

# Correlation between Concerns about the Infection of Economic Workers due to the COVID-19 Pandemic and the Practice of Tooth Brushing after Lunch

Min-Young Kim<sup>†</sup>

Department of Dental Hygiene, Howon University, Gunsan 54058, Korea

**Background:** Like direct infection from COVID-19, psychological concern about infection could affect health. Concern about COVID-19 infection was associated with individual habits to practice rules for preventing infection. Therefore, this study aimed to check occupational types and whether to practice tooth brushing after lunch depending on the occupation of economic workers and find correlations between concerns about infection due to COVID-19 pandemic and tooth brushing after lunch.

**Methods:** The raw data was from the community health survey conducted in 2020. Among 229,269 adult participants aged 19 years and older, 138,970 economic workers were included in the final analysis. The chi-squared test was used to find differences in psychological concerns due to the COVID-19 pandemic. According to the participants, the rate of practicing tooth brushing after lunch was based on COVID-19-related psychological concerns. Multiple logistic regression analysis was conducted to check the influence of psychological concerns due to the COVID-19 pandemic on the rate of practicing tooth brushing after lunch.

**Results:** According to occupational classifications, professionals and office workers and career soldiers had 1.551- and 1.581-times higher practicing rates than managers, respectively, whereas machine operators, agricultural and fishery sector workers, and daily laborers had lower practicing rates. Regarding COVID-19-related psychological concerns, the group with a lower concern about infection had a 1.076 times higher practicing rate than that with greater concern. The group with greater concern about blame from neighbors had 1.119 times higher practicing rate than that with lower concern.

**Conclusion:** The correlations between higher economic workers' concerns about infection and blame from neighbors and higher recognition of the necessity to prevent COVID-19 and practice tooth brushing after lunch were confirmed. It is necessary to prepare measures for practicing tooth brushing after lunch suitable to the characteristics of occupational types and work environments of economic workers.

**Key Words:** Coronavirus disease, Infection, Tooth brushing

## Introduction

### 1. Background

Since World Health Organization (WHO) declared the COVID-19 pandemic in March 2020, the disease has continued with more infectious power until now<sup>1)</sup>. As the COVID-19 pandemic has remained for a long time, uncertainties with lots of quarantined people and higher mortality have made people feel fear and anxiety a lot and caused limits and changes in life in broad physical, mental,

and social sectors<sup>2-4)</sup>. In addition, social distancing, limited outing, and working from home has changed people's daily lives, causing various psychological problems, including stress, depression, grief, and anxiety<sup>5,6)</sup>.

Unlike other diseases, infectious ones like COVID-19 have the characteristics of inflicting fear, which affects emotions, behaviors, and psychological responses<sup>7)</sup>. Therefore, the occurrence of COVID-19 causes changes and limits in not only daily lives but also psychological concerns<sup>8)</sup>. According to Organisation for Economic Co-operation

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<sup>†</sup>Correspondence to: Min-Young Kim, <https://orcid.org/0000-0003-2095-8059>

Department of Dental Hygiene, Howon University, 64 Howondae 3gil, Impi, Gunsan 54058, Korea  
Tel: +82-63-450-7776, Fax: +82-63-450-7779, E-mail: 6514114@hanmail.net

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and Development (OCED), COVID-19 has caused direct health deterioration and decreased income, employment, social relationship, and safety due to concerns<sup>9)</sup>. Isolation due to social distancing (32.1%) and concern about health due to spreading infection (30.7%) were the main causes of psychological difficulties<sup>10)</sup>. In addition, it was confirmed that concerns about COVID-19 infection among individuals and their families were higher<sup>11,12)</sup>.

Economic workers who work in closed spaces with low income may be at higher risk of COVID-19 infection because of difficulties in observing the governmental rules for COVID-19 prevention<sup>13,14)</sup>. Concerns about COVID-19 infection were higher in people with lower educational attainment and income and those in the agricultural, fishery, and service sectors. Changes in daily lives, including sleep disorders and bad eating habits, and practicing rules for individual prevention of infection were associated with the concerns about COVID-19 infection<sup>15)</sup>.

