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Factors affecting emerging infectious disease prevention behaviors among young workers based on ecological modeling

Hyo Eun Park[1] & Hye Young Song[2]✉

This cross-sectional, descriptive survey study aimed to identify the factors affecting emerging infectious disease prevention behaviors among young workers aged < 40 years. The factors affecting infection prevention behaviors among young workers were investigated with respect to perception of personal, inter-personal, organizational, and community responses based on ecological modeling. A total of 260 young workers residing in Jeollabuk-do region in South Korea were selected via convenience sampling. Multiple regression analysis performed to assess the factors affecting emerging infectious disease prevention behaviors. Multiple regression analysis revealed that infection prevention behaviors were significantly higher among healthy female participants compared with that in not very healthy female participants. Furthermore, infection prevention behaviors were significantly lower among those residing with family members with a confirmed diagnosis compare with that in those who did not. The infection prevention behaviors were higher among participants with higher levels of perceived susceptibility and perceived self-efficacy showed higher infection prevention behaviors. Thus, health managers should actively promote the implementation of infection prevention behaviors in the workplace by developing executable infection prevention guidelines and programs to enhance the perceived susceptibility and self-efficacy of workers in preparation for outbreaks of emerging infectious diseases.

Keywords Young, Workers, Infection prevention behaviors, Ecological model

Abbreviations

COVID-19	Coronavirus disease 2019
WHO	World Health Organization
CT	Computed tomography
SARS	Severe acute respiratory syndrome
MERS	Middle East respiratory syndrome
MSPSS	Multidimensional scale of perceived social support
EID-PHB	Emerging infectious diseases preventive health behavior
IRB	Institutional review board
ANOVA	One-way analysis of variance
VIFs	Variance inflation factors

Coronavirus disease 2019 (COVID-19), caused by the SARS-CoV-2 virus and first reported in Wuhan, China, was declared a global pandemic by the WHO on March 11, 2020[1]. The disease spreads quickly and easily, causing symptoms like high fever, shortness of breath, dry cough, and pneumonia[2]. Diagnosis is typically confirmed via RNA testing or CT scans[1,3–5]. In response, countries implemented strict measures like lockdowns and social distancing to curb transmission and alleviate pressure on healthcare systems[6].

The likelihood of a large-scale outbreak of an emerging infectious disease, such as COVID-19, on a global scale has been increasing for the past two decades. This risk has become more evident through the spread of a zoonotic disease, such as COVID-19. The WHO has declared six public health emergencies of international concern since 2007, including the 2009 influenza A (H1N1) pandemic, Ebola outbreaks (west Africa in 2013–

[1]School of Health Science, Department of Nursing, Hanseo University, 46, Hanseo 1-ro, Haemi- Myun, Seosan-Si, Chungcheognam-do 31962, Republic of Korea. [2]Department of Nursing, Woosuk University, Samrye-eup, Wanju-Gun, Jeonbuk 55338, Republic of Korea. ✉email: lemonbam84@woosuk.ac.kr

2015 and Democratic Republic of the Congo in 2018–2020), polio (2014–present), and Zika virus disease. Multifaceted measures have been implemented to prevent the spread of these infectious diseases. Crises involving the spread of respiratory infectious diseases, such as severe acute respiratory syndrome (SARS), H1N1 influenza, and Middle East respiratory syndrome (MERS), have helped enhance the national disease control in South Korea. Furthermore, the revision and announcement of the "Infectious Disease Control and Prevention Act" in December 2019 for the prevention of emerging infectious diseases and re-transmission of existing infectious diseases has resulted in heightened vigilance among the public.

Cough etiquette, use of masks, hand washing, and disinfecting and ventilating the surrounding environment based on existing droplet infection prevention rules are the key prevention methods for the prevention and control of COVID-19 infection[7,8]. Specific antivirals or vaccines for the disease are not developed immediately, especially during the outbreak of an emerging infectious disease; thus, non-pharmacological interventions, such as personal hygiene and social distancing, remain the most effective preventive measures[4,5]. However, voluntary participation and receptive attitude from members of society are crucial for the effectiveness of non-pharmacological interventions[9].

Preventive measures taken by the members of society are crucial; however, Among patients infected with COVID-19, the proportion of the population aged 20–39 was 29.1% in South Korea[7]. Thus, the importance of implementing emerging infectious disease prevention behaviors in this population is becoming increasingly apparent[7]. The 20s and 30s represent active years of an individual's life. Notably, many individuals contracted COVID-19 through social gatherings during the early stages of the pandemic, which increased the likelihood of becoming infected or spreading the infection to someone else. Therefore, identifying the factors that influence the health behaviors of young adults plays a crucial role in facilitating a timely response to future infection crises. In particular, young adults are the drivers of economic activity and social connections. Thus, implementing social distancing policies in this population is difficult[8]. As young adulthood is a period when health behaviors can be reinforced or modified[10], it is very important to establish health behaviors for preventing emerging infectious diseases in this population[11].

It is necessary to identify factors that influence the preventive behavior of new infectious diseases in the young adult population, where establishing health behaviors is important. Most previous studies on infectious disease prevention behaviors conducted in South Korea have focused on the prevention behaviors of individuals[12,13]. Thus, infection prevention behaviors have been identified based on personal variables using Health Belief Model[14] and Theory of Reasoned Action[15] in most studies. However, infection prevention behaviors are determined by personal characteristics and relationships with family or neighbors and their surroundings[16]. Thus, identifying the interactions with the community and surrounding social/physical environment of individuals is important[17,18]. This study aims to understand the interactions between individuals and the environment through a multidimensional approach using an ecological model and to identify factors affecting preventive behavior against emerging infectious diseases.

