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Original Article

Influence of oral health status on absenteeism and presenteeism as indices of work productivity loss

Naoko Adachi ^{a*}, Kumiko Sugimoto ^{a,b}, Hitomi Suzuki ^b,
Kayoko Shinada ^a

^a Department of Preventive Oral Health Care Sciences, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Tokyo, Japan

^b Department of Oral Health Care Education, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Tokyo, Japan

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KEYWORDS

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Abstract *Background/Purpose:* Work productivity reduction due to oral health problems has not been well investigated. This study aimed to examine the impact of oral health status, including periodontitis, dental caries, and oral health-related quality of life (QOL), on absenteeism and presenteeism.

Materials and methods: This cross-sectional study included 559 workers of a Japanese industrial company. Data on dental health and general health checkups were obtained from workers' health records, and the workers responded to questionnaires on work productivity loss due to oral health problems, job stress, and oral health-related QOL. The odds ratio (OR) and 95% confidence interval (CI) for presenteeism and absenteeism were calculated using multiple logistic regression analyses of oral health status and oral health-related QOL adjusting with sex, age, educational background, occupation, job stress, current smoking, and hypertension.

Results: Of the 559 participants, 6.6% and 8.9% reported absenteeism and presenteeism, respectively, due to oral health problems. Multiple logistic regression analyses identified the number of decayed teeth (OR = 1.12, 95%CI = 1.02–1.24) as a significantly associated factor with presenteeism, and additionally low oral health-related QOL with both absenteeism (OR = 2.48, 95%CI = 1.20–5.11) and presenteeism (OR = 5.00, 95%CI = 2.46–10.19).

Conclusion: The number of decayed teeth and low oral health-related QOL were significantly associated with presenteeism and/or absenteeism. This highlights oral health problem as a potential factor for productivity loss.

* Corresponding author. Department of Preventive Oral Health Care Sciences, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo, 113-8510, Japan.

E-mail address: adachi.pvoh@tmd.ac.jp (N. Adachi).

Introduction

Oral health care for the working-age population is important because oral diseases have been reported to significantly affect overall health and predispose people to lifestyle-related diseases.^{1–7} However, the survey of dental diseases in Japan 2022 reported that 29.3% of people aged 35–54 years (working-age) had decayed teeth and 40.1% had periodontal pockets of at least 4 mm.⁸ This survey suggested that the status of oral health among the working-age population is still a pressing issue, even though the efforts such as propagating oral health knowledge and enhancing regular dental checkups to promote oral health across all age groups have been implemented based on the “Act on the Promotion of Dental and Oral Health” in Japan.⁹

Improving the oral health of the working-age population is also important from the viewpoint of work productivity because it is highly likely that oral diseases affect work performance. However, only a few studies have examined the association between oral diseases and work productivity,^{10–15} although many reports have been written on reduced work productivity and resultant economic losses induced by a variety of physical and mental illnesses such as regional pain, rheumatoid arthritis, migraine, mental depression, and other conditions.^{16–25} Previous studies have generally used absenteeism and presenteeism as indices of reduced work productivity. Absenteeism is the state in which the worker is absent, tardy, or leaving early from work due to sickness. Presenteeism is the state in which the worker’s performance or mental concentration is reduced due to a health problem while the worker is present at work.²⁶ Regarding economic loss, Collins et al. suggested that the impact of presenteeism is much larger than that of absenteeism.²³ Yoshimoto et al. also reported that mental illness and musculoskeletal symptoms were the major causes of presenteeism, which levied a significant economic burden in Japan.²⁴

In the dental field, previous studies have focused on absenteeism caused by dental pain.^{10–12} Studies on absenteeism due to toothache or orofacial pain, primarily comprised of toothache, reported that the rate of absenteeism was 4.6% in the past month among Singaporean workers,¹⁰ and 15%–18% in the past 6 months among Brazilian workers.^{11,12} Since oral health policies have been particularly promoted in recent decade in Japan, the situation regarding absenteeism may differ from previous reports, highlighting the need for further investigation. To the best of our knowledge, the recent study by Zaitzu et al., which suggested that periodontal disease is associated with presenteeism but not absenteeism, is the first report on the association between presenteeism and dental diseases.¹³ A web-based questionnaire survey among

Japanese workers successively conducted by Zaitzu’s group concluded that workers reporting poor oral health showed higher risks for various work problems including lack of focus.¹⁴ Sato et al. investigated the association between oral health status and work productivity evaluated by the World Health Organization Health and Work Performance Questionnaire, and reported that periodontal status was associated with a 7.8% decline in work performance,¹⁵ where the periodontal status was evaluated by self-administered questionnaire.