It is necessary to determine the level of psychological concerns in economic workers and the causes, as the pandemic is likely to continue. Furthermore, it is necessary to consider the influences of concern about the COVID-19 pandemic on practicing rules for individual prevention of infection<sup>15)</sup>. As the pandemic continues, concerns about infection are greater, thereby requiring individuals' efforts to prevent infection in their daily lives. The most common rules for the individual prevention of COVID-19 infection are wearing a mask and washing hands. In addition, health care management could be easy in daily life. For example, keeping clean oral parts, which are the main path to getting the virus, by practicing tooth brushing in economic workers is important for preventing virus infection<sup>16)</sup>.

Economic workers' oral health is part of adult oral and workplace oral health with individually and socially important meanings. Regarding economic workers, depending on their work environments and employment types, the oral health behavior of practicing tooth brushing after lunch could be influenced<sup>17)</sup>. Skipping lunch by economic workers was lowest in three meals a day, and lunch was mostly eaten in restaurants and workplaces, according to the survey<sup>18)</sup>. Regarding engaging in economic activities, economic workers spend most of their time in the workplace, and if the environment is not offered, it may be

challenging to practice tooth brushing after lunch<sup>17)</sup>. Therefore, in various workplaces, economic workers may not practice tooth brushing after lunch. In previous studies, the workgroups not available for tooth brushing after lunch were found<sup>17)</sup>. Demographic and socio-economic factors may affect practicing tooth brushing after lunch; however, there was no study on determining the correlation between concerns about infection and practicing tooth brushing during the COVID-19 pandemic, considering the recent social changes. As psychological concerns due to COVID-19 were higher, the level of practicing rules for infection prevention was higher<sup>15)</sup>. Therefore, it is necessary to study whether the practice of tooth brushing after lunch increases as economic workers' psychological concerns due to the COVID-19 increase. However, the correlations between these factors are few, considering the special situation of the COVID-19 pandemic and its longer continuation.

## 2. Objectives

Studies on a large sample of community people are limited, and there are insufficient previous studies. Practicing tooth brushing due to the COVID-19 pandemic is important for preventing infections; however, there are very few studies about the related factors regarding economic workers. Therefore, this study aimed to analyze the correlations between economic workers' concerns about infection due to the COVID-19 pandemic and their practice of tooth brushing after lunch.

## Materials and Methods

### 1. Ethics statement

This study was approved for exempting the review by Institutional Review Board (IRB) of Howon University according to IRB regulations (NO. 1041585-202206-HR-001-01).

### 2. Study design

This study analyzed the raw data of the community health survey conducted and published by Korea Disease Control and Prevention Agency (KDCA) in 2020. This raw data was designed to produce statistical data on

national community health with representativeness and reliability<sup>19)</sup>. According to the procedure for using it, the raw data was requested, approved, and offered through its website.

### 3. Sample size

The adult participants aged 19 years and older in the community health survey conducted in 2020 were 229,269. Of these, 138,970 persons who responded with “Yes” to the question of whether they engage in economic activities were analyzed as the final participants.

### 4. Intervention

For demographic and socio-economic factors, sex (male and female), ages (19~29, 30~39, 40~49, 50~59, and ≥60 y), household income (1 million KRW [low], 1~2 million KRW [low-middle], 2~3 million KRW [middle], 3~6 million KRW [upper-middle], and 6 million KRW and higher [high]), occupation (according to large classification code in standard occupational classification: manager, professionals, office workers, service and sales workers, machine operators, agricultural and fishery sector workers, daily laborers, and career soldiers), and educational attainment (middle school graduates and lower, high school graduates, and university [college] graduates and higher).

