On becoming edentulous. An investigation into the dental and behavioural reasons for full mouth extractions.
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INTRODUCTION AND AIMS OF THE INVESTIGATION

1.1 General introduction

The oral health problem with the highest prevalence, i.e. caries, appears almost to have been solved from a clinical and biological point of view. The chemical and biological causes and processes resulting in carious lesions are fairly well known. Consequently, over the past 30 years great technological strides have been made with regards to restorative treatment: high speed airrotors, anaesthesia, dental composites, etc. The contribution of advanced scientific knowledge and technology to the dental health of the population might, however, be questioned. The efficacy of this technological approach is considerably reduced because financial barriers sometimes prevent advanced dental treatment methods from being accessible for the population at large. Moreover, because of the sometimes sophisticated studies into the causes and treatment of caries and periodontal disease, the (too) simple rule of "no plaque, no disease", can easily be forgotten. This rule means that the most important way of substantially improving and maintaining dental health of all people within an operative health care system is to improve the preventive health behaviour of the population. More knowledge about the behavioural aspects of dentistry, instead of further technological progress, might, therefore, be a more effective means of improving the overall dental health condition. This knowledge might be especially useful in explaining the sometimes high percentage of edentulous people in western, industrialized societies. Because technological know-how and equipment has accumulated in these countries, the percentage of edentulous people might reflect problems in the need and demand mechanisms within the dental health care system. It is sometimes suggested that the pro-
portion of the adult population which is edentulous is "possibly the best single indicator of the dental state of a country" (1). Some authors consider the percentage of adults who wear full dentures as a (negative) output measure of the dental health care system (2, 3). Or, as formulated by Todd & Whitworth (1): "If the aim of the dental service is to preserve natural teeth then the prevalence of total tooth loss is a measure of how far away we are from reaching that objective".

In this chapter the extent of edentulousness in populations will be outlined. After that a review will be given of possible disease and non-disease reasons for full mouth extraction as well as the primary and secondary aims of the research project into reasons for full mouth extraction.

1.2 The prevalence of edentulousness

The WHO International Collaborative Study on Dental Manpower, which started in 1972 (4), gives information about edentulousness in different parts of the world (Table 1.1). The edentulousness rates are comparable because they were collected in an identical way and they all refer to the same age group (35-44 yr). Marked differences exist, especially between Canterbury (New Zealand) and Yamanashi (Japan). Detailed and reliable figures for The Netherlands are not available for that period (5). However, in 1981 21.7% of the Dutch population in the age group 35-44 yr was edentulous (6).

In Fig. 1.1 a review based on nationwide samples is given of changes in edentulousness rates in different countries. Where possible, changes in the course of time are shown. The Netherlands appear to have one of the highest percentages of edentulous people in the world. Almost all countries show a decrease in the number of edentulous people. The Finnish figures seemed to be stable, but further analysis showed that remarkable regional differences were present (12). In New Zealand no reliable (nation wide) data from previous
Table 1.1

Percentage edentulous in both jaws
(Age group 35-44 years)

<table>
<thead>
<tr>
<th>Study area</th>
<th>Metro</th>
<th>Nonmetro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltimore</td>
<td>11.3</td>
<td>9.9</td>
</tr>
<tr>
<td>Ontario</td>
<td>5.3</td>
<td>15.8</td>
</tr>
<tr>
<td>Sydney</td>
<td>7.6</td>
<td>18.6</td>
</tr>
<tr>
<td>Hannover</td>
<td>2.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Yamanashi</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Canterbury</td>
<td>27.2</td>
<td>44.2</td>
</tr>
<tr>
<td>Dublin</td>
<td>6.7</td>
<td>8.7</td>
</tr>
<tr>
<td>Trøndelag</td>
<td>2.4</td>
<td>7.4</td>
</tr>
<tr>
<td>Leipzig</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Lodz</td>
<td>0.9</td>
<td>1.1</td>
</tr>
</tbody>
</table>

years were available. Indications were found that incidence figures have recently decreased rapidly (17). The percentage of edentulous people in the age group 35-44 years decreased from 27.8% to 14.4% between 1976 and 1982 (17). A striking decrease occurred in England and Wales between 1968 and 1978. This trend is remarkable because as edentulousness is an irreversible condition any changes in the figures will be
Fig. 1.1 Edentulousness rates for different countries at different moments'.