The ecological model defines the interactions between individuals and their environment as an ecological system and enables the implementation of multi-dimensional interventions based on this theory[19,20]. The Social Ecological Model (SEM) conceptualizes health as being influenced by distinct levels: individual, interpersonal, organizational, societal making it particularly appropriate for analyzing complex socio-environmental factors[21,22]. In dividual factors include demographic characteristics and individual knowledge, attitudes, and behaviors that can affect individuals. Interpersonal factors refer to social support from family, friends, and neighbors who can have social homogeneity and support. Organizational factors refer to factors that affect individual behavior by connecting organizations and individuals in a social environment that affects individual health. Community factors refer to relationships between organizations, systems, and each network in the community. Finally, public policy factors include national-level policies or laws[19,20]. In addition, in previous studies on the influence of health behavior, individual factors, interpersonal factors, organizational factors, and community factors were mainly studied as multidimensional determinants[23]. The components of the ecological model can be grouped as follows. Perception of personal, inter-personal, organizational, and community responses to emerging infectious disease are important factors that influences the response behaviors. Personal factors reflect the health belief about emerging infectious diseases. Individuals exhibit different levels of interest or concern about health and safety, with some individuals implementing active prevention behaviors when the severity and risks is perceived to be high[24]. However, health beliefs may influence the behavior of the individuals toward emerging infectious diseases. Inter-personal factors reflect social support according to emerging infectious disease prevention behaviors; whether prevention behaviors are strengthened is determined by the level support from family, friends, and others. Those with stronger social support are likely to practice safe behaviors more actively[25].

Organizational factors measure the organizational awareness of health culture related to emerging infectious diseases. Individuals actively practice prevention behaviors when organizations emphasize safety and adhere to and promote infectious disease-related guidelines in a consistent manner. Moreover, creating a health culture within the organization also affects prevention behaviors[26]. Community factors refer to the awareness of government response to emerging infectious diseases. The public is notified about public disaster safety and prevention rules and precautions through text messages in South Korea[27]. The government response to emerging infectious diseases is recognized to be effective and individuals have an increasingly high tendency to follow government orders, which are all important factors for practicing infection prevention behaviors[28]. This study aimed to identify the factors affecting infection prevention behaviors among young individuals through ecological modeling, thereby providing basic data for the formulation of policies.

Methods

Research design

This was a cross-sectional, descriptive survey study that aimed to identify the factors affecting emerging infectious disease prevention behaviors among young workers aged 20–39 years.

Research participants

Young workers residing in South Korea were recruited to participate in this study through convenience sampling. Recruitment announcements comprising the study description and questionnaire were posted on online bulletin boards. Only those who understood the objective of the study and voluntarily agreed to participate were selected as participants.

The sample size was calculated using G*power 3.1 program. The minimum sample size required for multiple regression analysis was estimated to be 217 based on the parameters of moderate effective size of 0.15, significance level of 0.05, statistical power of 0.95, and 19 predictors as proposed by Cohen[29]. The sample size was determined to be 260 for the present study, considering a dropout rate of 20%. All 260 participants completed the online survey and there were no dropouts.

Research instruments

General characteristics of the participants

The general characteristics of the subjects who participated in the study were as follows: gender, age, marital status, education level, job type, employment type, years of service, economic status, subjective health status, infection with new infectious diseases (COVID-19, MERS, etc.), infection with new infectious diseases (COVID-19, MERS, etc.) of family members living together.

Personal factors

Items related to personal factors were extracted from the scale developed by Lee[26] for measuring health beliefs regarding COVID-19 to assess the perception of the participants regarding emerging infectious diseases. These items were revised to reflect emerging infectious diseases rather than COVID-19; further revisions and supplementation were performed to suit the objective of the present study. The scale comprised 21 items regarding five factors. The subfactors comprised perceived susceptibility (#1–4), perceived seriousness (#5–9), perceived benefits (#10–12), perceived barriers (#13–17), and perceived self-efficacy (#18–21). Each item was rated on a seven-point Likert scale, with each score indicating the following: 1, very strongly disagree; 2, strongly disagree; 3, somewhat disagree; 4, do not agree nor disagree; 5, somewhat agree; 6, strongly agree; and 7, very strongly agree). Higher scores indicated higher level of perception of emerging infectious diseases. The reliability of the instrument in the study by Lee was Cronbach's $\alpha = 0.753$. The reliability of each subfactor was $\alpha = 0.795$, 0.741, 0.724, 0.773, and 0.732 for perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, and self-efficacy, respectively. The reliability of the instrument used in this study was $\alpha = 0.68$, 0.80, 0.74, 0.83, and 0.62 for perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, and self-efficacy, respectively.

Social support

A version of the Multidimensional Scale of Perceived Social Support (MSPSS) originally developed by Zimet[30] and adapted into Korean by Shin and Lee was used to measure social support. The MSPSS comprised 12 items in three sub-domains: support from family (#3, 4, 8, and 11), support from friends (#6, 7, 9, and 12), and support from significant others (#1, 2, 5, and 10). Each item was rated on a seven-point Likert scale, with higher scores indicating higher levels of social support. The reliability of the scale in the study by Shin and Lee[25] was Cronbach's $\alpha = 0.85$. The reliability of each domain was Cronbach's $\alpha = 0.85$, 0.75, and 0.72 for support from family, friends, and significant others, respectively. The reliability of the scale in this study was Cronbach's $\alpha = 0.91$.

