Acta Odontologica Scandinavica, 2010; 68: 278–283

informa
healthcare

ORIGINAL ARTICLE

Periodontal condition of the elderly in Finland

ANNA-MAIJA HANNELE SYRJÄLÄ[1], PEKKA YLÖSTALO[1] & MATTI KNUUTTILA[1,2]

[1]*Department of Periodontology, Institute of Dentistry, University of Oulu, Oulu, Finland, and* [2]*Oral and Maxillofacial Department, Oulu University Hospital, Oulu, Finland*

Abstract

Objective. To describe the periodontal condition of the elderly in Finland and its association with sociodemographic factors. ***Material and methods.*** The study was based on a subpopulation of 1460 persons (748 dentate persons) aged ≥65 years who participated in a nationally representative Health 2000 Survey in Finland. The data for this study were collected by means of an interview and a clinical oral examination. ***Results.*** Seventy-three percent of the participants in this study had gingival bleeding in at least one sextant. The proportion of participants with no teeth with deepened periodontal pockets ≥4 mm deep was 31%. Twenty-eight percent of the participants had one to three teeth with deepened periodontal pockets ≥4 mm deep, 15% had four to six and 26% had ≥7. At the individual level, a high number of teeth with deepened periodontal pockets was associated with sociodemographic factors such as high age, intermediate or higher education, and living in a rural area. ***Conclusion.*** At a national level, the greatest need for periodontal treatment presently derives from persons aged 65–74 years and/or those with low education, due to their high representation in the elderly population.

Key Words: *Elderly people, epidemiology, periodontal disease*

Introduction

Periodontitis is a common oral disease that affects about one-third of the general population in some form, being more common among elderly people than among younger and middle-aged people [1]. In the future, periodontitis will became even more prevalent among elderly people, since they will most likely maintain more of their own natural teeth than did previous age cohorts.

Demographic changes are probably the most important factor that will affect a future increase in the prevalence of periodontitis. For example, according to the European Commission [2], the proportion of persons in Europe who are aged ≥65–79 years will increase by 37% from 2010 to 2030, meaning an increment of >22 million persons.

Population changes can be estimated fairly well on the basis of demographic parameters, whereas changes in the periodontal condition of the population are less predictable due to a lack of representative data on periodontal health and also due to other factors, such as unexpected changes in the delivery and use of health services, for example. From the point of view of public health, it is therefore important to monitor the oral health and geographic distribution of the population in order to estimate treatment need, develop preventive dental programs, and assure adequate delivery of care [3]. The aim of this study was to describe the periodontal condition of a Finnish nationally representative elderly population.

Material and methods

In 2000–01 the National Institute for Health and Welfare of Finland (THL), formerly the National Public Health Institute, conducted a Health 2000 Survey, a nationally representative population-based study [4]. The original sample included home-dwelling, community-dwelling, and institutionalized persons ≥30 years old who were living in continental Finland (n = 8028). The present report is based on a subpopulation of persons aged ≥65 years (n = 1460), of whom 814 were dentate. Periodontal pocket depth was measured in 748 subjects. The data for this report

Correspondence: Anna-Maija Syrjälä, Department of Periodontology, Institute of Dentistry, P.O. Box 5281, University of Oulu, Oulu, FI-90401, Finland. Tel: +358 08 5375011. Fax: +358 08 5375560. E-mail: Anna-Maija.Syrjala@oulu.fi

(Received 4 November 2009; accepted 27 April 2010)

ISSN 0001-6357 print/ISSN 1502-3850 online
DOI: 10.3109/00016357.2010.494619

were collected by means of interviews and clinical oral examinations [5]. Informed consent was acquired from the participants or their guardians. The ethical committee of Helsinki University Hospital approved the study protocol.

Interview

The interviews were performed by trained professional interviewers from Statistics Finland in the participant's home, in a place indicated by the participant, or in an institution. The guardians of the participants were asked to provide supplementary data, if needed.

Place of residence was classified as a rural area, a population centre, or a city. Education was categorized as follows: basic education, i.e. vocational education or on-the-job training; intermediate education, i.e. secondary or post-secondary vocational training, apprenticeship training, qualification based on competence tests, a specialist vocational qualification, or a matriculation examination; and higher education, i.e. educated at a post-secondary vocational institution, polytechnic, or university [5]. Marital status was classified as living with a spouse (married, common-law relationship) versus living alone (divorced, juridical separation, widowed, or single).