1) All figures concern nationwide samples, except for Finland 1959 (rural population).

Sources:
New Zealand: 1976: Cutress et al 1979 (7); 15 yr and older;
England and Wales: 1968 and 1978: Todd & Walker 1980 (10); 1983: The 1983 update (11); 16 yr and older;
slow. In 1983 the graph representing the (theoretical) situation in England and Wales in which no new cases of full mouth extraction occurred (the maximum potential reduction graph) approximated the graph representing the actual prevalence figures. In The Netherlands the Central Bureau of Statistics (CBS) suggested 30% edentulousness as being a reliable figure for the period of 1981 to 1983. This represents a relatively small reduction when compared with the figure for 1970 (32.6%). Detailed analysis of the smaller (and less reliable) sub-samples of 1981, 1982 and 1983 indicates that an accelerated decrease might have started. The slightly higher figure for 1984 might be due to sample fluctuations (9).

1.3 Reasons for edentulousness: oral health problems

To date no large scale studies have been carried out into the dental condition of patients at the time of full mouth extraction. A great deal of research has, however, been done into disease reasons for single tooth extractions. These studies investigated whether or not teeth were lost because of caries or periodontal disease and many demonstrated that the role which periodontal diseases play in tooth extraction increases with age (18-23). These investigations suggested that in older age groups (between 35 and 50 years old) periodontal disease progressively overtakes caries as the main reason for full mouth extraction. Recently, the importance of periodontal disease as a generalized public health problem has been questioned (24). This point of view is supported by studies showing that the progression of periodontal disease is generally not as high and linear (25-30) as has been suggested over the last two decades. Advanced periodontal disease seems to be confined to a relatively small high risk group (24, 31, 32). The role which caries or periodontal disease plays in full mouth extraction is, however, not known.
1.4 Non-disease factors and edentulousness

Reasons other than dental ones may also play a role in full mouth extraction. These so called non-disease reasons include sociological, psychological and economic variables which affect the etiology and progress of dental disorders. Some examples are: attitude towards dental health, dental attendance pattern, experiences with dental visits, anxiety, etc. These factors also influence the decision process preceding full mouth extraction. Indications that non-disease factors could be important in explaining why people decide to have full dentures were reported by Todd & Whitworth (1). Based on data collected in an epidemiologic investigation in Scotland, they made predictions as to which patients would have full dentures within one year. According to their criteria forty-two of the total sample of 1170 were likely to get full dentures, 39 of which already had partial dentures. After one year 12 had received full dentures for the first time. Only three of these were among the group of predicted denture wearers. The authors stated that the high prevalence of total tooth loss in Great Britain cannot be explained solely on the basis of dental disease.

Dental attendance pattern might be an important non-disease factor in the incidence of full mouth extractions. It appears from the literature that edentulousness and dental attendance are associated with each other. People with the highest (objective) need are the least inclined to seek medical help and they also benefit least from health education (33, 34). People with a low socioeconomic status seem to be especially at risk (35-37). Although dental attendance figures increased markedly in The Netherlands between 1974 and 1983, further analysis showed that males, the elderly, low income groups and especially people with a low education still had much lower attendance figures (37). Rise (38) showed that conclusions drawn from figures showing improvement in regular dental attendance pattern for groups with a low socioeconomic status should be handled with care.
Norway, a tendency was found towards a greater increase in lower income groups when comparing the proportion of regular attenders per income group in 1973 and 1983 (38). A tendency towards more inequality was found, however, when the results were corrected for the "ceiling effect", i.e. expressing the percentage increment as a proportion of the potential demand (i.e. the percentage non attenders).