For psychological concerns about infection due to the COVID-19 pandemic, five questions were used for asking “How are your concerns about the following items due to the COVID-19 pandemic?”. Concerns about infection “I am concerned about being infected by COVID-19,” concerns about death “I am concerned about dying from COVID-19,” concerns about blame from neighbors “I am concerned about blame or discrimination from my neighbors due to COVID-19 infection,” concerns about infections of health-vulnerable people “I am concerned about infection of health-vulnerable people including my family”, and concerns about economic damages “I am concerned about my family’s involvement in economic damages (including unemployment or difficulties in finding jobs) were measured using a five-point scale. “Very,” “yes,” and “so-so” were classified as greater concerns, while “quite not” and “never” were classified as

lower concerns. The Cronbach’s alpha of the concerns about COVID-19 infection was 0.78.

The rate of practicing tooth brushing after lunch was calculated using the fraction percentage of the economic workers who responded “Yes” to the question “Did you brush your teeth after lunch yesterday?”.

### 5. Statistical methods

For the statistical analyses, STATA ver. 12.0 (Stata Co., College Station, TX, USA) was used. The analyses were done according to the Community Health Survey Use Manual. Chi-squared test was conducted for the differences in psychological concerns due to the COVID-19 pandemic according to participants’ demographic and socio-economic characteristics, the differences in practicing tooth brushing after lunch according to psychological concerns due to the COVID-19 pandemic, and the differences in practicing tooth brushing after lunch according to demographic and socio-economic characteristics of the participants. Odds ratio (OR) and 95% confidence interval (CI) were estimated using multiple logistic regression analyses to check the influences of psychological concerns due to the COVID-19 pandemic on practicing tooth brushing after lunch. Statistical significance was set at p-value of 0.05, and the non-statistically significant results (p-value > 0.05) were marked with star keys.

## Results

### 1. The differences in psychological concerns due to the COVID-19 pandemic according to the participants’ demographic and socio-economic characteristics

For concerns about infection due to the COVID-19 pandemic, blame from neighbors, and infection of health-vulnerable people according to demographic and socio-economic characteristics of the participants, those with greater psychological concerns showed higher rates than those with lower concerns, and female groups showed higher rate (p<0.001). In addition, greater concerns about death, blame, and economic damages showed a higher rate with age (p<0.001). For household income, concern about death was 52.7% in participants earning 1 million

**Table 1.** The Differences in Psychological Concerns due to the COVID-19 Pandemic according to the Participants' Demographic and Socio-Economic Characteristics