Perception of organizational health culture

Perception of organizational health culture was measured using items regarding organizational health culture that were extracted from the instruments developed by Lee[31] for measuring social environment that affect health. This instrument comprised 52 items in a total of nine domains: social engagement, social activities, social relationships, social support, norm conformity, social trust, organizational system, organizational health culture, and community competence. Among them, the organizational health culture domain comprised eight items in the sub-domains of collective health culture and atmosphere for practicing health culture (e.g., health education, health management, environment for health-promoting practice). Each item was rated on a four-point Likert scale, with each score indicating the following: 1, strongly disagree; 2, disagree; 3, agree; and 4, strongly agree. Higher scores indicated more positive organizational health culture. The reliability of the items related to the perception of organizational health culture in the original instrument was Cronbach's $\alpha = 0.85$. The reliability of the instrument used in this study was Cronbach's $\alpha = 0.77$.

Perception of government response

Perception of government response was measured using the instrument originally used in a study by You[32]. The validity and reliability of the instrument was subsequently tested by Kim et al.[33]. This instrument comprises five items designed to measure the level of perception about the efforts taken by the government in controlling, treating, and providing information regarding COVID-19 (i.e., the health authorities are doing a good job of controlling COVID-19). COVID-19 was revised to emerging infectious diseases and the instrument was supplemented for this study. The instrument used in this study comprised six items. Each item was rated on a five-point Likert scale, with each score indicating the following: 1, strongly disagree; 2, disagree; 3, Neutral;

4, Agree; and 5, Strongly agree). Higher scores indicate a higher level of perception that the government is mounting a good response to emerging infectious diseases. The reliability of the instrument in the study by Kim et al.[33]. was Cronbach's α = 0.906. The reliability of the instrument used in this study was Cronbach's α = 0.91.

Infection prevention behaviors

The Emerging Infectious Diseases Preventive Health Behavior (EID-PHB) scale developed by Lee[24] was used to measure the infection prevention behaviors. The EID-PHB scale comprises 34 items under eight factors: droplet infection prevention (#1–6), contact—social distancing (#7–11), contact—contaminated carriers (#12–14), contact—hand hygiene (#15–19), airborne infection prevention (#20–22), bloodborne infection prevention (#23–26), environmental management (#27–29), and psychological coping (#30–34). Each item was rated on a five-point Likert scale, with each score indicating the following: 1, strongly disagree; 2, disagree; 3, Neutral; 4, Agree; and 5, Strongly agree). Higher scores indicate a higher level of practicing emerging infectious disease prevention behaviors. The reliability of the scale in the study by Lee was Cronbach's α = 0.92. The reliability of the scale was in the present study was Cronbach's α = 0.92.

Data collection method

Data collection spanned from June 1st to 15th, 2024. A preliminary survey was administered to 20 "H" company workers after preparing the study description and questionnaire for online use to assess any issues with the readability of the online questionnaire and difficulty understanding the questions. The main survey was commenced only after the preliminary survey. The recruitment announcement was posted on the bulletin board of "A" company. The bulletin board was open for use by employees of each affiliate, and even if they were not employees of Company A, they could participate in the research if they were young workers. Individuals who voluntarily agreed to participate in the study after receiving an explanation regarding the objective, methods, and voluntary nature of participation in the study completed the online consent form. Participants who completed the survey were given a small token of appreciation.

Ethical considerations

This study was approved by the Institutional Review Board (IRB) of W University, which is affiliated with the researchers (IRB No.WS-2024-39). All methods were performed in accordance with the relevant guidelines and regulations by Institutional Review Board (IRB) of W University. To facilitate ethical participation, study objective, methods, voluntary nature of participation, right to withdraw consent at any time, and no negative consequences for not participating in the study were specified in the participant information sheet; only those who voluntarily agreed to participate in the online survey were included in the study. All subjects gave informed consent prior to the study. Personally Informed consent, such as the name of individual participant, was not collected and the collected data were encoded and stored on a locked personal computer.

Data analysis methods

The methods used for statistical analysis in this study were as follows.

Frequency and descriptive statistics analyses were performed to identify the general characteristics of the participants.

Descriptive statistics analysis was performed to identify the personal, inter-personal, organizational, and community-related factors of the participants related to emerging infectious diseases and the level of emerging infectious disease prevention behaviors among the participants.

Independent sample t-test and one-way analysis of variance (ANOVA) were performed to assess significant differences in emerging infectious disease prevention behaviors according to the general characteristics of the participants. Scheffé's post-hoc test was performed using variables that showed significant differences in ANOVA.

Pearson's correlation analysis was performed to analyze the correlations between personal, inter-personal, organizational, and community factors and emerging infectious disease prevention behaviors among the participants.

Multiple regression analysis was performed to assess the factors affecting emerging infectious disease prevention behaviors.

All statistical analyses were performed using SPSS Statistics 26. Statistical significance was determined based on significance level of 0.05.

Results

General characteristics of the participants

A questionnaire survey was administered to workers aged 20–39 years. Among them, 260 workers who completed the survey were included as participants of this study. The general characteristics of the participants were identified through frequency and descriptive statistics analyses (Table 1).

The participants comprised 100 men (38.5%) and 160 women (61.5%). The mean age of the participants was 31.46 years, with 120 participants being aged 20–29 years (46.2%) and 140 participants aged 30–39 years (53.8%). A total of 152 participants (58.5%) were not married, 106 participants (40.8%) were married, and two participants (0.8%) were divorced/separated/widowed. The number of participants with highest education level of high school, college, and graduate school or higher was 25 (9.6%), 214 (82.3%), and 21 (8.1%), respectively.