Different groups of people do not, apparently, have an equal access to dental health care facilities. Nuttall (39) concluded that a large proportion of the edentulous population is made up of people who were infrequent dental attenders. In the 1983 update (11) of the national adult dental surveys of 1968 and 1978 in England and Wales (10), it was concluded that regions which had higher levels of edentulousness generally had correspondingly lower percentages of regular attenders among their dentate populations. Tuominen (40) concluded that a scarcity of dental services is the usually factor which prevents people from preserving their natural dentition.

The underlying reasons for (early) tooth loss has been indicated by many authors. Gray et al. (41) suggested that regional variation in sound and untreated teeth reflects a regional variation not in disease but in the level of treatment. Ashford (42) found that the emphasis given to the conservation of permanent teeth (measured by the ratio of permanent teeth filled to permanent teeth extracted) tends to increase with an increase in the supply of dental care. Nuttall (43) formulated criteria for dentally successful and unsuccessful patients and he selected two contrasting groups of patients based on these criteria. It appeared that extractions were more prevalent among the dentally unsuccessful and that fewer patients in this group received restorative dental treatment at their last visit to the dentist. He concluded that more of the dentally unsuccessful dislike interventive dental treatment and that they seek to avoid it by postponing their visits to a dentist. When they do visit a dentist, more of them seek to eliminate further need for treatment by having teeth removed in preference to having
them restored. When studying frequent and infrequent dental attenders, Nuttall (39) found that infrequent attenders had almost two and a half times more teeth extracted and had more prosthetic appliances. Regular attenders received more restorations and periodontal treatment.

The role dentists might play in tooth extraction was suggested by Davis (44). He discussed the philosophy of the dental profession based on the disputed focal infection theory, as a reason for high edentulousness figures. (In the focal infection theory the mouth is an important, possibly the most important, entry point for bodily infections and many disorders). Craft & Sheiham (45) found that general dental practitioners in the North of England (with low dentist-population ratios and high edentulousness) were less preventively oriented than general dental practitioners in the more urbanized South of England (with high dentist-population ratios and low edentulousness).

It is not only the relationship between the dental attendance pattern (c.q. dental treatment received) and tooth loss which indicates that non-disease factors play a role in total tooth loss. Cohen (46), for example, argued that tooth loss does not bear a close relationship to the prevalence of dental disease and she wondered what incentives for extraction exist in a particular health care system. Davis (44) came to the same conclusion. In order to illustrate the role which non-disease factors are supposed to play, he presented a review of the relationship between edentulousness and seven occupational levels in New Zealand (Table 1.2).

Davis (44) concludes that there is no indication that this remarkable gradient reflects the occurrence of dental disease. DMF levels, for example, in the different social status groups were comparable. Looking at the number of missing teeth as a proportion of the DMF score (M/DMF ratio), it was apparent that only one-fifths of affected teeth were extracted among the patients in the highest occupational group compared to four-fifths of those in unskilled manual occupations.
Table 1.2

Percentage edentulousness and social status¹

<table>
<thead>
<tr>
<th>low status</th>
<th>high status</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Percentage edentulous

<table>
<thead>
<tr>
<th>low status</th>
<th>high status</th>
</tr>
</thead>
<tbody>
<tr>
<td>63.5</td>
<td>20.5</td>
</tr>
<tr>
<td>49.5</td>
<td>28</td>
</tr>
<tr>
<td>41.5</td>
<td>8</td>
</tr>
</tbody>
</table>

¹) WHO ICSDM, 35-44 age group, Canterbury, New Zealand.

In The Netherlands a clear distribution of edentulism according to educational level was found (Table 1.3). Indications were found that this might reflect differences in dental disease levels (47). Differences in preventive behaviour between different educational groups might be presumed, because in the same period (1981-1983) 48.6%¹ of the adults without full dentures and with only primary education were classified as dentally fit by the State Health Insurance Scheme (48). In the case of adults with secondary general education, senior vocational training this figure was 77.6%².

