Original Research Article

PREVALENCE OF DENTAL CARIES IN PERMANENT SECOND MOLARS IN TEENAGERS USING ICDAS

ABSTRACT :

Introduction : Dental caries is a chronic disease of the tooth which is represented by demineralisation and destruction of the organic matter of the tooth. Dental caries are versatile, capable of affecting the crown portion of the tooth initially, and may affect the unprotected root surfaces later on. International Caries Detection and Assessment System (ICDAS) provides a systematic approach of reviewing the available clinical dental caries to evaluate the development of dental caries

Materials and method : This study is a single centered retrospective study in which the data was collected from a private dental college and hospital in Chennai, India. Patient details were collected from the hospital management system and a total of 1804 samples were collected. The data was tabulated using Excel and then statistically analysed using the latest version of SPSS software.

Results and discussion : The prevalence of ICDAS score 3 in second molars is higher in 17 year old patients with 2.88% in maxillary right second molars, 3.33% in maxillary left second molars, 3.55% in mandibular left second molars and 3.71% in mandibular right second molars. The prevalence of dental caries in permanent second molar is 9.34%. It is seen that ICDAS score 3 is 8.71% prevalent followed by ICDAS score 5 which is 0.63%.

Conclusion : Within the limitations of the study, it was found that the prevalence of dental caries in permanent second molars is 9.34% with ICDAS score 3 being the most prevalent followed by ICDAS score 5 which is 0.63%.

Keywords : Dental caries, ICDAS classification, innovative criteria

INTRODUCTION :

Dental caries, also commonly referred to as tooth decay, is a prevalent chronic disorder of the tooth(1). Risk factors for tooth decay include physical, biological, environmental and lifestyle related elements. These risk factors lead to stepwise demineralisation and remineralisation of the hard tissues present in the teeth(2). Dental caries can be present throughout the lifetime, in both deciduous and secondary dentition(3). Dental caries result as an outcome of interaction between microbes that produce acid, fermentable sugars and other host elements like saliva and environment of the oral cavity(4). Dental caries affects the crown portion of the tooth initially, and may affect the unprotected root surfaces later on(5). The equity between microbial and defensive factors impact and determine the start, development and advancement of the dental

Comment [A1]: Dental caries is repeated many times in the para

caries(6). Dental caries may be as simple as pit and fissure caries which can be treated with pit and fissure sealants or may involve enamel, dentin and pulp which requires restoration, deep caries restoration or root canal treatment accordingly(7).

Assessing and recording of carious lesions is the key component in the assessing phase of the dental hygiene process of care(8). Measuring dental caries is necessary for conducting epidemiological studies among population groups, for public health programme arrangement and assessment, and to test prevention and control procedures(9). The ICDAS system serves as a fair measuring unit for dental caries(10). International Caries Detection and Assessment System (ICDAS) provides a systematic approach of reviewing the available clinical dental caries to evaluate the development of dental caries(11). ICDAS score 0 represents sound tooth structure, score 1 represents the first noticeable visual change in the enamel, score 2 represents the marked visual change in the enamel, score 3 represents the localised enamel break down involving no visible dentin, score 4 represents the underlying dark shadow from the dentin which may or may not involve enamel breakdown, score 5 represents distinct cavity with visible dentin and score 6 represents extensive distinct cavity with visible dentin(12). Prevalence of dental caries is computed with taking factors like percent of people impacted, number of tooth affected, number of teeth surfaces involved and extent, magnitude and severity of the carious lesion(13).

Comment [A2]: Rephrase the sentence

Dental caries being an irregularly distributed disease, is preventable and treatable, in which economic status, nutrients and lifestyle habits play a major role(14). To achieve primary prevention of dental caries, the focus should be targeted on factors like acid producing bacteria, insufficient saliva flow, deficient exposure to fluoride, poor economic status, imbalance in diet and improper maintenance of oral hygiene(15). Secondary prevention approach and management should focus on managing the development of dental caries by using comparatively less intrusive and conservative treatment for the patients(16) . Many studies show that everyday use of fluoride toothpaste has proven a key factor in reducing the dental caries all over the world in recent years(17). Our team has extensive knowledge and research experience that has translate into high quality publications(18–30)(31–37). The aim of this study is to evaluate the prevalence of dental caries in permanent second molars in teenagers using ICDAS.

