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Is there an occupational status gradient in the development of periodontal disease in Japanese workers? A 5-year prospective cohort study

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ABSTRACT

Background: Development of periodontal disease (PD) may be affected by socioeconomic status. This study examined the relationship between occupational status and PD in a 5-year prospective cohort of Japanese workers.

Methods: In total, 19,633 participants had initial examinations at the Aichi Health Promotion Foundation, of whom 8210 participants aged 20 years or older did not have PD. Follow-up examinations were conducted for 3757 participants, accounting for 45.8% of baseline participants. Ultimately, 3390 participants were analyzed according to the criterion of job classification at baseline, which was based on the International Standard Classification of Occupations, 1987. Oral examinations were performed using the Community Periodontal Index (CPI). The CPI scores were coded as follows: healthy (score of 0); bleeding after probing (1); dental calculus (2); shallow pockets (3); and deep pockets (4). Participants with one or more sextants with a score >2 were diagnosed with PD. Poisson regression analysis was performed to adjust for age and other potential confounders.

Results: Overall, 31.6% of men and 23.8% of women had developed PD (CPI scores of 3 or 4). The adjusted relative risk (RR) for PD (CPI scores of 3 or 4) in men was not significant. On the other hand, the adjusted RRs for PD (CPI score of 4) in men were 2.52-, 2.39-, and 2.74-fold higher for skilled workers, sales persons, and drivers, respectively, than for professionals. In contrast, we found no gradient in women.

Conclusions: We found a gradient related to the risk of developing PD according to occupational status among men in a Japanese worker population.

1. Introduction

Periodontal disease, marked by inflammation of the gingival tissue caused by bacterial plaque, is one of the most widespread inflammatory chronic diseases.[1] Systemic inflammation induced by periodontal disease may play a significant role in the pathogenesis of atherosclerosis or diabetes progression.[2,3] Moreover, people who are unable to fully masticate due to severe periodontal disease and/or tooth loss have insufficient daily nutrient intake and could be more vulnerable to non-communicable disease.[4]

Biological and lifestyle factors, including smoking, alcohol consumption, and psychological stress, are well-known risk factors for periodontal disease.[2–10] Recently, however, some studies have suggested that socioeconomic status (SES) is a determinant of oral health or periodontal disease.[11–15] For example, poorer oral health was observed among individuals with a lower poverty-income ratio and education level.[16] In addition, a marked difference in prevalence of periodontal disease was found among five social groups classified according to income in both in Australia and

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Vietnam. Furthermore, within-country social variation in periodontal disease was quite similar between the two countries.[17] These results indicate that SES may explain a large portion of individual variation in periodontal disease risk.

A recent study indicated differences in periodontal status according to job classification in Japan.[18] However, our current understanding of occupational status as a risk factor in periodontal health is mainly based on a few cross-sectional studies with small sample sizes,[18–21] although numerous studies have demonstrated associations between occupational status and other health outcomes.[22–24] Thus, there is still demand for a long-term follow-up study in a large population to investigate occupational status as a possible independent risk factor of periodontal disease. We therefore examined the relationship between occupational status and incidence of periodontal disease in a 5-year prospective cohort study in Japanese workers.

2. Methods

2.1. Study design and participants

We conducted a prospective cohort study to investigate the relationship between occupation and periodontal disease. Subjects were those who participated in the annual health checks that are recommended for all employees by the Ministry of Health, Labour and Welfare of Japan. Subjects in this study worked in and around Nagoya City, which is the largest city in Aichi Prefecture, with a population of approximately 2.3 million. A total of 19,633 participants had an initial physical and dental examination at the Aichi Health Promotion Foundation between April 2001 and March 2002. Inclusion in the present study was restricted to participants aged 20 years or older who did not have periodontal disease (Community Periodontal Index [CPI] score <3) at baseline (n = 8210).[25] Follow-up examinations were completed between April 2006 and March 2007 for 3757 participants, accounting for 45.8% of all baseline participants. Participants who had less than 20 teeth were excluded to avoid under- or over-estimation of the prevalence of periodontal disease, which can occur when examining the periodontal status of patients with fewer teeth in partial-mouth assessments.[26] Participants whose classification of occupation was 'employee's family' or not obtained at baseline were also excluded. Moreover, we excluded participants with the following occupations due to the small sample size by gender: security (men only; n = 9), farmers and fishermen (women only; n = 2), and truck drivers (women only; n = 1). After applying these eligibility criteria, a total of 3390 participants were entered into the analysis. The study was reviewed and approved by the Ethics Committee of Aichi Gakuin University.

