
The Borderland between Caries and Periodontal Disease II

Edited by
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1980



Academic Press London · Toronto · Sydney
Grune & Stratton New York · San Francisco

ACADEMIC PRESS INC. (LONDON) LTD.
24/28 Oval Road
London NW1 7DX

United States Edition published by
GRUNE & STRATTON INC.
111 Fifth Avenue
New York, New York 10003

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British Library Cataloguing in Publication Data
Borderland between Caries and Periodontal
Disease Conference, 2nd, Geneva, 1980
The borderland between caries and periodontal
disease, II.
1. Dental caries—Congresses
I. Title II. Lehner, T
III. Cimasoni, G
617.6'7 RK331 77-77147

ISBN 0-12-792506-6

Filmset by Willmer Brothers Limited,
Birkenhead, Merseyside
Printed in Great Britain by
Fletcher and Son Ltd, Norwich

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Proceedings of the 2nd European Symposium on the Borderland between Caries
and Periodontal Disease held at Geneva, Switzerland, 28-29 February 1980

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Preface

The first symposium on the "Borderland between Caries and Periodontal Disease", held at the Royal Society of Medicine in 1977 in London, left little doubt about the desirability to pursue this multidisciplinary approach. The second symposium on this subject was held in Geneva in February 1980 and the 17 contributions are published in this volume.

The multidisciplinary approach to the two most common diseases of mankind has been maintained by bringing together immunologists, microbiologists, biochemists, epidemiologists and clinicians. The rationale for considering caries together with periodontal disease is that the initiating factors in both diseases are the components of dental bacterial plaque and that the host immune responses modulate the effects of plaque antigens. Recent advances in our understanding of the complexities of the microbiology of dental plaque, and the identification of a plethora of new microorganisms in periodontal disease makes this a most challenging subject. The enormous strides in basic immunology which have taken place over the past two decades have also greatly influenced applied immunology. Indeed, oral immunology is a relatively new subject which has caught the imagination of a considerable number of scientists working in the field of oral biology. The interplay between immunological factors, microbial antigens and enzyme functions is seen at its best in the gingival crevicular domain which is the initial site of development of caries and periodontal disease.

The aims of this volume are to present recent concepts of immunology, microbiology and biochemistry of dental plaque components, with direct reference to the epidemiology of caries and periodontal disease, and to the current and prospective preventive measures. The future in prevention of these two chronic diseases lies in a painstaking, systematic investigation of the factors and mechanisms responsible for these diseases. An informed interchange of ideas and of new concepts between the different disciplines is essential in achieving the ultimate aim of preventing dental disease.

May 1980

The Editors

Acknowledgements

The organisers of the Symposium wish to acknowledge financial support from the Swiss National Fund for Scientific Research; GABA AG, Basle; Hawe-Neos, Gentilino; Trisa AG, Triengen; Uhlmann-Eyraud SA (Laroche-Navaron), Geneva; Informationskreis Mundhygiene und Ernährungsverhalten (IME), Frankfurt.

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1. Caries and Periodontal Disease as a World Health Problem

D. E. BARMES

Despite the vast amount of data in the WHO Oral Disease Data Bank, I still have fundamental difficulties in placing periodontal disease on a priority scale as a world health problem. These difficulties arise because we continue to have doubts about the comparability of our measurement tools, the amount of prevention and treatment needed, the efficacy of our methods of prevention and treatment and the impact on either oral health or general health on existing levels of these diseases. If we keep to the broad canvas, which may be unjust to the large amount of detailed information we have, but is necessary for this paper, one single telling example suffices. Although we continue to say that after 30 years of age the major cause of loss of teeth is periodontal disease, it is impossible yet on a global basis to substantiate that claim with sound data. There is even some inferential data from the International Collaborative Study of Dental Manpower Systems (WHO, 1979) which would question the validity of that statement. Unless sound data on tooth mortality as a result of periodontal disease becomes more plentiful, it is unlikely that we will convince any but the "converted" that it poses a world health problem of some substance, although we can talk endlessly about prevalence of the disease at 90% or more from the age of 15 onwards.

