

Caries prevalence and associated predisposing conditions in recently hospitalized elderly persons

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Budtz-Jørgensen E, Mojon P, Rentsch A, Roehrich N, von der Muehll D, Baehni P. Caries prevalence and associated risk factors in recently hospitalized elderly persons. *Acta Odontol Scand* 1996;54:251–256. Oslo. ISSN 0001–6357.

The prevalence of caries and caries risk factors was studied among 120 consecutively hospitalized elderly persons. Coronal caries was recorded using the WHO criteria, and active and inactive root caries in accordance with Fejerskov et al. The CPIITN was used to evaluate the periodontal state and plaque accumulation in accordance with Löe & Silness. Of the 1212 teeth examined 5% had active coronal caries (2% inactive), 14% active root caries (2% inactive), and 10% fillings with recurrent caries. No relationship was found between caries prevalence, degree of dependence, number of medicaments, age, and gender. Patients with psychiatric diseases had increased caries prevalence ($P < 0.01$), and lower caries prevalence was associated with frequent tooth brushing ($P < 0.05$). At the tooth level root caries was associated with high plaque scores ($P < 0.001$), degree of gingival recession ($P < 0.001$), presence of coronal caries ($P < 0.001$), and increased pocket depth ($P < 0.01$). The results strongly indicate that oral hygiene measures should be introduced immediately after hospitalization of these patients. □ *Dental caries; gerodontology; hospitalization; oral hygiene; root caries*

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Older adults are retaining more teeth than in past generations, due to an increased awareness of oral hygiene, a better knowledge of the prevention and treatment of oral diseases, and a greater utilization of dental services. Thus, the prevalence of edentulousness for 65- to 69-year-olds within the same community was reduced by approximately 30% from the period 1982–83 to the period 1989–90 (3). As a result, geriatric dentistry today entails not only prosthodontic and restorative and periodontal treatment, but will increasingly include preventive measures (4).

The prevalence of caries in older populations is available in many recent studies, indicating that untreated caries is an increasing problem (1, 5, 6). Prevalence studies also indicate that elderly persons living in long-term institutional care have poorer oral health and more caries than non-institutionalized older adults (7–12). Different factors may be responsible for the variations in the prevalence of dental caries between institutionalized and non-institutionalized patients, such as age, physical and mental disabilities, medications, current oral hygiene, cultural background, and socio-economic status.

It was the purpose of the present study to determine the prevalence of coronal and root caries and several different caries risk factors among patients hospitalized in a geriatric hospital. The population included both institutionalized and non-institutionalized elderly before hospitalization.

Materials and methods

The study was a part of a survey intended to probe the oral health status and behavior of the elderly persons in the canton of Geneva (13, 14). All patients ($n = 216$) admitted to one ward of the Geneva University Geriatric Hospital during a period of 9 months participated in the study. Information about the socio-economic and medical status was obtained from the hospital files. The patients were interviewed, and a full-mouth examination was performed by one of three dentists during the first week of hospitalization. The intraoral examination was carried out at bedside or while the patient was sitting in a chair, with the dentist using a dental mirror, a shepherd probe, a periodontal probe and illumination from a frontal lamp. Oral hygiene was evaluated by scoring plaque on the mesial and buccal surfaces of each tooth, using the Plaque Index (PI) (2). Coronal caries and root caries (> 1 mm gingival recession) were recorded and classified in active coronal caries (lesion in a pit, a fissure, or on a smooth surface with undermined enamel or soft walls and softened floor), inactive coronal caries (lesions hard on probing), active root caries (yellow or light brown discoloration, softened or leathery on probing), and inactive root caries (dark, smooth, shiny, and hard on probing (1, 15, 16); recurrent caries were detected on the basis of the WHO criteria (15). The presence of gingivitis, calculus, and pocket depth was recorded for

