ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 16, Issue, 05, pp.28187-28189, May, 2024
DOI: https://doi.org/10.24941/ijcr.47181.05.2024

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

STRATEGIES FOR DENTAL CARIES PREVENTION AND TREATMENT: A COMPREHENSIVE GUIDE TO CARIES MANAGEMENT

Dr. Zara Suharwardy[1], Dr. Anju Bala[1], Dr. Rajnish K Jain[1], Dr. Ambica Khetarpal[1], Dr. Sandeep Kumar[2] and Dr. Umar Hussain Shah[3]

[1]Department of Conservative Dentistry& Endodontics, PDM Dental College & Research Institute, Bahadurgarh (Haryana), India; [2]Indian Institute of Health Management Research, Jaipur (Rajasthan), India; [3]Department of Orthodontics, Himachal Dental College, Sundernagar (Himachal Pradesh), India

ARTICLE INFO

Article History:
Received 10th February, 2024
Received in revised form
15th March, 2024
Accepted 24th April, 2024
Published online 20th May, 2024

Key words:

Dental Caries, ART, Remineralisation, Fluoride, CPP-ACP, White Spot Lesion.

***Corresponding author:**
Gueu Patrice NAMAN

ABSTRACT

Objective: The purpose of this review article is to provide a comprehensive overview of the current understanding of dental caries, encompassing its etiology, risk factors, diagnostic methods, and management strategies. Through Critical analysis of existing literature and emerging research trends, this review aims to elucidate gaps in knowledge, and propose evidence-based recommendations for improving prevention, diagnosis and treatment approaches to mitigate the burden of dental caries on global oral health. ***Materials and method***: Database system PubMed, Google Scholar, land research gate were used to extract the articles. Only English language studies were accessed. A Boolean search of the PubMed data set was implemented to combine a range of keywords. The following filters were applied: abstract, free full text, full text, clinical trial, randomized control trial, systemic review, meta-analysis and review. More studies were also obtained by manual searches and textbooks on dental caries. ***Results***: By using this process, 683 articles and studies were obtained. The most relevant studies were chosen and used in the current review. The selected articles are included in the reference list. ***Conclusions***: Dental caries management requires a multifaceted approach that integrates preventive, therapeutic strategies. While significant advancement has been made, challenges such as early detection and addressing disparities in access to care remain. By continuing to innovate and prioritize patient centered interventions, we can work towards achieving optimal oral health outcomes and reducing burden of dental caries worldwide.

Citation: ***Dr. Zara Suharwardy, Dr. Anju Bala, Dr. Rajnish K Jain, Dr. Ambica Khetarpal, Dr. Sandeep Kumar and Dr. Umar Hussain Shah.*** **2024.** "Strategies for Dental Caries Prevention and Treatment: A Comprehensive Guide to Caries Management*". International Journal of Current Research*, 16, (05), 28187-28189.

INTRODUCTION

Dental caries is a common chronic infectious resulting from tooth adherent cariogenic bacteria, primarily Streptococcus Mutans, which metabolize sugars to produce acid, demineralizing the tooth structure over time.[1] Dental caries is a term that refers to both the disease and the resulting lesion. The caries process occurs in the biofilm, which is permanently active with every pH fluctuation and the lesion manifest in dental hard tissues.[1] The results of the global burden of disease study released by Lancet in 2017 showed that among 328 diseases, the prevalence of permanent dental caries ranked first and the incidence ranked second. There are around 2.44 billion people worldwide suffering from permanent tooth decay.[2] Management of dental caries has changed significantly in recent years. The new management approaches aim to preserve healthy tissue, as proposed in minimally invasive dentistry.

This aims to achieve several goals, such as implementation of a preventive philosophy, individualized risk assessments for patients, early detection of carious lesions, and remineralization of the noncavitated lesion.[3,4,5] When the pulp is exposed by caries, it can be managed in a more conservative way that includes vital pulp therapy (VPT).[6] Caries prevention, early detection, and a diagnosis based on risk indicators and risk factor assessments are the most current practical approaches. Furthermore, as proposed in minimally invasive dentistry, the new management approaches preserve healthy tissue and maintain pulp vitality.[1] Unfortunately, many dentists continue to treat dental caries and pulp disease with invasive procedures. However, it will undoubtedly take time to shift to non-invasive and minimally invasive techniques in everyday life.[7,8,9] The article provides an overview on various treatment modalities for caries management.

It also discusses the different approaches used to accomplish minimally invasive dentistry based on the extension of the carious lesion.