Having commenced in such a gloomy way, and trusting that it will have some beneficial effect on data collection in the future, I can pass to a brighter note, at least in terms of what we *can* claim. Our data shows us clearly that there is a sharp contrast between highly industrialized and developing countries in terms of caries prevalence and trends. In the main, highly industrialized countries have high to very high prevalence of the disease, but some are now experiencing a decrease associated with comprehensive preventive programmes. Developing countries have been experiencing increases in the disease at varying rates and for varying periods, but still, there is a majority of countries at the very low, low or moderate prevalence levels. Thus, of 80 developing countries for which we have data, 51 have a mean DMF index of 3 or less at 12 years of age, but only four out of 25 highly industrialized countries have a DMF index within that range. There is little doubt that data from the 58 countries, most of them developing, for which we do not yet have sufficient information to use as national estimates, would

make this contrast even more striking. A further contrast relates to the fact that the D component of DMF means tends to be much higher in most developing countries than in the highly industrialized nations, even to the extent of closely approximating 100%. These data give a very clear picture of the huge caries problem which is growing fast in developing countries.

Notwithstanding the vast differences in the available data for the two major oral diseases, an integrated approach to their prevention, control and residual care, as suggested by the title of this symposium, is an excellent strategy for a number of reasons.

If we look first at manpower implications, we have abundant information for highly developed countries, that even ratios approaching one dental operator (dentist or operating auxiliary) to 1000 in countries where caries prevalence is high have not managed to keep whole populations in a state of optimal oral health, although in some situations successful restoration and rehabilitation have been achieved. International Collaborative Study data for New Zealand, Norway and Denmark illustrate this point in that the DMF mean at 13–14 years is predominantly F.

That tremendously costly manpower supply can be compared with ratios calculated in a recently completed planning manual (WHO, 1980) prepared in the Oral Health unit of WHO. The manual indicates that one dental operator to 30 000 is sufficient for a goal-oriented, preventive first approach, where the DMF index at 12 years of age is no more than 1.5 and periodontal disease prevalence is moderate to high. Where the DMF index is 3 and periodontal disease prevalence again moderate to high; the recommended ratio is about 1:4000. If all countries reached the caries levels so common in highly industrialized countries, while retaining their existing periodontal disease problems, the present world population would thus need 3 500 000 clinical dental personnel to provide the comprehensive treatment coverage needed. However, if all countries stabilized even at the 3 DMF level at 12 years, which is considerably higher than is now experienced by many, only a little more than 800 000 dental personnel would be required. These two figures should be contemplated against the present world dental manpower estimates of about 600 000, plus the data for developing countries which indicates that only about 100 000 of these are employed in such countries, although they account for 80% of the world's population. There is no need to comment further on the economic and equitable distribution reasons for a concerted approach to management of caries and periodontal disease, or on the enormity of the economic/health problem posed on a global level by these two diseases.

Considering next the preventive aspect, upon which manpower economy depends, there is now a massive amount of data on reduction of dental caries incidence by the use of fluorides. Fluoridation of water supplies has been the most safe and economic method used to date and has achieved effective

reductions in DMF means at 12 years, from above 6 to slightly below 3 DMF teeth. However, fluoridated water still reaches only 5% of the world's population. Furthermore, its extension over the past few years has been slow, not only because of sociopolitical or technical obstacles, but because many populations are not served by water supplies which could be safely and effectively fluoridated.

Thus, the use of fluoride toothpaste, fluoride tablets, fluoridated salt, fluoride rinses and high fluoride-bearing pastes has grown, and effective national, provincial or local programmes have resulted. Probably the most rapid further growth amongst these methodologies will be related to fluoride rinses, pastes and toothpastes, where the latter are not already universally used. All of those vehicles are best incorporated in school-supervised, individually applied programmes, for which oral hygiene routines are either indispensable or easily added. They are, therefore, ideal for the strategy of preventing and/or controlling the prevalence of dental caries and periodontal disease simultaneously.

