Archives of Oral Biology 86 (2018) 7–12

Contents lists available at ScienceDirect

Archives of Oral Biology

journal homepage: www.elsevier.com/locate/archoralbio

Research paper

Risk factors for tooth loss in middle and older age after up to 10 years: An observational cohort study

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ARTICLE INFO

Keywords:
ILSE
Longitudinal
Tooth loss
Tooth mobility
Community-dwelling
Older people

ABSTRACT

Objective: The objective of this research was to identify risk factors for tooth loss in two birth cohorts, quinquagenarians and septuagenarians, after up to 10 years of clinical observation.
Design: One hundred and twenty-three participants were recruited from the Interdisciplinary Study of Adult Development (ILSE) and examined at baseline and up to 10 years after. Thirty-nine and 84 participants belonged to the older (OC; born in 1930/32) cohort and younger (YC; born in 1950/52) cohort, respectively. Each participant underwent a dental examination comprising evaluation of the dental status (number of teeth, prosthetic restorations), Plaque Index (PI), Gingival Index (GI), DMF-S, periodontal probing depths (PD) and tooth mobility (TM). Incidence of tooth loss over the study period was calculated for both cohorts as well as for the grouped dental target variables. A logistic regression model for tooth loss (0 = tooth present/1 = tooth lost) was compiled with possible binary confounders.
Results: During the study period (eight years in mean), 1.2 (1.9) and 2.6 (2.6) teeth were lost in YC and OC, respectively, reflecting correspondent loss rates of 5% and 14% ($p < 0.001$). However, primarily TM > 1 merged into substantial tooth loss (60% lost). The regression analysis confirmed the bivariate findings. Older age and worse oral health issues were identified as risk factors for tooth loss($p < 0.05$).
Conclusions: Both quinquagenarians and septuagenarians show relevant tooth loss over a period of up to 10 years but more in septuagenarians. The predominant predictor for tooth loss seems to be greater tooth mobility. With the rising challenges due to aging in several societies, knowing the risks might help clinicians when weighing treatment strategies and should encourage refining preventive measures for older patients.

1. Introduction

The retention or loss of permanent teeth is of major importance with respect to patients' oral function and aesthetics and, therefore, oral health-related quality of life (Tan, Peres, & Peres, 2016). Altogether, tooth loss is an important epidemiologic indicator of oral health (Mojon, Thomason, & Walls, 2004). The causes of tooth loss are variable; oral and systemic diseases as well as sociodemographic factors can contribute to it (Baelum, van Palenstein Helderman, Hugoson, Yee, & Fejerskov, 2007; Beck, Sharp, Koch, & Offenbacher, 1997; Koyama et al., 2016; Machtei et al., 1999; Petersen, Bourgeois, Ogawa, Estupinan-Day, & Ndiaye, 2005). Oral diseases, especially periodontal disease – the sixth most prevalent chronic disease in the world – and untreated caries are associated with tooth loss (Baelum et al., 2007; Marcenes et al., 2013). These factors, in turn, are heightened by lifestyle (e.g., unhealthy nutrition, smoking), attitudes toward dental care and patients' educational and socioeconomic backgrounds (Avlund, Schultz-Larsen, Christiansen, & Holm-Pedersen, 2011; Baelum et al., 2007; Koyama et al., 2016; Machtei et al., 1999). Because some contributing factors may accumulate throughout the life span, aging subsequently correlates with tooth loss (Chambrone & Chambrone, 2006; Müller, Naharro, & Carlsson, 2007). Overall, however, tooth loss in many industrialised countries is decreasing as a consequence of preventive measures such as periodic dental visits, including professional tooth cleaning, and raising awareness of the importance of oral health and nutrition counselling in young people (Dye et al., 2007; Kassebaum

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https://doi.org/10.1016/j.archoralbio.2017.11.001
Received 6 June 2017; Received in revised form 31 October 2017; Accepted 4 November 2017