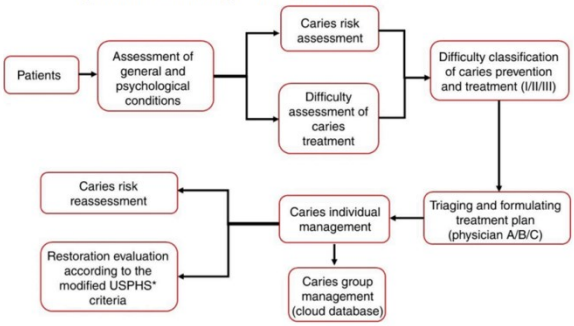
REVIEW

Dental Caries: Dental caries is a complex multifactorial disease characterized by demineralisation of dental hard tissue in deciduous and permanent teeth. If properly managed, dental caries is preventable and reversible disease.[10,4,11,12,13,14]The ecological plaque hypothesis believes that dental caries is not caused by a specific type of microorganism acting alone but is the result of a shift in the microbiota of the dental biofilm towards one cariogenic species. Oral acidic bacteria conditions from regular sugar consumption select the bacteria that empathize more with this environment and eliminate the benign species that do not tolerate such condition.[1]

Caries management: The management of dental caries should be aimed at the following:

- Detecting initial lesions
- Determining caries activity
- Performing a caries risk assessment
- Preventing new carious lesions
- Preserving dental tissue
- Maintaining health of teeth for as long as possible Initially caries should be managed using non-invasive techniques. Minimal invasive approach should be used for cavitated lesions.[1,15]

Dental caries management flow chart
(source- Lei cheng et al March 2022)



Treatment: Following are the treatment approaches for dental caries:

- ***Atraumatic Restorative Treatment:*** Atraumatic restorative treatment (ART) is a minimally invasive technique that involves the removal of decayed tissue with hand instruments alone, usually without the use of anesthesia or electrically powered equipment, and the restoration of the dental cavity with glass ionomer cement or resin-modified glass-ionomer cement and compomers.[16] Much research has been carried out regarding ART. The indications, technique, material, and success of ART have been thoroughly examined in various countries.[17] The ART is valuable therapeutic technique, especially in children, anxious patients, under resourced community and when the dental instruments are not available.[16]

- ***Step-wise Caries removal Technique:*** This procedure involves two independent sessions spaced six months apart to allow changes in dentine and pulp to take place.[18,19,20] Its is indicated when the carious lesion is close to the pulp radiographically (about 75% in to the dentine).[20] In the first visit, the selective caries removal to soft dentine approach is used, and the tooth is restored with glass ionomer restoration. In the second appointment, 6-12 months later, a new periapical radiograph is taken to evaluate periapical pathosis. Selective removal to firm dentine is carried out, glass ionomer may be used or calcium hydroxide as a liner followed by composite resin restoration.[21]

- ***Sealants*:** Sealants are used preventively (stopping the initiation of caries) or therapeutically (arresting the progression of either enamel or dentine caries.) A number of materials are used as sealants including bis-GMA resin, glass ionomer, compomer and flowable composite resin. Sealants are highly effective at caries prevention, reducing the incidence of dental caries over a 40 years period by greater than 50%.[21]

- ***Indirect pulp capping***: Pulp capping is a minimal invasive vital therapy that preserves the pulp vitality of teeth with deep caries lesions or accidental pulp exposure.[22] The IPC approach is used in deep cavity preparation with or without residual carious dentine that is near to the pulp but does not display apparent pulp exposure.[23]Many calcium silicate based materials are used for this like MTA.It aims to preserve vitality of the pulp and promote reparative dentine formation.[23]

- ***White spot lesions:*** This is one of the most conservative approaches to preserve the tooth and pulp vitality while avoiding invasive treatment. This method is called the "micro-invasive procedure".[24] It can be treated with fluoride-containing toothpaste, mouthwash,gels, casein phosphopeptide amorphous calcium phosphate (CPP-ACP) are all advised (25) Early detection and diagnosis of caries based risk indicators and risk factor assessments are effective. Furthermore, Approaches such as noninvasive, microinvasive, and minimally-invasive should be considered, especially when the carious lesions are not cavitated.

