

Original Article



Mental health symptoms among dependent contractors in Korea: a cross-sectional study based on the Fifth Korean Working Condition Survey

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Abbreviations

CI: confidence interval; DC: dependent contractor; KNSO: Korea National Statistical

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ABSTRACT

Background: Recently, there has been a call to improve the holistic welfare of dependent contractors (DCs). Thus, our study examined the relationship between DCs and mental health symptoms and how this relationship was modified by age, sex, and income status of workers.

Methods: A total of 27,980 workers from the Fifth Korean Working Conditions Survey are included in our study. The participants who reported having depression or anxiety over the last 12 months are defined those who had mental health symptoms. We performed exact matching for age group and sex, followed by conditional logistic regression with survey weights. Finally, stratified analyses by age, sex and income level were conducted.

Results: DCs were found to be at increased risk of depression/anxiety compared to other workers. The odds ratio (OR) is 1.52 (95% confidence interval [CI]: 1.06–2.17). In the stratified analyses, vulnerable groups were middle-aged (OR [95% CI]: 1.68 [1.10–2.54]), female (OR [95% CI]: 1.85 [1.20–2.84]), and low-income (OR [95% CI]: 3.18 [1.77–5.73]) workers.

Conclusions: Our study's results reinforce those of other studies that show that DCs are at greater risk of experiencing mental health issues than other workers and that this risk is greater for middle-aged, female, and low-income workers. These results suggest that appropriate policy efforts should be made to improve the psychological well-being of DCs.

Keywords: Dependent contractor; Worker in special employment types; Depression; Anxiety

BACKGROUND

Over the last few decades, the traditional binary classification of employment status as either self-employed or employee has been largely challenged by changes in labor relationships.¹ Dependent contractors (DCs), also called dependent self-employed workers or special employment-types workers, provide labor services under a work consignment contract, not an employment contract. Such workers are not protected by labor laws because they are not classified as employees. Thus, there have been increasing calls for protection for DCs

Office; KSCO: Korean Standard Classification of Occupations; KWCS: Korean Working Conditions Survey; OR: odds ratio; OSHRI: Occupational Safety and Health Research Institute.

Competing interests

The authors declare that they have no competing interests.

Author contributions

Conceptualization: Baek SU, Won JU; Data curation: Baek SU; Formal analysis: Baek SU, Lim SS; Investigation: Baek SU, Yun S, Lee WT, Kim MS; Supervision: Lim SS, Yoon JH, Won JU; Visualization: Baek SU; Writing - original draft: Baek SU; Writing - review & editing: Lim SS, Yun S, Lee WT, Kim MS, Yoon JH, Won JU.

recently.² In response, the International Labor Office created a separate category for DCs in the International Classification of Status in Employment-18.³

According to the Korea National Statistical Office (KNSO), there were nearly 500,000 DCs, accounting for 2.4% of all wage workers and 24.0% of non-typical workers.⁴ Typical DC occupations include insurance salespersons, visiting teachers, golf caddies, and truck drivers in Korea. However, the recent changes in the economic structure, such as the rise of the gig economy, have contributed to the increasing number of jobs classified as DC.⁵ The number of DC-related occupations covered by the Industrial Accident Compensation Insurance Act in Korea increased from 4 in 2008 to 14 in 2021, newly including software technicians and platform workers, such as door-to-door deliverers and drivers.⁶

DCs are known to have low job security, high income volatility, and lack of social protection because they are not protected by labor laws.^{2,7} Precarious employment harms workers' physical and psychological health such as putting them at an increased risk of work-related injuries, cardiovascular disease, and psychological disorders.^{8,9} Among the dimensions of precarious employment, employment insecurity has been consistently reported in multiple studies as having an adverse effect on workers' mental health. For instance, temporary/daily work is associated with depressive mood in Korea.¹⁰ On the other hand, the effect of exclusion from labor protection law and social security system is left undiscovered, though one previous study found employment insurance can protect psychological health.¹¹ Moreover, a recent systematic analysis on precarious employment mentioned that the income volatility has not yet been addressed among the dimensions of precarious employment.¹²

Job insecurity can have differential effects by worker's characteristics,¹³ such as their family responsibilities,¹⁴ age,¹⁵ and sex.¹⁶ However, it is unclear whether job insecurity has differential effects by income status. DCs are often exposed not only to job insecurity but also high level of income volatility because of their performance-based earning system.¹⁷ Also, they have been excluded from social security, regulatory protection and labor policy because they are not classified as employees.^{18,19} Considering income instability and lack of social protection have been addressed as key features of DC, these factors need to be taken into account when investigating the mental health of DC. However, majority of prior studies on precarious employment have mainly focused on employment insecurity, and little is known about the health effects of other characteristics of DC.