Embodied in the reasons supporting the strategy so far is, of course, the improved health of populations. That entails not only a direct effect through a reduction in oral disease experience, but also indirect effects on all health sectors through economy of manpower and essential supporting facilities which can be used for other health achievements. However, the health implications of dental caries and periodontal disease, in isolation from these factors, have not been satisfactorily quantified. The most telling facts are (1) that the public begins to value oral health services when the DMF index rises to moderate or higher levels, 3 DMF teeth at 12 years of age being once more significant in approximating the borderline of rapidly increasing demand, and (2) that higher levels of disease have led to dramatic rises in edentulousness in several highly industrialized countries, even where comprehensive services are available. The triggering mechanism in increased demand for services is clearly dental caries, but, as indicated earlier, it is not clear how much tooth loss is due to one or both diseases. However, from our own clinical observations and the growth of professional concern for periodontal care, it is clear that periodontal disease has a significant to major role in decisions about conserving or losing teeth in adult life and about the radical decision to accept the edentulous state. Similarly, the desire for conservative care of the supporting tissues, as well as the teeth, is evident, even if not well quantified, in any population once the demand for any conservative services develops. Thus, the interrelation of these two major oral diseases and the need for an integrated approach in providing care and, at the same time, secondary prevention is evident.

Satellite reasons for an integrated approach relate to the types of manpower besides the dentist or specialist who might manage prevention and care of

both conditions and to the necessary monitoring of trends in incidence of the two diseases at the same time. Obviously, from our Basic Oral Health Survey Methods (WHO, 1977), separate monitoring makes no sense, and the same can be said for manpower dealing with health education and non-manipulative prevention. However, even for the latter, particularly prophylaxis, and for other items of care, it is a fundamental consideration whether auxiliaries should be limited, as they often are, to care of the supporting tissues or care of the teeth. Certainly, such an artificial division is rarely possible in national oral health programmes for less affluent populations, and one must query its basis in human health for any population.

So far we have looked at the global situation briefly in regard to caries and periodontal disease and we have considered and endorsed an integrated approach to prevention, control and care of the two conditions. What then could be a global strategy to apply such an approach to alleviate existing, or to reverse growing problems in oral health?

It will be obvious to all by now that 3 DMF teeth in a 12-year-old child, as a national average, is of special interest to our oral health programme. It is the level which not only represents a crude average for 80% of the world's population living in developing countries, but also approximates the level to which we know, from the experience of a number of highly industrialized countries, that we can reduce high and very high levels of the disease. It is also the level consistent with a need for about one dental operator to every 4000 people. Depending on the national philosophy and resources, that ratio can relate to dentists only or to far fewer dentists supported by operating dental auxiliaries. The planning manual referred to earlier recommends a ratio of one dentist to 12 500 people with approximately two operating auxiliaries to one dentist, making up the overall 1:4000.

Thus, this goal is meaningful for developing countries and highly industrialized countries alike. For the former, it means either halting the trend of increasing caries prevalence so as not to exceed that level, or returning to that level for those which have already exceeded it. For a few fortunate countries it may even be possible to stay below the 3 DMF level, but the rate of increase which has already taken one or two developing countries to the very highest caries prevalence levels recorded in our data must not be underestimated. For the highly industrialized countries, the goal means a practical and economically dramatic return to a reasonable level of oral health. For developing countries it gives some hope of attaining adequate dental manpower levels at reasonable costs and for highly industrialized countries the opportunity to control escalating costs in the oral health sector and redistribute health manpower proportions.

Therefore, 3 DMF teeth at 12 years of age is being proposed as a global goal for the year 2000. Already, leaders of the dental profession have been asked to

consider the appropriateness of this goal at the World Congress in Paris last September, in a symposium on "Child Dental Health" in Tokyo last November and in various working groups and meetings within the WHO programme. Thus far it has been very well received. As with any goal, some will achieve more than is targeted, others less: some will achieve it well before the year 2000 while others will be "behind the clock". However, the achievement of that goal, on average, by the year 2000 will have a major impact on oral health and health economics in general for the next century.