Variable	Total	Concerns for infection		Concerns for death		Concerns for blame from neighbors		Concerns for health-vulnerable people's infection		Concerns for economic damages	
		Low	High	Low	High	Low	High	Low	High	Low	High
Sex											
Male	74,130 (53.3)	26,602 (35.9)	47,522 (64.1)	47,072 (65.5)	27,010 (36.5)	20,598 (27.8)	53,473 (72.2)	10,621 (15.6)	57,655 (84.4)	17,199 (23.2)	56,918 (76.8)
Female	64,840 (46.7)	15,796 (24.4)	49,036 (75.6)	34,476 (53.2)	30,322 (46.8)	13,031 (20.1)	51,766 (79.9)	7,173 (12.0)	52,379 (88.0)	12,346 (19.0)	52,483 (81.0)
Age (y)											
19 ~ 29	14,013 (10.1)	5,253 (37.5)	8,759 (62.5)	9,824 (70.1)	4,183 (29.9)	4,458 (31.8)	9,552 (68.2)	2,528 (20.1)	10,025 (79.9)	4,194 (29.9)	9,815 (70.1)
30 ~ 39	19,079 (13.7)	6,213 (32.6)	12,865 (67.4)	12,896 (67.6)	6,178 (32.4)	5,231 (27.4)	13,845 (72.6)	2,280 (12.7)	15,704 (87.3)	5,228 (27.4)	13,849 (72.6)
40 ~ 49	28,405 (20.4)	9,450 (33.3)	18,952 (66.7)	18,929 (66.7)	9,468 (33.3)	7,767 (27.4)	20,622 (72.6)	3,692 (13.9)	22,943 (86.1)	6,902 (24.3)	21,500 (75.7)
50 ~ 59	34,005 (24.5)	10,297 (30.3)	23,704 (69.7)	20,257 (59.6)	13,721 (40.4)	8,010 (23.6)	25,963 (76.4)	4,701 (15.5)	25,732 (84.5)	6,691 (19.7)	27,310 (80.3)
≥60	43,468 (31.3)	11,185 (25.7)	32,278 (74.3)	19,642 (45.2)	23,782 (54.8)	8,163 (18.8)	35,257 (81.2)	4,593 (11.4)	35,630 (88.6)	6,530 (15.0)	36,927 (85.0)
Household income											
Lower	208 (0.1)	67 (32.2)	141 (67.8)*	98 (47.3)	109 (52.7)	62 (29.8)	146 (70.2)	22 (11.5)	169 (88.5)	21 (10.1)	187 (89.9)
Lower-middle	276 (0.2)	83 (30.1)	193 (69.9)	141 (51.7)	132 (48.3)	63 (22.9)	212 (77.1)	16 (6.4)	235 (93.6)	23 (8.3)	253 (91.7)
Middle	338 (0.3)	120 (35.6)	217 (64.4)	191 (56.7)	146 (43.3)	88 (26.1)	249 (73.9)	43 (13.7)	271 (86.3)	65 (19.2)	273 (80.8)
Middle-high	787 (0.6)	232 (29.5)	555 (70.5)	473 (60.3)	312 (39.7)	161 (20.5)	625 (79.5)	95 (13.4)	613 (86.6)	149 (18.9)	638 (81.1)
High	136,313 (98.8)	41,486 (30.4)	94,815 (69.6)	79,920 (58.7)	56,314 (41.3)	32,955 (24.2)	103,262 (75.8)	17,444 (13.9)	107,962 (86.1)	29,010 (21.3)	107,282 (78.7)
Occupation											
Managers	3,548 (2.6)	1,252 (35.3)	2,295 (64.7)	2,401 (67.7)	1,146 (32.3)	978 (27.6)	2,569 (72.4)	550 (16.8)	2,728 (83.2)	881 (24.8)	2,667 (75.2)
Professionals & office workers	39,685 (28.6)	12,881 (32.5)	26,801 (67.5)	27,045 (68.2)	12,624 (31.8)	10,393 (26.2)	29,278 (73.8)	5,646 (15.4)	30,951 (84.6)	12,420 (31.3)	27,259 (68.7)
Service & sales workers	29,101 (21.0)	8,379 (28.8)	20,720 (71.2)	17,102 (58.8)	11,981 (41.2)	7,024 (24.1)	22,067 (75.9)	3,796 (14.3)	22,815 (85.7)	4,740 (16.3)	24,360 (83.7)
Machine operators	20,332 (14.6)	7,030 (34.6)	13,301 (65.4)	12,913 (63.6)	7,402 (36.4)	5,709 (28.1)	14,601 (71.9)	2,761 (15.0)	15,679 (85.0)	3,890 (19.1)	16,437 (80.9)
Agricultural & fishery	22,412 (16.1)	6,078 (27.1)	16,329 (71.9)	9,834 (43.9)	12,560 (56.1)	4,156 (18.6)	18,233 (81.4)	2,210 (10.5)	18,800 (89.5)	3,485 (15.6)	18,923 (84.4)
Daily labors	23,069 (16.6)	6,518 (28.3)	16,549 (71.7)	11,730 (50.9)	11,319 (49.1)	5,168 (22.4)	17,869 (77.6)	2,712 (12.9)	18,390 (87.1)	3,821 (16.6)	19,240 (83.4)
Soliders	663 (0.5)	216 (32.6)	447 (67.4)	438 (66.1)	225 (33.9)	150 (22.6)	513 (77.4)	94 (14.7)	547 (85.3)	269 (40.6)	394 (59.4)
Education											
≤Middle	35,631 (25.6)	8,444 (23.7)	27,181 (76.3)	15,010 (42.2)	20,583 (57.8)	6,084 (17.1)	29,498 (82.9)	3,279 (9.9)	29,791 (90.1)	4,527 (12.7)	31,092 (87.3)
≤High	44,091 (31.8)	13,647 (31.0)	30,440 (69.0)	25,917 (58.8)	18,138 (41.2)	11,147 (25.3)	32,907 (74.7)	5,881 (14.7)	34,185 (85.3)	7,899 (17.9)	36,187 (82.1)
≥ University	59,121 (42.6)	20,279 (34.3)	38,838 (65.7)	40,534 (68.6)	18,571 (31.4)	16,351 (27.7)	42,754 (72.3)	8,620 (15.8)	45,958 (84.2)	17,100 (28.9)	42,014 (71.1)

