Investigating tooth loss and associated factors among older Taiwanese adults

Tze-Fang Wang [a,*], Ying-Yu Chen [b], Yiing-Mei Liou [a], Chyuan Chou [c]

[a] School of Nursing, National Yang Ming University, Taipei, Taiwan
[b] Food and Drug Administration Section, Public Health Bureau, Taoyuan County Government, Taiwan
[c] School of Public Health, Johns Hopkins University, Maryland, DDS, Dr.PH, USA

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ABSTRACT

The aim of this study was to evaluate factors associated with tooth loss in older Taiwanese adults with different numbers of remaining teeth. This study evaluated oral health status and tooth loss among 2286 adults aged over 65. Subjects were classified according to number of teeth (Group 1 <20 teeth vs. Group 2 ≥20 teeth). Tooth loss and oral health data were collected from the National Health Interview Survey (NHIS), compared between groups and analyzed by multivariate modeling. Group 1 subjects were older and had more partial dentures. Tooth loss was associated with self-limited food choices due to oral health status, and malnutrition. Tooth loss in Group 2 subjects was significantly associated with lower mental status. Tooth loss may predict cognitive status (odds ratio (OR) 1.30) and physical-disability (OR 1.79). Our results suggested that tooth loss was associated with age, more partial dentures, self-limited food choices, malnutrition, and lower mental and cognitive status and physical disability.

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1. Introduction

Tooth loss is the result of multiple factors related to health, lifestyle and specific demographic and socioeconomic influences (Arora, Schwarz, Sivaneswaran, & Banks, 2010; Chatrchaiwiwatana, 2007; Copeland, Krall, Brown, Garcia, & Streckfus, 2004; Haugejorden, Klock, & Trovik, 2003; Klein, Klein, & Knudtson, 2004; Moreira Rda, Nico, Barrozo, & Pereira, 2010; Susin, Oppermann, Haugejorden, & Albandar, 2005; Susin, Haas, Oppermann, & Albandar, 2006). In Taiwan, the extent of tooth loss increases as age increases. About 12.6% of adults aged 65 and older are edentulous and, correspondingly, the number of adults needing prostheses increased from 39.7% to 61.3% as age increased (Kuo, Yang, Lai, Yap, & Ho, 2009). Lee and colleagues found that older adults' perceptions of their oral health status had a greater impact on quality of life than their actual clinical oral health as represented by the number of natural teeth retained (Lee, Shieh, Yang, Tsai, & Wang, 2007). In that study, tooth loss as a clinical factor in oral health demonstrated a significant difference in health-related quality of life, suggesting that the influence of oral health on overall health deserved attention. Although studies have investigated aspects of tooth loss and oral health among older Taiwanese adults (Kuo et al., 2009; Lee et al., 2007), adequate nationwide evidence for older adults' oral health status is lacking, as well as is the knowledge of factors contributing to tooth loss in the older adult population.

While tooth loss in young people is significantly associated with a history of more than two teeth with dental caries (Susin et al., 2006), demographic and socioeconomic characteristics along with general health status, oral health status and dental hygiene practices contribute to tooth loss in older adults (Moreira Rda et al., 2010). Studies around the world have shown associations between tooth loss and various oral health-related factors. In Finland, tooth loss correlated with selected cardiovascular risk factors in older adults as well as with their mortality and quality of life (Syrjäiä, Ylöstalo, Hartikainen, Sulkava, & Knuuttila, 2010). A longitudinal study of aging also showed a relationship between the number of teeth and mortality risk (Padilha, Hilgert, Hugo, Bós, & Ferrucci, 2008). In Thailand, age, smoking, chewing betel nuts, dental caries and periodontitis were the most significant factors contributing to lost teeth in a rural population (Chatrchaiwiwatana, 2007). Assessment of the prevalence, extent, and risk indicators for tooth loss among older adults in Brazil revealed that losing more than four teeth was associated with female gender, low socioeconomic status, heavy smoking, a history of dental caries or filled teeth and loss of clinical attachment (Susin et al., 2005). Although a community survey in Taiwan in 2009 showed that 12.6% (311/2469) of adults aged 65 and

above were edentulous (Kuo et al., 2009), sufficient epidemiologic evidence from Taiwan is not presently available to explain the increasing nationwide trend in tooth loss and associated oral-health related variables. Because Taiwan, along with mainland China, has an aging population with one of the most rapid growth rates for older adults (Executive Yuan: Council for Economic Planning & Development, 2010; Hwang, 2008), nationwide epidemiological evidence is needed to understand the oral health status of our older adult population and to explain the increasing nationwide trend in tooth loss.

In 2005, the NHIS original database was conducted in Taiwan. This gathered comprehensive demographic and health-related data from a representative sample of the Taiwanese population, including oral health-related factors (Taiwan National Health Interview and Medication Survey 2005–2006). The comprehensive data from the survey was made available to the public and we recognized that it could facilitate the collection and epidemiologic evaluation of tooth loss and oral health-related variables. We hypothesized that the number of healthy teeth remaining in older adults would be associated with their general oral health status and may have an impact on the status of their physical and psychological health status. We also felt that describing and comparing the data of older adults by number of remaining teeth would help to reveal the oral health status of older adults in Taiwan, and help to identify factors responsible for the nationwide increase in tooth loss. The cut-off point for number of teeth (<20 vs. ≥ 20 remaining teeth) was suggested by the official goals of the World Health Organization for the year 2000; this projected that acceptable levels of oral health were reflected by life-long retention of a functional, esthetic natural dentition of not less than 20 teeth and not requiring a prosthesis, a definition also adopted by previous studies (Akpata, Otoh, Enwonwu, Adeleke, & Joshipura, 2011; Petersen, Kjøller, Christensen, & Krustup, 2004).