MATERIALS AND METHODS :

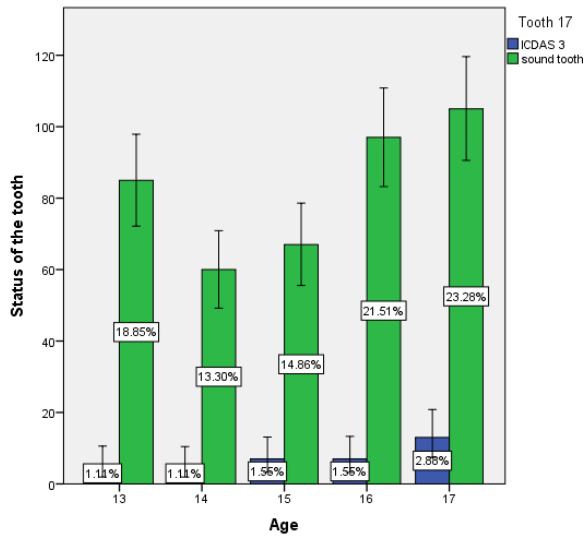
This was a single centered retrospective study done in a university hospital setting. The patient details were collected from the hospital management system from a private dental college and hospital in Chennai, India. Patient records between June 2019 and February 2021 were analysed. A total of 1804 teenagers who visited the hospital for dental treatment were included for data collection. The inclusion criteria included children within the age group of 13 to 17. Children from other age groups and problems other than dental caries were excluded. The data was

Comment [A3]: How was the sample size calculated

collected, tabulated and analysed using Excel sheet. These data were cross verified with photographs. Approval from the ethical committee was taken before beginning the study.
The collected data was later transferred and analysed using the latest version of SPSS software for statistical analysis. Frequency distribution was done to analyse the data. For chi square test, p value was set as 0.05 as level of significance.

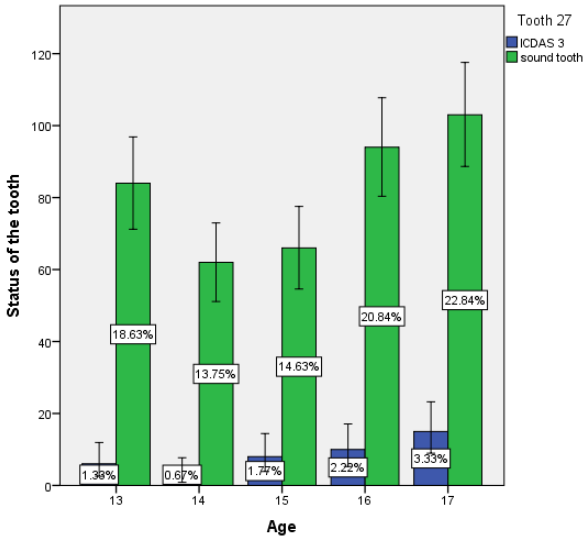
RESULTS :

From the data collected in this study, it is seen that ICDAS score 3 is more prevalently seen in 17 year old patients. ICDAS score 3 is 8.71% prevalent which is followed by ICDAS score 5 which is 0.63% prevalent. ICDAS score 1,2, and 4 are not seen in these samples. Graph 1 represents the percentile distribution of correlation between the age of the patients and status of maxillary right second molar wherein X axis represents the age of the patients participating and Y axis represents the count of the teeth. Blue colour denotes that the tooth is scored 3 in the ICDAS system and green colour denotes that the status of the tooth is sound. Prevalence of dental caries with ICDAS score 3 is most prevalent in 17 year old patients (2.88%) followed by 16 year old patients (1.55%) when observed in maxillary right second molar. The p value of the correlation graph is found to be 0.635(>0.05) which is statistically insignificant.