Values are presented as number (%).

Using chi-square test.

\*p-value >0.05.

KRW and lower ( $p < 0.001$ ), concern about blame was 79.5% in those earning 3 ~ 6 million KRW (upper-middle) ( $p < 0.05$ ), and concerns about health-vulnerable people's infection and economic damages were highest with 93.6% ( $p < 0.05$ ), and 91.7% ( $p < 0.001$ ), respectively, in those earning 1 ~ 2 million KRW (low-middle); however, concerns about infection were not statistically significant ( $p > 0.05$ ). For occupations, the agricultural and fishery sectors showed the highest psychological concerns (infection, death, blame from neighbors, infection of health-vulnerable people, and economic damages) ( $p < 0.001$ ). For educational attainment, middle school graduates and lower ( $p < 0.001$ ) showed the highest psychological concerns (infection, death, blame from neighbors, infection of health-vulnerable people, and economic damages) (Table 1).

2. The differences in the rates of practicing tooth brushing after lunch according to psychological concerns due to the COVID-19 pandemic

The rate of economic workers' practice of tooth brushing after lunch was 69.5% (Table 2). For the differences in practicing tooth brushing after lunch according to psychological concerns due to the COVID-19 pandemic, the rate of practicing tooth brushing was higher in the groups with greater concerns about infection (70.0%) ( $p < 0.001$ ) and blame from neighbors (76.1%) ( $p < 0.001$ ), respectively.

3. The differences in the rates of practicing tooth brushing after lunch according to the participants' demographic and socio-economic characteristics

Male (63.4%) had a lower rate of practicing tooth brushing than female (76.6%) ( $p < 0.001$ ). People aged 60 years and older showed a 58.1% rate of practicing tooth brushing ( $p < 0.001$ ). As household income was higher, the rate of practicing tooth brushing was also higher, with the highest rate occurring in those earning 3 ~ 6 million KRW (upper-middle) (71.6%) ( $p < 0.05$ ). For occupational classifications, professionals and office workers (84.2%) had the highest rate, whereas the agricultural and fishery sector workers showed a higher rate of not practicing tooth brushing after lunch ( $p < 0.001$ ). In addition, as educational attainment was higher, the rate of practicing tooth brushing after lunch was also higher ( $p < 0.001$ ) (Table 3).

4. The influences of psychological concerns due to the COVID-19 pandemic on the rate of practicing tooth brushing after lunch

The result of multiple logistic regression analysis of the factors associated with economic workers' practice of tooth brushing is shown in Table 4. Female had a 1.954 times higher rate of practicing tooth brushing after lunch (95% CI, 1.899 ~ 2.011) than male. Compared with the group aged between 19 and 29 years, the older groups, excluding those aged 30 ~ 39 years, showed a lower practice of tooth brushing after lunch. For income, there was no statistically significant difference. For occupational

Table 2. The Differences in the Rates of Practicing Tooth Brushing according to Psychological Concerns due to the COVID-19 Pandemic

Variable	Total	Concerns for infection		Concerns for death		Concerns for blame from neighbors		Concerns for health-vulnerable people's infection		Concerns for economic damages	
		Low	High	Low	High	Low	High	Low	High	Low	High
After lunch tooth brushing											
Yes	95,300 (69.5)	28,571 (30.0)	66,719 (70.0)	56,745 (59.6)	38,502 (40.4)	22,781 (23.9)	72,464 (76.1)	12,406 (14.2)	75,175 (85.8)	21,458 (22.5)	73,831 (77.5)
No	41,766 (30.5)	13,104 (31.4)	28,658 (68.6)	23,513 (56.4)	18,217 (43.6)	10,219 (24.5)	31,501 (75.5)	5,095 (13.2)	33,413 (86.8)	7,655 (18.3)	34,098 (81.7)

Values are presented as number (%).  
Using chi-square test.

