



Oral Hygiene Index in Children with Stainless Steel Crowns in the Permanent Molars

V. Karthik ^a and E. M. G Subramanian ^{b*#}

^a Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 77, Tamil Nadu, India.

^b Department of Pediatric and Preventive Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 77, Tamil Nadu, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJPR/2024/v14i2322

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/79854>

Original Research Article

Received: 24/11/2021

Accepted: 29/01/2022

Published: 29/01/2024

ABSTRACT

Aim: The aim of this study is to assess the oral hygiene index in children with stainless steel crowns in the permanent molars.

Introduction: Dental caries is a common disease, especially in children. Stainless steel crowns are used for the rehabilitation of carious molars to restore form and function either after root canal treatment or when caries is multi surface. Plaque and debris accumulates around these crowns if children fail to maintain it properly. Oral Hygiene Index shows patient's oral hygiene and the presence of plaque on the surface of the teeth.

Materials and Method: This was a retrospective study conducted in a private dental institution in Chennai. The data was collected from the digital archives information system. 100 patients who fulfilled the inclusion and exclusion criteria were included in the study. The data analysis was performed using SPSS software. The chi square test and pearson correlation was done. p value <0.05 was considered statistically significant.

Professor and Head;

*Corresponding author: Email: subramanian@saveetha.com;

Result: 24 patients had the OHIS score of 1.5, 18 patients had the OHIS score of 2, 24 patients had the OHIS score of 2.5, 18 patients had the OHIS score of 3, 16 patients had the OHIS score of 1. Boys had higher OHI scores compared to girls.

Conclusion: Within the limitations of the study, it can be concluded that 40% children had good oral hygiene scores. Girls had better oral hygiene scores compared to boys. Oral hygiene instructions should be given to children with stainless steel crowns to prevent the spread of caries and gingival diseases to adjacent teeth.

Keywords: stainless steel crown; permanent molars; OHIS score; diet; Innovative technology.

1. INTRODUCTION

Dental caries occur when bacteria, primarily *Streptococcus mutans*, colonise the tooth surface and metabolize dietary carbohydrates to produce lactic and other acids, leading to tooth demineralization [1]. Premature loss of primary molars due to caries can cause arch space loss, leading to crowding of permanent teeth, compromising aesthetics and ultimately which will lead to orthodontic correction [2,3]. The loss of posterior teeth may also affect diet and overall growth and development of a child during the growth period. Hence saving the tooth by pulp therapy and restoring the form and function using stainless steel crowns has been advocated.

Interventions in young children at risk for dental caries focus on reducing the burden of bacteria, reducing refined sugar consumption, and increasing tooth tolerance to caries growth [4]. Fluoride, maternal therapy to improve oral health, xylitol, and topical antimicrobials such as chlorhexidine or povidone-iodine are examples of bacteria-reduction strategies [5,6].

For a long time stainless steel crowns have been a huge part of the therapeutic armamentarium in pediatric dentistry [7]. The main indications for their use is in those primary and permanent teeth that are either hypocalcified or that have various and broad carious lesions and whose pulps have been removed [8]. Therefore stainless steel crowns remain the treatment of choice for the restoration of primary molar teeth although it's not much aesthetic. Shedding of the primary tooth has helped to maintain the aesthetics meanwhile it is preserved through its mixed dentition stage of development [9,10]. For permanent molar teeth, semi permanent restoration that is stainless steel crown are useful and instead it can be used until the molars completely erupt [11]. stainless steel crowns provide full coronal coverage where the recurrence of decay will not be promoted and also the smooth surface of the tooth helps to easily clean using daily oral hygiene practice [12,13]. However plaque and debris accumulates

around these crowns if children fail to maintain it properly. Our team has extensive knowledge and research experience that has translate into high quality publications [14-30].

Oral Hygiene Index is a sensitive, simple method for finding group or individuals oral hygiene quantitatively [31]. It is used by various people since the index helps as a tool in dental epidemiology and program evaluation [32]. Oral Hygiene Index depicts a patient's oral hygiene and depicts the presence of plaque on the tooth surface [33]. OHI helps in the determination of a presence of the dental plaque and food residues [34]. Previous studies had assessed the OHI score based on decay progression in children and probability of getting secondary caries in childrens using crowns were not included. The aim of the present study is to assess the oral hygiene index in children with stainless steel crowns in the permanent molars.