Officer workers, service workers, sales workers, professionals, civil servants, functional/technical workers, and others constituted 139 (53.5%), 26 (10.0%), seven (2.7%), 33 (12.7%), 29 (11.2%), eight (3.1%), and 18 (6.9%) participants, respectively. Regular workers, contract workers, dispatched workers, and temporary workers constituted 231 (88.8%), 24 (9.2%), two (0.8%), and three (1.2%) participants, respectively. The mean length of

Variable	Categories	*n*(%)	M ± SD
Sex	Male	100(38.5)	
	Female	160(61.5)	
Age (years)	20–29	120(46.2)	31.46 ± 4.90
	30–39	140(53.8)	
Marital status	Not married	152(58.5)	
	Married	108(41.5)	
Education level	High school graduate	25(9.6)	
	College graduate	214(82.3)	
	Graduate school or higher	21(8.1)	
Occupation	Office workers	139(53.5)	
	Service workers	26(10.0)	
	Sales worker	7(2.7)	
	Professionals	33(12.7)	
	Civil servants	29(11.2)	
	Functional/technical workers	8(3.1)	
	Others	18(6.9)	
Employment type	Regular worker	231(88.8)	
	Contract worker	24(9.2)	
	Dispatched worker	2(0.8)	
	Temporary worker	3(1.2)	
Length of employment (years)	< 2	50(19.2)	5.88 ± 4.96
	2–5	97(37.3)	
	5–10	54(20.8)	
	≥ 10	59(22.7)	
Economic status	Upper	28(10.8)	
	Middle	215(82.7)	
	Lower	17(6.5)	
Health status	Good health	51(19.6)	
	Average	185(71.2)	
	Poor health	24(9.2)	
Confirmed diagnosis of emerging infectious disease	Yes	217(83.5)	
	No	43(16.5)	
Confirmed diagnosis of emerging infectious disease among cohabiting family members	Yes	212(81.5)	
	No	48(18.5)	

Table 1. General characteristics of the participants ($n = 260$).

employment was 5.88 years, with 50 (19.2%), 97 (37.3%), 54 (20.8%), and 59 (22.7%) participants having < 2, 2–5, 5–10, and ≥ 10 years of employment, respectively.

In this study, 28 (10.8%), 215 (82.7%), and 17 (6.5%) participants had upper, middle, and lower economic status, respectively. Further, 51 (19.6%), 185 (71.2%), and 24 (9.2%) participants reported good, average, and poor health, respectively.

The number of participants cohabiting with individuals with a confirmed diagnosis of emerging infectious disease was 217 (83.5%). The number of participants cohabiting with family members with a confirmed diagnosis of emerging infectious disease among cohabiting family members was 212 (81.5%).

Personal, inter-personal, organizational, and community factors related to emerging infectious diseases and the level of emerging infectious disease prevention behaviors among the participants.

The personal, inter-personal, organizational, and community factors of the participants related to emerging infectious diseases and the level of emerging infectious disease prevention behaviors among the participants were identified using descriptive statistics analysis (Table 2).

The personal factors related to emerging infectious diseases were measured by scores ranging between 1 and 7 points. The mean perceived seriousness, perceived susceptibility, perceived benefits, perceived barriers, and perceived self-efficacy scores were 5.86 ± 0.77, 5.84 ± 0.74, 4.99 ± 1.12, 4.66 ± 1.16, and 5.48 ± 0.87 points, respectively. A score ranging between 1 and 7 points was used to assess social support, an inter-personal factor. The mean score was 6.03 ± 0.69 points. Perception of organizational culture, an organizational factor, was measured by a score ranging between 1 and 4 points, and the mean score was 2.86 ± 0.54 points. Perception of government response, a community factor, was measured by a score ranging between 1 and 5 points, and the mean score was 3.66 ± 0.75 points.

The implementation rate of emerging infectious disease prevention behaviors was measured using a score ranging between 1 and 5 points; the mean score was 4.03 ± 0.47 points. The scores for each domain

Variable	Range	Mean	Standard deviation	Skewness	Kurtosis
Perceived seriousness	1–7	5.86	0.77	− 0.90	2.37
Perceived susceptibility	1–7	5.84	0.74	− 0.80	0.79
Perceived benefits	1–7	4.99	1.12	− 0.52	− 0.13
Perceived barriers	1–7	4.66	1.16	− 0.50	− 0.54
Perceived self-efficacy	1–7	5.48	0.87	− 0.86	1.59
Social support	1–7	6.03	0.69	− 1.89	6.68
Perception of organizational culture	1–4	2.86	0.54	− 0.32	− 0.17
Perception of government response	1–5	3.66	0.75	− 0.81	0.88
Infection prevention behaviors	1–5	4.03	0.47	− 0.54	0.42
Droplet infection prevention	1–5	4.14	0.56	− 0.67	0.53
Contract – social distancing	1–5	3.38	0.99	− 0.39	− 0.68
Contact – contaminated carriers	1–5	4.18	0.62	− 0.94	1.07
Contact – hand hygiene	1–5	4.32	0.56	− 1.02	1.67
Airborne infection prevention	1–5	3.60	0.83	− 0.40	− 0.54
Bloodborne infection prevention	1–5	4.49	0.59	− 1.20	1.56
Environmental management	1–5	4.08	0.66	− 0.48	− 0.03
Psychological coping	1–5	4.20	0.53	− 0.55	0.16

Table 2. Personal, inter-personal, organizational, and community factors of the participants and emerging infectious disease prevention behaviors.

of infection prevention behaviors appeared were as follows: 4.49 ± 0.59, 4.32 ± 0.56, 4.20 ± 0.53, 4.18 ± 0.62, 4.14 ± 0.56, 4.08 ± 0.66, 3.60 ± 0.83, and 3.38 ± 0.99 points for bloodborne infection prevention, contact—hand hygiene, psychological coping, contact – contaminated carriers, droplet infection prevention, environmental management, airborne infection prevention, and contract—social distancing, respectively.