This study was conducted to investigate the status of absenteeism and presenteeism caused by oral diseases and the association of oral health status assessed by oral checkups with absenteeism and presenteeism. Not only oral health status but also subjective evaluation of oral health-related quality of life (QOL) may relate to work productivity, because several studies^{27–29} demonstrated a significant association between oral health status and oral health-related QOL. Thus, this study also focused on the association of oral health-related QOL with absenteeism and presenteeism.

Materials and methods

Study design and ethical approval

This cross-sectional survey was conducted at a Japanese dental and medical device manufacturing company in 2015. All workers of this company ($n = 712$) underwent oral health and general health checkups and were given an explanation of the purpose and procedure of the study and a self-administered questionnaire. Out of all workers, the workers who voluntarily participated in this study gave their written informed consent and completed the questionnaire.

This study was approved by the Institutional Review Board of The University of Tokyo (Approval number 10589) and the Ethics Review Committee of the Faculty of Dentistry, Tokyo Medical and Dental University (Approval number D2018-014). All study procedures were performed in accordance with the principles outlined in the Declaration of Helsinki. This study conformed to the Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) guidelines for human observational studies.

Data collection

The main outcome of this study, the work productivity loss (absenteeism/presenteeism) attributable to a person’s oral health condition, was obtained using the following questionnaire. Absenteeism was assessed using the question, “In the past year, have you been late, left early, or missed work

because of oral health problems?" Presenteeism was assessed using the question, "In the past year, have you been unable to concentrate on your work because of oral health problems?" The questionnaire also included educational background, occupation, current smoking status, and work-related stress (The Brief Job Stress Questionnaire).³⁰ The Brief Job Stress Questionnaire was originally developed in Japan and is used for stress checks of employees, which is mandatory once a year under the Occupational Safety and Health Act in Japan.³¹ The educational background was divided into two categories: ≥ 13 years and ≤ 12 years. The occupation was also categorized into two groups: blue-collar (processing, assembly work, or sales) and white-collar (design, management, clerk, or others). The stress scores were classified into high and low stress using the reference values established in the index.³²

Data on each participant's oral health status were obtained from the records of oral health checkups. The oral examinations were conducted by 20 well-trained dentists who were members of regional Dental Association. They confirmed in advance the standardized oral health survey methods of the World Health Organization (WHO) guidelines.³³ A dental unit equipped with lighting, a dental mirror, and a WHO community periodontal index (CPI) probe were used for inspection of the condition of teeth and gingiva. The number of teeth (excluding wisdom teeth), number of decayed, missing, and filled teeth (DMFT), periodontal status, and denture use were recorded. To evaluate periodontal status, the WHO's 1997 version of the CPI³⁴ was used. CPI codes of ≥ 3 ; i.e., a periodontal pocket of ≥ 4 mm, were defined as the presence of periodontal disease.

To assess oral health-related QOL, the Japanese version of the GOHAI, which has been evaluated for reliability and validity for Japanese people,³⁵ was used. The GOHAI scale, which was originally created by Atchison et al., in 1990,³⁶ consists of 12 items including three subscales: functional, psychosocial, and pain/discomfort. The GOHAI score ranges from 12 points to 60 points, with higher scores indicating a higher oral health-related QOL. The GOHAI scores were divided into low and high groups based on the standard median values of Japanese for respective sex and age groups reported in 2006.³⁷ The scores of subscales such as physical functioning, psychosocial functioning, and pain/discomfort were also calculated.

To consider systemic diseases, data from general health checkups were used to identify diabetes and hypertension. Persons with HbA1c $\geq 6.5\%$, fasting plasma glucose ≥ 126 mg/dL, taking medication for diabetes, or previously diagnosed type 2 diabetes were considered to have diabetes. Persons with systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg, taking medication for hypertension, or previously diagnosed hypertension were considered to have hypertension.

