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TOOTH LOSS AMONG DIABETIC PATIENTS

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SUMMARY

Periodontal disease, the consequence of which is tooth loss, is influenced by diabetes. The aim of this study was to assess the number of missing teeth in a group of diabetic patients (n=100), mean age 55, and to compare it with a control group (n=189), mean age 53. The results showed the number of extracted teeth per subject to be significantly greater in the group of diabetics (16.2) than in the control group (13.6) (p<0.001). Furthermore, patients with non-insulin dependent diabetes had significantly more extracted teeth (18.2) than those with insulin dependent diabetes (14.2) (p<0.001). The mean duration of diabetes was 10.6 years. The number of missing teeth was found to increase with the disease duration.

INTRODUCTION

Diabetes is one of the most common diseases of the modern times and one of the most frequent systemic disorders that can be connected with the development of periodontal disease (1-4). It is assumed that there are pathogenetic collagenic mechanisms of diabetes that stimulate the more intensive progression of periodontal disease. These mechanisms include metabolic impairment, vascular changes in the periodontium, changes of microbiotic flora in the periodontal pocket, and functional disorder of peripheral blood leukocytes (5).

The problem of caries in diabetics is partially solved by introducing insulin in regular therapy. According to many researches, there is a statistically nonsignificant difference in caries frequency between diabetic and healthy persons (6-8). Tooth loss is an inevitable result of periodontal disease, so it remains a problem that is difficult to control (9-11). Faulconbridge et al. (7) showed the children with good diabetes control to have distinctive pathologic lesions of the gingiva, although their prevalence of caries being comparable to that in the healthy population. The prevalence of periodontitis increases with age. Destructive features of periodontal disease are more common in diabetic patients (12). The studies by Bačić et al. (8,13) showed the number of extracted teeth to be significantly greater in the group of diabetics than in the control group. Also, the prevalence of periodontal disease and the need of dental treatment are significantly higher in diabetics.

According to the World Health Organization (WHO) criteria (14), by the age of 34 teeth are usually extracted for caries, and later because of periodontal disease. Therefore, we decided to include diabetics older than 35 in the study and to determine the mean

Table 1. **Mean number of missing teeth in diabetic patients and control subjects according to age groups**

	Number of missing teeth	
	Diabetic patients	*Control group*
Age (yrs)	Mean value	Mean value
35-44	12.3	8.8
45-54	13.7	9.7
55-64	16.2	14.4
>64	23.4	21.8
Total	16.4 *	13.6 *

* $p < 0.001$

Figure 1. **Distribution of diabetic patients according to type of diabetes and age groups.**
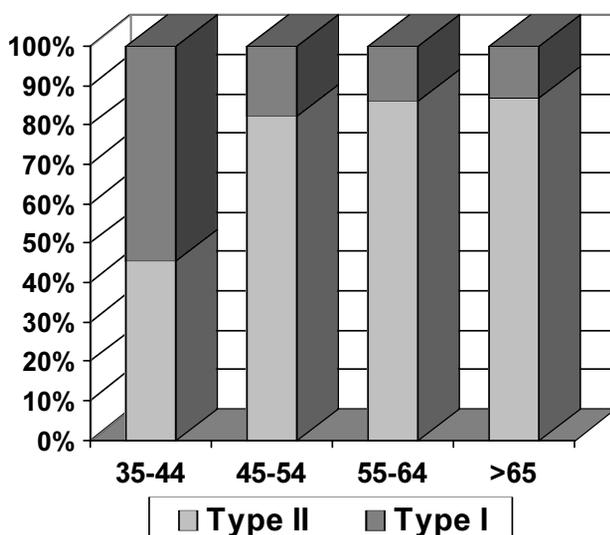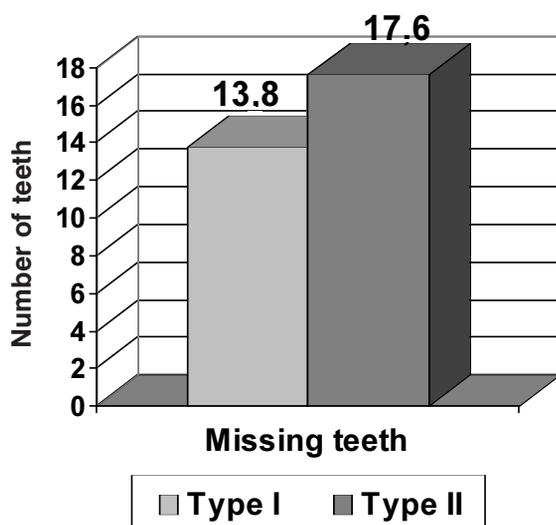

