Public Health Implications of Recent Research in Periodontal Diseases

Brian A. Burt, BDS, MPH, PhD
Professor and Director
Program in Dental Public Health
School of Public Health
The University of Michigan
Ann Arbor, MI 48109-2029

Abstract

Knowledge of the epidemiology, natural history, and bacterial etiology of the periodontal diseases has advanced considerably as a result of research conducted through the 1980s. Prevention and control of these conditions, however, remains mechanical, cumbersome, and often impractical, based as it is on bacterially nonspecific plaque removal for an indeterminate period. This research has not yet changed the content of public health programs, but it does affect the way the programs are applied. Because severe, generalized disease seems to be less prevalent than previously thought, the need of regular, routine professional care for everybody is questioned. Professional care in a public health context is likely to be more efficient when targeted toward those with severe disease. Dental health education for personal oral hygiene is still supported by scientific studies, though a targeted approach and careful assessment of educational content is needed. Until predictive screening methods for identifying susceptible individuals are developed, selection of priority groups for education and treatment should be guided by epidemiologic data.

Key Words: periodontitis, gingivitis, public health, dental health education, professional care, epidemiology

Introduction

Humankind has been ravaged by disease epidemics since the beginning of recorded history (1-3). Until recent times, there was little people could do about them other than pray; indeed, the public health response to the British cholera epidemic of 1831 was an official prayer for deliverance (4). Until about the mid-1950s, "pyorrhea" was like cholera in the early 19th century: one got it or one did not; but either way, one could do little about it. When contracted, "pyorrhea" led to its own kind of mortality—total tooth loss.

Systematic study of the periodontal diseases came late (5-8). Early epidemiologic research presented a picture of almost universal susceptibility, especially where oral hygiene was poor (9-17). More recent basic, clinical, and epidemiologic study, however, has greatly sharpened our understanding of these diseases. This research has led to current perceptions of the diseases that differ from earlier ones, and that can be summarized as follows:

1. Only a small proportion of persons exhibit severe, widespread periodontitis. Mild gingivitis is common, and most adults demonstrate some loss of bony support and loss of probing attachment.
2. Gingivitis and periodontitis are associated with different bacterial flora. Gingivitis precedes periodontitis; however, not all sites with gingivitis later develop periodontitis.
3. Although usually related to age in population, periodontitis is not a natural consequence of aging.
4. Periodontitis is not the major cause of tooth loss in adults.

Periodontal disease is a generic term for a set of bacterial, inflammatory conditions of the supporting structures of the teeth. Until more specific interventions are developed, prevention is necessarily based on public education for oral hygiene and on professional cleaning at periodic intervals. This paper examines the scientific basis for these practices in light of recent research, and explores the related issue of targeting in the public health approach to control of gingivitis and adult periodontitis. Less prevalent periodontal conditions that do not appear preventable by public health means, such as localized juvenile periodontitis, are not included in this review.

Review of Recent Research

"Severe" periodontitis usually means loss of attachment of 6 mm or more, and "generalized" periodontitis means an unspecified but considerable number of teeth affected. Epidemiologic evidence now suggests that generalized, severe periodontitis is unusual. This appears true even when oral hygiene is poor, gingivitis severe, and professional treatment limited (18-23). In populations with better oral hygiene, severe periodontitis is even less prevalent, though some degree of gingivitis is common (24-29). Initial reports from the 1985-86 National Oral Health Survey of Adults state that only 8 percent of American employed adults under age

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65 suffer from severe periodontitis, defined as at least one site where loss of attachment was 6 mm or more (30). The modern use of precise periodontal measurements, rather than the earlier indexes that did not employ probing, has led to these changes in perceptions of susceptibility.

The association between age and periodontitis still requires further study. Several reports have concluded that severe periodontitis is no more prevalent in older than in younger persons (26,28), and analyses of national survey data from 1971-74 found tooth retention to be as closely related to oral hygiene as it was to age (31). Severe loss of attachment, however, was found in 34 percent of persons over 65 in the National Survey of Adults, compared to only 8 percent of those under 65 (30). These differences between older and younger groups might be real, or they might reflect sampling differences and cohort effects. The direct relationship between age and periodontal diseases may reflect principally the results of long-term plaque accumulations (32,33), perhaps exacerbated by poorer plaque tolerance in aging tissues (34,35). Older people still appear to be a priority group for public health periodontal programs.

