

Review Article

Study of Prevalence and Management of Dental Caries in India: A Systematic Review

Wahied Khawar Balwan^{1*}, Neelam Saba²¹Assistant Professor, Department of Zoology, Govt. Degree College Kilhotran, Jammu & Kashmir, India²Assistant Professor, Department of Zoology, Govt. Degree College Doda, Jammu & Kashmir, India**Article History**

Received: 13.07.2023

Accepted: 24.08.2023

Published: 28.08.2023

Journal homepage:<https://www.easpublisher.com>**Quick Response Code**

Abstract: Oral cavity is the mirror which reflects general health. Dental caries is widely prevalent globally but the distribution and severity of dental caries varies across countries and regions. Dental caries is a microbial disease of the teeth that results in decalcification of calcified tissue & dissolution of the softened tissue of the teeth. Dental caries has affected the teeth of all nations, irrespective of geographic and bio-cultural differences. Prevalence of dental caries is a pressing health concern affecting at least half of the Indian population.

Keywords: Oral Cavity, Dental caries, Microbial, Disease, Decalcification, Dissolution.

Copyright © 2023 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Dental caries is a widely prevalent disease worldwide. According to Global Oral Health Data Bank, prevalence varies from 49% to 83% across different countries [1]. Dental caries is a microbial disease of the teeth that results in decalcification of calcified tissue and dissolution of un-calcified tissues (Soft tissue) of the teeth. The word caries derived from Latin word meaning 'rot' or 'decay'. Irrespective of age, it has shown to have a negative impact on the health related quality of life. Data suggests that there has been a decline in the prevalence of dental caries worldwide but has been at markedly different rates in high and middle/low income countries. While there has been a greater decline in the high income countries which could majorly be attributed to the use of fluorides and established preventive programs while in some low and middle income countries, there decline has been less or inverse because of the increasing consumption of sugars and refined foods [2]. Dental caries has multifactorial causes in initiation and progression. It is a dynamic and complex process. Many theories have been proposed for the cause of dental caries like miller's acidogenic theory, proteolytic theory & proteolytic chelation theory. Most widely accepted one is the Miller's acidogenic theory. According to Miller's acidogenic theory the dental caries is a chemo-

parasitic process. The microorganisms, diet and tooth surface plays a role.

1. **Role of Microorganism:** The mouth is full of bacterial species and many of it plays a role in causing dental caries. The main role is by bacteria *Streptococcus mutans* which initiates the caries process. The other bacteria *Lactobacillus acidophilus* play a role in caries progression and Actinomyces is implicated in root caries.
2. **Role of Diet:** The carbohydrate foods are the main substrates for microorganisms. Sticky food like chocolates and other carbohydrates are more caries producing than any other food.
3. **Role of Tooth Surface:** Retentive and difficult areas to clean like pit and fissure, grooves, crowded and mal-aligned teeth, sides of the teeth which make contact with other teeth and partially erupted impacted tooth (wisdom tooth) can cause food retention and these areas of the teeth are more prone for dental caries.
4. **Caries-an acidogenic process:** Any retentive carbohydrate food left for reasonable time in the teeth surfaces are attacked by the bacteria of the mouth. Bacteria by the fermentation process produces acid from the food (refined and sticky carbohydrates), usually the major acid produced is

*Corresponding Author: Dr. Wahied Khawar Balwan

Assistant Professor, Department of Zoology, Govt. Degree College Kilhotran, Jammu & Kashmir, India

lactic acid. These acids act upon the teeth to produce dental caries (cavitation).

5. **Role of Dental Plaque:** Dental plaque is a bio-film made of bacteria's and salivary proteins. It forms on the teeth that are not adequately cleaned. It plays a role in dental caries by locating the bacteria and carbohydrate on the tooth surface so that fermentation & acid formation takes place.

Dental caries (Fig.1) affects all the age groups with teeth, both the age groups with teeth, both genders in all races and all socio-economic groups. Poor oral hygiene and food habits play a major role. Sticky carbohydrate foods especially junk food and snacks get stagnated in the tooth surfaces. If they are left retained for long time, it can initiate dental caries. Children do get more of dental caries because of craving for sweets and chocolates [15, 17, 18].



Figure 1: Different Images of Dental Carries among school going Children of Doda region of Jammu & Kashmir, India

Types of Dental Caries

The types of dental caries can be [16-18]:

1. Based on Duration
 - a. Acute caries and
 - b. Chronic caries
2. Based on Surfaces
 - a. Smooth surface caries
 - b. Pit and fissure caries and
 - c. Root caries
3. Based on Age
 - a. Infant-Nursing bottle caries
 - b. Adolescent caries and
 - c. Senile caries-old age
4. Based on location of the tissue involved
 - a. Enamel caries
 - b. Dentinal caries and
 - c. Cemental caries.