Clinical oral examination

Five calibrated dentists from the Health 2000 Survey group performed the clinical oral examination. All visible and tactile teeth and tooth remnants in the maxilla and mandible were included in the number of teeth.

Periodontal pocket depth was measured by probing the four surfaces of each tooth, except in the dental radices and third molars. The deepest pocket depth (categorized as a probing depth of 4–5 or ≥6 mm) was recorded for each tooth. The number of teeth with periodontal pockets ≥4 and ≥6 mm deep was used as an outcome variable to measure periodontal infection.

Bleeding on probing was measured immediately after probing and recorded in sextants dd. 17–14, 13–23, 24–27, 37–34, 33–43, and 44–47. Bleeding was categorized as follows: no gingival bleeding in any of the sextants versus gingival bleeding in one or more sextants.

The percentage agreement in the parallel measurements under field circumstances between the field examiners and the reference examiner on bleeding on probing was 66% ($\kappa = 0.36$), and on the presence of periodontal pockets 77% ($\kappa = 0.41$) [6].

The basic characteristics of the study population are shown in Table I.

Table I. Characteristics of the study population[a].

Sociodemographic variable	≥65-year-old dentate and edentulous persons (n = 1460) (%)
Gender	
Proportion of males (n = 716)	49.1
Age (years)	
≥80 (n = 420)	28.8
75–79 (n = 236)	16.2
70–74 (n = 381)	26.1
65–69 (n = 423)	29.0
Education	
Basic (n = 1060)	72.9
Intermediate (n = 252)	17.3
Higher (n = 143)	9.8
Marital status	
Living alone (n = 716)	49.1
Living with a spouse (n = 742)	50.9
Place of residence	
Rural area (n = 426)	29.2
Population center (n = 223)	15.3
City (n = 811)	55.6

[a]Cluster sampling and weights are not used.

Statistical analyses

Relative risks were estimated using Poisson regression models, where the number of teeth was used as an offset variable. In order to take into account the sample weights and two-stage cluster sampling, analyses were made using the SVYTAB and SVYPOISSON procedures in Stata/SE, version 8.0 (StataCorp LP, College Station, TX). In order to be representative of the Finnish population in age groups aged ≥65 years, Table II and the Figures are also based on weighted counts and cluster sampling.

Results

Dentulousness and number of teeth

The proportion of dentate subjects in the study population was 57%, being smallest in the older age groups and among females and those with low education (Figures 1 and 2).

Deepened periodontal pockets and gingival bleeding

The proportion of participants having no teeth with deepened periodontal pockets was 31%; 28% had one to three teeth with periodontal pockets with a pocket depth of ≥4 mm, 15% had four to six,

Table II. Association between sociodemographic variables and periodontal disease. Results of Poisson regression models, relative risks (RRs), and 95% confidence intervals (CIs)[a].

Sociodemographic variable	Adjusted[b] RR (95% CI)	
	Teeth with periodontal pockets ≥4 mm deep	Teeth with periodontal pockets ≥6 mm deep
Gender		
Male	0.8 (0.4–1.5)	1.0 (0.5–2.2)
Female	1.0	1.0
Age (years)		
≥80	3.9 (1.5–10.2)	3.3 (1.1–10.1)
75–79	1.3 (0.5–3.3)	0.7 (0.2–2.2)
70–74	0.6 (0.2–1.6)	0.7 (0.2–1.9)
65–69	1.0	1.0
Education		
Basic	0.5 (0.2–1.3)	0.3 (0.8–1.0)
Intermediate	1.4 (0.7–2.7)	1.2 (0.6–2.6)
Higher	1.0	1.0
Marital status		
Living alone	1.1 (0.6–2.2)	1.3 (0.6–3.1)
Living with a spouse	1.0	1.0
Place of residence		
Rural area	2.5 (1.1–5.9)	1.6 (0.6–4.5)
Population center	1.2 (0.4–3.5)	0.8 (0.2–3.5)
City	1.0	1.0

[a]Risk estimates are based on weighted counts and cluster sampling to represent the Finnish population.
[b]Adjusted for gender, age, education, marital status, and place of residence.

and 26% had ≥7. The proportion of participants having no teeth with deep periodontal pockets (pocket depth ≥6 mm) was 69%. Twenty-three percent of the participants had one to three teeth with deep periodontal pockets, and 8% of the participants had ≥4.