Infection prevention behaviors according to the general characteristics of the participants

Independent sample t-test and one-way ANOVA were performed to assess significant differences in terms of emerging infectious disease prevention behaviors according to the general characteristics of the participants (Table 3). Significant differences were observed according to sex ($t = -5.01$, $p < .0.001$), age ($t = 4.44$, $p < .0.001$), marital status ($t = -3.42$, $p = 0.001$), education level ($F = 4.23$, $p = .0.016$), employment type ($F = 2.47$, $p = 0.044$), length of employment ($F = 5.46$, $p = .0.001$), economic status ($F = 3.62$, $p = 0.028$), health status ($F = 13.87$, $p < 0.001$), confirmed diagnosis of emerging infectious disease ($t = -3.04$, $p = 0.003$), and confirmed diagnosis of emerging infectious disease among cohabiting family members ($t = -5.95$, $p < .001$).

Comparison between the mean scores revealed that the compliance of infection prevention behaviors among female participants were higher than that among male participants. Similarly, the compliance of infection prevention behaviors among those aged 20–29 years was higher than that among those aged 30–39 years. Moreover, participants without a spouse tended to exhibit a higher compliance of infection prevention behaviors than their counterparts. The results of the Scheffé's post-hoc test revealed that the compliance of infection prevention behaviors among college graduates was significantly higher than that among high school graduates.

The results of the Scheffé's post-hoc test revealed that the compliance of infection prevention behaviors among regular or contract workers was significantly higher than that among dispatched workers. The results of the Scheffé's post-hoc test revealed that the compliance of infection prevention behaviors among those with < 5 years was significantly higher than that among those with ≥ 10 years of employment.

The results of the Scheffé's post-hoc test revealed that the compliance of infection prevention behaviors in those with upper economic status was significantly higher than that among those with lower economic status. The results of the Scheffé's post-hoc test revealed that the compliance of infection prevention behaviors among those with good health was significantly higher than that among those with poor health.

Comparisons between the mean scores for differences according to confirmed diagnosis of emerging infectious disease revealed a significantly higher compliance of infection prevention behaviors among those who did not have such experience. Moreover, the differences according to the confirmed diagnosis of emerging infectious disease among cohabiting family members also showed significantly higher compliance of infection prevention behaviors among those did not have such experience.

Correlations between personal, inter-personal, organizational, and community factors of the participants

Pearson's correlation analysis was performed to analyze the correlations between personal, inter-personal, organizational, and community factors and the compliance of emerging infectious disease prevention behaviors among the participants (Table 4).

Infection prevention behaviors showed significantly positive correlation with perceived seriousness ($r = 0.27$, $p < 0.001$), perceived susceptibility ($r = 0.22$, $p < 0.001$), perceived benefits ($r = 0.28$, $p < .0.001$), and perceived self-efficacy ($r = 0.43$, $p < .0.001$); however, a significantly negative correlation with perceived barriers was observed ($r = -0.23$, $p < 0.001$).

Variable	Categories	M ± SD	t/F(*p*)	Scheffé
Sex	Male	3.85 ± 0.47	− 5.01 (< 0.001)	
	Female	4.14 ± 0.44		
Age (year)	20–29	4.16 ± 0.38	4.44 (< 0.001)	
	30–39	3.91 ± 0.51		
Marital status	Spouse	3.91 ± 0.51	− 3.42 (0.001)	
	No spouse	4.11 ± 0.42		
Education level	High school graduate[a]	3.78 ± 0.38	4.23 (0.016)	a < b
	College graduate[b]	4.06 ± 0.47		
	Graduate school or higher[c]	3.96 ± 0.50		
Occupation	Officer worker	4.04 ± 0.46	0.27 (0.950)	
	Service worker	4.02 ± 0.51		
	Sales worker	3.94 ± 0.33		
	Professionals	4.01 ± 0.37		
	Civil servant	4.10 ± 0.49		
	Functional/technical worker	3.92 ± 0.77		
	Others	3.97 ± 0.55		
Employment type	Regular worker[a]	4.03 ± 0.46	2.74 (0.044)	c < a,b
	Contract worker[b]	4.08 ± 0.53		
	Dispatched worker[c]	3.11 ± 1.08		
	Temporary worker[d]	3.91 ± 0.09		
Length of employment (years)	< 2[a]	4.16 ± 0.45	5.46 (0.001)	d < a,b
	2 to < 5[b]	4.10 ± 0.40		
	5 to < 10[c]	3.99 ± 0.54		
	≥ 10[d]	3.84 ± 0.48		
Economic status	Upper[a]	4.24 ± 0.38	3.62 (0.028)	c < a
	Middle[b]	4.01 ± 0.48		
	Lower[c]	3.92 ± 0.41		
Health status	Very good health[a]	4.28 ± 0.37	13.87 (< 0.001)	c < b < a
	Good health[b]	3.99 ± 0.46		
	Poor health[c]	3.74 ± 0.49		
Confirmed diagnosis of emerging infectious disease	Yes	3.99 ± 0.48	− 3.04 (0.003)	
	No	4.19 ± 0.37		
Confirmed diagnosis of emerging infectious disease among cohabiting family members	Yes	3.97 ± 0.48	− 5.95 (< 0.001)	
	No	4.29 ± 0.30		

Table 3. Infection prevention behaviors according to the general characteristics of the participants.