Mental disorders of workers affect their psychological well-being and lower their work efficiency and productivity.²⁰ Factors associated with the poor mental health of workers include hazardous working conditions, poor work-life balance, workplace discrimination, and job insecurity.²¹ However, proper intervention that reduce occupational stress could help protect workers' mental health.²²

Most studies on DCs have examined their legal status, while only a few have examined their psychological well-being of DC. Furthermore, to our knowledge, there is no analysis of how the effects of being a DC differs by demographic group. However, precarious work condition has a detrimental effect on mental health,²³ so it was hypothesized that DCs are more at risk of poor psychological health than other workers. Therefore, our study investigated the characteristics of DCs, the relationship between DC status and mental health symptoms, and how this relationship changed by age, sex and income level.

METHODS

Study design and study population

This study examined responses to the Fifth Korean Working Conditions Survey (KWCS), which was conducted from June to September 2017. The Occupational Safety and Health Research Institute (OSHRI) has conducted the KWCS every 5 years since 2006. Participants are at least 15 years old and are selected by multistage, stratified, random sampling. Participants are interviewed individually by an expert interviewer. They are surveyed about their occupation as classified by the Korean Standard Classification of Occupations (KSCO), working environment, work characteristics, sociopsychological characteristics, health, and demographic characteristics. Raw KWCS data is available in both Korean and English upon request (<https://www.kosha.or.kr/eoshri/index.do>).

The Fifth KWCS had 50,205 participants, but our study only examined wage workers ($n = 30,108$). DCs are classified as wage workers by the KWCS. Soldiers ($n = 93$) and those who did not answer at least one question were excluded from analysis ($n = 2,035$). Finally, 27,980 participants were included in the current study (Fig. 1).

Main variables

The KWCS classifies DC according to whether the participants' earnings are performance-based or not ("Does your income correspond to how many clients you meet and you provide prizes or services (performance-based earning system)?"). On the other hand, Article 125 of the Industrial Accident Compensation Insurance Act states only insurance salesperson, construction machine operator, visiting teacher, golf caddie, door-to-door deliverer, quick service deliverer, loan solicitor, credit card solicitor, designated driving service worker, door-to-door salesperson, door-to-door rental equipment examiner, electrical and electronic home appliance fitters and repairer, truck driver, and software technician can be classified as DC.⁹ In our study, among the workers belonging to these 14 designated occupations by the law ($n = 1,575$), those whose earning was not performance-based were excluded from the DC ($n = 788$). In other words, those who have (1) performance-based earning system and (2) occupations within the scope of a DC, according to the Industrial Accident Compensation Insurance Act in Korea are classified as DC in our research design ($n = 787$). Four-digit 6th KSCO codes are used for classification.

Regarding their mental health, participants were asked, "Over the last 12 months, did you have any of the following health problems?" to which they could respond "Yes" or "No" to each problem. Those who responded "Yes" to depression or anxiety were defined as having mental health symptoms.

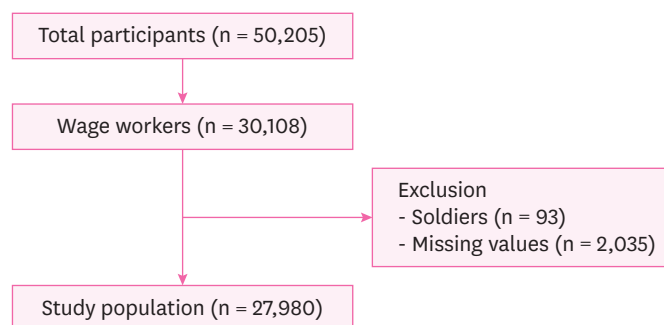


Fig. 1. Flowchart of selection of study population.