**Table 3.** The Differences in the Rates of Practicing Tooth brushing after Lunch according to the Participants' Demographic and Socio-Economic Characteristics

Variable	After lunch tooth brushing		p-value
	Yes	No	
Sex			< 0.001
Male	46,314 (63.4)	26,773 (36.6)	
Female	48,986 (76.6)	14,993 (23.4)	
Age (y)			< 0.001
19~29	10,908 (80.3)	2,683 (19.7)	
30~39	14,747 (78.6)	4,008 (21.4)	
40~49	20,772 (74.3)	7,171 (25.7)	
50~59	23,833 (70.8)	9,829 (29.2)	
≥60	25,040 (58.1)	18,075 (41.9)	
Household income			0.006
Lower	128 (62.7)	76 (37.3)	
Lower-middle	174 (63.7)	99 (36.3)	
Middle	214 (64.5)	118 (35.5)	
Middle-high	555 (71.6)	220 (28.4)	
High	93,476 (69.5)	40,981 (30.5)	
Occupation			< 0.001
Managers	2,538 (72.4)	968 (27.6)	
Professionals & office workers	33,029 (84.2)	6,191 (15.8)	
Service & sales workers	21,458 (75.3)	7,053 (24.7)	
Machine operators	12,230 (61.1)	7,779 (38.9)	
Agricultural & fishery	10,797 (48.5)	11,451 (51.5)	
Daily labors	14,602 (64.2)	8,159 (35.8)	
Soliders	528 (81.0)	124 (19.0)	
Education			< 0.001
≤ Middle	19,561 (55.4)	15,751 (44.6)	
≤ High	29,601 (68.1)	13,840 (31.9)	
≥ University	46,068 (79.2)	12,120 (20.8)	

Values are presented as number (%).

Using chi-square test.

classifications, professional and office workers and career soldiers showed 1.551 times (95% CI, 1.426~1.687) and 1.581 times (95% CI, 1.274~1.961) higher rates, respectively, than managers. In contrast, service and sales workers, machine operators, agricultural and fishery sector workers, and daily laborers showed lower practicing rates. For educational attainment, high school and college graduates showed 1.460 times (95% CI, 1.404~1.518) and 1.875 times (95% CI, 1.789~1.964) higher rates, respectively, than middle school graduates and lower. For psychological concerns due to the COVID-19 pandemic, the group with lower concern showed a 1.076 times higher rate (95% CI, 1.041~1.113) of practicing tooth brushing after lunch than that with greater concern. Furthermore, the group with lower concern about blame from neighbors

showed 1.119 times higher rate (95% CI, 1.081~1.159) than that with greater concern. The rate of practicing tooth brushing after lunch was low for the group with greater concerns about health-vulnerable people's infection and economic damages.

## Discussion

### 1. Key results

In this study, the community health survey data on 138,970 persons aged 19 years and older were analyzed to determine the correlation between economic workers' concerns about infection and the practice of tooth brushing after lunch. Based on their replies to the psychological concerns-related questions, the levels of economic workers'



**Table 4.** The Influences of Psychological Concerns due to COVID-19 Pandemic on the Rate of Practicing Tooth Brushing after Lunch