Figures 1 and 2 show the proportion of subjects with deepened periodontal pockets according to age group and education group. The proportion of persons with ≥7 teeth with a probing depth of ≥4 mm was largest among those with high education (37%), compared with 22% in the intermediate education group and 11% in the low education group. However, the absolute number of persons with ≥7 teeth with a probing depth of ≥4 mm as well as the absolute number of persons with teeth with deepened periodontal pockets were largest among those with low education (Figure 2).

Among men, the mean number of teeth with periodontal pockets with a pocket depth of ≥4 mm (the extent of periodontal infection) was lower in older than younger age groups (Figure 3), whereas among women no essential differences between age groups were observed. From Figure 4 it can be seen that those with higher education had a higher mean number of deepened periodontal pockets than those with low education (Figure 4).

At the individual level, it was found that a high number of teeth with deepened periodontal pockets was associated with being ≥80 years old, intermediate or higher education, and living in a rural area (Table II).

Seventy-three percent of the participants in this study had gingival bleeding in at least one sextant. No essential differences in gingival bleeding were found between genders, between education groups, or between different age groups.

Discussion

The strength of our study is that it involved a representative sample of the Finnish population in age groups aged ≥65 years. Also, the analyses of these data were performed in such a manner that we were able to extrapolate findings for the total population aged ≥65 years.

Our study showed that periodontal diseases are common among Finnish elderly people aged ≥65 years, irrespective of whether they are measured by means of the presence of gingival bleeding or deepened periodontal pockets. In these data the prevalence of deepened periodontal pockets was higher among elderly people than reported previously in Finland [7] and elsewhere [8–11].

In this elderly population, the prevalence and extent of periodontal infection were highest among those with high education, which is most likely due to the fact that educated persons have retained more teeth. This indicates a high need for periodontal treatment in these individuals. Despite this, it must be emphasized that the most total need for treatment derives from subjects with low education, because they form 75% of the total Finnish population in these age groups [12]. However, this will most likely change in the future, and treatment need will derive to a large extent from subjects with high education because their representation in the elderly population will increase. Despite these changes in educational level, we are tempted to believe that demographic changes, i.e. an increase in the proportion of elderly people in the population, will be the most important reason for an increase in total periodontal treatment need.

Severe periodontal problems (presence of deepened periodontal pockets ≥6 mm) affected about one-third of the population aged ≥65 years in this study. This indicates a need for more advanced periodontal therapy [13].

Periodontal disease may also have an impact on general health, i.e. systemic low-level inflammation [14,15],

