
What Dental Diseases Are We Facing in the New Millennium: Some Aspects of the Research Agenda

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Key Words

Caries · Review · Future

Abstract

The next decades will show a shift in the attention given to diseases of the dental hard tissues. Clinical evidence on how to prevent dental caries is now available. More emphasis should be given to optimising the rational use of schemes of prevention. Caries still shows epidemic patterns in many countries while in some developed countries a high prevalence of the disease is limited to a small group. Increased attention is needed for new manifestations of pathology such as dental erosion, and for caries in special high-risk groups. New methods of presenting caries prevalence and incidence data should be implemented to ensure that the diseases of the dental hard tissues continue to have an important place on the political and research agendas.

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With the start of the new millennium we need to ask whether the research community will have to tackle new challenges in the near future. Will there be new forms of

dental disease, perhaps different manifestations of the oral diseases currently experienced, or the need for changes in the available methods of prevention?

With the gradual increase in average age specific problems due to ageing will become more manifest. This should result in more attention given to diseases of the oral soft tissues and to diseases resulting from general physiological changes, such as partial salivary dysfunction due to age. With respect to the treatment of diseases of the dental (hard) tissues more attention is now given to minimal intervention dentistry, which is characterised by optimising preventive treatments for early stages of dental caries and delaying restorative treatment to allow for a maximum chance of natural repair or arrestment. This change in attitude of dental professionals makes new types of products necessary.

It is not to be expected that in the next decades new diseases of the dental hard tissues will suddenly come up, but the sociodemographic changes will present new problems. Dental caries will remain a problem for a sizeable proportion of the population. In developed countries caries is often associated with socio-economic status. In addition, the increased mobility of people worldwide leads to changes in life style and increased expectations of general and dental health. These present new challenges to deter-

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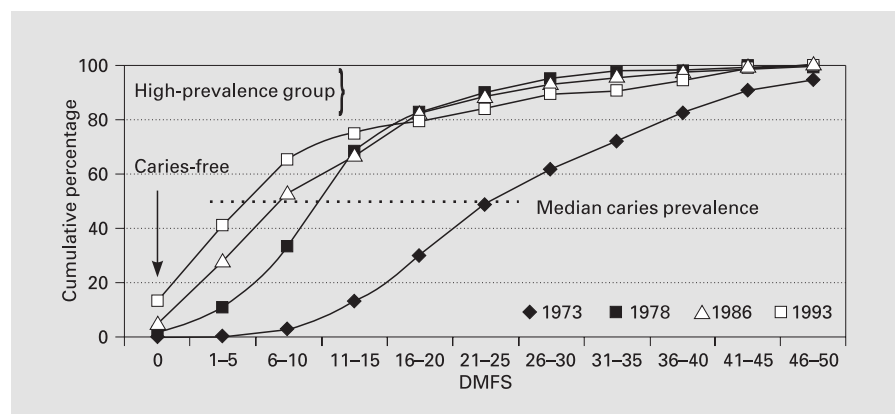
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Fig. 1. Caries prevalence data from 15-year-olds in Sweden. Different graphical representations at one glance show the numbers of caries-free individuals, the median caries prevalence and the caries status in the high-prevalence group [data from Hugoson et al., 2000a].



mine optimal prevention and treatment schemes. Erosion of the dentition is now accepted as an important (new) dental health hazard. It is associated with specific eating and drinking habits and patterns.

In this article various issues are raised which deal with new or changed manifestations of dental diseases. It also discusses the need to group oral hygiene products into subgroups that deal with different types of disease patterns. Finally, dental public health questions aimed at optimising the effects of research findings are posed.

Miscellaneous Issues

Presenting Caries Data

The recent decades have shown a significant difference in caries prevalence and incidence between countries as well as between individuals living in one country. An evaluation of the data in various countries has shown that caries prevalence may differ by a factor 7 between countries [Marthaler et al., 1996]; likewise it seems that the differences within the people of one country have increased [Poulsen and Scheutz, 1999; Hugoson et al., 2000a, b; Thomson et al., 2000]. Therefore, it becomes increasingly important not only to report the data of the caries status as average figures but also to look at prevalence distributions. Several suggestions for this purpose have been made, such as by Bratthall et al. [2000], who propose a SIC (Significant Caries Index), which gives the average caries level of the 33% population group most affected by caries.

To allow an evaluation of the data at one glance I suggest to plot the caries prevalence data versus the cumulative frequency (see fig. 1). With this type of representation

one figure combines the number of caries-free individuals, the median DMFS value and the DMFS distribution in the high-prevalence individuals. This type of data presentation should improve the general awareness that caries as an infectious disease is still far from being extinct. From this particular data set it is clear that the caries prevalence of the group most affected by caries has hardly improved in the last 25 years [data from Hugoson et al., 2000a].

Position: When presenting data for the prevalence of caries a more realistic picture of the distribution of the disease should be given.

High-Risk Groups

Special attention should be given to the current high-risk groups. A sizeable group of young children still suffers from a high prevalence and incidence of dental caries [Twetman et al., 2000]. Early childhood caries frequently also puts the children at risk for caries in the permanent dentition. This occurs directly as a result of caries progressing from the deciduous dentition into the permanent dentition. Secondly, it may be caused by maintaining a high level of caries-pathogenic bacteria in the oral environment or by maintaining poor oral hygiene or dietary habits. More research should be aimed at establishing whether these children can be treated successfully with a more intensified prevention protocol. A question is whether such research should focus on optimising the caries-preventive effects of products by improving chemical and antimicrobial actives or on methods to optimise compliance of children and parents.