REFERENCES

1. Rathee M, Sapra A. Dental Caries. Stat Pearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan.
2. Cheng L., Zhang, L. *et al*. Expert consensus on dental caries management. Int J Oral Sci 2022;14(1):17.
3. Warreth A. Dental Caries and its Management. Int J Dent. 2023;2023:9365845.
4. B.Barett and M. O' Sullivan, "Management of the deep carious lesion: a literature review,' ' Journal of the Irish Dental Association 2021; 67: 36–42.
5. S.Lennon and H.F. Duncan, "Minimally invasive endodontics– pulp fact or pulp fiction?" Journal of the Irish Dental Association 2020; 66:135–138.
6. Simon, S. Perard, M., Zanini, M., Smith, A.J.E. Charpentier, S.X. Djole, P.j. Lumley. Should pulp chamber pulpotomy be seen as a permanent treatment?

Some preliminary thoughts. Int Endod J. 2013;46(1):79-87.
7. Giacaman RA, Munoz- Sandoval C, Neuhaus KW, Fontana M, Chalas R. Evidence based strategies for the minimally invasive treatment of carious lesions: Review of the literature. Adv Clin Exp Med. 2018; 27(7): 1009-1016.
8. Labib ME, Hassanein OE, Moussa M, *et al*. Selective versus stepwise removal of deep carious lesions in permanent teeth: a randomized controlled trial from Egypt– an interim analysis. BMJ Open 2019; 9:e030957.
9. Schwendicke, F., Splieth, C.H., Bottenberg, P., Breschi, L.,Campus, G., Domejean, S., EKSTRAND, K., Giacaman, R.A., Haak, R., Hanning, M., Hickey, R.,Juric,H.,Lussi, A., Machiulskiene, V., Manton, D., jablonski-Momeni, A.,Opdam,N., Paris, S., Santamaria, R.,.. Banerjee, A. How to intervene in the caries process in adults: proximal and secondary caries? An EFCD-ORCA-DGZ expert Delphi consensus statement.Clin Oral Investig 2020; 24(9):3315-3321.
10. European Society of Endodontology (Esc), Duncan F.F; Gallu K.M., et a. European society of endodontology position statement: management of deep caries and the exposed pulp. International Endodontic journal.2019;52:923-934.
11. Derry C. Caries detection and diagnosis, sealants and management of the possibly carious tissue. British Dental Journal 2013;214(11):551-557.
12. Schwendicke F. Walsh T. lamont T., *et al*. Interventions for treating cavitated or dentine carious lesions. Cochrane Database Syst Rev. 2021; 2021(7): CD013039.
13. Urquhart O, Tampi MP, Pilcher L, *et al*. Non Restorative treatments for Caries: Systemic Review and Network Meta-analysis. J Dent Res.2019
14. B Nyvad *et al*. Dental caries from a molecular microbiological perspective. Caries Res.2013;47(2):89-102.
15. Schwendicke F *et al*. Managing carious lesions: Consensus Recommendations on carious tissue removal. Adv Dent Res.2016;28(2):58-67
16. Dorri M *et al*. Atraumatic restorative treatment versus conventional restorative treatment for managing dental caries. Cochrane Database syst Rev.2018;12(12): CD008072.
17. 17.American Academy of Pediatric Dentistry Council on Clinical Affairs. Policy on alternative restorative treatment (ART). Pediatr Dent.2005-2006;27(7 suppl) :30.
18. F Brouwer *et al*. Detecting Secondary Caries lesions: A systematic review and meta-analysis. J Dent Res.2016;95 (2):143-51.
19. Bjornal L *et al*. Randomized clinical trial on Deep carious lesions: 5 Year follow up. J Dent Res.2017;96(7):747-753.
20. Ortega-Verdugo P, Warren JJ, Kolker JL,*et al*. Retrospective analysis of factors associated with the success of stepwise excitation procedure in deep carious lesions. J Am Dent Assoc.2018;149(6):442-450.
21. Deery, C. Caries detection and diagnosis, sealants and management of the possibly carious fissure. Br Dent J 2013; 214:551-557.
22. European Society of Endodontology. Quality guidelines for endodontic treatment: consensus report of the European society of Endodontology. Int Endod J.2006 Dec;39 (12):921-30.
23. Kunert M, Lukomska- Sysmanska M. Bio-Inductive Materials in Direct and Indirect Pulp Capping - A Review Article. Materials (Basel).2020;13(5):1204.
24. Chen Y, Chen D, Lin H. Infiltration and sealing for managing non-cavitated proximal lesions: a systematic review and meta- analysis. BMC Oral Health. 2021;21(1):13.
25. Holmgren, C., Roux, D. & Domejean, S. Minimal intervention dentistry: Atraumatic restorative treatment(art)- a minimum intervention and minimally invasive approach for the management of dental caries. Br Dent J 2013; 214:11-18.

****