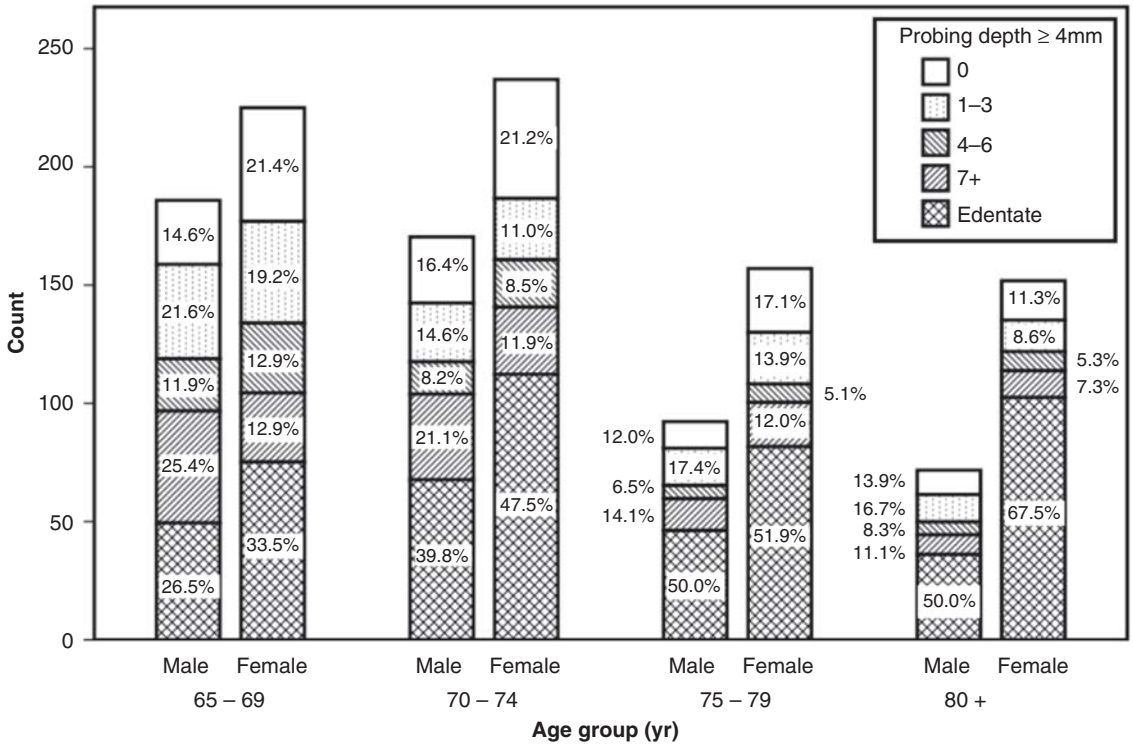

Figure 1. Proportions of subjects who are edentulous or have 0, 1–3, 4–6, or ≥7 deepened periodontal pockets ≥4 mm deep, according to gender and age. The proportions are based on weighted counts and cluster sampling to represent the Finnish population.

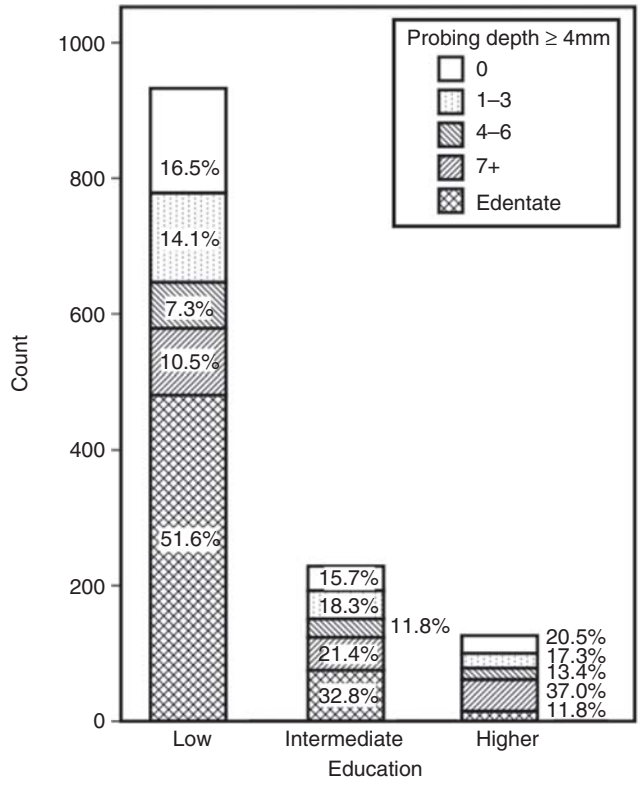

Figure 2. Proportions of subjects who are edentulous or have 0, 1–3, 4–6, or ≥7 deepened periodontal pockets ≥4 mm deep, according to level of education. The proportions are based on weighted counts and cluster sampling to represent the Finnish population.

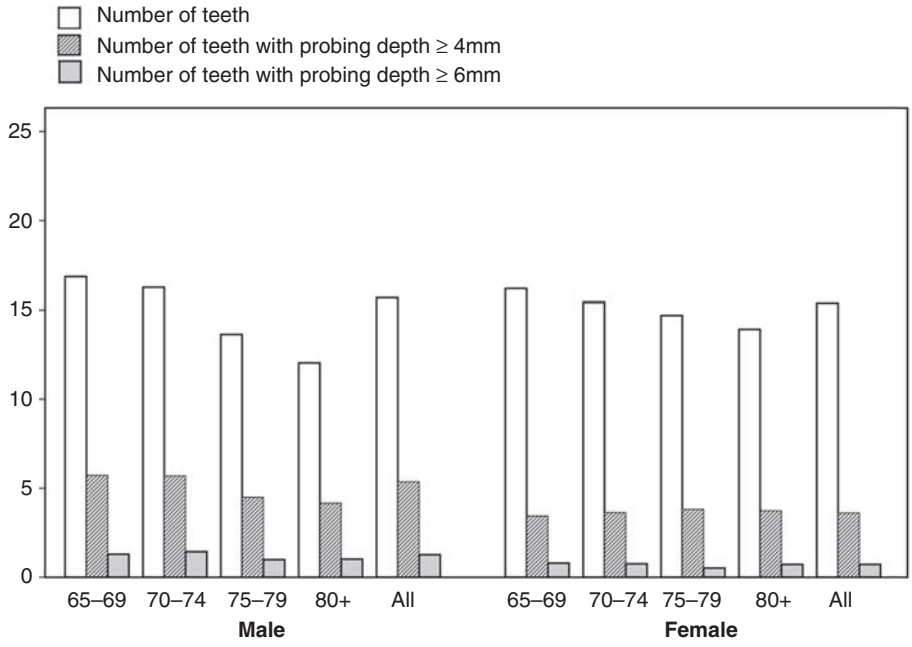

Figure 3. Mean number of teeth among dentate persons and mean number of teeth with probing depths of ≥4 and ≥6 mm, according to gender and age. The means are based on weighted counts and cluster sampling to represent the Finnish population.