Nevertheless, for the subject of this meeting there appears to be a very large deficiency. Where is periodontal disease in all this? The overall goal is not intended to be exclusive. Indeed, it should give rise to many sub-goals relating to all aspects of oral disease and oral health sector activities and organization, all of them, hopefully, practical and measurable. For periodontal disease such a sub-goal is a very high priority and one might even call it a twin goal in line with the philosophy of this symposium. However, this need returns us to the first challenging point in this paper. In what terms shall we express and with what measurements shall we evaluate this twin goal? I have tried to set such a goal in terms of no more than one segment with calculus and one segment with gingivitis, or gingival bleeding, on average, at 15 years, as measured by the Oral Health Surveys Basic Methods, or by the proposed method being tested following the report of the Scientific Group on the Aetiology, Epidemiology and Prevention of Periodontal Diseases (WHO, 1978). That is the type of goal we need, but much work needs still to be done before we are sure that it is relevant as an objective in periodontal health, in preventive capabilities and in treatment resources.

Mention of the need for this development work leads me to the concluding question. What type of programme is needed for our global goal for the year 2000? First, national integrated planning is essential. Already we see penalties at both extremes of failure to plan in an integrated way. Where the oral disease problem and/or awareness is increasing, an already short supply of manpower has reached disaster proportions. Where oral disease prevention programmes are very successful, over-supply of manpower is rapidly becoming a reality and will almost surely cause much hardship and waste before a remedy is found. These penalties can only be avoided if prevention, treatment, manpower production, evaluation and overall administration are integrated for a defined population, be it national or provincial. Therefore, promotion of integrated planning based on periodic standard monitoring is a fundamental pillar of any programme to achieve our goal.

Within that framework the overwhelming priority area is prevention. Where prevention is school-based, using fluoride rinses, pastes or even tablets and gels, oral hygiene will be either an integral or an easily linked part of the

activity which will then practise the integrated approach to management of caries and periodontal disease. Where prevention of caries is “remote” in terms of water or salt fluoridation, the oral hygiene activity specially directed to prevention and control of periodontal disease will need to be mounted separately. Health education will be fundamental to either situation and even more important if programmes of individual action in the community are to be the main approach.

Apart from these two main factors there are numerous possibilities in terms of manpower types, targeted or non-targeted services, and standard systems of recording, administering and sustaining oral health programmes, which will support the drive towards target achievement. In particular, carefully selected research endeavours will be necessary to improve our ability in all areas, but particularly to prevent dental caries and periodontal disease. Such endeavours, it is hoped, would show us the way by the year 2000 to formulate a much more ambitious goal for the following generation.

In conclusion, then, it is felt that the borderland between dental caries and periodontal disease is not just a catchy title. It is a fundamental concept which leads us to an integrated approach in planning, preventing, providing treatment and manpower, as well as evaluating our progress to much better oral health on a global basis as we enter the twenty-first century.

Summary

The World Health Organization Data Bank on Oral Disease contains a vast amount of information on the prevalence and trends of dental caries and periodontal disease. In developing countries, the prevalence of dental caries has been low and often extremely low, but increasing incidence in such populations is virtually a constant in data gathered over the past 10–20 years. Those increases have been so great that several developing countries have now entered the high and very high prevalence categories, one of them having returned the highest level of dental caries ever recorded for a whole population at 12 years of age. By contrast, prevalence of dental caries in highly industrialized nations has usually been in the high and very high categories, since reliable national studies commenced in the past two or three decades. Nevertheless, there are signs that some of these populations are now achieving large reductions in incidence of the disease, mainly through preventive programmes using fluorides.

Periodontal disease is shown to be even more prevalent than dental caries, although at a more advanced age. The evidence of an equivalent contrast between developing and developed nations is not clear, but there is a trend for lower prevalence of those diseases, although still at an important level, in developed countries.