2. MATERIALS AND METHODS

A single centred study was done among outpatient population with stainless steel crowns visiting saveetha dental College and Hospital, chennai, India between August 2020 to January 2021

2.1 Study Sample Size

A total of 500 pediatric dental patients visited the department of pediatric and preventive dentistry during August 2020 and January 2021. Inclusion criteria included healthy children aged 6-18 years with stainless steel crowns. Children outside the age group, not having stainless steel crowns and were medically compromised. 100 patients who fulfilled the exclusion and inclusion criteria were included. Data was analysed from the patient records available in digital information archives system. The data that were collected was compiled into microsoft excel spreadsheet. The age was categorized into three groups 6-10 years, 11-15 years and 15-18 years of age respectively. It was analysed using SPSS, IBM

software version 23 with chi-square test. P value was set as 0.05 as the level of significance.

2.2 Scoring Criteria for OHIS

- 0 – No debris
- *1 – Soft-tissue debris covering <1/3rd of tooth surface
- *2 – Soft-tissue debris covering >1/3rd but <2/3rd of tooth surface
- *3 – Soft-tissue debris covering >2/3rd of tooth surface.

2.3 Inclusion and Exclusion Criteria

All the pediatric patients who visited our dental college with stainless steel crowns in permanent molars were included in the study. Pediatric patients without stainless steel crowns were excluded from this study. In the present study, the sampling method used was a random sampling method.

3. RESULTS

Fig. 1 shows the association between age of the participants and OHIS score, x axis represents the age group distribution as 6-10 years, 11-15 years and 16-18 years respectively axis represents OHIS score which is measured in the patients with stainless steel crowns. Among the age group 6 -10 years ,OHIS score 1.5 is the most common at 5%. P value = 7.24(p>0.05) showing the insignificance.

Fig. 2 shows the association between the gender of the participants and OHIS score. X axis represents the gender, males and females respectively. Y axis represents the OHIS score which is measured in the patients with stainless steel crown in the permanent molars. P value = 2.53 (p>0.05) showing the insignificance. Among the gender, males have the OHIS score of 2.5 and 3 is most common at 14%.