Figure 2. **Missing teeth according to type of diabetes.**

number of missing teeth according to type and duration of diabetes, sex and age, and to compare these data with those obtained in healthy subjects.

SUBJECTS AND METHODS

Study group consisted of a random sample of 100 diabetics (51 men and 49 women), mean age 55 years, recruited from the patients treated at the Vuk Vrhovac Institute, University Clinic of Diabetes, Endocrinology and Metabolic Diseases, Zagreb. Diabetics were divided according to C-peptide findings; there were 43 patients with insulin dependent diabetes (type I) and 57 patients with non-insulin dependent patients (type II), with a mean disease duration of 10.6 years. Control group consisted of 189 healthy individuals (115 men and 74 women), mean age 53 years, examined at private dental clinics in Zagreb. All study subjects were divided into four age groups of 35-44, 45-54, 55-64 and >64 years.

Only clinical examination of oral cavity was done with specific instruments (dental mirror and standard probe). Clinical examination without additional orthopantomograms was chosen to ensure full safety of study subjects, thus giving up the potential usefulness of additional tooth x-rays (the prevalence of *dentes retenti* and *radices relictae* is not decisive for result interpretation). Dental status was only recorded for the teeth that were missing (except for third molars, which were not observed). Data were also collected on the subject age, sex, and in diabetics on the type and duration of diabetes. In both diabetic and control groups, the measurements were done by the same examiners (I.Č.-B. and ☐.V.) respecting the predetermined criteria. Data were recorded in special WHO dental health forms. Data were statistically processed using SPSS software and variance analysis.
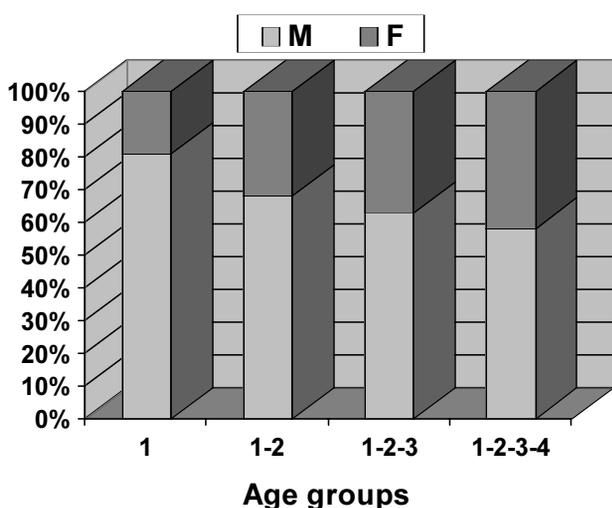
RESULTS

The mean number of missing teeth *per* person in diabetic group was 16.4, which significantly exceeded the mean number of extracted teeth in control subjects (13.6; $p < 0.001$) (Fig. 1). The distribution of diabetic patients according to type of diabetes and age showed a higher prevalence of non-insulin dependent diabetes (type II) and a decreasing tendency of insulin dependent diabetes (type I) with age. The proportion of type I diabetic patients was as high as 54.4% in the

35-44 age group, declining to 17.6% in the 45-54, 13.8% in the 55-64, and 13.0% in the >64 age group (Fig. 1). Type II diabetic patients had a significantly greater number of missing teeth than type I diabetics (18.2 *vs.* 14.2, p<0.001) (Fig. 2).