Detection & Role of Dental Caries

In the initial stages caries is chalky white because of decalcification. Later on it becomes dark either black or brown because of accumulation of debris and staining of the surface. Caries activity starts from the surface and starts involving the deeper tissues which results in loss of the decayed tissue causing cavity. When caries involve only enamel there is no pain, when it reaches dentin causes sensitivity and when reaches

pulp which has nerve fibers there will be pain because of inflammation of pulp. It is called pulpitis [16, 17, 21].

Signs & Symptoms of Dental Caries

Dental caries is a multifactorial disease which commonly affects children of all age groups, due to changing lifestyle, food patterns, increased in intake of carbohydrate, and decrease in exposure to fluoride [3]. An individual has to do self-examination of teeth in front of the mirror and look out for any changes like discoloration of teeth especially black or brown color. If there is stagnation of food or any other obvious cavity on the surface of tooth can be dental caries. Sensitivity & pain are felt in the later stages if the caries is deep. In advanced stages the tooth itself will be grossly destructed with only root stumps remaining [16, 17, 18]. The caries teeth are usually black in color which affects appearance. If there is cavity the food can get stagnated leading to bad breath. Moreover bacteria can enter through the tooth into the blood and cause disease in distant organs. This is called as focal infection. If the caries invades the pulp it can cause severe pain [16-18, 20]. If any changes in the teeth as mentioned in signs and symptoms of dental caries are noticed then it is better to seek a professional approach by visiting a dentist.

History of Dental Caries

Dental caries is considered to be a disease of modern civilization. Pre historic humans rarely suffered from dental caries because of their food habits. They ate raw uncooked foods which are mostly fibrous. Even now studies in primitive tribals show low incidence of dental caries. Refined and sticky carbohydrate food which forms the diet in modern society is the main cause of dental caries.

Treatment & Prevention of Dental Caries

It results in loss of teeth. The functions of teeth are for good appearance, speech and chewing. All these functions get affected. Healthy teeth are needed for a pleasant smile which is foremost for self-confidence and appearance. A person without teeth cannot pronounce words accurately. For digestion of food it has to be chewed before swallowing. A person without teeth cannot chew food leading to indigestion [14-16, 19]. Teeth with caries cavity and not involving the pulp can be treated conservatively by doing filling. Various materials are used like silver amalgam, cements and resins. Cosmetic fillings can restore the tooth to its original color, shape and function. If the caries involves the pulp then Root canal treatment (RCT) has to be done to relieve the pain and save the tooth. The RCT treated tooth has to be protected by an artificial crown. If the caries is extensive and grossly destructive then the tooth has to be extracted and replaced by artificial tooth [16-18, 21]. Maintenance of oral hygiene is vital to prevent dental caries and for overall general health. Brushing of teeth with standardized tooth brushes and tooth pastes to be done both in the morning and night. Rinsing the mouth after every meals and drinking water helps to remove the food debris. Chlorhexidine mouth washes, interdental brushes and dental flosses can be used in selected cases. Sugarless chewing gums containing xylitol helps to prevent dental caries. Fluorinated tooth pastes help to reduce caries attack in children. On the whole a good oral hygiene is mandatory to prevent dental caries [16-20].

DISCUSSION

Dental caries is the most prevalent of all oral diseases of childhood due to which it has become the main focus of the dental health profession. Dental caries is seen in almost all geographic areas of the World. The prevalence of dental caries among Indian school going children in primary dentition ranges from 64-78% and in permanent dentition, the value ranges from 18-67%. Female had higher caries incidence than male. Prevalence of 61.8% noticed in low socioeconomic group and 49.1% in high socioeconomic status people [4]. A descriptive type of epidemiological study carried out in the region of Vaishali, Bihar, India, done by Goenka et al. (2018) with a sample size of 1,000 school-going children of 5-13 years age group was examined to find the prevalence of dental caries. In this study population, 312 children were belonging to 5-7 years age group, 353 children belonging to 8-10 years

age group, 335 children belonging to 11-13 years age group. Out of 1,000 children, males were 501 and females were 499. The examination procedure and criteria were those recommended by WHO. The data show that caries prevalence in 5-7 years age group was found to be 65.1%, whereas 8-10 years age group was 56.7% and 11-13 years age group was 45.4%. Thus, the prevalence of caries decreased as the age advanced. This is due to the fact that there is increased awareness of oral hygiene with age. The prevalence rate among gender was found to be 59.3% in males and 51.7% in females. The difference in prevalence of caries among gender has been found to be statistically significant. According to the location, the prevalence of dental caries in the urban population was 58.9%, whereas in the rural population, it was 51.4%. The high caries prevalence in the urban population is due to accessibility to food items rich in refined sugar and reduced intake of coarse food in their diet, and the prevalence value was 61.8% in low-socioeconomic status group. The difference was found to be highly significant statistically [5-7].