Question: Should caries prevention in high-risk individuals in general be focussing on optimising the 'chemistry' of new or established treatments or on compliance?

A second age group at risk are high-risk adolescents. Typically these are young adults that have not or hardly experienced caries at the cavitation level, and suddenly confront their dentist with advanced caries at multiple sites in the dentition. This phenomenon shows that individuals are never free of the risk of caries, and that tooth decay may occur when a patient changes his eating pattern or oral hygiene routines [Ettinger, 1999; Kallestal et al., 2000].

Question: Could the group of high-risk individuals benefit from products with higher levels of fluoride, or should they be treated with professionally applied methods that provide them with large reservoirs of fluoride which will be released at times when these are needed?

Many individuals suffer from salivary dysfunction. This can be the result of some trauma of the salivary glands, or it may be of pathophysiological origin, for instance after using medication that affects saliva production [Ferguson, 1999]. Impaired salivary function causes different pathologies of the oral soft tissues and may result in a very fast deterioration of the dental hard tissues. Not only does saliva normally provide many buffer systems that neutralise acids formed in the dental plaque, it also contributes to the clearance of foodstuffs from the plaque and the mouth. At the same time saliva is responsible for clearance of fluoride and other therapeutics of toothpaste. Frequent fluoride treatments, given during radiation of the head and neck region, have proven to be successful in preventing dental caries.

Position: For the increasing group of individuals suffering from salivary dysfunction it should be studied whether special products should be developed, with characteristics of maximum retention of caries-preventive substances and minimal side effects of other constituents.

Dental care is aimed at preserving teeth as long as possible. From epidemiological surveys it is evident that the number of teeth in the older age groups has increased substantially in the last decades. Nevertheless, patients often suffer from diseases of the periodontium, gingival retraction or calculus formation, which may all lead to the tooth root surface becoming exposed to the oral cavity. The cementum covering the root and the underlying dentine are more susceptible to caries than enamel, which probably is one of the reasons why nature has chosen to cover the coronal part with enamel, which is more resistant to wear and chemical attacks. When the tooth root is exposed it is, given the location, the first site for plaque

accumulation. In particular in combination with insufficient salivary function this leads to a high prevalence and incidence of root surface caries. Until today root surface and dentin caries have been studied with many of the techniques and approaches which proved to be successful for coronal, enamel caries. However, the dentinal tissue is very different from enamel, as is the aetiology and pathogenesis of dentin caries. Some recent observations have shown that dentin benefits from elevated – beyond 0.15% – fluoride levels in a dentifrice or rinse [ten Cate et al., 1995; Nyvad et al., 1997].

Position: Treatment policies and optimised products should be further developed to reduce the risk of root surface caries.

Erosion

Erosion of the dentition occurs when teeth are in frequent contact with acid solutions. This may be due to consumption of acid beverages, fruits or other foodstuffs [ten Cate and Imfeld, 1996; Shaw and Smith, 1999]. Also people suffering from eating disorders or other conditions which lead to frequent contacts between the gastric fluids and the dentition show loss of tissue due to its dissolution in strong acids. The prevalence of erosive defects may be up to 20% in certain age groups. Currently it is questioned to what extent fluoride treatments are able to prevent loss due to erosion and wear of tissue softened during erosion. On theoretical grounds fluoride is unlikely to have a large effect when dental tissues are brought in contact with acidic solutions below pH 4.0 [Meurman and ten Cate, 1996]. Nevertheless, some authors have reported favourable results [Buyukyilmaz et al., 1997].

Question: Are fluoride products efficacious in preventing mineral loss during erosion or erosion-related abrasion? Could products and prevention therapies be optimised for this purpose?

Toothpastes as a Vehicle for Therapeutics

The decline in caries prevalence has run parallel with the introduction of fluoride, and in particular the introduction of fluoride dentifrices has been indicated by experts as the main cause for the caries reduction [Bratt-hall et al., 1996]. This success has prompted the use of dentifrice as a vehicle for other therapeutic substances. A success factor for future use of these products is their proper clinical evaluation. Only too often are new products already put on the market without having been clinically tested. Also there has been a trend to increase the number of therapeutics incorporated in one product to produce the 'good for all illnesses' family toothpaste

[Mandel, 1998]. In my view it should be questioned whether this is an advisable development. Alternatively, products should be further developed for groups at special risk. In a period where the public is 'taught' that for all types of hair there are special shampoos, we are underestimating our patients by advising them all to use the 'total family toothpaste'.

Position: Patient information should be aimed at informing the public about the possibilities of the therapeutic use of dentifrices and their rational use.

Dissemination of Scientific Data, Patient Information and Education

Dental research has evolved considerably over the last decades, and produced basic and directly applicable information regarding all types of oral pathologies. There is, however, also evidence that many of the research findings are not translated into advice for dental practitioners, or used by these groups in their daily routines. Likewise there is a gap between clinical evidence on the one hand and treatment protocols and insurance policies on the other [Frame et al., 2000]. 'Evidence-based dentistry' to replace 'dentistry by intuition' should be a goal for work-

ers in dental public health, making optimal use of the new developments in information technology.

Position: The research community should increase their efforts to make their findings available to dental practitioners as well as translate their conclusions for the public at large.

Conclusion

In the past decades research has generated a wealth of data on many topics related to dental health. The changes in the demographic profile of the population are causing a shift in disease patterns and lead to new questions, concerning early childhood caries, high-risk adolescents, older individuals, some of whom have impaired salivary function, subjects with eating disorders or habits leading to erosion, and others. The prevention of these diseases, nowadays, makes a combined direct therapeutic and behavioural approach necessary. For that reason the dissemination and translation of research findings for a larger readership is becoming increasingly important.

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