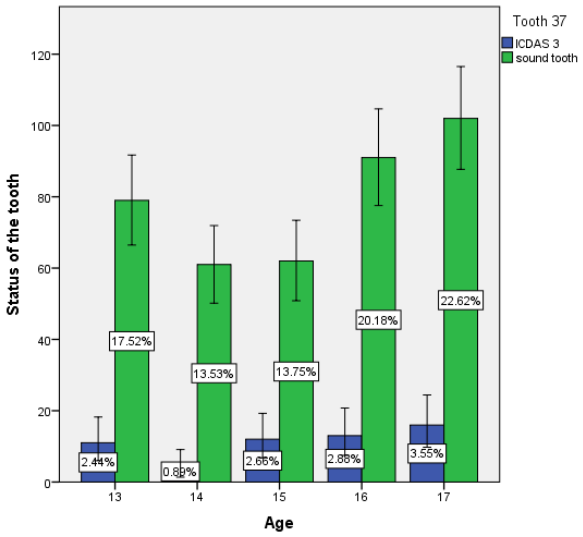
Graph 1 : Percentile distribution of correlation between age of the patients and status of maxillary right second molar. The p value is 0.635(>0.05) which is statistically insignificant.

Graph 2 represents the percentile distribution of correlation between the age of the patients and status of maxillary left second molar wherein X axis represents the age of the patients participating and Y axis represents the count of the teeth. Blue colour denotes that the tooth is scored 3 in the ICDAS system and green colour denotes that the status of the tooth is sound. Prevalence of dental caries with ICDAS score 3 is most prevalent in 17 year old patients (3.33%) followed by 16 year old patients (2.22%) when observed in maxillary left second molar. The p value of the correlation graph is found to be 0.371(>0.05) which is statistically insignificant.



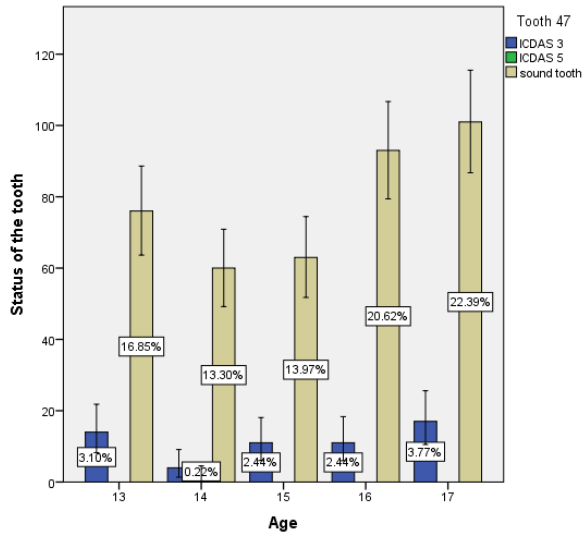
Graph 2 : Percentile distribution of correlation between age of the patients and status of maxillary left second molar. The p value is 0.371 (>0.05) which is statistically insignificant.

Graph 3 represents the percentile distribution of correlation between the age of the patients participating and the status of mandibular left second molar wherein X axis represents the age of the patients participating and Y axis represents the count of the teeth. Blue colour denotes that the tooth is scored 3 in the ICDAS system and green colour denotes that the status of the tooth is sound. Prevalence of dental caries with ICDAS score 3 is most prevalent in 17 year old patients (3.55%) followed by 16 year old patients (2.88%) when observed in mandibular left second molar. The p value of the correlation graph is found to be 0.482(>0.05) which is statistically insignificant.



Graph 3 : Percentile distribution of correlation between age of the patients and status of mandibular left second molar. The p value is 0.482 (>0.05) which is statistically insignificant.