Another cross-sectional study was done in Belagavi, Karnataka, India, by Hireman *et al.* (2016) with a sample size of 13,200 children, i.e., the Belagavi district was divided into 11 talukas, 1,200 children were randomly selected from each taluk. There are 200 - 300 primary schools in each taluk comprising of all strata like urban, periurban, and rural. The data from a self-designed screening form based on WHO oral health assessment shows that caries prevalence is high in primary dentition was high in 8-9-year-old schoolchildren, and in permanent dentition it was high in 10-11-year-old children. Thus, the study revealed the overall prevalence of dental caries in primary teeth among 6-11-year-old schoolchildren was 78.9%. This prevalence rate is higher when compared with caries prevalence in other countries like Sri Lanka (65.3%), China (41%), South Africa (39.7%), and the United States (41%) [8-10]. A cross sectional study in schools of Kashmir region of Jammu and Kashmir, India was carried out by Ain et al in 2016 and it was reported that the overall prevalence of dental caries among 12 years old school children was found to be 25%. Frequency of dental caries was found to be higher in low socioeconomic class children as compared to that in upper socioeconomic class [11]. A study carried out by Shah *et al.*, (2016) showed that dental caries prevalence in primary dentition was higher in subjects' ≤ 6 years of age where the prevalence was 50.9%; in subjects 7 to 11 years of age, the prevalence was 25.2%. Caries prevalence in permanent dentition within the age group 7 to 11 was 69.1%, while in subjects' ≥ 12 years, the prevalence was 66.2%. Use of toothbrush was the most prevalent method of cleaning the teeth in both the genders, while toothpaste was reported to be the most prevalent material to be used for tooth cleaning followed by tooth-powder. Highest caries prevalence

was seen in the subjects using datun sticks as a method to clean their teeth (80.5%) [12].

A cross sectional study was carried out by Singh *et al.*, (2014) on 322 children in the age group of 6-12 years studying in different Govt. Schools of Miran Sahib Zone of R.S. Pura Block. The children were assessed for dental caries by 'Oral Cavity Examination' in outdoor daylight or with a torch. Dental caries was diagnosed according to the presence of 'Decayed / Filled Teeth' present according to the WHO oral health survey 1999. Dental caries was assessed in relation to mode of tooth cleaning, children taking sweets/toffees, oral cleanliness habits, education level of mother and income status of family. Over all prevalence of dental caries was found to be 18.01%. The prevalence was slightly higher 18.63% in girls as compared to 17.39% prevalence seen in boys. Low prevalence (7.65%) of Dental caries was seen in children of literate mothers as compared to illiterate mothers having high prevalence rate of 34.12%. the prevalence was higher (100%) in children with bad oral cleanliness as compared to prevalence (14.28%) seen in children with good oral hygiene [13].

CONCLUSION

General health and oral health are inseparable. Dental caries plays an important role in oral health problems. Its prevalence and severity is increasing day by day throughout the world. Prevention is better than cure. Effort and care should be taken from the childhood to prevent dental caries by maintaining a good overall oral hygiene. Healthy fibrous food should be taken. Minimize or avoid the intake of sticky junk food. Everyone should do self-examination to notice any changes like black discoloration and cavity in the tooth. If there is any suspicion of dental caries, better to visit a dentist to restore and save the tooth.

RECOMMENDATIONS

In order to raise the awareness about oral health, a widespread oral health education regarding the dietary habits and oral hygiene practices is required involving the schools as well as community as a whole. India, being a developing country, has inadequate resources for delivery of oral health care to all, so the school based integrated package consisting of emergency dental treatments, affordable preventive measures like fluoride applications, and a traumatic restorative treatment should be organized for the betterment of oral health situation to a large extent. For oral health promotion programs, schools as well as primary health care centres should be involved by the health policy makers so as to trim down the dental caries burden. Moreover, oral health related topics should be included in the school curriculum so that the appropriate knowledge and awareness regarding oral health is incorporated among the children at a very early stage which would be carried over by them

throughout their life through adolescence to adulthood. Oral health authorities should also concentrate on policies that increase the accessibility to healthy foods and promote behavioral changes in dietary habits by imposing restrictions on advertising and legislation to control detrimental foods, and bans on the selling of unhealthy food items in and around school premises.

Conflict of interest

Authors declare there is no conflict of interest.