Statistical analysis

Quantitative variables were presented as the mean and standard deviation (for normally distributed data) or the median and interquartile range (for skewed data distributions). Qualitative variables were presented as frequencies

and percentages. Student's *t*-test or the Mann–Whitney *U* test was used to compare continuous variables between the two groups. The chi-square test or Fisher's exact test was used to compare categorical variables with outcomes. The adjusted Odds ratio (OR) and 95% confidence interval (CI) for presenteeism/absenteeism were calculated using multiple logistic regression analyses with various oral health conditions such as number of present teeth, periodontal pocket of ≥ 4 mm, number of decayed teeth, and oral health-related QOL (low GOHAI and the subscale scores). The following were used as covariates: sex, age, educational background, occupation, high job stress, current smoking, diabetes, and hypertension. The threshold for statistical significance was set at $P < 0.05$. All statistical analyses were performed using Stata/IC 16.1 (Stata Corp, College Station, TX, USA).

Results

Characteristics of the participants

Out of 712 workers, 559 (the participation rate: 78.5%) voluntarily participated in this study. The characteristics of the participants, including 330 males and 229 females, are summarized in Table 1. The mean age (standard deviation: SD) of the total workers was 38.2 (11.3), with a significantly lower age in males than in females ($P = 0.023$). Absenteeism was reported by 6.6% of all participants, and presenteeism was reported by 8.9% of them. The percentage having absenteeism was significantly lower in males (4.8%) than in females (9.2%) ($P = 0.045$), whereas no significant difference between males (9.4%) and females (8.3%) was observed in the percentages reporting presenteeism. Regarding oral health status, males had significantly more present teeth ($P = 0.014$) and decayed teeth ($P < 0.001$) than females; however, the periodontal and denture status did not significantly differ between the two groups. The total GOHAI scores did not differ significantly between males and females; however, psychosocial functioning scores among GOHAI subscales were significantly lower in females than in males ($P = 0.037$). Although the status of diabetes and hypertension did not significantly differ between the two groups, the percentage of present smokers was significantly higher in males than in females ($P < 0.001$). Regarding other sociodemographic variables, females showed a significantly higher percentage of blue-collar workers ($P < 0.001$) and lower educational levels ($P < 0.001$).

Association between work productivity and participants' characteristics

Comparisons of the participants' characteristics between the groups with and without absenteeism or presenteeism are presented in Table 2. There was no significant difference in age between participants with and without absenteeism, whereas the mean age of participants with presenteeism was significantly lower than that of those without presenteeism ($P = 0.036$). Total GOHAI scores and GOHAI subscale scores were significantly lower in both the absenteeism-positive and presenteeism-positive groups.

Table 1 Characteristics of the participants.

	Total (n = 559)		Male (n = 330)		Female (n = 229)		P- value
Age, mean (SD) ^a	38.2	(11.3)	37.3	(11.7)	39.5	(10.7)	0.023
Absenteeism, n (%) ^b	37	(6.6)	16	(4.8)	21	(9.2)	0.045
Presenteeism, n (%) ^b	50	(8.9)	31	(9.4)	19	(8.3)	0.655
Present teeth, mean (SD) ^a	27.8	(2.4)	28.0	(2.3)	27.5	(2.4)	0.014
Periodontitis, n (%) ^b	168	(30.1)	109	(33.0)	59	(25.8)	0.065
Decayed teeth ≥ 1 , n (%) ^b	273	(48.8)	183	(55.5)	90	(39.3)	<0.001
Decayed teeth, mean (SD)	1.5	(2.5)	1.7	(2.8)	1.0	(1.9)	—
median (IQR) ^c	0	(0, 2)	1	(0, 2)	0	(0, 1)	<0.001
DMFT, mean (SD) ^c	11.8	(6.9)	11.1	(7.0)	12.9	(6.6)	0.002
Denture use, n (%) ^d	13	(2.3)	7	(2.1)	6	(2.6)	0.386
GOHAI score, median (IQR) ^c	56	(50, 59)	56	(50, 59)	55	(50, 58)	0.297
GOHAI subscore, median (IQR)							
Physical function (range: 0–25) ^c	24	(21, 25)	24	(22, 25)	24	(21, 25)	0.149
Psychosocial function (range: 0–25) ^c	23	(21, 25)	23	(21, 25)	23	(20, 25)	0.037
Pain/discomfort (range: 0–10) ^c	9	(8, 10)	9	(8, 10)	9	(8, 10)	0.793
Low GOHAI, n (%) ^b	260	(46.5)	150	(45.5)	110	(48.0)	0.547
Diabetes, n (%) ^d	15	(2.7)	10	(3.0)	5	(2.2)	0.605
Hypertension, n (%) ^d	70	(12.5)	46	(13.9)	24	(10.5)	0.244
Smoking, n (%) ^b	162	(29.0)	114	(34.5)	48	(21.0)	<0.001
High job stress, n (%) ^b	104	(18.6)	67	(20.3)	37	(16.2)	0.215
Occupational category							
Blue-collar, n (%) ^b	311	(55.6)	161	(48.8)	150	(65.5)	<0.001
Education ≥ 13 years, n (%) ^b	221	(39.5)	160	(48.5)	61	(26.6)	<0.001