Variable	1	2	3	4	5	6	7	8	9
1. Perceived seriousness	1								
2. Perceived susceptibility	0.61(< 0.001)	1							
3. Perceived benefits	0.38(< 0.001)	0.25(< 0.001)	1						
4. Perceived barriers	− 0.03(0.646)	0.17(0.005)	0.01(0.916)	1					
5. Perceived self-efficacy	0.40(< 0.001)	0.26(< 0.001)	0.57(< 0.001)	− 0.19(0.002)	1				
6. Social support	0.12(0.056)	0.16(0.011)	0.10(0.095)	− 0.10(0.115)	0.37(< 0.001)	1			
7. Perception of organizational culture	0.14(0.029)	0.09(0.143)	0.27(< 0.001)	− 0.22(< 0.001)	0.37(< 0.001)	0.26(< 0.001)	1		
8. Perception of government response	0.09(0.141)	0.16(0.008)	0.34(< 0.001)	− 0.12(0.060)	0.46(< 0.001)	0.27(< 0.001)	0.40(< 0.001)	1	
9. Infection prevention behaviors	0.27(< 0.001)	0.22(< 0.001)	0.28(< 0.001)	− 0.23(< 0.001)	0.43(< 0.001)	0.26(< 0.001)	0.28(< 0.001)	0.31(< 0.001)	1

Table 4. Correlations between personal, inter-personal, organizational, and community factors and infection prevention behaviors among the study participants.

Social support, an inter-personal factor related to emerging infectious disease, exhibited a significantly positive correlation with infection prevention behaviors ($r = .0.26$, $p < .0.001$). Perception of organizational culture, an organizational factor, also exhibited a significantly positive correlation with infection prevention behaviors ($r = .0.28$, $p < .0.001$). Perception of government response, a community factor, also showed a significantly positive correlation with the compliance of infection prevention behaviors ($r = .0.31$, $p < .0.001$).

Dependent variable	Independent variable	B	SE	β	t	*p*	VIF
Infection prevention behaviors	(Constant)	2.50	0.23		10.71	0.000	
	Sex						
	Male	(ref.)					
	Female	0.23	0.05	0.24	4.54	0.000	1.06
	Health status						
	Very poor health	(ref.)					
	Very good health	0.24	0.06	0.20	3.79	0.000	1.06
	Confirmed diagnosis among cohabiting family members						
	No	(ref.)					
	Yes	−0.16	0.07	−0.13	2.35	0.020	1.16
	Perceived susceptibility	0.10	0.03	0.16	2.96	0.003	1.11
	Perceived self-efficacy	0.16	0.03	0.29	5.08	0.000	1.22

Table 5. Factors affecting the compliance of infection prevention behaviors among the participants. $F = 24.22 (p < .001)$, $R^2 = 0.32$, adjusted $R^2 = 0.31$, Durbin–Watson = 1.98

Factors affecting the compliance of infection prevention behaviors among the participants

Multiple regression analysis was performed to investigate the factors affecting the prevalence of emerging infectious disease prevention behaviors among young workers using variables that exhibited significant differences in infection prevention behaviors according to the general characteristics and variables that showed a significant correlation in the correlation analysis (Table 5). Consequently, sex, health status, and confirmed diagnosis among cohabiting family members were the general characteristics included in the final model; perceived susceptibility and perceived self-efficacy were the personal factors included in the final model. Interpersonal, organizational, and community factors were not included in the model as they were not significant.

The model fit was significant ($F = 24.22$, $p < .001$), with an explanatory power of approximately 31%. The Durbin–Watson statistic was 1.98, a value close to 2, indicating no problem with assumption of independence of residual. The variance inflation factors (VIFs) were all < 10, indicating no issues with multicollinearity.

With respect to the regression coefficient for each variable, according to sex, the compliance of infection prevention behaviors were significantly higher among female participants than that among male participants ($\beta = 0.24$, $p < 0.001$); according to health status, the prevalence of infection prevention behaviors was significantly higher among those with very good health than among those with very poor health ($\beta = 0.20$, $p < 0.001$). Moreover, the prevalence of infection prevention behaviors among those cohabiting with family members with a confirmed diagnosis was significantly lower than that among those cohabiting family members without a diagnosis ($\beta = 0.13$, $p = 0.020$).

Perceived susceptibility ($\beta = 0.16$, $p = 0.003$) and perceived self-efficacy ($\beta = 0.29$, $p < 0.001$) had a significantly positive influence on the prevalence of infection prevention behaviors. Thus, those with higher perceived susceptibility and perceived self-efficacy had higher infection prevention behaviors.

Discussion

This descriptive study used the method of ecological modeling proposed by McLeroy et al.[20] to identify the factors related to infection prevention behaviors among young workers, including personal, inter-personal, organizational, and community factors. A total of 260 young workers from South Korea compliance were recruited to participate in this study through convenience sampling and the status of emerging infectious disease prevention behaviors was analyzed.

The present study revealed significant differences in terms of the compliance of emerging infectious disease prevention behaviors according to the general characteristics, namely, sex, age, marital status, education level, employment type, length of employment, economic status, health status, confirmed diagnosis of emerging infectious disease, and confirmed diagnosis of emerging infectious disease among cohabiting family members.

The compliance of infection prevention behaviors was higher among women than that among men in the present study. Women typically exhibit higher levels of awareness and interest in health than men. Women tend to practice preventive health behaviors more frequently, are aware of health-related risks, and tend to avoid risks. Statistically, women are more likely to visit hospitals or undergo health checkups than men, and are more adaptive in preventive health behaviors such as quitting smoking, drinking, and exercising regularly[34,35]. These findings suggest that women may perceive the risk of health problems at a greater level and place greater importance on prevention measures[36,37].

A higher compliance of infection prevention behaviors was observed in participants without a spouse than in those with a spouse. People without spouses have fewer opportunities for face-to-face contact due to living with a spouse, which reduces the risk of infection[38]. People with spouses are more likely to be infected with new infectious diseases through close contact with their spouse or children[8].

The compliance of infection prevention behaviors among college graduates was significantly higher than that among high school graduates. College graduates are generally more capable of understanding infectious disease-related information and prevention guidelines than high school graduates[39]. This is likely to lead to better information interpretation and appropriate practice. College graduates are more likely to consistently

practice preventive behaviors because they have a higher self-efficacy in believing that their behaviors can prevent infection[40].