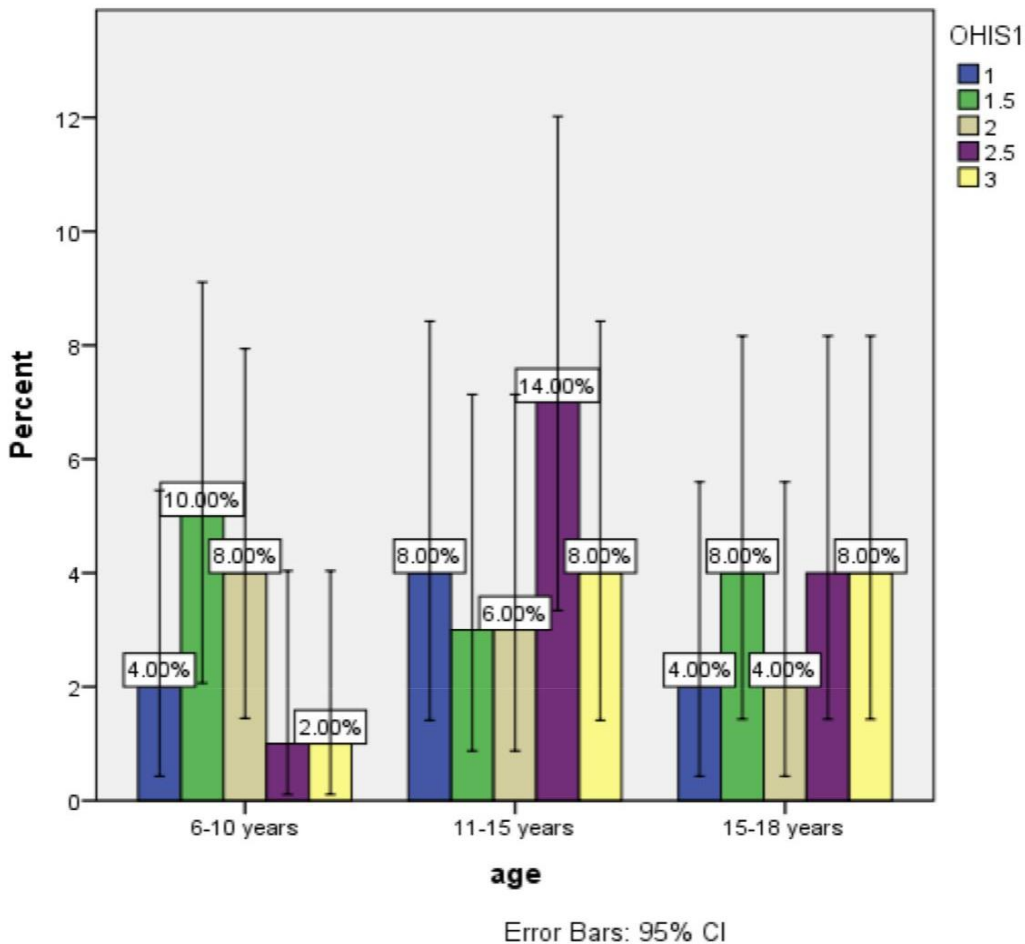


Fig. 1. Association graph between Age and OHIS Score

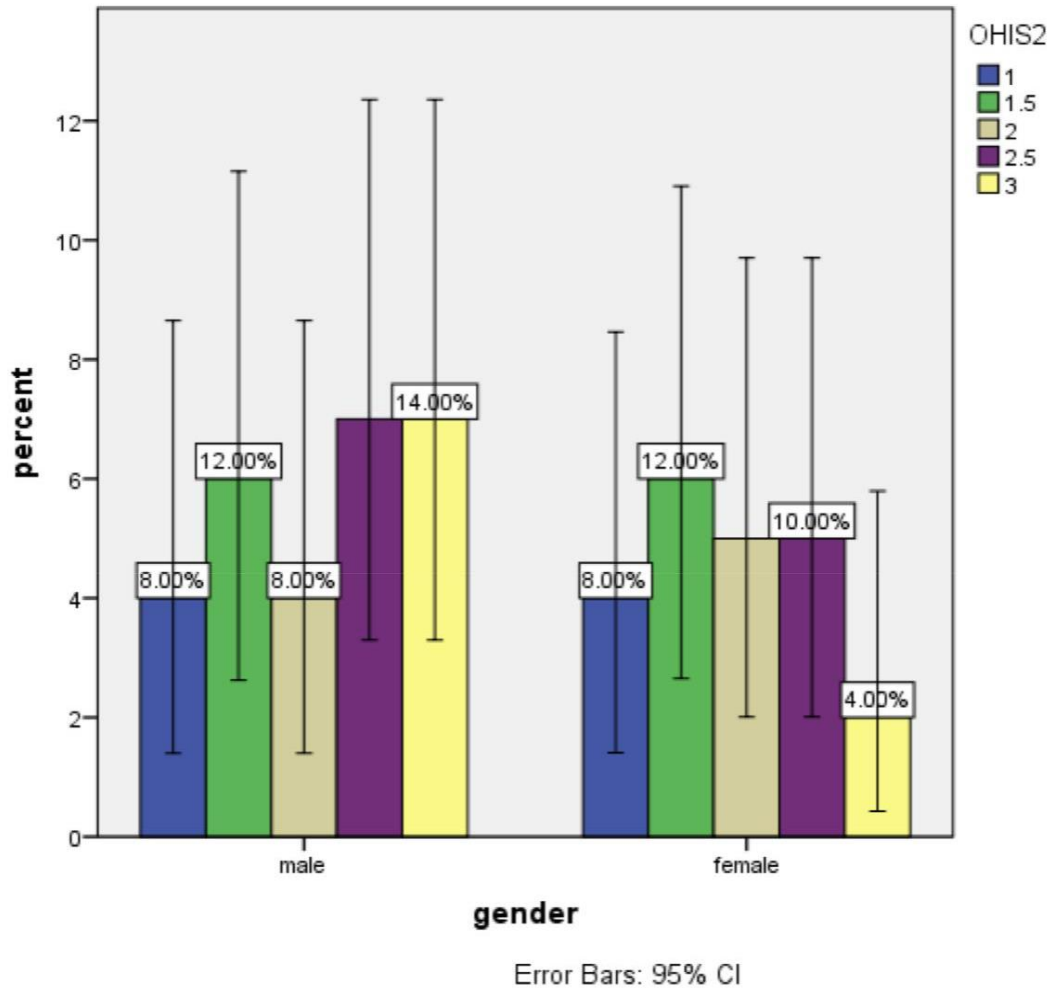


Fig. 2. Association between gender and OHIS score

4. DISCUSSION

Stainless steel crowns have been used for over 70 years for the rehabilitation of primary and permanent molars which are either carious or have developmental defects [35]. Among the age group of 11-15 years 2, OHIS score 2.5 is the most common at 7% and among 16-18 year old, OHIS score of 1.5, 2.5, 3 is common at 4%. collectively among all the study sample age groups. Among all the study sample groups, 24 patients had the OHIS score of 1.5, 18 patients had the OHIS score of 2, 24 patients had the OHIS score of 2.5, 18 patients had the OHIS score of 3, 16 patients had the OHIS score of 1. The full coverage restoration of stainless steel crowns has made it the most successful restoration of choice for children with multi surface carious lesions in both primary and permanent molars. The longevity and durability of these crowns has not been matched till date

by any other crown [9]. Among the females OHIS score of 1.5 is the most common at 12% [36]. Despite these advantages, a major disadvantage is the metallic appearance of the crown which has been considered anesthetic. However plaque has been found to accumulate more on stainless steel crowns compared to natural teeth which allows patient education about their oral hygiene [12]. In the present study 40% children had good oral hygiene scores. This is similar to previous studies. In the present study, 14% children aged 11-15 showed a score of 2 indicating moderate oral hygiene. This could be due to the fact that children in this age group are teenagers and have a slight aversion to what they are told. In contrast, children aged 15-18 showed better OHI scores. This could be due to the fact that teenagers have matured and understood the consequences of their actions [37]. Oral hygiene instructions should be given to all children with crowns. This is because crowns

can act as a foci of infection for future caries and periodontal diseases [38]. Our study has a few limitations. The study that is conducted includes a very small sample size and the outcome depends on the age of the patients visiting the hospital.

5. CONCLUSION