SD, standard deviation; IQR, interquartile range; DMFT, decayed, missing, and filled teeth; GOHAI, general oral health assessment index (oral health-related QOL).

^a Student's t-test.

^b Chi-square test.

^c Mann–Whitney U test.

^d Fisher's exact test.

Other characteristics such as oral health status, systemic health condition, and working status did not differ significantly between the groups with and without absenteeism or presenteeism.

The results of multiple logistic regression analysis for work productivity using oral health status as an independent variable are shown in Table 3. The OR and 95% CI for presenteeism with the number of decayed teeth was 1.12 and 1.02–1.24 ($P = 0.022$), indicating that the risk for presenteeism increased significantly with the number of decayed teeth.

In addition, the results of multiple logistic regression analyses for work productivity with GOHAI scores are shown in Tables 4 and 5. The OR (95% CI) with low GOHAI for absenteeism and presenteeism was 2.48 (1.20–5.11, $P = 0.014$) and 5.00 (2.46–10.19, $P < 0.001$), respectively. Among the GOHAI subscales, physical functioning score was significantly associated with absenteeism (OR = 0.80; 95% CI = 0.69–0.92, $P = 0.002$) and presenteeism (OR = 0.75; 95% CI = 0.65–0.86, $P < 0.001$), indicating that low physical functioning increased the risk of reduced work productivity.

Discussion

This cross-sectional study investigated the status of absenteeism and presenteeism (as indices of work

productivity loss) and the relationship between oral health status and work productivity at a manufacturing company in Japan. Multiple logistic regression analyses demonstrated that the number of decayed teeth was significantly associated with presenteeism, and low oral health-related QOL was significantly associated with presenteeism and absenteeism.

The proportions of workers with absenteeism and presenteeism due to oral health problems were 6.6% and 8.9%, respectively, which are considerably higher than those reported by a previous study (2.7% and 6.8%, respectively).¹³ One reason for this discrepancy may be the category of companies. This study included only a single manufacturing company, whereas the previous study included education/learning support and transport companies in addition to manufacturing companies. The poorer oral health status in the participants of the present study may be another cause of the higher ratios of absenteeism and presenteeism, where the mean number of decayed teeth in this study and the previous study was 1.5 and 0.8, respectively, and the prevalence of periodontitis was 30.1% and 10.2%, respectively.

Regarding the relationship between work productivity and objective oral health status, the number of decayed teeth was significantly associated with presenteeism but not absenteeism. Because a quite high ratio of present participants had decayed teeth (48.8%) and decayed teeth

Table 2 Association between work productivity and participants' characteristics.