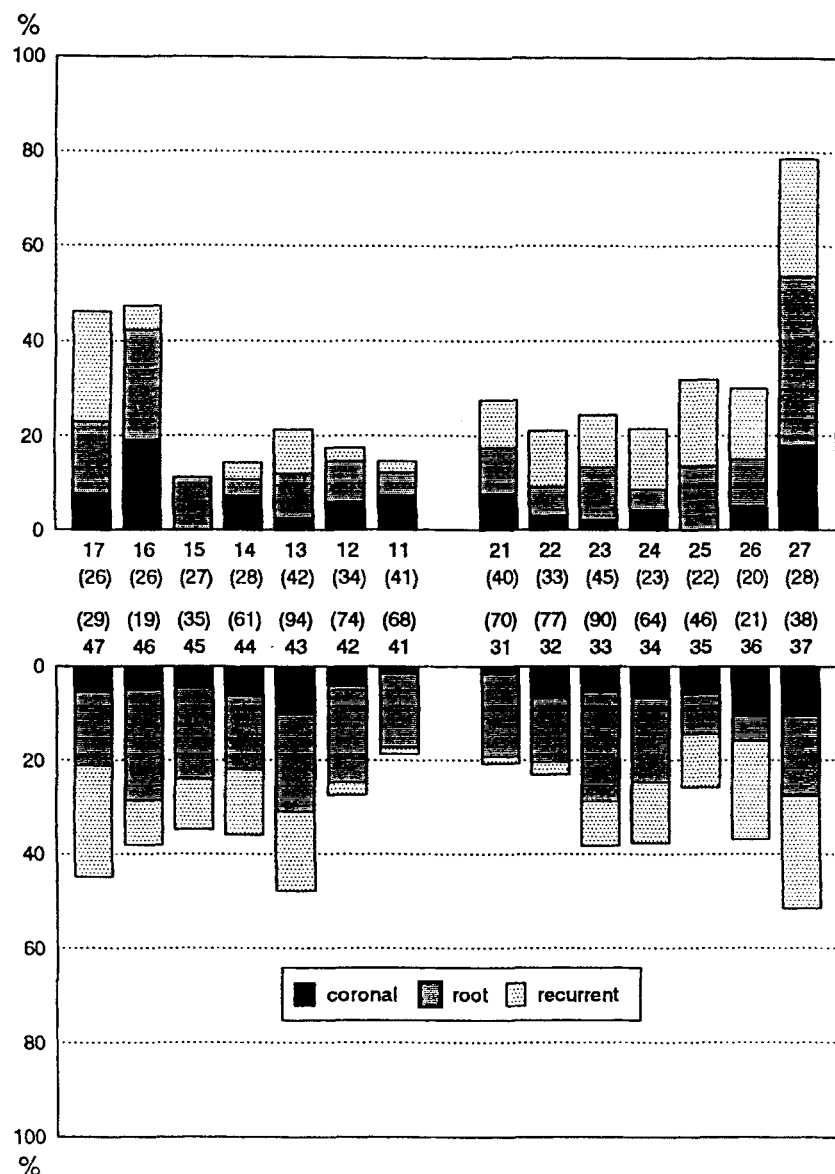


Fig. 1. Prevalence of active coronal caries, root caries, and recurrent caries in 1212 examined teeth in 120 hospitalized patients. The figures in parentheses indicate the number of teeth actually present and examined.

each tooth in accordance with the CPITN criteria (17). Pocket depth and gingival recession (reference point: cemento-enamel junction or crown margins) were measured mesially and buccally on each tooth. Two experienced dentists calibrated the three examiners, but repeated examination could not be carried out because of hospital restraints.

All information collected was entered in a computer database. Overall prevalence data have been reported elsewhere (18). This report is based on data from the dentate subjects, and the analysis was performed with the patient and, when possible, the tooth as the statistical unit. The statistical techniques used were the

Pearson chi-square, the Kruskal-Wallis one-way analysis of variance, and logistic regression. The level of significance was set at $P < 0.05$.

Results

General and oral health status

The total sample consisted of 120 elderly persons; of the sample 72% were women, and the mean age was 83 years, with a range from 69 to 97 years. Of the patients 72% were non-institutionalized before hospitalization.