cardiovascular health [16,17], and aspiration pneumonia [18]. Further, periodontal disease has been found to predict tooth loss [13], which in turn means impaired masticatory function, decreased quality of life, and increased need for prosthetic treatment.

The common nature of periodontal problems means that awareness of periodontal disease and its risk factors should be increased by dental professionals. It is important to organize regular periodontal recall and maintenance care by dentists and oral hygienists among elderly people living at home, in a sheltered home, or in an institution. Further, multiprofessional oral healthcare that includes nurses, relatives, and care-givers should be organized, and they have to be encouraged to take care of the oral health of elderly people. The World Health Organization has also recommended that countries engage in strategies that improve oral health among elderly people; control of oral diseases ought to be strengthened and national public programs that include oral health promotion and disease prevention should be set up [3].

Besides the representativeness of the data, another strength is that the data were based on clinical examinations conducted by calibrated dentists.

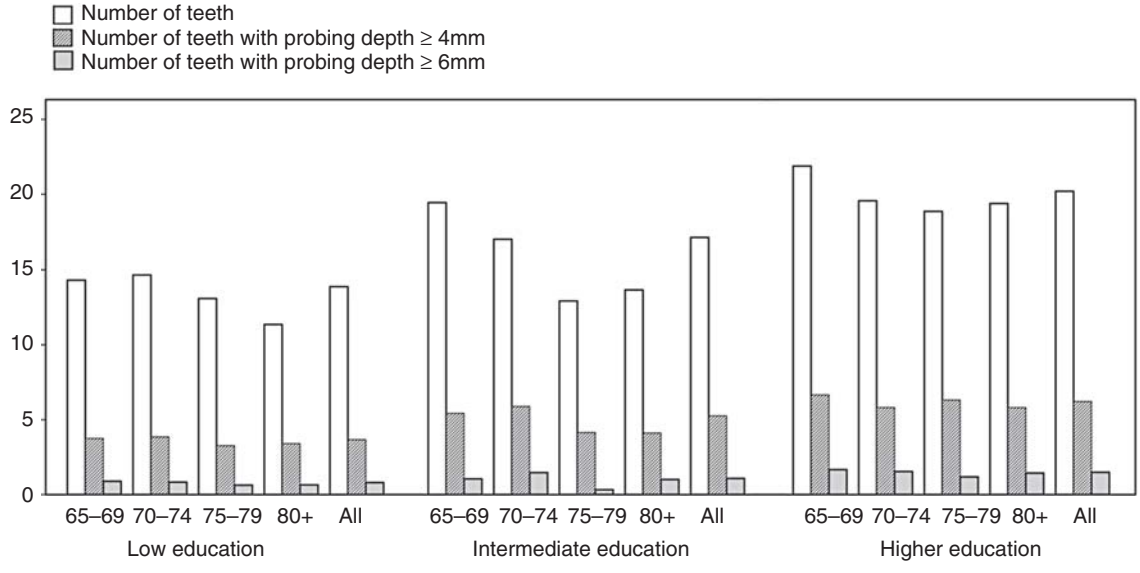

Figure 4. Mean number of teeth and mean number of teeth with probing depths of ≥4 and ≥6 mm, according to level of education. The means are based on weighted counts and cluster sampling to represent the Finnish population.

Measurement of clinical attachment level was not included in the study protocol, because the study was large and measurement of clinical attachment level is time-consuming; this is one weakness of this study. On the other hand, the presence of deepened pockets is a standardized measure for assessing present periodontal infection and is widely used in research, in screening, and also in clinical work to assess periodontal treatment need. Further, the presence of deepened periodontal pockets describes the need for periodontal treatment, but it must also be noted that deepened periodontal pockets may be residual pockets after periodontal care and may not necessarily require treatment.

