A perspective on Dental caries – Changing approaches, Status, Issues and Possibilities

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Abstract

Dental research is vital to the future of the oro-dental health particularly and the general health of the population. Past discoveries have enabled people today to enjoy far better oral health than generations a century ago. However, not all people have achieved the same level of oral health and well-being. This is indeed a major issue as dental caries is a preventable disease, not an inevitable one. To this end, it demands the best efforts of public and private agencies and individuals.

Keywords: Challenges, Caries, Issues, Perspective, Prevention and Research

Introduction

Dental caries is a localized, progressive demineralization of the hard tissues of the crown and root surfaces of teeth. Acids produced by bacteria, particularly *Streptococcus mutans* and possibly *lactobacilli* that ferment dietary carbohydrates, cause the de-mineralization. This process occurs within dental plaque, a bacteria-laden gelatinous material that adheres to the surfaces of teeth. It is a dynamic process; periods of demineralization alternate with periods of remineralization (Dawes, 1989; Rolla and Saxegaard, 1990). This article endeavours to view dental caries from the perspective of primary prevention approaches and the burgeoning increase in dental caries levels and the research issues facing the field, inhibiting a formula for primary prevention - not needing the support of organized bodies or platforms.

Minimally invasive or non-invasive conservative approach

Conservative dentistry is actually starting to become a buzzword. It is high time too. At least among many dentists, there is a focus to consider conservative approaches in the treatment of dental caries. Moreover, the science of dentistry as a whole is aiming to progress towards a framework of viewing and handling the subject of dental caries and insisting on a non-invasive and pre-emptive intervention. Thus, as the best practices...
on no account view or see dental caries as a representation of its usual clinical presence, they are now also not considering restorations or secondary and tertiary clinical interventions as the only remedy to dental caries.

As the understanding of the causation of dental caries development increases and moves towards a multi-factorial, multistage process, which extends from infection to demineralization to cavitation, the necessity for more and higher-quality research to better explain and define its complex stages of development and the varied factors affecting its growth prevails (American dental hygienists association, 2001).

Thus, it is now of paramount importance to actively focus towards helping the population at large with preventive approaches to treatment and modifying their oral health comportments in the direction of prevention, rather than cure.

**Dental caries – the last fifty years**

Dental caries is one of the most widespread infectious illnesses affecting humans; it is universal. It begins soon after teeth erupt, and its prevalence rate increases with age. During the forty years from 1970-2010, significant reductions in the prevalence of dental caries have been achieved. Regardless of the improvements, the issue of dental caries is an ever-present danger for a large proportion of the population irrespective of the race, nation, gender and ethnicity. The costs to diagnose, prevent, treat and retreat dental disease, particularly dental caries, are considerable. To give an example, Canadian dental care costs in 1989 were an estimated $3.1 billion, which is 2.4 times the level of such costs in 1980 (Graves and Stamm, 1985). At the same rate, it would probably surpass the fifteen to twenty-five billion Canadian dollars mark, currently.

Although there are large international and regional differences, the incidence and prevalence of coronal dental caries between the years 1970-1990 had declined in industrialized countries (Ripa, 1990). The prevalence of dental caries amongst Canadian children in 2005 was thirty-three to fifty percent lower than it was during the years 1980-1995. Many children had no tooth decay or fillings (Brunelle and Carlos, 1990). In the United States, fifty percent of children between five to seventeen years of age had permanent teeth completely free of decay and restorations in 1986 (Schwartz et al., 1986). The rate of progression of carious lesions through tooth enamel and dentine had slowed as well (Kandelman and Lewis, 1988; Niessen and Weyant, 1989).

Moreover, reviews showed that dental caries, not periodontal disease, was the primary cause of tooth loss in adults (Stephens et al., 1991 and Glass et al., 1987). It was hoped that the marked improvement in dental caries status and in retention of teeth among children in whom the improvements were seen would eventually become evident in adults as these children grow up to become adults. In addition, a transition period of about forty years before improvements are evident in all age groups was expected (Seichter, 1987).

