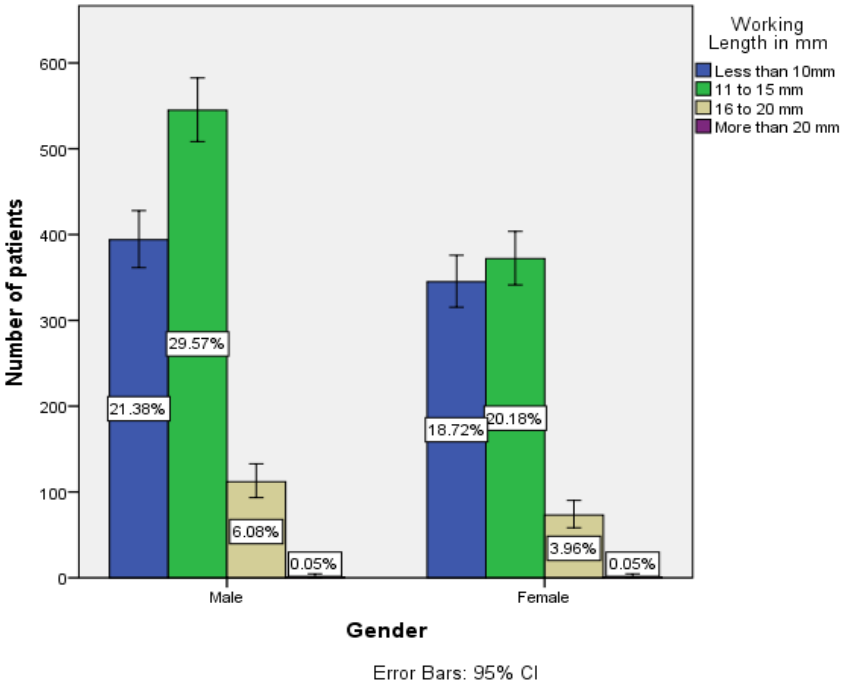

Figure 1 : The bar graph represents the comparison between gender and working length . The horizontal axis represents the gender and the vertical axis represents the working length in mm.

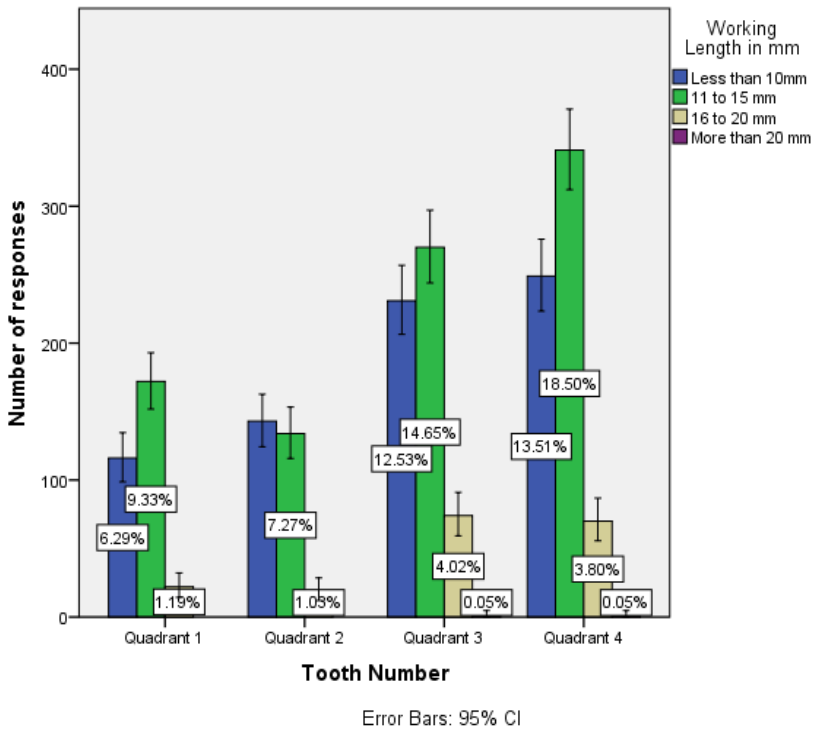

Figure 2 : The bar graph represents the comparison between tooth number and working length . The horizontal axis represents the tooth number and the vertical axis represents the working length in mm.