Within the limitations of the study, it was found that children had good oral hygiene. Children in the age group 11-15 had poorer oral hygiene compared to children between 6-10 and 15-18. Girls were found to have better oral hygiene than boys.

6. LIMITATIONS

This study was conducted within the saveetha dental college and only in permanent molars.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

FUNDING

The present project is funded by

- Saveetha Institute of Medical and Technical sciences
- Saveetha Dental college and Hospitals
- Saveetha University
- VKK building contractors.

ACKNOWLEDGEMENT

The authors would like to acknowledge the help rendered by Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Website [Internet]. Available from: Kokoceva-Ivanovska O, Carcev M. Ultra-Structural Changes of the Early Childhood Caries Starting Phases of Development [Internet]. Balkan Journal of Dental Medicine. 2014;18:38–40. Available:<http://dx.doi.org/10.1515/bjdm-2015-0006>
2. Douglass JM. Response to Tinanoff and Palmer: Dietary Determinants of Dental Caries and Dietary Recommendations for Preschool Children [Internet]. Vol. 60, Journal of Public Health Dentistry. 2000; 207–9. Available:<http://dx.doi.org/10.1111/j.1752-7325.2000.tb03329.x>
3. Zimmer S, Robke FJ, Roulet J-F. Caries prevention with fluoride varnish in a socially deprived community. Community Dentistry and Oral Epidemiology. 1998;27: 103–8. Available: <http://dx.doi.org/10.1111/j.1600-0528.1998.tb01998.x>
4. Schwendicke F, Frencken J, Innes N. Caries Excavation: Evolution of Treating Cavitated Carious Lesions [Internet]. Karger Medical and Scientific Publishers; 2018;176. Available:<https://play.google.com/store/books/details?id=HNVeDwAAQBAJ>
5. Jaksic-Gvozdic D, Milovanovic J. Socioeconomic significance and prevention of early childhood caries. Acta stomatologica Naissi. 2014;30;1362–72. Available:<http://dx.doi.org/10.5937/asn1469362j>
6. Nagy K, Tusek I. Prevalence, severity and risk factors for development of early childhood caries [Internet]. Stomatoloski Informator. 2012;5–10. Available:<http://dx.doi.org/10.5937/stominf1231005n>
7. Meyer F, Enax J. Early Childhood Caries: Epidemiology, Aetiology, and Prevention. International Journal of Dentistry. 2018; 2018:1–7. Available:<http://dx.doi.org/10.1155/2018/1415873>
8. Weintraub JA. Prevention of early childhood caries: a public health perspective. Community Dentistry and Oral Epidemiology. 1998;26:62–6. Available:<http://dx.doi.org/10.1111/j.1600-0528.1998.tb02095.x>