The extensive decline in the incidence of dental caries has not benefited all children equally. US data show that twenty to twenty-five percent of children - the so-called "high-risk" children - have high levels of tooth decay (Nadeau et al., 1991). In addition, clinical trials at Ontario, Canada, investigated children at high risk for developing dental caries and found that the levels of tooth decay were similar to those reported years ago (Beck, 1990). Children who were classified as being at high risk for developing dental caries and aged six to seven years exhibited, had eleven or twelve DMFS per child on an average; and those ten to eleven years of age had nine or ten such surfaces per child on an average.

Thus, one can see that children at high risk of developing caries, in fact have extremely high if not
higher DMFS as compared with the DMFS a few decades earlier. There are reports of increase in the prevalence of dental caries rates in many countries and at high levels (Bagramian et al., 2009). Consequently, there is an increasing trend towards increased prevalence of dental caries; thus reversing the benefits of a continued decline in caries rates observed over the past thirty to thirty-five years.

Risk factors and risk indicators

Few articles provide detailed reviews of the many risk factors and risk indicators for dental caries (Hunt, 1990; Graves et al., 1990 and Hunter, 1998). Some individuals are at a greater risk for dental caries occurrence than others are.

There is a shortage of high quality longitudinal studies (Harris et al., 2004). The evidence suggests that children are most likely to develop caries if Streptococcus mutans is acquired at an early age, although this may be partly compensated by other factors such as good oral hygiene and a non-cariogenic diet (Harris et al., 2004). Diet and oral hygiene may interact so that if there is a balance of ‘good’ habits by way of maintaining good plaque control and ‘bad’ habits by way of having a cariogenic diet, the development of caries may be controlled (Harris et al., 2004).

Thus, an identification of risk factors and groups (at risk of developing caries) is important and will help in the maintenance of health and the social structures established to provide support to maintain their programs in order to continually improve oral health (Sarić and Hasanagić, 2008).

Issues in dental caries epidemiology

Epidemiological studies about dental caries in schoolchildren are numerous (Álvarez-Arenal et al., 1998; Llodra et al., 2000 and Noguerol et al., 1990). However, many of these studies only analyses caries prevalence, as the prevalence rate of caries, or through the different caries ratios (DMFT: Decayed, Missing, filling in definitive tooth; dmft: decayed, missing, filling in temporary tooth; dft: decayed, filling in temporary tooth) (Álvarez-Arenal et al., 1998 and Llodra et al., 2000).

Dental caries is a disease in which cultural and hygienic habits are decisive. The existence of a strong relation of prevalence found in different habitats and different moments, with these factors, is a distinct possibility. On the other hand, determining the factors associated with the appearance of caries is of greater interest, given that these factors present high geographical and temporal stability (Diehnelt and Kiyak, 2001). However, the number of articles that analyze these factors is low. Despite there being studies on the factors associated with caries in twelve-year-olds (Mascarenhas, 1999; Irigoyen and Sánchez-Hinojosa, 2000 and Harris et al., 2004), studies that use multivariate methodology (a method that allows one to isolate the contribution of each of the risk factors) including cultural variables are scarce (Cadernos Saúde Pública, 2003).

Challenges in the study of dental caries

There is the need for further research, to identify and validate caries risk assessment strategies and apply the same in dental practice. It is of paramount interest to ascertain whether it is possible to identify high-risk individuals on a consistent basis. In addition, whether this can lead to improved efficiencies in long-term management of such patients is the next conundrum. More importantly, studies are required to establish whether such approaches prevent caries initiation and arrests or reverse the progression of carious lesions in these individuals.

Another pointer follows from the consistent finding that past caries experience is a strong predictor of future disease (Klock and Krasse, 1979; Steiner et al., 1992 and Zero et al., 2001). Most studies have
used the DMFS (decayed, missing, filled surfaces) index to determine past caries experience, and many investigators do not report the necessary information to separate out the “D” (decayed) component from the “F” (filled) component (Zero D et al. 2001). Most studies do not report the presence of non-cavitated lesions, which have predictive value (Klock et al., 1979 and Steiner et al., 1992).