Graph 4 represents the percentile distribution of correlation between the age of the patients participating and the status of mandibular right second molar wherein X axis represents the age of the patients participating and Y axis represents the count of the teeth. Blue colour denotes that the tooth is scored 3 in the ICDAS system, green colour denotes that the tooth is scored 5 in the ICDAS system and beige colour denotes that the status of the tooth is sound. Prevalence of dental caries with ICDAS score 3 is most prevalent in 17 year old patients (3.77%) followed by 13 year old patients (3.10%) when observed in mandibular right second molar. The p value of the correlation graph is found to be 0.262(>0.05) which is statistically insignificant. The prevalence of dental caries in permanent second molar is 9.34%. It is seen that ICDAS score 3 is 8.71% prevalent followed by ICDAS score 5 which is 0.63%.



Graph 4 : Percentile distribution of correlation between age of the patients and status of mandibular right second molar. The p value is 0.262 (>0.05) which is statistically insignificant.

DISCUSSION :

The risk of getting tooth decay varies with the location of the tooth. Posterior teeth like molars and premolars have higher probability for developing dental caries(38). Presence of increased number of grooves, pit and fissures and multiple roots contributes to easier development of dental caries in posterior teeth(39). It is found in our study that the prevalence of ICDAS score 3 in second molars is higher in 17 year old patients with 2.88% in maxillary right second molars, 3.33% in maxillary left second molars, 3.55% in mandibular left second molars and 3.71% in mandibular right second molars. The prevalence of dental caries in permanent second molar is 9.34%. It is seen that ICDAS score 3 is 8.71% prevalent followed by ICDAS score 5 which is 0.63%. There is a gradual increase in the incidence of dental caries with ICDAS score 3 with age in the teenagers.

In an article by Alm A, et al., approximal caries prevalence was recorded in various age groups. The article concluded that the prevalence of dental caries in teenagers was more common in 15 year old patients (40). This is in contradiction with the findings from our study which showed that prevalence of dental caries in second molars were more in 17 year old patients. Alshahrani, et al., in 2018 collected clinical data of dental status from 20 male teenagers and analysed the prevalence of dental caries (41). Prevalence of dental caries in the population was found to be 72.9% with maximum prevalence in the posterior teeth. This is in accordance with our study which shows 9.34% of dental caries prevalence in the second molars.

Comment [A4]: A study conducted

Migle, et al., studied the prevalence and severity of dental caries in teenagers in Lithuanian countries(42). 18 year olds had had the most prevalence of dental caries in that cross sectional study. This is in slight accordance with our study wherein the prevalence of dental caries was more in 17 year old patients. Skinner J, et al., studied the correlation between increased intake of sugary drinks and prevalence of dental caries in teenagers in Australia(43). The study showed that 16 years old were more prone to dental caries which goes hand in hand with our study where 17 year olds were more prevalent for developing dental caries in second molars.

CONCLUSION : Within the limitations of the study, it was found that the prevalence of dental caries in permanent second molars is 9.34% with ICDAS score 3 being the most prevalent followed by ICDAS score 5 which is 0.63%. 17 year olds were the most affected teenagers. Preventive measures like using fluoride toothpaste, maintaining good oral hygiene, having balanced nutritious diet and limiting sugary drinks will go a long way to prevent dental caries.

ETHICAL CLEARANCE : Taken from Saveetha Institute Human Ethical Committee.