REFERENCES

1. Frencken, J.E., Sharma, P., Stenhouse, L., Green, D., Laverty, D., and Dietrich, T. (2017). Global epidemiology of dental caries and severe periodontitis - a comprehensive review. *J Clin Periodontol.*, 44, S94–105.
2. Lagerweij, M.D., and Van Loveren, C. (2015). Declining Caries Trends: Are We Satisfied? *Curr Oral Health Rep.*, 2(4), 212–217.
3. Hiremath, A., Murugaboopathy, V., Ankol, A.V., Hebbal, M., Mohandoss, S., and Pastay, P. (2016). Prevalence of dental caries among primary school children of India—a cross-sectional study. *J Clin Diagnos Res.*, 10(10).
4. Ebinezer, J., and Nagaraj, V. (2021). Prevalence of dental caries among children in Indian population. *Journal of Scientific Dentistry*, 11(1), 29-30.
5. Goenka, P., Dutta, S., Marwah, N., Sarawgi, A., Nirwan, M., and Mishra, P. (2018). Prevalence of dental caries in children of age 5 to 13 years in district of Vaishali, Bihar, India. *Int J Clin Pediatr Dent.*, 11(5), 359.
6. Wang, Y., Xing, L., Yu, H., and Zhao, L. (2019). Prevalence of dental caries in children and adolescents with type 1 diabetes: a systematic review and meta-analysis. *BMC Oral Health*, 19(1), 213.
7. Musinguzi, N., Kemoli, A.M., and Okullo, I. (2019). Prevalence and treatment needs for early childhood caries among 3-5-year-old children from a rural community in Uganda. *frontiers In. Public Health*, 7, 259.
8. Hiremath, A., Murugaboopathy, V., Ankola, A.V., Hebbal, M., Mohandoss, S., and Pastay, P. (2016). Prevalence of dental caries among primary school children of India—a cross-sectional study. *J Clin Diagnos Res.*, 10(10), ZC47.
9. Nomura, Y., Maung, K., Khine, K., Min, E., Sint, K.M., and Lin, M.P. (2019). Prevalence of dental caries in 5-and 6-year-old Myanmar children. *Int. J. Dent.*, (1), 1–7.
10. Mukouyama, C., Koike, Y., and Hirohara, T. (2018). Transitional changes in the prevalence of dental caries in children and preventive strategies: a review of nationwide annual surveys in Japan. *Oral Health Prev Dent.*, 16(2), 107–111.
11. Ain, T.S., Sultan, S., Gowhar, O., Ravishankar, T.L., and Kumar, S. (2016). Prevalence of dental caries among 12 year old school children in

- Kashmir, India-A cross sectional study. *International journal of contemporary medical research*, 3(7), 2156-2159.
12. Shah, A.F., Tangade, P., Ravishankar, T.L., Tirth, A., Pal, S., and Batra, M (2016). Dental Caries Status of Institutionalized Orphan Children from Jammu and Kashmir, India. *Int J Clin Pediatr Dent.*, 9(4), 364-371.
 13. Singh, G., Kour, G., Mengi, V., and Singh, B. (2014). A study of dental caries among school children in rural area of Jammu. *Annals of Dental Speciality*, 2(1), 1-5.
 14. Shafer (2009). *Dental caries*. Textbook of oral pathology; sixth edition, Elsevier, section II, 409-473.
 15. Philip, S., and Eversole. (2004). *Infection of teeth and bone*. Contemporary oral and maxillofacial pathology; second edition, Mosby, 70-78.
 16. Peter, S. (1999). *Epidemiology, etiology and prevention of dental caries*. Essentials of preventive & community dentistry, first edition, Arya publishing house, 34-179.
 17. Richard, L., and Robert, B. (2006). *Dental Caries*. Oral Microbiology and immunology, first edition, 2006, ASM press Washington, D.C. 233-252.
 18. Sturdevant, (2006). *Cariology*. Art and science of operative dentistry, fifth edition, Elsevier, 67-131.
 19. Wahied, K.B., and Sachdeep, K. (2021). Lifestyle Diseases: The Link between Modern Lifestyle and threat to public health. *Saudi Journal of Medical and Pharmaceutical Sciences*, 7(4), 1-6.
 20. Neelam, S., and Wahied, K.B. (2021). Potential Threat of Emerging and Re-emerging Zoonotic Diseases. *Annals of the Romanian Society for Cell Biology*, 25(5), 29-36.
 21. Balwan, W.K., Neelam, S., and Nazia, R. (2021). A systematic review of Obesity-an Invited disease. *Journal of Natural Remedies*, 1(2), 23-31.

Cite This Article: Wahied Khawar Balwan & Neelam Saba (2023). Study of Prevalence and Management of Dental Caries in India: A Systematic Review. *EAS J Dent Oral Med*, 5(4), 115-119.