In conclusion, this study shows that periodontal infection, whether measured by means of gingival bleeding or deepened periodontal pockets, was common among persons aged ≥65 years. Although the results showed that periodontal infection at the individual level is associated with high age, high education, and living in a rural area, the total need for treatment is presently derived to a large extent from persons aged 65–74 years and/or with low education, due to their high representation in the elderly population.

Acknowledgement

The present research is part of the Health 2000 Survey, organized by The National Institute for Health and Welfare of Finland (http:\\www.ktl.fi/health2000) and partly supported by the Finnish Dental Society Apollonia and the Finnish Dental Association.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

[1] Albandar JM. Epidemiology and risk factors of periodontal diseases. Dent Clin North Am 2005;49:517–32.

[2] Commission of the European communities. Communication from the commission. Green paper "Confronting demographic change: a new solidarity between the generation". COM (2005) 94 final. Brussels: Commission of the European communities; 2005. p. 4–5. Available from http://eur-lex.europa.eu/LexUriServ/site/en/com/2005/com2005_0094en01.pdf.

[3] Petersen PE, Yamamoto T. Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. Community Dent Oral Epidemiol 2005;33:81–92.

[4] Aromaa A, Koskinen S, editors. Health and functional capacity in Finland. Baseline results of the Health 2000 Health Examination survey. Series B 12/2004. Helsinki: National Public Health Institute; 2004. p. 9–28 [cited 29 January 2010]. Available from: http://www.terveys2000.fi/julkaisut/baseline.pdf.

[5] Suominen-Taipale L, Nordblad A, Vehkalahti M, Aromaa A, editors. Oral health in the Finnish adult population. Health 2000 survey. Helsinki: National Public Health Institute; 2008. p. 9–20 [cited 29 January 2010]. Available from: http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2008/2008b25.pdf.

[6] Vehkalahti M, Knuuttila M, Hausen H. Quality assurance. In: Suominen-Taipale L, Nordblad A, Vehkalahti M, Aromaa A, editors. Oral health in the Finnish adult population. Health 2000 survey. Helsinki: National Public Health Institute; 2008. p. 17–20 [cited 29 January 2010]. Available from: http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2008/2008b25.pdf

[7] Ajwani S, Tervonen T, Närhi TO, Ainamo A. Periodontal health status and treatment needs among the elderly. Spec Care Dentist 2001;21:98–103.

[8] Fox CH, Jette AM, McGuire SM, Feldman HA, Douglass CW. Periodontal disease among New England elders. J Periodontol 1994;65:676–84.

[9] Miyazaki H, Ohtani I, Abe N, Ansai T, Katoh Y, Sakao S, et al. Periodontal conditions in older age cohorts aged 65 years and older in Japan, measured by CPITN and loss of attachment. Community Dent Health 1995;12:216–20.

[10] Petersen PE, Ogawa H. Strengthening the prevention of periodontal disease: the WHO approach. J Periodontol 2005;76:2187–93.

[11] Krustrup U, Petersen PE. Periodontal conditions in 35-44 and 65-74-year-old adults in Denmark. Acta Odontol Scand 2006;64:65–73.

[12] Population with educational qualification by level of education 2000. Table 0514. Regional Database. Statistics Finland, Helsinki; 2008. http://tilastokeskus.fi/tup/altika/index.html.

[13] Matuliene G, Pjetursson BE, Salvi GE, Schmidlin K, Brägger U, Zwahlen M, et al. Influence of residual pockets on progression of periodontitis and tooth loss: results after 11 years of maintenance. J Clin Periodontol 2008;35:685–95.

[14] Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. J Clin Periodontol 2008;35:277–90.

[15] Raunio T, Nixdorf M, Knuuttila M, Karttunen R, Vainio O, Tervonen T. The extent of periodontal disease and the IL-6-174 genotype as determinants of serum IL-6 level. J Clin Periodontol 2007;34:1025–30.

[16] Elter JR, Hinderliter AL, Offenbacher S, Beck JD, Caughey M, Brodala N, et al. The effects of periodontal therapy on vascular endothelial function: a pilot trial. Am Heart J 2006;151:47.

[17] Blum A, Kryuger K, Mashiach Eizenberg M, Tatour S, Vigder F, Laster Z, et al. Periodontal care may improve endothelial function. Eur J Intern Med 2007;18:295–8.

[18] Awano S, Ansai T, Takata Y, Soh I, Akifusa S, Hamasaki T, et al. Oral health and mortality risk from pneumonia in the elderly. J Dent Res 2008;87:334–9.