REFERENCES :

1. Selwitz RH, Ismail AI, Pitts NB. Dental caries. Lancet. 2007 Jan 6;369(9555):51–9.
2. Guzmán-Armstrong S, Fontana M, Nascimento M, Zandona A. Caries Management. Elsevier Health Sciences; 2019.
3. da Silva GS, Anabuki AA, Viana KA, Corrêa-Faria P, Moterane MM, Tedesco TK, et al. Sedation versus protective stabilization for dental treatment of children with caries and challenging behavior at the dentist (CHOOSE): a study protocol for a non-randomized clinical trial. BMC Oral Health. 2021 May 12;21(1):256.
4. Rodrigues Neto EM, Valadas LAR, Lobo PLD, Fonseca SG da C, Fechine FV, Lotif MAL, et al. Antimicrobial Efficacy of Propolis-Containing Varnish in Children: A Randomized and Double-Blind Clinical Trial. Evid Based Complement Alternat Med. 2021 Apr 26;2021:5547081.
5. Navarro CLA, Grgic O, Trajanoska K, van der Tas JT, Rivadeneira F, Wolvius EB, et al. Associations Between Prenatal, Perinatal, and Early Childhood Vitamin D Status and Risk of Dental Caries at 6 Years. J Nutr [Internet]. 2021 May 12; Available from: http://dx.doi.org/10.1093/jn/nxab075
6. Hadler-Olsen E, Jönsson B. Oral health and use of dental services in different stages of adulthood in Norway: a cross sectional study. BMC Oral Health. 2021 May 13;21(1):257.

7. Mahboobi Z, Pakdaman A, Yazdani R, Azadbakht L, Shamshiri AR, Babaei A. Caries incidence of the first permanent molars according to the Caries Assessment Spectrum and Treatment (CAST) index and its determinants in children: a cohort study. BMC Oral Health. 2021 May 13;21(1):259.

8. Theocharopoulou A, Lagerweij MD, van Strijp AJ. Use of the ICDAS system and two fluorescence-based intraoral devices for examination of occlusal surfaces. Eur J Paediatr Dent. 2015 Mar;16(1):51–5.

9. Ali S, Gilani SBS, Shabbir J, Almulhim KS, Bugshan A, Farooq I. Optical coherence tomography's current clinical medical and dental applications: a review. F1000Res. 2021 Apr 22;10:310.

10. Ekstrand KR, Gimenez T, Ferreira FR, Mendes FM, Braga MM. The International Caries Detection and Assessment System – ICDAS: A Systematic Review [Internet]. Vol. 52, Caries Research. 2018. p. 406–19. Available from: http://dx.doi.org/10.1159/000486429

11. Khattak MI, Csikar J, Vinall K, Douglas G. The views and experiences of general dental practitioners (GDP's) in West Yorkshire who used the International Caries Detection and Assessment System (ICDAS) in research. PLoS One. 2019 Oct 4;14(10):e0223376.

12. Foley JI. Dental students consistency in applying the ICDAS system within paediatric dentistry. Eur Arch Paediatr Dent. 2012 Dec;13(6):319–22.

13. Galarneau C, Arpin S, Boiteau V, Dubé M-A, Hamel D, Wassef N. Dental Caries Experience in Elementary School Students in Quebec: Surveillance Study Using ICDAS II. J Can Dent Assoc. 2020 Jul;86:k3.

14. Badria FA, Zidan OA. Natural products for dental caries prevention. J Med Food. 2004 Autumn;7(3):381–4.

15. Cappelli DMD MPH D, Rd CCM. Prevention in Clinical Oral Health Care. Elsevier Health Sciences; 2007. 312 p.

16. Hamada S, Koga T, Ooshima T. Virulence factors of Streptococcus mutans and dental caries prevention. J Dent Res. 1984 Mar;63(3):407–11.

17. Rodrigues LKA, Nobre dos Santos M, Pereira D, Assaf AV, Pardi V. Carbon dioxide laser in dental caries prevention. J Dent. 2004 Sep;32(7):531–40.

18. 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 Jan;12(1):67–70.

19. 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 Sep;23(9):3543–50.

20. Ramakrishnan M, Dhanalakshmi R, Subramanian EMG. Survival rate of different fixed posterior space maintainers used in Paediatric Dentistry – A systematic review [Internet]. Vol. 31, The Saudi Dental Journal. 2019. p. 165–72. Available from: http://dx.doi.org/10.1016/j.sdentj.2019.02.037

21. 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 Jan;12(1):21–6.