The mean duration of diabetes mellitus in the diabetic group as a whole was 10.6 years. Cumulative review of sex distribution according to age groups revealed the number of male diabetic patients to decrease with age, in spite of their predominance in younger age groups (Fig. 3).

Figure 3. **Cumulative distribution of sex relations.**

DISCUSSION

Although the mean number of missing teeth does not give a direct insight into the periodontal status, it is an important factor in estimating oral health. It is known that by the age of 34 teeth are mostly lost due to caries, and after age 34 the cause is in most cases periodontal disease (14). In this study, the mean number of missing teeth *per* person was 16.4, which was statistically significantly higher than the number of extracted teeth in control subjects (13.6; p<0.001). Oral complications most frequently associated with diabetes include tooth loss, gingivitis, periodontitis and pathologic changes of oral soft tissues (8,15,16). Many authors mention diabetes as a risk factor for the occurrence of periodontitis, which leads to early tooth loss (17-19). The mechanism of diabetes correlation with periodontitis primarily involves vascular changes, then neutrophilic dysfunction, impaired collagen synthesis,

and genetic predisposition. It is known that diabetes induces vascular changes in all tissues, including capillaries of periodontal structures. Gingival capillaries undergo basal membrane thickening, however, other pathologic changes such as membrane disruption, intramembranous presence of collagen and edematous endothelium may also be observed. These changes have been postulated to impair oxygen expansion, leukocyte migration and immune factor activities, thus contributing to the progression of periodontitis and tooth loss by disordered microcirculation in diabetics (19). Glavind et al. (20) found that diabetics had 9.5 teeth less at age 20-40, whereas Bačić et al. (8) found the mean tooth loss to be 12.3. Mackenzie and Millard (21) also found a greater number of extracted teeth because of alveolar bone loss. The findings that after age 35 there is a significantly higher prevalence of individuals with deeper periodontal pockets (WHO) and that diabetes is associated with periodontal disease may confirm the hypothesis that the main cause of tooth loss in this population group is advanced periodontal disease. On the other hand, the studies by Ainan et al. (22) and Oliver et al. (19) show that well-controlled diabetics do not loose more teeth than healthy individuals and that the risk of periodontitis in diabetics can be reduced by minimizing plaque and calculus under professional dental care. In our study, the patients with non-insulin dependent diabetes had significantly more extracted teeth (18.2) than those with insulin dependent diabetes (14.2; p<0.001). There were as many as 34.5% of completely edentulous diabetics older than 54 and 60.9% of diabetics older than 64. Another study in edentulous diabetics showed no correlation between edentulousness and diabetes mellitus (23).

Although in this study there was no statistically significant sex difference in tooth number, cumulative sex distribution showed a declining number of males but an increasing number with aging. Data on tooth loss in diabetics are just one of the indicators of disease severity that is usually due to metabolic disorder.

There is a very interesting study by Moore et al. (24), demonstrating that diabetics do not use preventive measures more intensively than non-diabetics. This probably is due to the lack of appropriate information on oral complications in their disease, which is quite surprising in the present world of widely available information. It is generally known that longstanding

diabetes mellitus brings many unavoidable complications on various organs (diabetic retinopathy, neuropathy, nephropathy) as the result of impaired body resistance. A recent study deals with favorable responsiveness of well controlled diabetic patients to conventional periodontal procedures, comparable to that of healthy individuals (25).

It is concluded that inadequate metabolic control, dental calculus and longstanding diabetes can increase the risk of periodontitis as well as of tooth loss. On the other hand, diabetics who regularly control their disease and oral health through selfcare and regular dental and oral professional care, have a lower risk of tooth loss. Our results pointed to a conclusion that the number of missing teeth was significantly higher in patients with diabetes mellitus than in the control group. The higher percentage of tooth loss may suggest that diabetic patients are not aware of oral health and the necessity of oral control by which the risk of tooth loss can be reduced irrespective of the type and duration of the disease.

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