REVIEW ARTICLE

Appropriateness of Relying on Tooth Brushing as a Caries Prevention Method

Muhammad Humza Bin Saeed, Nida Ovais, Anum Zehra Khan, Yusuf Bhatti, Farida Pervaiz

ABSTRACT

For a long time, the practice of tooth brushing has been advocated as a highly effective method of maintaining oral hygiene and preventing dental caries, so much so that the efficacy of this practice has never really been questioned. However in the recent literature the greater role in the decline of dental caries has been attributed to the use of fluoridated tooth pastes. Is tooth brushing an effective technique modality for preventing dental caries by itself? Is tooth brushing without any usage of fluoridated tooth pastes effective in achieving a caries free dentition or is the role of the fluoridated toothpaste integral to achieve this?

This article assesses the dental literature available to determine whether it is appropriate to rely on tooth brushing as caries preventive method.

Tooth brushing cannot be completely disregarded as an oral hygiene measure. Following an efficient Tooth-brushing technique with appropriate frequency and Fluoridated Tooth paste can prevent tooth decay.

Key Words: *Tooth Brushing, Caries Prevention, Oral Hygiene* .

Introduction

For a long time, the practice of brushing the teeth has been prevalent in various parts of the world. Ever since tooth brushing has been in practice, it is advocated as an efficient and effective means to prevent dental caries. It has only been recently, since the past few decades, that the concept of dental caries being a multi-factorial disease has been discovered. Does enough evidence exist to support the role of tooth-brushing in the prevention of dental caries? Should the practice of tooth-brushing be still advocated and promoted as an oral health strategy? What role do fluoride containing toothpastes have in the decline in caries prevalence? Are tooth brushes merely carriers for tooth pastes, or do they have any other significant role to play as well?

Tooth Brushing: A Standard of Oral Care:

Tooth-brushing has been a commonly prevalent practice in various cultures for many centuries and toothbrushes have evolved with time. The first reported toothbrushes were the ones that are mentioned in early Chinese literature.[1] In his book published in 1698, Cornells van Solingen – a doctor from the Hague, presented the first toothbrush in Europe.[2] In 1938, Nylon filaments were introduced for the first time.[2] Today, all tooth brushes are essentially made of synthetic materials.[1] Oral hygiene awareness across the globe is on the rise. In the United States only, $3.2 billion are spent every year on public oral hygiene products.[1] Despite the availability of a large variety of oral hygiene products, tooth-brushing remains as the most commonly used measure in oral hygiene practice today.[1]

Correspondence:
Dr. Muhammad Humza Bin Saeed
Assistant Professor
Department of Community Dentistry IIDC,
Riphah International University, Islamabad
Email: humza84@yahoo.com

Multifactorial Aetiology of Dental Caries:

To reason the validity of tooth-brushing as a suitable measure for the prevention of dental caries, the concept of caries and its aetiology must be understood. Edwina Kidd has defined caries as “a process that may take place on any tooth surface in the oral cavity where dental plaque is allowed to develop over a period of time”.[3] Dental plaque has been classified as an example of a biofilm.[3] Jan Lindhe defines biofilm as “the relatively indefinable microbial community associated with a tooth surface or any other hard, non-shredding material”.[1] Hence, the development of the carious process is essentially related to the presence of dental plaque in the tooth surface. Dental plaque formation has been described as a normal, physiological process.[3] The Question arises - Is development of caries a normal physiological process? To answer this question, one has to take a closer look at the factors that lead to the development of caries.Research on the aetiology of caries suggests the development of caries has been described as a multi-factorial process. It is a product