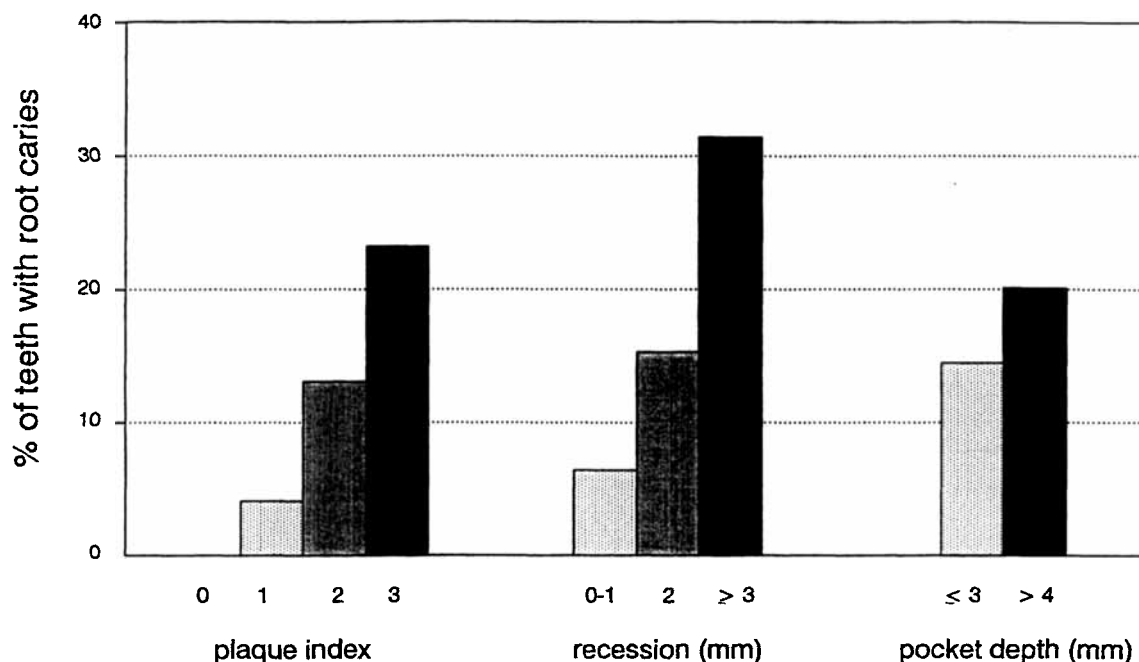


Fig. 2. Relationship between prevalence of root caries and plaque index (combined scores for mesial and buccal tooth surfaces), gingival recession, and pocket depth.

Almost half of the patients had been hospitalized owing to cardiovascular diseases, and 15% due to respiratory diseases. Injuries following a fall or an accident accounted for 16% of the hospitalizations. Mental diseases had been diagnosed in 11% of the patients, and in 14% dementia was suspected, as it was not possible to carry out an interview of these patients. Other medical conditions present were diabetes (10%), renal problems (10%), cancer (9%), and digestive diseases (8%). All the patients were taking sleeping pills after their hospitalization in addition to other medications. The most frequently prescribed drugs were antidepressants (49%), analgesic drugs (29%), antihypertensive drugs (26%), and anticoagulants (25%). Most of the patients (68%) were prescribed one to three drugs, and 24% were prescribed four or more different drugs.

The average number of teeth per patient was 11.1 (median, 9.5), and only 10% had more than 22 teeth left. Of the patients 61% had active caries (33% coronal and 54% root caries) and 18% inactive caries (9% coronal and 11% root caries). Of the patients 35% had one or two teeth with active caries lesions, 15% had three to five teeth with active caries lesions, and 11% had six or more teeth with active caries. Forty-three per cent of the patients had fillings showing recurrent caries. Of the 1212 teeth examined (excluding 120 roots) 71 (5%) had active coronal caries and 190 (14%) active root caries, whereas 126 (10%) had fillings with recurrent caries. Inactive caries was observed in relatively few teeth (coronal, 2%; root, 2%). Altogether, almost 30% of the teeth needed some sort of caries

therapy (Fig. 1). The 120 visible root remnants were observed among 23% of the patients.

Caries prevalence related to social and medical variables

No relationship was found between the prevalence of active coronal caries, root caries, or recurrent caries, respectively, and various sociodemographic variables including age, gender, degree of dependence, institutionalized or outpatients, regular or irregular dental visits. However, patients who brushed their teeth more frequently ($\geq$ twice a day) were more often caries-free ($P < 0.05$).