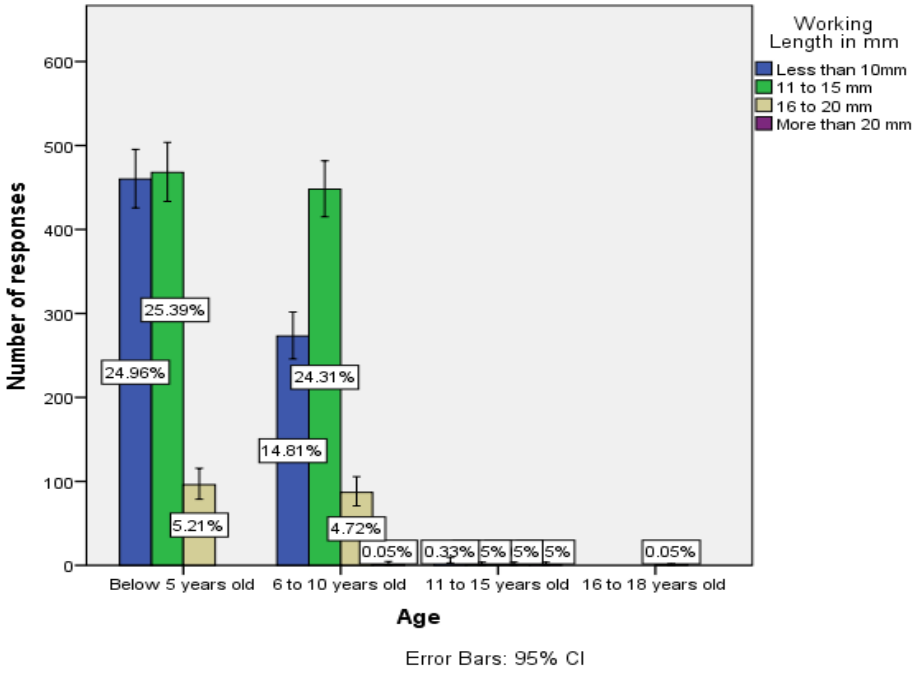

Figure 3 : The bar graph represents the comparison between age and working length . The horizontal axis represents the age and the vertical axis represents the working length in mm.

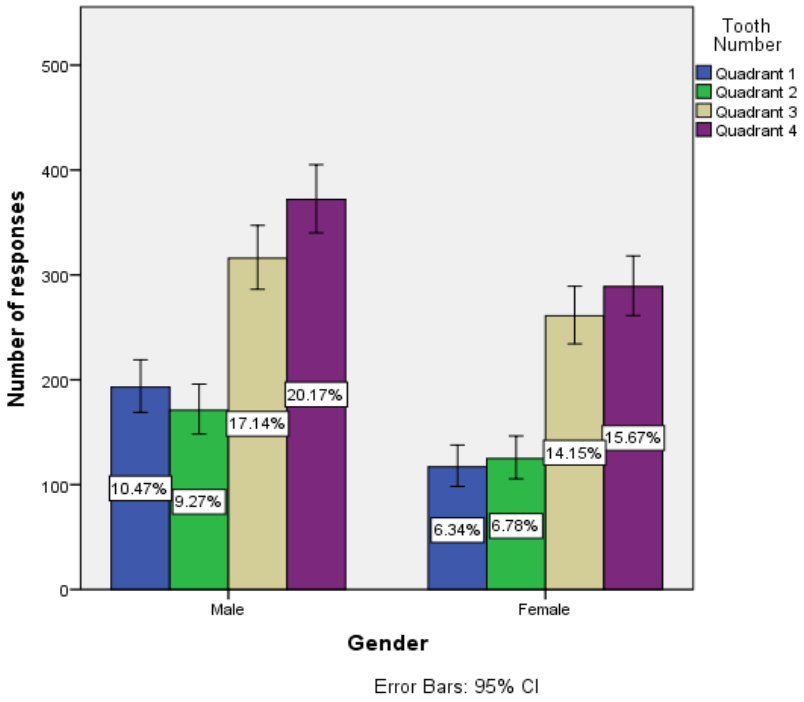

Figure 4 : The bar graph represents the comparison between gender and tooth number . The horizontal axis represents the gender and the vertical axis represents the tooth number.