Our purpose in conducting this study was to evaluate oral health and factors associated with tooth loss among older adults in Taiwan by comparing differences based on the number of teeth.

Such evidence may support the development of national programs and policies for dental care in Taiwan in order to improve the oral health of older adults and encourage the long-term retention of healthy natural teeth.

2. Methods

This study applied a cross-sectional design with secondary database analysis to evaluate data collected from the NHIS provided by the Bureau of Health Promotion, National Health Research Institutes and Food and Drug Administration of the Department of Health, Executive Yuan, Taiwan (Taiwan National Health Interview and Medication Survey 2005–2006). The interpretation and conclusions contained herein do not represent those of the Bureau of Health Promotion or National Health Research Institutes and Food and Drug Administration, Department of Health, Executive Yuan.

2.1. Data collection

A total of 27,726 Taiwanese subjects in three age groups (<12 years, 12–64 years and >65 years) completed the NHIS. In the present study, the data of 2727 adults aged 65 or older who completed the survey were reviewed and data of 2286 older adults who met the inclusion criteria were retained for data analysis (disposition of subjects is shown in Fig. 1). Inclusion criteria were: 65 years old or older and had completed the NHIS. Those who had not completed the NHIS or whose records were missing and those who were institutionalized or receiving in-home nursing care were excluded. The 2286 subjects were classified into two groups based
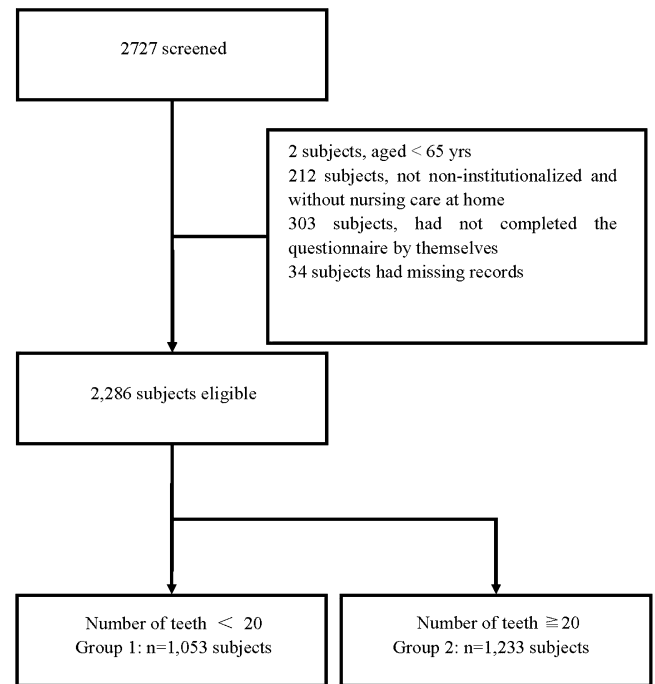

Fig. 1. Flow chart of subjects' disposition.

on number of teeth: Group 1 included 1053 subjects with fewer than 20 teeth left (ranged from 0 to 19 teeth) and Group 2 included 1233 subjects with 20 more 20 teeth (ranged from 20 to 28 teeth). Among the subjects in Group 1, 555 elder adults had no teeth (edentulous). All subjects had provided signed informed consent when they completed the NHIS.

Data for the range of variables measured by the NHIS were collected from the NHIS database (details shown below), including results of four previously validated scales: the Activities of Daily Living (ADL) (Katz, Downs, Cash, & Grotz, 1970) and Instrumental Activities of Daily Living (IADL) (Lawton & Brody, 1969) scales, the Center for Epidemiological Studies-Depression (CES-D) scale (Kohout, Berkman, Evans, & Cormoni-Huntley, 1993) and the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975).

2.2. NHIS

The NHIS was conducted in 2005 using a multi-stage stratified systematic sampling design that allowed data to represent the national population of Taiwan (Taiwan National Health Interview and Medication Survey 2005–2006). A total of 27,726 Taiwanese subjects in three age groups (<12 years, 12–64 years and >65 years) completed the survey (response rate 80.6%) and each provided signed informed consent. All family members of selected households participated and were interviewed by well trained interviewers. All data were released to the public. Variables measured by the NHIS included demographics (age, gender, education, marital status, income and body mass index (BMI); disease history; lifestyle behavior (tobacco smoking, alcohol consumption, betel nut chewing); dental hygiene practices (number of times teeth were brushed daily, timing of brushing, and frequency of using dental floss, mouthwash and having regular dental scaling by a professional dentist or dental service); self-reported oral health (number of lost teeth, dental prostheses, oral health status, self-limitation of food due to oral health status); dental service utilization (dental visits in last year, reason for latest dental visit, dental fees paid, location of dental care services); and