Patients with psychiatric disorders had significantly more caries than the others ($P < 0.01$). No other disease was related to caries prevalence, and there was no relationship between the number of prescribed drugs and caries prevalence.

Using logistic regression models, the presence of caries (coronal or root caries) could not be estimated accurately using data on social and medical situation. The optimum combination of risk factors comprised gender (men), out- or in-patients (in-patients), cardiovascular diseases and psychiatric disorders (diagnosed). However, this model could classify correctly only 74% of the patients.

The questions related to oral hygiene except for the frequency of tooth brushing did not help to identify the subjects with caries. This latter question alone enabled us to extrapolate the presence or absence of caries in 78% of the subjects. No other question or combination

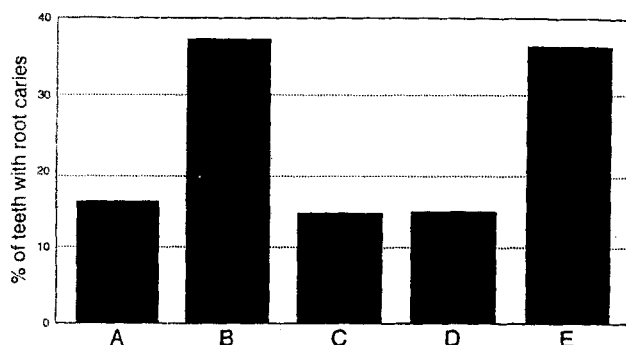


Fig. 3. Prevalence of root caries of teeth without coronal caries (A) versus teeth with coronal caries (B), unrestored teeth (C), restored teeth without recurrent caries (D), and restored teeth with recurrent caries (E).

of questions could do better even when combined with information on the medical status. Furthermore, including time elapsed since the last visit to the dentist or the last type of dental treatment received did not increase the accuracy of the logistic model.

Caries prevalence and oral health status

Active root caries was associated with a high score for plaque on either buccal or mesial tooth surfaces ($P < 0.001$) (Fig. 2).

Active root caries was detected more frequently on teeth with severe gingival recession ($P < 0.001$) (Fig. 2). Thus, root caries was found on 31% of the teeth with severe gingival recession and 15% of the teeth with moderate recession, compared with 6% of the teeth with slight or no gingival recession. Root caries was detected more frequently on teeth with pockets ≥ 4 mm ($P < 0.05$) (Fig. 2). In addition, active root caries was detected about three times more frequently on teeth also affected by coronal caries than on teeth without coronal caries ($P < 0.001$) (Fig. 3). Furthermore, root caries was present about three times more frequently on teeth with recurrent caries adjacent to fillings than on teeth without restorations or with sound restored teeth ($P < 0.001$) (Fig. 3).

Active coronal caries was also associated with a high score for plaque on either buccal ($P < 0.05$) or mesial ($P < 0.01$) tooth surfaces.

Discussion

The reliability of the data collected during this study could not be evaluated since it was not possible to carry out repeated examinations. However, the use of well-defined clinical criteria and the calibration of the examiners should have guaranteed minimum examiner variability (19–22).

The present population was characterized by being

irregular attenders to dental check-ups and by having poor oral hygiene and a relatively high prevalence of active caries. Thus, there was an association between high plaque scores and prevalence of root caries and coronal caries and an association between the prevalence of root and coronal caries. These observations support the results of previous prevalence and incidence studies showing positive correlations between poor oral hygiene, coronal caries, and root caries (4, 23, 24). Few lesions were considered to be inactive. This is in contrast to a study carried out on healthy elderly subjects showing a predominance of inactive lesions (1). A relatively high prevalence of active caries versus inactive caries in elderly patients with gingival recession and exposed roots is an indication of high caries activity and the presence of a caries-active microflora (25). It could be argued that the poor oral hygiene observed in the present study was due to a disturbance of the brushing habits caused by the hospitalization. However, while the relationship between high plaque score and both coronal and root caries was very strong, the short period between day of hospitalization and the clinical examination could not have had any effect on the present caries situation.