	Absenteeism					Presenteeism				
	No		Yes		P-value	No		Yes		P-value
n (%)	522	(93.4)	37	(6.6)	—	509	(91.1)	50	(8.9)	—
Age, mean (SD) ^a	38.1	(11.3)	39.8	(11.2)	0.386	38.5	(11.4)	35.0	(10.4)	0.036
Present teeth, mean (SD) ^a	27.8	(2.4)	27.4	(2.4)	0.276	27.8	(2.4)	28.1	(2.4)	0.449
Periodontitis, n (%) ^b	157	(30.1)	11	(29.7)	0.965	154	(30.3)	14	(28.0)	0.740
Decayed teeth, mean (SD)	1.5	(2.5)	1.1	(2.2)	—	1.4	(2.4)	2.2	(3.3)	—
median (IQR) ^c	0	(0, 2)	0	(0, 1)	0.118	0	(0, 2)	1	(0, 3)	0.057
Denture use, n (%) ^d	11	(2.1)	2	(5.4)	0.210	11	(2.2)	2	(4.0)	0.327
GOHAI score, mean (SD)	54.1	(6.0)	49.1	(8.7)	—	54.3	(5.8)	47.8	(8.1)	—
median (IQR) ^c	56	(50, 59)	50	(44, 57)	<0.001	56	(51, 59)	49.0	(42, 54)	<0.001
GOHAI subscale score, median (IQR)										
Physical function (range: 0–25) ^c	24	(22, 25)	21	(18, 24)	<0.001	24	(22, 25)	21	(17, 23)	<0.001
Psychosocial function (range: 0–25) ^c	23	(21, 25)	22	(18, 23)	0.003	23	(21, 25)	20	(18, 23)	<0.001
Pain/discomfort (range: 0–10) ^c	9	(8, 10)	8	(6, 10)	0.003	9	(8, 10)	8	(6, 10)	<0.001
Low GOHAI, n (%) ^b	235	(45.0)	25	(67.6)	0.008	221	(43.4)	39	(78.0)	<0.001
Diabetes, n (%) ^d	15	(2.9)	0	(0.0)	0.614	15	(2.9)	0	(0.0)	0.383
Hypertension, n (%) ^d	69	(13.2)	1	(2.7)	0.070	68	(13.4)	2	(4.0)	0.070
Smoking, n (%) ^b	153	(29.3)	9	(24.3)	0.518	149	(29.3)	13	(26.0)	0.626
High job stress, n (%) ^b	97	(18.6)	7	(18.9)	0.959	92	(18.1)	12	(24.0)	0.304
Occupational category										
Blue-collar, n (%) ^b	290	(55.6)	11	(29.7)	0.887	287	(56.4)	24	(48.0)	0.255
Education ≥13 years, n (%) ^b	210	(40.2)	22	(59.5)	0.207	203	(39.9)	18	(36.0)	0.592

SD, standard deviation; IQR, interquartile range; GOHAI, general oral health assessment index (oral health-related QOL).

^a Student's t-test.^b Chi-square test.^c Mann–Whitney U test.^d Fisher's exact test.**Table 3** Multiple logistic regression analysis of work productivity with oral health status.

	Absenteeism			Presenteeism		
	OR	95%CI	P-value	OR	95%CI	P-value
Number of present teeth	0.96	0.83–1.11	0.574	1.01	0.88–1.16	0.895
Periodontitis (Ref: no periodontitis)	0.94	0.43–2.02	0.870	1.02	0.52–2.03	0.946
Number of decayed teeth	0.94	0.79–1.13	0.519	1.12	1.02–1.24	0.022
Age	1.02	0.99–1.05	0.277	0.98	0.95–1.01	0.189
Sex (female) (Ref: male)	1.58	0.77–3.25	0.213	0.93	0.49–1.78	0.934
Hypertension (Ref: no hypertension)	0.16	0.02–1.20	0.074	0.30	0.07–1.29	0.105
Smoking (Ref: no smoking)	0.86	0.39–1.93	0.722	0.80	0.40–1.60	0.525
High job stress (Ref: low job stress)	1.11	0.46–2.64	0.820	1.42	0.70–2.88	0.328
Blue-collar worker (Ref: white-collar)	0.76	0.35–1.67	0.496	0.56	0.28–1.11	0.098
Education ≥13 years (Ref: ≤12 years)	0.59	0.25–1.40	0.233	0.65	0.31–1.34	0.243

OR, odds ratio; CI, confidence interval.

can cause pain or feelings of unease, having decayed teeth may have caused disturbance of mental concentration on work but not absence from work. In contrast, having periodontitis did not relate to both absenteeism and presenteeism, which is different from the findings of a previous study showing that periodontitis was associated with presenteeism.¹³ The discrepancy in outcomes between the studies may result from a difference in questions asking about the presence or absence of presenteeism. Presenteeism was assessed using the question, "Have you been unable to concentrate on your work because of oral health

problems?" in this study, while the prior study used the question "Have you had trouble working due to an oral health condition?" Thus, presenteeism in the prior study involved a wider range of working problems such as speaking problems and halitosis, which may have resulted in the association with periodontal diseases.

Multiple logistic regression analyses for the association between work productivity and oral health-related QOL (GOHAI) demonstrated that low GOHAI was significantly associated with absenteeism and presenteeism. Further analyses performed using GOHAI subscales indicated that

Table 4 Multiple logistic regression analysis of work productivity with oral health-related QOL (GOHAI).