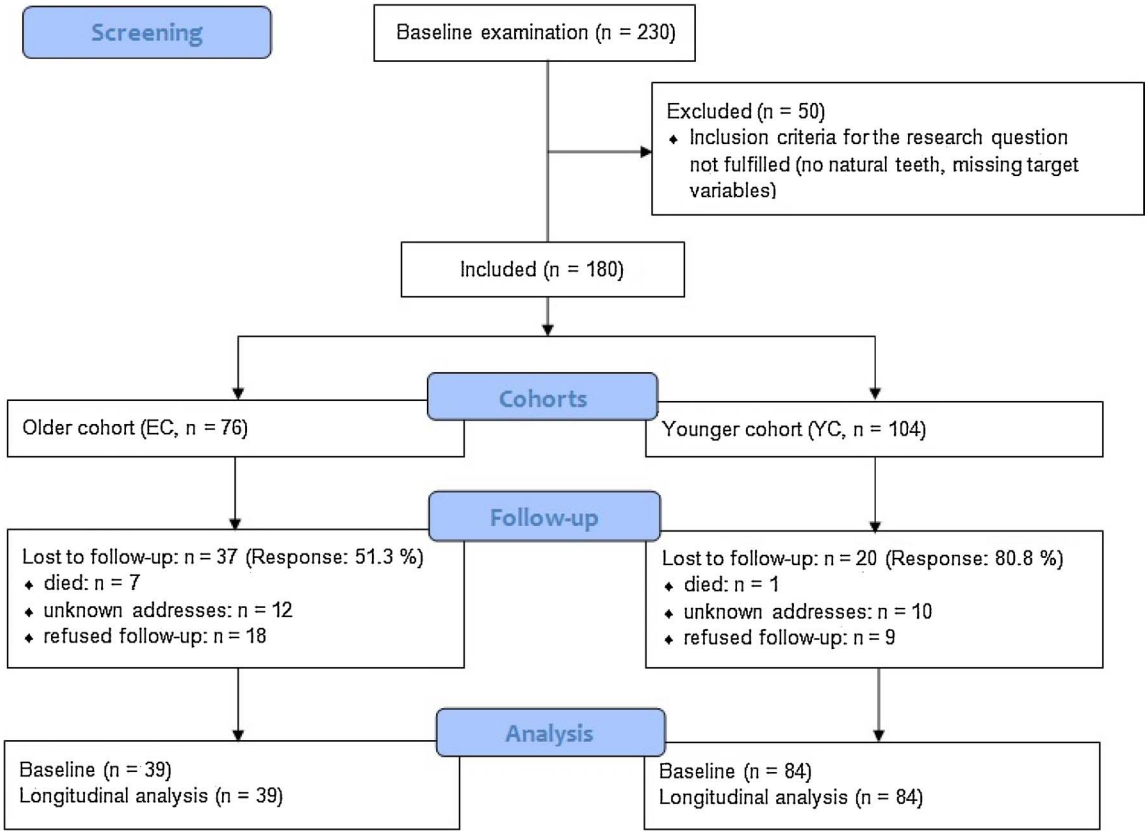

Fig. 1. Study flowchart.

et al., 2015). Moreover, patients have diseased teeth treated more frequently, avoiding the progression of periodontal disease or endodontic problems. Even older communities subsequently preserve a substantial number of remaining teeth (Dye et al., 2007; Hugoson et al., 2005). However, the World Health Organization's goal of preserving more than 20 teeth by the age of 80 has not yet been realised (World Health Organization, 2003). In Germany, for example, people between the ages of 65 and 74 years and between 75 and 100 years have approximately 11–18 missing natural teeth, respectively, and missing teeth are nearly ubiquitously recovered by prosthetic restorations. The level of refurbishment due to caries in the same age groups is stated to be 90% and 83%, respectively (Micheelis & Schiffner, 2005). Similar outcomes were found in other developed countries (Bernabé & Sheiham, 2014). However, especially periodontal disease is still a major dental threat worldwide and leads to tooth loss. In older people, the prevalence is nearly two-thirds of the population (Kassebaum et al., 2014; Marcenes et al., 2013). Nevertheless, if patients are subjected to periodontal therapy with subsequent maintenance, tooth loss rates are estimated to be less than one tooth over ten years, which corresponds to a tooth-related loss rate of 1.8% (Chambrone & Chambrone, 2006). Beyond institutional studies, using comprehensive therapies in highly compliant patients, only a few longitudinal studies have focused on tooth loss and associated confounders in the general older population. A previous community-based study looked at tooth loss in people aged 27–67 years over two years. The authors projected a loss of 0.2 teeth per patient per year (estimated 10-year loss: two teeth). In this study, evident risk factors were high periodontal pocket depths, systemic diseases and smoking (Machtei et al., 1999). Another study, with the same observation time, found an incidence of 3% for tooth loss. Molars, teeth with periodontal attachment loss, tooth mobility and untreated caries were at higher risk for loss (Gilbert et al., 1999). For people aged 65 years and older, a mean loss of 0.4 from 21 teeth over 18 months (estimated 10-year loss: three teeth per patient) was detected (Hunt, Drake, & Beck, 1995). A prolonged follow-up of the same source population revealed a tooth-related loss rate of 18% after 5 years. Attachment loss, periodontal probing depths > 3 mm and being a member of the black race as well as rural residence were independent predictors for tooth loss in this study (Beck et al., 1997). A further study of 73 older adults living in a rural environment, which observed the participants for up to 15 years, revealed a moderate tooth loss rate of 11% (2.1 tooth lost per participant). Accordingly, attachment loss and untreated caries were associated with tooth loss (Warren et al., 2001). On the contrary, this rural sample showed a lower tooth loss rate after a longer observation time than the urban sample of Beck (Beck et al., 1997) showed. However, to the knowledge of the authors, no longitudinal data on the extent and the determinants of tooth-related losses for quinquagenarians and septuagenarians in an urban region exist. Such study would be relevant to consider risk factors in dental treatment planning and to estimate the extent of dental treatment needs coming with demographic changes.

The objective of this prospective cohort study, therefore, was to identify risk factors for tooth loss in two birth cohorts, quinquagenarians and septuagenarians, after up to 10 years of clinical observation. The research hypothesis was that tooth loss in both birth cohorts is comparable over the study period.

2. Material and methods

2.1. Sample

Prior to the start of the study, ethical approval for both the baseline and the follow-up examinations was gathered from the local review board of the University of Heidelberg (registration numbers 181/2005 and 371/2013). A sub-sample of the Interdisciplinary Longitudinal Study of Adult Development (ILSE) (Sattler et al., 2015) was recruited. The ILSE study was designed as a longitudinal observational cohort