Except for one other study (26) no similar study seems to have been carried out to assess caries prevalence in recently hospitalized elderly subjects. The percentage of subjects with root remnants was 23%, which is a relatively low prevalence compared with studies carried out on nursing home residents showing root remnants in about 40%–70% (7, 8, 27). On the other hand, the prevalence of active coronal caries (33%) and active root caries (54%) was higher than that found in several other studies (7, 8, 10, 12, 16, 27). Overall, it is difficult to compare prevalence rates of caries without considering population differences (28). However, the relatively high prevalence of active caries compared with the prevalence of root remnants might reflect a more recent deterioration of oral hygiene and increase of caries activity. A deterioration of the general health situation might be the underlying factor responsible for this change.

It was unexpected that the prevalence of caries was not related to the patients' degree of dependence or whether they had been institutionalized before hospitalization. This is in contrast to other studies indicating that the degree of helplessness is a predominant factor influencing the occurrence of untreated caries (7, 28). In contrast, another study indicated no differences in caries prevalence among institutionalized and non-institutionalized patients (9). It is possible that some of the patients were categorized as dependent as a consequence of the acute medical condition for which they had become hospitalized. In fact, patients with psychiatric disorders, often a chronically debilitating condition, had increased prevalence of caries. Such patients generally have very poor oral hygiene, frequent xerostomic drug intake, and high counts of salivary

mutans streptococci, factors predisposing to increased caries incidence and prevalence (11, 24, 28, 29).

Caries prevalence was not related to the number of drugs prescribed. This was not unexpected, since medication to a large extent had been introduced after hospitalization.

Different methods of reporting prevalence data for root caries have been proposed, including number of lesions per person, the percentage of the population affected by root caries, the number of teeth affected, and the percentage of exposed root surfaces affected by root caries. The present study was restricted to record the number of patients and the individual teeth affected by active (leathery or soft) lesions and/or inactive (hard) lesions. Caries adjacent to fillings including exposed root surfaces was categorized as recurrent caries and not as root caries. The present study therefore does not report the true prevalence of root caries (root surfaces affected by caries) but estimates the number of patients/teeth affected by active root caries (coronal and recurrent caries), figures that are important to assess the patients' need of caries therapy. A detailed reporting of DMF scores does not seem meaningful in a population with so few remaining teeth and so high prevalence of active caries.

With regard to the intraoral distribution of root caries several studies indicate that molar and premolar teeth of the mandible are most frequently affected, followed by the maxillary molars and canines (1, 4). In the present study the root caries prevalence was more evenly distributed between the different tooth groups, probably because we scored the number of teeth with root caries and not the number of tooth surfaces affected.

The prevalence of active root caries was related to the degree of gingival recession. The reason for this association is not obvious, since caries is likely to develop at the level of the junction between gingiva and the root surface (30); thus, the caries risk would be the same with 1 or 3 mm of recession. However, a tooth with a large gingival recession mesially and/or distally is likely to have its dentogingival junction at the root level on most of the tooth circumference, thus being maximally exposed to root caries. It is also possible that large gingival recession occurs among individuals with inadequate plaque control, resulting in high root caries prevalence. This was further confirmed by the finding that root caries occurred more frequently on teeth with high plaque scores, coronal caries, recurrent caries, or periodontal pockets, which indicates that the patients had intraoral environmental conditions that predisposed to caries due to, for example, smoking, carbohydrate consumption, decreased salivary secretion rates or salivary buffering capacity, infrequent tooth brushing, and irregular check-ups. Such associations between behavioral and intraoral variables and root caries prevalence have been shown in other studies (10, 23, 30–34). The results of the present study, therefore, strongly indicate that poor oral hygiene is a major

caries-predisposing factor in elderly patients. This is in contradiction to an FDI report (35) concluding that there is no consistent relationship between oral hygiene and caries.

The patients hospitalized in the Geriatric Hospital of Geneva usually stay for 1–2 months for necessary medical care. The present study strongly indicates that dental and oral care is also necessary. The fact that the patients showed predominantly active caries lesions and few inactive lesions suggests that they were highly susceptible to caries. This calls for rigorous oral hygiene measures, by mechanical and chemical means (fluoride, chlorhexidine) immediately after hospitalization. The purpose of this regimen would be to turn the active lesions into inactive lesions, thus preventing further progression of the disease.

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Received for publication 20 October 1995

Accepted 13 December 1995