Variable	After lunch tooth brushing		
	OR	p-value	95% CI
Sex (Ref.=Male)			
Female	1.954	<0.001	1.899 ~ 2.011
Age (y) (Ref.=19 ~ 29)			
30 ~ 39	0.955	0.135	0.900 ~ 1.014
40 ~ 49	0.851	<0.001	0.805 ~ 0.899
50 ~ 59	0.919	0.003	0.870 ~ 0.971
≥ 60	0.851	<0.001	0.803 ~ 0.903
Household income (Ref.=Lower)			
Lower-middle	1.071	0.744	0.708 ~ 1.620
Middle	1.058	0.780	0.170 ~ 1.577
Middle-high	1.011	0.950	0.709 ~ 1.442
High	1.175	0.307	0.861 ~ 1.604
Occupation (Ref.=Managers)			
Professionals & office workers	1.551	<0.001	1.426 ~ 1.687
Service & sales workers	0.977	0.593	0.897 ~ 1.063
Machine operators	0.733	<0.001	0.673 ~ 0.798
Agricultural & fishery	0.444	<0.001	0.407 ~ 0.483
Daily labors	0.725	<0.001	0.666 ~ 0.790
Soliders	1.581	<0.001	1.274 ~ 1.961
Education (Ref.=≤Middle)			
≤ High	1.460	<0.001	1.404 ~ 1.518
≥ University	1.875	<0.001	1.789 ~ 1.964
Concerns for infection (Ref.=Low)			
High	1.076	<0.001	1.041 ~ 1.113
Concerns for death (Ref.=Low)			
High	1.026	0.092	0.995 ~ 1.058
Concerns for blame from neighbors (Ref.=Low)			
High	1.119	<0.001	1.081 ~ 1.159
Concerns for health-vulnerable people's infection (Ref.=Low)			
High	0.947	0.015	0.906 ~ 0.989
Concerns for economic damages (Ref.=Low)			
High	0.882	<0.001	0.850 ~ 0.916

OR: odds ratio, CI: confidence interval.

concerns were confirmed. The correlation with practicing tooth brushing after lunch in a workplace where they spend the most time a day was also checked. In the group of economic workers with greater concerns about COVID-19 infection and blames from neighbors, the rate of practicing tooth brushing after lunch was higher, whereas the group with greater concerns about infection of health-vulnerable people and economic damages showed a lower rate of practicing tooth brushing after lunch.

## 2. Interpretation

Economic workers' practice of tooth brushing after

lunch was higher in women, younger groups, high-income earners, and those with higher educational attainment. In this study, psychological concerns due to COVID-19 according to economic workers' demographic and socio-economic characteristics were higher in female, older groups, the group with lower educational attainment, and agricultural and fishery sector workers. This is consistent with a previous study on the people in Daegu area<sup>15)</sup>. It was also consistent with a previous study on general adults, in which greater concerns were associated with lower educational attainment and older groups<sup>20)</sup>.

For income, there was no statistically significant

difference. For occupational classifications, professionals, office workers, and career soldiers showed higher practicing rates than managers, whereas machine operators, agricultural and fishery sector workers, and daily laborers showed lower practicing rates. In the previous studies on community people based on a community health survey conducted in 2019, men, older people, workers in the agricultural and fishery sectors, and those with lower educational attainment had lower practicing rates<sup>21)</sup>. The reason for the lower practicing rate in men may have various causes, one of which may be due to lower concern for oral health<sup>22)</sup>. The studies on workers based on the Korea National Health and Nutrition Examination Survey analysis showed office workers and professionals had the highest rate of practicing tooth brushing (66.4%). In contrast, daily laborers had the lowest rate (23.6%), confirming the differences in the practice of tooth brushing after lunch among the occupational classifications<sup>17)</sup>.

If economic workers were older, had lower educational attainment, and were in the agricultural and fishery sectors, their psychological concerns were higher and their practice of tooth brushing. And this result's meaning shall be concerned. According to an occupational information study in Korea, the average age was highest in the agricultural and fishery sectors<sup>23)</sup>. In agriculture and fishery, simple farming, fisheries, and forest work are usually done in outdoor settings. As a result, for economic workers, it is interpreted that vulnerability due to work and various employment types affect oral health behaviors of tooth brushing rather than individuals' demographic and socio-economic factors.