The prevalence of full dentures correlates with low education or low socioeconomic status. Underlying causes such as a lack of knowledge about the causes of dental disease, positive attitudes towards full dentures, irregular dental at-

¹) adjusted percentage; the unadjusted percentage was 36.0
²) adjusted percentage; the unadjusted percentage was 80.5
Table 1.3

Persons of 16 years and older having full dentures according to educational level, 1981/1983 (Total n = 22,000;9)

<table>
<thead>
<tr>
<th>Educational level</th>
<th>Full dentures</th>
<th>Full dentures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unadjusted</td>
<td>adjusted¹</td>
</tr>
<tr>
<td>Only primary education (alleen lo²)</td>
<td>71.3</td>
<td>43.8</td>
</tr>
<tr>
<td>Secondary general education, junior vocational training (lavo, mavo, lbo)</td>
<td>38.0</td>
<td>37.6</td>
</tr>
<tr>
<td>Secondary general education, senior vocational training (havo, vwo, mbo)</td>
<td>19.4</td>
<td>29.0</td>
</tr>
<tr>
<td>Vocational colleges, bachelor degree (hbo, universiteit candidaats)</td>
<td>11.8</td>
<td>23.6</td>
</tr>
<tr>
<td>University (universiteit doctoraal)</td>
<td>8.8</td>
<td>17.9</td>
</tr>
</tbody>
</table>

¹) With the Multiple Classification Analysis the unadjusted percentages are corrected for differences in age, sex, income and type of health insurance (Private or State Health Insurance Scheme).

²) Within parenthesis: Dutch denomination of educational level.

tendance, lack of financial resources, etc., contribute to the prevalence of full dentures (35, 36). Some authors suggest that especially the joint effects of the low availability and accessibility of dentists together with socioeconomic and cultural factors lead to high edentulousness figures (15, 40, 49). The so called non-disease or social factors are becoming increasingly recognised as a reason for full mouth extraction (1, 50-52). Weintraub (15) summarized that:
"...it is probable that edentulism is due to various combinations of oral disease, cultural and attitudinal determinants, and treatment received".

Some relationships between non-disease factors and edentulousness have been explored. No research has, however, been carried out into the underlying mechanisms and factors which lead to the decision to have all one's teeth extracted. Moreover, in spite of the detailed knowledge about the reasons for single tooth extractions, no research has been done into the dental reasons for full mouth extractions. A research project was, therefore, started into the disease and non-disease reasons for full mouth extractions.

1.5 Aims of the investigation

The aims of the investigation were:

a. To describe the dental condition at the time of full mouth extraction.

b. To explore the role of non-disease factors, in relation to the dental condition, which lead to full mouth extraction.

The studies based on these aims have been described in eight papers (chapters) and cover the following subjects:

a. The caries status in an urban area at the time of full mouth extraction with regard to age, sex, educational level and dental attendance pattern (chapter 3.).

b. The periodontal condition in an urban area at the time of full mouth extraction with regard to age, sex, educational level and dental attendance pattern (chapter 4.).

c. The difference in the incidence of edentulousness between an urban and rural area with regard to age, sex, educational level and type of health insurance (chapter 5.).

d. The differences in the caries status between an urban and rural area at the time of full mouth extraction with regard to age, sex and educational level (chapter 6.).
e. The part played by periodontal disease in the decision making process prior to full mouth extraction in both an urban and rural area (chapter 7.).
f. The degree of agreement between dentists and patients and research workers concerning the dental condition at the time of full mouth extraction (chapter 8.).
g. The decision making process preceding full mouth extraction and the role which the social network plays in the final decision (chapter 9.).
h. The fit of a model(s) based on the collected data with regard to the dental histories preceding full mouth extraction (chapter 10.).
References