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The bacterial flora associated with gingivitis and periodontitis are not the same (36-41), though whether the conditions should be considered different diseases or not is of little practical importance for current prevention strategies. Bacteria associated with deep periodontal pockets are gram negative and anaerobic (42-45). While this finding is used to evaluate therapy and identify patients at risk (46,47), as yet there is no direct evidence to support an etiological role for these bacteria in periodontitis. There are even disagreements among authorities over whether the gram negative anaerobic bacteria in periodontitis represent an overgrowth of endogenous bacteria (48) or are exogenous infections (49). Gingivitis seems to be a nonspecific inflammatory process; over 70 different species have been associated with gingivitis (50). Defining the bacterial etiology of both diseases is a complex task, and is further complicated by the variety of individual reactions to infection (49,51). Moore et al. (52) suggested that destructive disease results from a colonization sequence, rather than just an increase in plaque mass or bacterial counts. Even though gingivitis does not always progress to periodontitis, meaning that under the Moore et al. hypothesis the colonization sequence does not develop, gingivitis still seems to be a necessary precursor of periodontitis. The conclusion is that periodontal disease prevention and management must still be based on nonspecific control of bacterial plaque deposits.

Periodontal disease has long been seen as the major cause of tooth loss over age 35, though evidence for this stock belief seems based largely on one report that reflected treatment practices in the early 1950s (53). But even at that time there was evidence that the most severe disease was found in relatively few persons (54). More recent data from several countries have shown that periodontal diseases account for few extractions at all ages, and cannot be considered as the major reason for tooth loss (55-58). By the time the last edentulous person from the "focal infection" era (59) has passed on, it can be anticipated that tooth loss from periodontal diseases will be limited to those relatively few teeth beyond redemption, and that mass extractions as routine dental treatment will have joined leeching in the archives of health care.

Public Education for Oral Hygiene

Douglass and his colleagues used national survey data to demonstrate that oral hygiene levels are improving over time (60). They also showed that while the proportion of individuals with pockets (3 mm or greater) did not change between the national surveys in 1960-62 and 1971-74, there was a considerable shift among the remainder away from having gingivitis toward having no inflammation at all. From the evidence linking plaque deposits with gingivitis, it is a plausible hypothesis that improved oral hygiene is causing the reduction in gingivitis.

The traditional approach toward oral hygiene is that all plaque should be removed, an approach that must be questioned for several reasons. One pragmatic reason is that while few people are capable of removing all plaque, oral hygiene levels are improving anyway. A corollary is whether a plaque-free condition, even if possible, is really necessary. If plaque forms naturally, it seems that some level of plaque must be compatible with oral health. To explore this issue, data from the NHANES I national survey were analyzed to compare people of all ages who had 25 or more teeth present (31). Results showed that oral hygiene levels at all ages were remarkably similar, suggesting that an oral hygiene level that corresponds to OHI-S scores of 0.3-0.6 might be compatible with tooth retention throughout life.

A further aspect of oral hygiene practices is that dental floss is not popular with many people (61-64). Should this be a concern in dental health education of the public? While some form of interdental cleaning is usually considered necessary to maximize the efficiency of tooth cleaning, the evidence that floss is the best way to do this is mixed (61,65-68). Interdental brushes have been reported as preferred and more efficient, especially for those with interdental spaces (61). Actually, there is no clear evidence that all persons need to practice interdental cleaning to maintain periodontal

health, though it is likely that some will.

Public educational programs to control periodontal diseases have been based upon the assumption that gingivitis progresses to periodontitis, and is therefore worth preventing. But gingivitis does not always progress to periodontitis, so it is difficult to see gingivitis by itself as a public health problem. The notion of periodontitis as a public health problem is probably more acceptable, being widely prevalent even if not always severe. However, prevention of periodontitis is still necessarily based upon regular plaque removal, so while the goal is to prevent periodontitis rather than gingivitis, the nonspecific plaque control required is still the same.