2.2. Classification of occupation

Occupational status of participants was classified according to the criteria of the Ministry of Health, Labour and Welfare of Japan, which was based on the International Standard Classification of Occupations, 1987.[27] The criteria classify the following nine major job groups: 1) professional (e.g., professionals and specialists); 2) managers; 3) office workers (e.g., computer operators, clerks, and secretaries); 4) skilled workers (e.g., factory workers and construction workers); 5) salespersons (e.g., shop assistants); 6) service occupations (e.g., superintendents, cleaners, and car park attendants); 7) security (e.g., guards); 8) farmers and fishermen; and 9) transport and telecommunication workers (e.g., truck drivers). A self-administered questionnaire was used to assess participants' classification of occupation, and the dental examiners were blinded to the results.

2.3. Diagnosis of periodontal disease

Seven dentists with calibrated inter-examiner kappa index values of 0.7–0.9 examined the participants under a reflected light using a mouth mirror and compressed air. Periodontal status was assessed using the standard World health Organization (WHO) criteria for CPI.[25] The oral cavity of the participants was divided into six sextants, which delineated four groups of teeth each containing the molars and premolars of one side of one jaw, and the two groups of teeth each containing canines and incisors of one jaw. According to the WHO criteria, 10 teeth were selected for periodontal examination: 2 M in each posterior sextant, and the upper right and lower left central incisors. Measurements were made using a CPI probe (YDM Co., Tokyo, Japan) at six sites (mesio-buccal, mid-buccal, disto-buccal, disto-lingual, mid-lingual, and mesio-lingual) of each tooth.[25] The CPI scores were coded as follows: healthy (score 0), bleeding after probing (score 1), dental calculus detected by probing (score 2), 4–5-mm shallow pockets (score 3), and ≥6-mm deep pockets (score 4). Participants with one or more sextants with a score >2 were diagnosed with periodontal disease.[25] As scores of 4 (pockets ≥6-mm deep) were considered to indicate irreversible damage due to the destruction of periodontal tissue,[28] it was deemed be reasonable to analyze the data for such participants separately from those with scores >2, to observe progression in periodontal disease.

2.4. Covariates

A health examination included height and weight measurement and blood tests. Body mass index (BMI) was defined as weight in kilograms divided by the square of height in meters. The value for HbA1c (%) was estimated as a National Glycohemoglobin Standardization Program (NGSP)-equivalent value, which was calculated using the formula A1C (%) = A1C (Japan Diabetes Society [JDS]) (%) + 0.4%, in consideration of the relational expression of HbA1c (JDS) (%) measured by the previous Japanese standard substance and measurement methods and A1C (NGSP).[29] Participants were considered diabetic if they met at least one of the following parameters: fasting blood glucose level ≥126 mg/dL (≥7.0 mmol/L), random plasma glucose level ≥200 mg/dL (≥11.1 mmol/L), or HbA1c ≥ 6.5% (HbA1c ≥ 6.1% according to JDS). Diabetes was diagnosed if the blood sample was confirmed to be a diabetic type according to both plasma glucose level and HbA1c at the same time.

A self-administered questionnaire was also used to assess medical history and lifestyle variables, including smoking habits (never, former, or current) and drinking habits (never, sometimes, or every day). In previous studies, BMI, diabetes, and smoking and drinking habits were considered to be independent risk factors for periodontal disease; therefore, these were entered into a multivariate analysis as potential confounding factors.[2,3]

2.5. Statistical analysis

All analyses were stratified by gender because career decisions and work environments of participants often differ by gender, which could therefore influence the effect on incidence of periodontal disease. To adjust for demographics and possible confounding factors and to estimate the relative risk (RR) of periodontal disease according to baseline occupation, Poisson regression analysis was performed with classification of occupation as an independent variable.[30,31] For the endpoint, sensitivity analysis was conducted in the following two ways: having one or more sextants with CPI score 3 or 4 (shallow or deep pockets ≥4 mm), or having one or more sextants with CPI score of 4 (deep pockets

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