of an interaction of various factors. Four factors have been described as to having a role to play in cariogenesis: host (susceptible tooth surface); environment (reduced salivary flow, low pH); time (bacterial growth only takes place in plaque that has been present for at least 48 hours) and the presence of bacterial plaque.[3,4] A less polished tooth surface is more susceptible to the accumulation of plaque, as it has an increased surface area.Regular flow of saliva keeps washing away bacterial plaque, maintaining the normal environment inside the mouth. Also saliva acts as a buffer by maintaining the pH of the oral cavity, thus, playing the role homeostasis in the oral environment. In situations where the salivary flow is reduced, such as due to certain drugs (tricyclic antidepressants, anti-hypertensives); systemic diseases (Sjogren's syndrome) or due to any other condition, the normal function of saliva of removing the plaque from the tooth surface and buffering the pH of the oral cavity is compromised, increasing the chances of caries to develop. Saliva maintains an alkaline pH within the oral cavity, which not only prevents caries from developing but also provides an optimum pH for the oral enzymes to carry out digestion. For the bacteria to ferment, they need an acidic environment. For an acidic environment to be present, a substrate (sugar) is required. Hence, to put it all together, in a favourable acidic environment produced by the presence of sugars, bacteria in plaque are able to ferment, leading to the development of caries on tooth surfaces.

Initiation of Caries and Carious Process:

The carious process initiates at the tooth surface – oral cavity environment /saliva interface. At this interface, a continuous exchange of ions is taking place. This is a normal physiological process in which the removal of ions from the tooth surface is balanced by an equal deposition of ions. This ionic equilibrium is maintained at a specific pH. Whenever there is a shift in pH, the ionic exchange equilibrium is imbalanced, as a result of interplay between the various factors described above – the net effect being the removal of ions from the tooth surface leading to acidic demineralisation. If the demineralisation process is not reversed, then it eventually leads to the initiation of the caries process. The aim of any modern caries preventive strategy is to optimise the ionic exchange at the tooth surface.[5]

At this point, it is important to be clear about the concept of caries being a multi-factorial process. Dietary factors, such as the frequent intake of sugary foods; tooth susceptibility factors, such as developmental tooth defects and change in oral physiological functions, such as hyposalivation are all essential factors in the aetiology of caries.

For the carious process to develop all four of the above mentioned factors have to be present. If any one of these factors is missing from the equation, then the carious process simply would not progress. Kidd describes this by discussing about plaque in particular. She states that, “Plaque is the cause of caries and any tooth surface that is plaque free will not decay”.[3] If we take Kidd's statement into consideration, then controlling the retention of plaque on the tooth surface would be an effective way to control caries. Hence, it may be inferred that any effective plaque control measure should be an effective and efficient caries prevention tool. It has been suggested that tooth brushing is an effective method of plaque removal.[1] Hence, theoretically, it can be established that the prevention of caries is effectively carried out by regular tooth brushing.

Discussion

Although the role of tooth-brushing has been considered as self-evident for a long time, it is imperative to look into the evidence that exists to support the motion that tooth-brushing, by itself, is sufficient to prevent caries. The most common outcome measure that has been used to evaluate the efficacy of any caries preventive measure has been the reduction in the incidence of caries.

In a systematic review of various dental literature, Kay and Locker found that although, tooth-brushing interventions do bring about a reduction in the incidence of dental caries, it is because of the use of fluoridated tooth pastes that the effect is seen rather that the use of toothbrushes.[6] Until about three decades ago, tooth pastes were used for cosmetic and social reasons. It has only been in the last 30 years or so that fluoride salts and other ingredients have been added to tooth pastes for the prevention of dental caries. Now, it is an accepted fact that regular tooth brushing using a fluoridated tooth paste has brought about a decline in caries incidence in many populations, since the 1970s.[3] However, it