Professional Care

The beneficial effects of regular professional cleaning, from intervals of two weeks to four months, have been documented in children (69-75) and in adults (76-80). The importance of regular professional maintenance care in persons who have received periodontal treatment has also been extensively reported (81-89). While there are some differences on how meticulous oral hygiene needs to be during the maintenance phase of clinical periodontal treatment (87,88), no one disputes the importance of good oral hygiene in periodontal patients. Regular professional removal of plaque, and establishing conditions to retard its subgingival regrowth, remains the basis for clinical management of periodontal diseases (48,90).

Professional care to remove plaque deposits is a cumbersome and inefficient form of treatment, much like the medical treatment of infections around the turn of the century: keeping wounds clean and hoping that the patient would get better. While further research is likely in time to bring about more precise treatment, nonspecific plaque removal is the best we can do with current knowledge. And even with more rational treatment, keeping the wound clean (i.e., plaque removal) will remain a sound treatment principle.

There are inherent problems in interpreting the results of long-term studies of disease outcomes. Virtually all suffer from severe loss of patients for follow-up, thus introducing a threat of bias. There are also uncertainties about whether improvements in attachment levels (91,92) represent natural healing or simply tightening of gingival attachment, and the "random burst" hypothesis (93), which if valid could affect observed disease outcomes, has yet to be fully accepted (94-97). Despite the value of maintenance care among treated periodontal patients, there are reports of patients in periodontal practices among whom lack of professional care did not necessarily result in the progression of severe disease, either over a short period (98) or the long term (99,100). Problems with interpreting clinical studies are exemplified by the data in Table 1, taken from a study that concludes that frequent maintenance is necessary for favorable periodontal outcomes (101). These data indicate that many pockets did not progress or even apparently healed in the absence of professional treatment; certainly the data do not support a universal need for regular professional care. In addition, if constant professional cleaning really is necessary to control periodontal diseases at the community level, everyone must become a patient for life—clearly not a feasible approach, and one philosophically out-of-tune with today's encouragement of more personal responsibility for individual health status.

TABLE 1
Progression in Probing Depth in 44 Patients in the Absence of Periodontal Treatment: Average Time of 5.25 Years Between Examinations (101)

First Exam	Probing Depth (mm) Second Exam	Change
1–3	1–3	72.9% same
	4–6	27.1% deteriorated
	7+	
4–6	1–3	91.4% same/better
	4–6	
	7+	8.6% deteriorated
7+	1–3	68.4% improved
	4–6	
	7+	31.6% same

Goals for Community Periodontal Health

The goals for programs of education and treatment, and how to achieve them, need to be defined carefully against the background of (a) uncertainty about the natural history of the periodontal diseases, (b) improving levels of oral hygiene, and (c) the inability to predict susceptibility to periodontitis (47,102-104). Goals perhaps could be expressed in practical terms of tooth retention and the maintenance of a functioning dentition, rather than in the more utopian terms of low gingivitis or low plaque. Achievement of such goals is likely still to require regular professional care for susceptible persons, although those less susceptible may not suffer if they receive less regular care. Such goals also imply acceptance of a certain level of gingivitis, and perhaps even minor pocketing, as compatible with an esthetic and functioning dentition.

The implications of recent periodontal research relate principally to two issues: (a) more limited susceptibility to severe disease than previously thought, especially among older people, and (b) the continuing scientific justification for maintaining good oral hygiene. If dental public health is to be efficient in its periodontal programs, however, targeting will need to be employed. While this philosophy is now well accepted, its practical application is frustrated by the absence of screening methods. In the meantime, care services could primarily be directed at the institutionalized and handicapped who have evidence of disease severe enough to threaten a functional dentition, with ambulatory low-income persons and handicapped less-sus-

ceptible persons as a second priority level. Education to promote a satisfactory level of personal oral hygiene should be directed at groups most susceptible to periodontitis, of which the most consistently identified are lower socioeconomic groups of all races. The accompanying challenge, as public health workers well know, is that favorable oral hygiene behavior is not easily developed in these groups. But until reliable tests for determining individual susceptibility to severe periodontitis become available, priority for public health programs will have to be determined from epidemiologic data.

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