Furthermore, recording caries via DMFS index does no good to indicate the status of the lesions. Whether it is active (there is demineralisation occurring) or passive (there has been secondary dentine formation or remineralisation occurring due to other issues) is not immediately clear. It would be of immense benefit, if such a possibility could exist or if modalities can be devised, wherein this feature can be made available to researchers and scientists. Such implements would probably give a better indication of future caries trends. Once such predictors are developed, then a comparison with the DMFS index, can really point out to the significance of the issue, much in the way of Significant Caries Index vis-à-vis DMFT.

Subjective assessment of the appearance and physical properties of tooth surfaces affected, currently determine caries activity (Zero et al., 2001). Thus, visible, tactile and radiographic methodologies to determine caries activity take precedence and the outlook is treatment rather than prevention. The development of technology to detect and quantify early caries lesions and to directly assess caries lesion status (active vs. inactive) may prove to be the best way to identify patients that require intensive preventive intervention (Zero et al., 2001).

With caries research being conducted in many parts of the world, the sheer diversity of issues faced in obtaining a clinical examination and recording caries is huge. It would be a start if there could be a few established paths of approaching this issue and a consistent framework guiding such records. Thus, there is a growing need for further discussion of appropriate measures of caries for children with primary and permanent teeth (Reisine and Psoter, 2001).

**Statistics and caries**

The aetiology of dental caries is multifactorial. Such a conceptual approach would require multi-level, multivariate analyses and the possible need for hierarchical and robust modelling (NIDCR, 2001). Moreover, the role of oral epidemiologists should increase and studies need to be designed by them as they understand the oro-dental and statistical necessities. Future studies should include variables that would provide opportunities for effective interventions to reduce risk and for the population at large to be able to act by themselves without the support of any organizations or bodies.

**Developing and Augmenting Research**

The need of the hour is to establish groundwork for caries research set-up in many developing and underdeveloped countries. India especially needs to take bold steps and usher in sweeping reforms in its research approaches especially with regard to dental caries. The imperative need, for strong research-oriented academic environments to develop the intellectual talent for research, to enable existing investigators to acquire and expand their skills in new areas of science, exists (Valachovic et al., 2001).

**Ignorance, efforts, and lessening the awareness chasm**

Dental caries as a disease is not inevitable. It is not going to occur for sure. It has probably become so partly due to people’s attitudes. There are many preventive approaches and thus it is indeed possible to prevent it. In spite of it being preventable, we are still taking about it today with the same, if not greater, seriousness than before. This could be attributed to the
gulf between research and the dissemination of the information gained from it, in addition to people’s outlook. For instance, only sixty-two per cent of U.S. adults recognize that the primary purpose of water fluoridation is to prevent dental caries; less than one-quarter of U.S. adults know that dental sealants prevent dental decay. What the above example demonstrates is that in the first instance, thirty-eight per cent of the people and in the second instance, seventy-five per cent of the people did not have the information or knowledge.

The dentists, dental specialists, researchers need to make sure that they primarily are targeting a particular group. The next logical step is to focus all their efforts in ensuring that this target population becomes educated to such an extent that they can think about their well-being and take informed, well-meaning decisions regarding their health care issues. More importantly, it should aid in modifying their actions towards promoting the oral health well-being of their family. To this end, all research should be geared towards inculcating in-built mechanisms, which help in conveying the keys to the target audience successfully. A severe need to enhance the public’s access to the most current science-based health information and encouraging them to use the same exists (NIDCR, 2001).

A major challenge is balancing individual rights and choices with the presumed larger social good or benefits gleaned from population studies (Foxman B, 2005).

Conclusions

The focus in dentistry has finally shifted towards a conservative approach. However, the decline in caries prevalence rates seen a few decades or a decade earlier is no longer the case. Caries rates are on the rise. To tackle this issue needs a new approach. We need to be on the lookout for newer risk factors or indicators and different ways of looking at established ones. This method involves inquiry into newer forms of looking at research. For this, we need to understand at least some of the important research issues.

Understanding the elementary mechanisms of illness and its prevention are paramount to providing the very best in patient care. Dental research is vital to the future of the oro-dental health particularly and the general health of the population in general. Past discoveries have enabled people today to enjoy far better oral health than generations a century ago. However, not all people have achieved the same level of oral health and well-being. This is indeed a major issue as dental caries is a preventable disease, not an inevitable one. To this end, it demands the best efforts of public and private agencies to enable development of suitable measures.

References


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