For psychological concerns due to COVID-19, the group with lower concern about infection had a 1.076 times higher rate of practicing tooth brushing than that with greater concerns, and the group with lower concern about blame from neighbors had a 1.119 times higher rate of practicing tooth brushing than that with greater concerns. It is interpreted that the increasing rate of practicing tooth brushing after lunch in the group with greater concerns about infection according to the spread of COVID-19 due to the pandemic is an instrument of preventing infection. Blames from neighbors could cause discrimination, depression, and deterioration in interpersonal relationships<sup>24)</sup>.

The previous studies showed the same contexts of higher psychological anxiety from stigmatization in the case of being infected, causing greater concern about infection<sup>25,26)</sup>. This is consistent with the study results that people fear being confirmed with infection and blamed by their neighbors<sup>27)</sup>, suggesting its psychological influences on economic workers.

The groups with greater concerns about infections in health-vulnerable people and economic damage showed a lower rate of practicing tooth brushing after lunch. Based on the result of the highest rate of fear of family infection due to COVID-19<sup>28)</sup>, there were greater concerns about infection of health-vulnerable people, including family, and economic damages in the studies on the old-aged<sup>29)</sup>. However, despite differences in the study participants, different results showed lower correlations with tooth brushing. Therefore, for education and intervention on economic workers' tooth brushing, it is necessary to increase the support of individuals and their family members.

In the workplace manual for preventing COVID-19 published by the Ministry of Employment and Labor<sup>30)</sup>, there is no item about practicing tooth brushing as individual or group rules for preventing infection. However, ignoring practicing tooth brushing without recognizing its importance seems to affect the differences in the rate of practicing tooth brushing after lunch depending on psychological concerns due to the COVID-19 pandemic in this study. Therefore, it is necessary to include tooth brushing, the most basic oral health management instrument for preventing virus infection, as both an individual rule for economic workers and a group rule for workplaces, in addition to washing hands and wearing masks to prevent COVID-19 infection.

### 3. Limitations

There is a limit to a cross-sectional study without determining causality factors. This study was not done considering various variables using secondary sources. This study analyzed whether economic workers brush their teeth after lunch; however, types of toothbrushes were not considered. In addition to the rate of economic workers' practice of tooth brushing, how frequently they do so should be included. It is necessary to determine



various factors affecting oral health, including whether to conduct oral health education programs in workplaces and whether there are places for tooth brushing. In future studies, it is necessary to conduct cohort studies during the continuing pandemic.

#### 4. Generalizability

This study is meaningful as it is about the behavioral aspects of economic workers recognizing the necessity to prevent COVID-19 further and practice tooth brushing after lunch more, as their concerns about infection and blame from their neighbors are greater. Concerns about confirming being infected, infection, death from the disease, blame from neighbors, vulnerable peoples' infection, and economic damages could have negative influences; however, it was confirmed that there were positive influences on practicing tooth brushing as the concerns were greater.

#### 5. Suggestions

In the era of the COVID-19 pandemic, focusing on the fact that dental healthcare is one of the means to prevent infection, it is expected that this study will meaningfully induce economic workers' dental care practice in the workplace. One factor should not be excluded from consideration. It is necessary to develop programs on practicing tooth brushing after lunch suitable for the characteristics of workers' work types and environments. However, individuals' efforts to practice are more important than anything. There are very few studies on whether psychological concern due to the COVID-19 pandemic has affected practicing rules for preventing infection associated with poor dental healthcare. Therefore, it is also required to check if practicing dental healthcare is done in addition to psychological concerns. Based on this, we need to take the necessary measures.

### Notes

#### Conflict of interest

No potential conflict of interest relevant to this article was reported.

#### Ethical approval

This study was approved by the Institutional Review Board of Howon University (NO. 1041585-202206-HR-001-01).

#### ORCID

Min-Young Kim, <https://orcid.org/0000-0003-2095-8059>

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