9. Prabhu S, Krishnamoorthy SH, Sathyaprasad S, Chandra H, Divyia J, Mohan A. Gingival, oral hygiene and periodontal status of the teeth restored with stainless steel crown: A prospective study. *Journal of Indian Society of Pedodontics and Preventive Dentistry*. 2018;36:273. Available:http://dx.doi.org/10.4103/jisppd.jisppd_227_17
10. Salama A. Zirconia Crowns versus Preveneered Stainless Steel Crowns in Primary Anterior Teeth A Retrospective Study of Clinical Performance and Parental Satisfaction. *Egyptian Dental Journal*. 2018;64:3075–84. Available:<http://dx.doi.org/10.21608/edj.2018.78283>
11. Pai R, Virupaxi S, Mandroli P. Retentive strength of luting cements for stainless steel crowns: A systematic review. *Journal of Indian Society of Pedodontics and Preventive Dentistry*. 2020;38:2. Available:http://dx.doi.org/10.4103/jisppd.jisppd_313_19
12. Stainless Steel Crown: A Review Article [Internet]. *Indian Journal of Forensic Medicine & Toxicology*; 2020. Available:<http://dx.doi.org/10.37506/ijfamt.v14i4.13169>
13. Hajjahmadi M, Akhlaghi N, Golbidi M. Attitudes of parents and children toward primary molars restoration with stainless steel crown. *Contemporary Clinical Dentistry*. 2017;8:421. Available:http://dx.doi.org/10.4103/ccd.ccd_379_17
14. Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *Eur J Dent* 2018; 12(1):67–70. Available:http://dx.doi.org/10.4103/ejd.ejd_266_17
15. Ramadurai N, Gurunathan D, Samuel AV, Subramanian E, Rodrigues SJL. Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. *Clin Oral Investig*. 2019 ;23(9):3543–50. Available:<http://dx.doi.org/10.1007/s00784-018-2775-5>
16. 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;31:165–72. Available:<http://dx.doi.org/10.1016/j.sdentj.2019.02.037>
17. 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(1):21–6. Available:http://dx.doi.org/10.4103/ejd.ejd_247_17
18. 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(S 01):S105–9. Available:<http://dx.doi.org/10.1055/s-0040-1721296>
19. Saravanakumar K, Park S, Mariadoss AVA, Sathiyaseelan A, Veeraraghavan VP, Kim S, 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. Available:<http://dx.doi.org/10.1016/j.fct.2021.112374>
20. Wei W, Li R, Liu Q, Devanathadesikan Seshadri V, Veeraraghavan VP, Surapaneni KM, 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(8):103238. Available:<https://www.sciencedirect.com/science/article/pii/S1878535221002537>
21. Gothandam K, Ganesan VS, Ayyasamy T, Ramalingam S. 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(1):41–50. Available:<http://dx.doi.org/10.1080/1351002.2019.1624085>
22. Su P, Veeraraghavan VP, Krishna Mohan S, Lu W. A ginger derivative, zingerone-a phenolic compound-induces ROS-mediated apoptosis in colon cancer cells