would be wrong to consider tooth-brushing only as a vehicle for fluoridated tooth pastes.[3] As suggested earlier, plaque removal is quite effectively carried out by tooth brushing. The quality of tooth-brushing is very important to its caries preventive effect – with the 'quality' here referring to the efficiency with which any technique is applied. Depending on the brushing technique and the quality of brushing, tooth-brushing by itself achieves about forty to fifty percent removal of plaque from the tooth.1In an in vivo experimental study during the 1970s, when a group of dental students stopped brushing their teeth for 23 days, white spots developed along their gingival; margins.[3] A more recent study found evidence in support of the hypothesis that the regular brushing with a fluoridated tooth paste is more effective in preventing caries than controlling dietary factors, in pre-school children.[7] However, this was only a cross-sectional survey and according to the hierarchy of evidence, it does not pertain to a high level of evidence. Considering the evidence that exists regarding tooth-brushing and dental caries, it can be said that the following factors are important for tooth-brushing to prevent and bring about a reduction in the incidence of dental caries: use of fluoridated tooth pastes; the tooth-brushing technique used and the quality of brushing; the frequency of tooth brushing and supervision (for children). It has been known for a long time that tooth-brushing with an appropriate frequency is a simple and effective way to reduce plaque levels[8] but what exactly is the right frequency for tooth-brushing? Since, the pathogenic periodontal bacteria only appear in plaque that has been present for more than 48 hours, it has been suggested that the plaque removal every second day should be adequate for preventing periodontal disease. However, for the maintenance of oral health as a whole, and not just the mere prevention of periodontal disease, brushing twice daily has been accepted as the international recommendation.8 However, there is no strong evidence in support of these regulations. The effectiveness of fluoridated tooth pastes and the quality of tooth brushing has already been discussed above. Although, it is recommended that children should brush their teeth under adult supervision for effective caries prevention, the evidences supporting this recommendation are weak.[9] Strong evidence to suggest that children should not rinse with water after brushing their teeth is present.[10] It is interesting to note that the decline in the incidence of caries began in the 1960s in the UK, whereas fluoridation was not introduced until the 1970s.[11]

Conclusion

Tooth-brushing is an oral hygiene measure that has been practiced for many years. It is an effective and efficient method of plaque removal. Plaque is one of the aetiological factors for caries. Subsequently, it can be argued that tooth brushing is an effective and an efficient method of caries prevention. However, tooth brushing cannot be completely disregarded as an oral hygiene measure, on the basis that certain authors have disapproved the role of tooth brushing in caries prevention – owing to the role of fluoridated tooth pastes.Tooth-brushing, when used with a fluoridated tooth paste, using an efficient technique with appropriate frequency can prevent tooth decay.

REFERENCES

1. Lindhe J, Lang NP, Karring T. Clinical Periodontology and Implant Dentistry. 5th Ed: Wiley; 2009.
2. Addy M, Edgar WM, Embery G, Orchardson R. Tooth Wear and Sensitivity: Clinical Advances in Restorative Dentistry: Taylor & Francis; 2000.
3. Kidd E. Essentials of Dental Caries: The Disease and Its Management. 3rd Ed:Oxford University Press Oxford; 2005.
4. Soames JV, Southam JC. Oral pathology: Oxford University Press; 2005.
5. Aukett J. Oral Health Promotion and Education:Unit 4: Unit of Distance Learning, MSc. Dental Public Health, King's College London Dental Institute, London; 2008.
6. Kay EJ, Locker D. Is dental health education effective? A systematic review of current evidence. Community dentistry and oral epidemiology. 1996; 24(4):231-5.
7. Gibson S, Williams S. Dental caries in pre-school children: associations with social class, tooth brushing habit and consumption of sugars and sugar-containing foods. Further analysis of data from the National Diet and Nutrition Survey of children aged 1.5-4.5 years. Caries research. 1999; 33(2):101-13.
8. Honkala S. Association between self-reported smoking and tooth-brushing among adolescents in Finland: King's College London Dental Institute, London; 1996.
9. The British association for the study of community dentistry. Delivering Better Oral Health: An evidence-based toolkit for prevention. Department of Health, United Kingdom; 2009.
10. Scottish Intercollegiate Guidance Network.SIGN 83. Scotland; 2005http://www.sign.ac.uk as seen on 21st October, 2013.
11. Downer MC. Time trend in dental decay in young children. Health trends. 1989; 21:7-9.