The compliance of infection prevention behaviors among regular workers was significantly higher than that in those who are temporary workers. Regular workers have greater job security than temporary workers; thus, they may have more interest in long-term health management[40,41]. A stable employment status can strengthen the motivation for maintaining health and thereby enabling a person to pay more attention to infection prevention behaviors. However, temporary workers typically face job insecurity and must prioritize maintaining their livelihood; this attitude makes it difficult to invest resources or time needed for infection prevention.

The compliance of infection prevention behaviors among the participants with < 5 years of employment was significantly higher than that among those with ≥ 10 years of employment. Individuals with a shorter length of employment follow infection prevention education and rules more strictly during the process of adapting to a new environment[42,43]. They tend to comply with prevention rules more closely as they are not yet familiar with the organizational culture[44]. These individuals typically exhibit high focus on prevention rules, especially at the beginning, as they are conscious of the views of managers or colleagues. In contrast, experienced workers may not routinely practice prevention measures as they become familiar with the environment.

The compliance of infection prevention behaviors among the participants with higher economic status was significantly higher. Individuals with better economic status are less likely to have an occupation with a high risk of infection[45,46]. For instance, officer workers and individuals with jobs that permit them to work from home can maintain social distancing or non-face-to-face work environment; economically vulnerable population are more likely to have jobs that require face-to-face interaction, which can increase the risk of infection. Thus, differences in the compliance of infection prevention behaviors may occur due to economic disparity.

The compliance of infection prevention behaviors was significantly higher among the participants with good health status compared with that in those with poor health status. Individuals with good health status are more likely to actively practice prevention behaviors to maintain their own health[47,48]. Healthy Individuals generally possess greater awareness of health and stronger motivation to comply with infection prevention behaviors to protect their health. This can lead to self-awareness regarding how valuable health is and prevention behaviors to avoid diseases.

The participants with a confirmed diagnosis of emerging infectious disease who did not showed significantly higher infection prevention behaviors than those who did. When a new infectious disease spreads, people feel fear and anxiety about infection[49]. Infectious disease prevention behavior also reflects a sense of social responsibility to protect the community, as there is a possibility that if one is infected, one can spread it to others[50]. People who are not infected with a new infectious disease strictly follow their infection prevention behaviors to protect themselves and the health of those around them.

The compliance of infection prevention behaviors in participants cohabiting with family members with a confirmed diagnosis of emerging infectious disease who did not was significantly higher infection than that in those who not. When a family member becomes infected, it become a direct factor that increases the risk of infection among other family members[51]. Households with a confirmed diagnosis must consider the possibility of re-infection; this fear can lead to stricter compliance with prevention behaviors. Moreover, a tendency to further strengthen prevention behaviors, such as mask wearing, hand washing, and social distancing, may aid in preventing the spread of infection[32].

Stepwise regression analysis was performed to investigate the factors affecting the compliance of emerging infectious disease prevention behaviors among young workers by inputting variables that showed significant differences in terms of the compliance of infection prevention behaviors according to the general characteristics and variables that showed a significant correlation in the correlation analysis. Consequently, sex, health status, and confirmed diagnosis among cohabiting family members perceived susceptibility and perceived self-efficacy were the personal factors included in the final model. Inter-personal, organizational, and community factors were not included in the model as they were not significant.

Inter-personal, organizational, and community factors affecting young workers and infection prevention behaviors were not significant. This finding is consistent with those of previous studies reporting that young individuals are more likely to be associated at a personal level, more so than being influenced at an inter-personal or organizational level[37,38].

Young workers' infection prevention behaviors were found to be significantly related to their awareness and knowledge of health. Young workers are influenced by their peers or coworkers, but at the same time, they tend to decide their behaviors through their own judgment and choices[43,44]. These personal factors play an important role in whether or not they practice infection prevention behaviors[45,46]. Based on the social ecological model, people's health behaviors are shown to be acted upon through interactions between environments such as personal factors, individual factors, and organizational factors[19,20]. Young workers' infection prevention behaviors were found to be highly related to the individual factors of the ecological model. Therefore, it would be very effective to develop an infection prevention program that focuses on the individual factors of young workers.

Thus, infection prevention education or management provided at organizational level may not be sufficient for young workers. Young individuals tend to view personal autonomy as being more important than organizational guidelines or rules. Thus, influence at the organizational level may not be significant[40,52]. Furthermore, young individuals may ignore or neglect workplace regulations or prevention measures if workplace regulations are lacking or prevention measures conflict with daily tasks.

Infection prevention behaviors among young workers did not show any significant associations with inter-personal, organizational, and community factors owing to lack of awareness of personal risks, placing value on autonomy, reduced influence at the organizational level, low interest in community factors, and lack of education

and participation[44]. Infectious disease prevention education and motivational strategies customized for young individuals must be developed to improve these outcomes.

Sex, health status, confirmed diagnosis among cohabiting family members are the factors affecting emerging infectious disease prevention behaviors among young workers, whereas perceived susceptibility and perceived self-efficacy are factors that revealed a significant difference. Consequently, the compliance of infection prevention behaviors was significantly higher among women than that in men.

Previous studies have demonstrated that women typically tend to practice health-related behaviors more actively than men[34,51]. For instance, women exhibit higher participation rate in regular health screenings, vaccinations, and health information acquisition than men[49]. The same can be applied to infection prevention behaviors. Women are more likely to be aware of the risks and practice behaviors to protect their health, which can manifest as infection prevention behaviors.