	Absenteeism			Presenteeism		
	OR	95%CI	P-value	OR	95%CI	P-value
Low GOHAI (Ref: high GOHAI)	2.48	1.20–5.11	0.014	5.00	2.46–10.19	<0.001
Age	1.02	0.99–1.05	0.275	0.97	0.94–1.00	0.049
Sex (female) (Ref: male)	1.65	0.81–3.38	0.169	0.83	0.44–1.59	0.583
Hypertension (Ref: no hypertension)	0.15	0.02–1.17	0.070	0.34	0.08–1.52	0.159
Smoking (Ref: no smoking)	0.82	0.37–1.83	0.636	0.86	0.43–1.72	0.671
High job stress (Ref: low job stress)	0.94	0.39–2.26	0.886	1.06	0.51–2.20	0.871
Blue-collar worker (Ref: white-collar)	0.80	0.37–1.73	0.569	0.59	0.30–1.17	0.130
Education ≥ 13 years (Ref: ≤ 12 years)	0.61	0.26–1.41	0.247	0.64	0.31–1.32	0.224

QOL, quality of life; GOHAI, general oral health assessment index (oral health-related QOL); OR, odds ratio; CI, confidence interval.

Table 5 Multiple logistic regression analysis of work productivity using the subscales of GOHAI.

	Absenteeism			Presenteeism		
	OR	95%CI	P value	OR	95%CI	P value
GOHAI subscale score						
Physical function	0.80	0.69–0.92	0.002	0.75	0.65–0.86	<0.001
Psychosocial function	1.09	0.93–1.28	0.303	1.01	0.87–1.16	0.920
Pain/discomfort	0.88	0.68–1.14	0.350	0.92	0.73–1.15	0.447
Age	1.02	0.98–1.05	0.364	0.96	0.93–0.99	0.015
Sex (female) (Ref: male)	1.52	0.73–3.19	0.263	0.66	0.33–1.32	0.239
Hypertension (Ref: no hypertension)	0.13	0.02–1.03	0.054	0.27	0.06–1.24	0.091
Smoking (Ref: no smoking)	0.78	0.34–1.77	0.550	0.79	0.38–1.65	0.531
Job stress (Ref: low job stress)	0.81	0.33–1.98	0.638	0.89	0.41–1.92	0.771
Blue-collar worker (Ref: white-collar)	0.85	0.38–1.89	0.682	0.59	0.29–1.23	0.158
Education ≥ 13 years (Ref: ≤ 12 years)	0.52	0.21–1.26	0.145	0.49	0.22–1.08	0.077

GOHAI: general oral health assessment index (oral health-related QOL); OR: odds ratio; CI: confidence interval.

low physical functioning solely increased the risk of both absenteeism and presenteeism, which implies that decreased oral health-related QOL relevant to presenteeism/absenteeism was primarily caused by problems of masticatory, swallowing, and speaking functions but not pain/discomfort and interpersonal psychological problems. These results suggest that providing oral health guidance based on a check of oral health-related QOL using GOHAI and the identification of subjective oral functional problems would be useful in preventing work productivity decline.

A limitation of this study is that the survey was conducted in a single company. Therefore, it is difficult to generalize the present results to the entire population of Japanese workers. Among present participants, the prevalence of decayed teeth and periodontitis was 48.8% and 30.1%, which was much higher and lower compared with the respective prevalence reported by Survey of Dental Diseases 2016. Thus, further investigations among more workplaces of various types are required to understand the general status of Japanese workers. Additionally, further research on factors relevant to oral health, such as workers' lifestyles and oral health behaviors, and workplace oral health initiatives, is necessary to gain a more comprehensive understanding of workers' oral health status and to enable more effective occupational oral health

planning, which may contribute to reducing productivity loss at work.

Another limitation is that this study did not use a validated questionnaire to assess work productivity. For general health problems, a variety of scales to measure absenteeism and presenteeism have been developed and tested for reliability and validity;³⁸ however, there are no established scales to measure those caused by oral health problems. Thus, we used similar questions on presenteeism and absenteeism as those used in the first report on the relationship between oral health and work productivity.¹³ Future studies to develop scales for assessing the impact of oral health on work productivity are required.

Despite the abovementioned limitations, this is the first study to examine the association between oral health status including oral health-related QOL and work productivity, adjusting for confounding factors such as systemic disease, stress, and sociodemographic variables. The results of this study could serve as useful information for planning occupational health promotion and reducing economic losses due to oral health problems.

Declaration of competing interest

The authors have no conflicts of interest to declare.

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