22. 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 Dec;14(S 01):S105–9.

23. 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 Jun 26;155:112374.

24. 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 Aug 1;14(8):103238.

25. 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 Dec;24(1):41–50.

26. 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 Dec;33(12):e22403.

27. 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 [Internet]. Vol. 24, Clinical Oral Investigations. 2020. p. 3275–80. Available from: http://dx.doi.org/10.1007/s00784-020-03204-9

28. 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 Aug;39(8):1379–84.

29. 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. 2021 Jun 24;9(2):025043.

30. 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 Jul 7;14:2851–61.

31. Sekar D, Nallaswamy D, Lakshmanan G. Decoding the functional role of long noncoding RNAs (lncRNAs) in hypertension progression. Hypertens Res. 2020 Jul;43(7):724–5.

32. Bai L, Li J, Panagal M, M B, Sekar D. Methylation dependent microRNA 1285-5p and sterol carrier proteins 2 in type 2 diabetes mellitus. Artif Cells NanomedBiotechnol. 2019 Dec;47(1):3417–22.

33. Sekar D. Circular RNA: a new biomarker for different types of hypertension. Hypertens Res. 2019 Nov;42(11):1824–5.

34. Sekar D, Mani P, Biruntha M, Sivagurunathan P, Karthigeyan M. Dissecting the functional role of microRNA 21 in osteosarcoma. Cancer Gene Ther. 2019 Jul;26(7-8):179–82.

35. Duraisamy R, Krishnan CS, Ramasubramanian H, Sampathkumar J, Mariappan S, NavarasampattiSivaprakasam A. Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments. Implant Dent. 2019 Jun;28(3):289–95.

36. Parimelazhagan R, Umapathy D, Sivakamasundari IR, Sethupathy S, Ali D, Kunka Mohanram R, et al. Association between Tumor Prognosis Marker Visfatin and Proinflammatory Cytokines in Hypertensive Patients. Biomed Res Int. 2021 Mar 16;2021:8568926.

37. Syed MH, Gnanakkan A, Pitchiah S. Exploration of acute toxicity, analgesic, anti-inflammatory, and anti-pyretic activities of the black tunicate, Phallusia nigra (Savigny, 1816) using mice model. Environ Sci Pollut Res Int. 2021 Feb;28(5):5809–21.

38. Pitts NB, Ekstrand KR, The ICDAS Foundation. International Caries Detection and Assessment System (ICDAS) and its International Caries Classification and Management System (ICCMS) - methods for staging of the caries process and enabling dentists to manage caries [Internet]. Vol. 41, Community Dentistry and Oral Epidemiology. 2013. p. e41–52. Available from: http://dx.doi.org/10.1111/cdoe.12025

39. R K, Keerthana R, Nasim I, Chaudhary M. Prevalence of proximal caries in the posterior teeth in patients visiting a dental college [Internet]. Vol. 11, Journal of Complementary Medicine Research. 2020. p. 246. Available from: http://dx.doi.org/10.5455/jcmr.2020.11.04.31

40. Alm A. On dental caries and caries-related factors in children and teenagers. Swed Dent J Suppl. 2008;(195):7–63, 1p preceding table of contents.

41. Alshahrani I, Tikare S, Meer Z, Mustafa A, Abdulwahab M, Sadatullah S. Prevalence of dental caries among male students aged 15–17 years in southern Asir, Saudi Arabia. The Saudi Dental Journal. 2018 Jul 1;30(3):214–8.

42. Žemaitienė M, Grigalauskienė R, Vasiliauskienė I, Saldūnaitė K, Razmienė J, Slabšinskienė E. Prevalence and severity of dental caries among 18-year-old Lithuanian adolescents. Medicina . 2016 Jan 29;52(1):54–60.

43. Skinner J, Byun R, Blinkhorn A, Johnson G. Sugary drink consumption and dental caries in New South Wales teenagers. Aust Dent J. 2015 Jun;60(2):169–75.