- (HCT-116). *J Biochem Mol Toxicol* 2019; 33(12):e22403.
Available:<http://dx.doi.org/10.1002/jbt.22403>
23. Mathew MG, Samuel SR, Soni AJ, Roopa KB. 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;24:3275–80.
Available:<http://dx.doi.org/10.1007/s00784-020-03204-9>
24. Sekar D, Johnson J, Biruntha M, Lakhmanan G, Gurunathan D, Ross K. Biological and Clinical Relevance of microRNAs in Mitochondrial Diseases/Dysfunctions. *DNA Cell Biol*. 2020;39(8):1379–84.
Available:<http://dx.doi.org/10.1089/dna.2019.5013>
25. Velusamy R, Sakthinathan G, Vignesh R, Kumarasamy A, Sathishkumar D, Nithya Priya K, et al. Tribological and thermal characterization of electron beam physical vapor deposited single layer thin film for TBC application. *Surf Topogr: Metrol Prop* [Internet]. 2021;9(2):025043. [cited 2021 Aug 10]
Available:<https://iopscience.iop.org/article/10.1088/2051-672X/ac0c61/meta>
26. Aldhuwayhi S, Mallineni SK, Sakhamuri S, Thakare AA, Mallineni S, Sajja R, et al. Covid-19 Knowledge and Perceptions Among Dental Specialists: A Cross-Sectional Online Questionnaire Survey. *Risk Manag Healthc Policy*. 2021;14:2851–61.
Available:<http://dx.doi.org/10.2147/RMHP.S306880>
27. S A, Abirami S, Navaneethan R, Varghese R. Comparison between antegonial notch depth, symphysis morphology and ramus morphology among different growth patterns in skeletal class I and class II subjects. *International Journal of Research in Pharmaceutical Sciences*. 2020;11:1975–83.
Available:<http://dx.doi.org/10.26452/ijrps.v11ispl3.3703>
28. G NK, Nithya KG, Bhagya LT, Prabhu D. Radiographic evaluation of permanent second molar development based on nollas stage of tooth development in 9-11-year-old male children. *International Journal of Research in Pharmaceutical Sciences*. 2020;469–74.
Available:<http://dx.doi.org/10.26452/ijrps.v11ispl3.2968>
29. Radiographic Evaluation of Permanent Canine Development Based on Nollas Stage of Tooth Development In 6–8-Year-Old Male Children. *Journal of Contemporary Issues in Business and Government*. 2021;27..
Available:<http://dx.doi.org/10.47750/cibg.2021.27.02.035>
30. Radiographic Evaluation of Permanent Canine Development Based on Nollas Stage of Tooth Development In 6–8-Year-Old Male Children [Internet]. *Journal of Contemporary Issues in Business and Government*. 2021;27.
Available:<http://dx.doi.org/10.47750/cibg.2021.27.02.035>
31. Beldüz Kara N, Yilmaz Y. Assessment of oral hygiene and periodontal health around posterior primary molars after their restoration with various crown types. *Int J Paediatr Dent*. 2014;24(4):303–13.
Available:<http://dx.doi.org/10.1111/ipd.12074>
32. Williams L. Stimulating and Promoting Excellent Oral Hygiene in Periodontal Patients [Internet]. Vol. 3, *Primary Dental Journal*. 2014. p. 81–3. Available from: <http://dx.doi.org/10.1308/205016814812736754>
33. Gurenlian J. Using technology to improve oral health [Internet]. Vol. 12, *International Journal of Dental Hygiene*. 2014;12:159–159.
Available:<http://dx.doi.org/10.1111/idh.12089>
34. Kokoceva-Ivanovska OR, Sarakinova O, Zabokova-Bilbilova E, Mijoska AN, Stavreva N. Oral Hygiene Index in Early Childhood Caries, Before and After Topical Fluoride Treatment. *Open Access Maced J Med Sci* [Internet]. 2018;6(2):378–83.
Available:<http://dx.doi.org/10.3889/oamjms.2018.070>
35. Mathew MG, Roopa KB, Soni AJ. Evaluation of clinical success, parental and child satisfaction of stainless steel crowns and zirconia crowns in primary molars. *Journal of Family* [Internet]; 2020.
Available:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7266243/>
36. Weinstein P, Harrison R, Benton T. Motivating parents to prevent caries in their young children: one-year findings. *J Am*

- Dent Assoc [Internet]. 2004;135(6): 731–8.
Available:<http://dx.doi.org/10.14219/jada.archive.2004.0299>
37. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. Int J Paediatr Dent [Internet]. 2007;17(6):391–406.
Available:<http://doi.wiley.com/10.1111/j.1365-263X.2007.00872.x>
38. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary. Clin Oral Investig [Internet]; 2020.
Available:<https://link.springer.com/article/10.1007/s00784-020-03204-9>

© 2024 Karthik and Subramanian; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/79854>