The compliance of infection prevention behaviors among those with very good health status were significantly higher than that among those with very poor health status. Healthy individuals are highly likely to have a regular exercise routine, well-balanced diet, and healthy lifestyle[48,49]. Such lifestyle can lead to infection prevention behaviors. Practicing infection prevention behaviors is an extension of healthy lifestyle. Thus, healthy individuals comply with prevention measures more strictly.

The compliance of infection prevention behaviors was significantly lower among those cohabiting with family members with a confirmed diagnosis. The occurrence of infection despite the efforts to avoid it could cause a sense of helplessness in households with individuals with a confirmed diagnosis[53]. This can lead to the false perception that the probability of being infected again is low or it can weaken the commitment to the prevention of infection. Such psychological factors can cause individuals to neglect prevention behaviors and reduce motivation for prevention behaviors after confirmed diagnosis[48].

The participants with higher perceived susceptibility and perceived self-efficacy exhibited a higher compliance e of infection prevention behaviors. Perceived susceptibility refers to the level of perception that an individual has about the risk of a particular disease or infection. Higher susceptibility to infection indicates that individuals are more likely to become infected; however, they are also more likely to actively take preventive measures[54]. For instance, individuals who reported that infectious diseases, such as COVID-19, are a real threat to their health practice prevention behaviors, such as mask wearing, hand washing, and social distancing, adhered to these measures more strictly[55]. Previous studies have also reported that a higher perceived susceptibility is associated with a greater compliance of prevention behaviors. This may be attributed to the belief that prevention measures are necessary being reinforced when individuals perceive an infection risk.

Perceived self-efficacy refers to the confidence that an individual has in their ability to successfully perform a particular task. Individuals with stronger faith that their prevention measures will be effective are more likely to perform more consistent and strict prevention behaviors[46]. Similarly, individuals practice mask wearing and hand hygiene care when they are confident that the occurrence of infection can be prevented through such prevention measures.

High self-efficacy induces behavioral modification[56]. However, low self-efficacy hinders the ability to perform practice prevention behaviors even if a high risk of infection is perceived. This could be one of the psychological reasons why individuals discontinue infection prevention behaviors. .

Perception was input to personal, inter-personal, organizational, and community response in the present study to investigate their influence on the factors influencing prevention behaviors among young workers. The present study is significant in that, while very few studies have been conducted on infection prevention behaviors among Korean workers, this study identified the factors affecting the compliance of infection prevention behaviors among workers to provide evidence for future studies. Young workers are influenced by their peers or coworkers, but at the same time, they tend to decide their behaviors through their own judgment and choices. These personal factors play an important role in whether or not they practice infection prevention behaviors. If a new infectious disease becomes prevalent in the future, the government will need to plan an infection prevention manual that focuses on the personal factors of young workers.

Moreover, it facilitates presenting alternatives at personal, company, and government levels for enhancing infection prevention behaviors among workers.

Nevertheless, the present study has some limitations. First, the sample size was small, as only a sample of the entire young population was included in this study; therefore, our findings cannot be generalized to all workers. Second, Since COVID-19 is a test paper from several years ago, people may not accurately remember or report behaviors related to infection prevention practices in a distorted manner. Third, the level of infection prevention practices may vary depending on regional restrictions, workers' occupations, and employment types.

Conclusions

This was a descriptive survey study that aimed to identify the factors influencing the compliance of infection prevention behaviors related to emerging infectious diseases among young workers. The present study revealed that sex, health status, cohabiting with family members with a confirmed diagnosis, perceived susceptibility, and perceived self-efficacy were the factors affecting the compliance of infection prevention behaviors among young workers. Young workers' infection prevention behaviors were found to be significantly related to their awareness and knowledge of health. Young workers are influenced by their peers or coworkers, but at the same time, they tend to decide their behaviors through their own judgment and choices. These personal factors play an important role in whether or not they practice infection prevention behaviors.

The COVID-19 pandemic continues to persist. Experts have warned about the risk of emerging infectious diseases that may occur in the future. Young workers may be at a higher risk of infection as they cannot maintain social distancing owing to the nature of their work. There is a high risk of spreading within the family and community when an infection occurs. A mass-outbreak within the workplace can result in lockdown

and closure, leading to a significant ripple effect on the national economy. Therefore, the following practical recommendations are proposed based on the findings of the present study.

Health managers in workplaces should actively promote the implementation of infection prevention behaviors by developing executable infection prevention guidelines and programs to enhance the perceived susceptibility and perceived self-efficacy of workers to respond to outbreaks of emerging infectious diseases. Moreover, efforts made by business owners and the government to improve the work environment, such as reducing the density within the workplace, must not be limited. The resurgence of COVID-19 is forecasted; thus, follow-up studies must be conducted to investigate the levels of infection prevention behaviors according to the job characteristics of the workers.

Data availability

The data used in this study securely stored and accessed through Woosuk University, the institution affiliated with the researchers. Data are available from the authors upon reasonable request and with permission from the Institutional Review Board (IRB) of Woosuk University. You can contact the corresponding author for the data availability.

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All tools have been approved by the author of the original tool.

Author contributions

H.Y0 prepared the data, planned the analyses, performed the analyses, and wrote parts of the manuscript. H.E. planned the analyses and wrote parts of the manuscript. H.Y. assisted in the preparation of data and analyses and produced the figures. H.Y. planned the analyses, and was responsible for the full draft of the manuscript. H.E. critically revised the analyses and the manuscript. All authors read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board (IRB) of Woosuk University, which is affiliated

with the researchers (IRB No.WS-2024-39). Individuals who voluntarily agreed to participate in the study after receiving an explanation regarding the objective, methods, and voluntary nature of participation in the study completed the online consent form.

Competing interests

The authors declare no competing interests.

Additional information

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Correspondence and requests for materials should be addressed to H.Y.S.

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