Covariates

Age, sex, education level, income category, occupation, working hours, shift work, and psychosocial job demands were possible confounding variables that were adjusted for. Age groups were classified as 15–29, 30–39, 40–49, 50–59, and ≥ 60 years old. Income category was classified into tertiles according to monthly income. Education level was classified as having completed middle school or lower, high school, and or college. Occupation was classified as blue-collar work, service and sales work, or white-collar work based on the KSCO. Managers, professionals and related workers, and clerks were grouped as white-collar workers. Service workers and sales workers were classified as service and sales workers. Skilled agricultural, forestry, and fishery workers; craft and related trades workers; plant workers, machine operators, and assemblers; and elementary workers were classified as blue-collar workers. Working hours per week were classified as < 40 , 41–52, and ≥ 53 . Workers were asked to answer “Does your job involve handling angry clients?”. According to the answer, participants were classified as “Rarely” (never, almost never), “Sometimes” (1/4 of working hours, half of working hours), and “Always” (3/4 of working hours, almost always, always). Participants were also asked to answer “Does your job require that you hide your feelings?”. Participants were classified as “Rarely” (never, rarely), “Sometimes” (sometimes), and “Always” (most of the time, always).

Statistical analysis

First, we performed exact matching for age groups and sex through the package “MatchIt” in R, resulting in 787 DCs being matched with 27,193 other types of wageworkers. None of the participants was excluded by this exact matching procedure. After matching, a χ^2 test was used to compare the characteristics of workers by DC status. Conditional logistic regression with survey weights was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs). Next, we stratified participants by age, sex and income level to examine the different impact of dependent contracting by worker's sociodemographic characteristics. Age stratification was conducted for the < 40 (young), 40–59 (middle-aged), and ≥ 60 (old) groups. For sensitivity analysis, weighted unconditional logistic regression was performed, and the outcomes are presented in the supplementary material. All statistical analyses and visualizations were performed using R (version 4.1.2; R Foundation for Statistical Computing, Vienna, Austria).

Ethics statement

This study was approved by the Institutional Review Board of Severance Hospital (approval number: 4-2021-1303).

RESULTS

Of the 27,980 wageworkers' responses examined in this study, 787 (2.8%) were DCs. The sociodemographic characteristics of the study population are shown in **Table 1**. Of the DCs, 76.6% of workers were female and 70.9% were service and sales workers. Compared to the control group, DCs were more likely to be exposed to psychological job demands. Of the DCs, 6.0% had mental health symptoms while only 3.6% of other workers did.

The prevalence of mental health symptoms by participant characteristics is presented in **Table 2**. The prevalence was high among the middle-aged group (40–49 and 50–59) than the other groups, and there was no significant difference between males and females. The

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Table 1. Sociodemographic characteristic of study sample by employment type in the Fifth Korean Working Conditions Survey

Characteristics	Total (n = 27,980)	Dependent contractor		p-value
		Yes (n = 787)	No (n = 27,193)	
Mental health symptoms (Depression/Anxiety)				0.001
No	26,949 (96.3)	740 (94.0)	26,209 (96.4)	
Yes	1,031 (3.7)	47 (6.0)	984 (3.6)	
Age				< 0.001
< 30	3,871 (13.8)	28 (3.6)	3,843 (14.1)	
30–39	6,399 (22.9)	116 (14.7)	6,283 (23.1)	
40–49	7,182 (25.7)	269 (34.2)	6,913 (25.4)	
50–59	6,399 (22.9)	313 (39.8)	6,086 (22.4)	
≥ 60	4,129 (14.8)	61 (7.8)	4,068 (15.0)	
Sex				< 0.001
Male	13,402 (47.9)	183 (23.3)	13,219 (48.6)	
Female	14,578 (52.1)	604 (76.7)	13,974 (51.4)	
Education level				< 0.001
Middle school or lower	3,498 (12.5)	38 (4.8)	3,460 (12.7)	
High school	9,735 (34.8)	368 (46.8)	9,367 (34.4)	
College	14,747 (52.7)	381 (48.4)	14,366 (52.8)	
Income category				< 0.001
Low	10,845 (38.8)	154 (19.6)	10,691 (39.3)	
Middle	8,488 (30.3)	325 (41.3)	8,163 (30.0)	
High	8,647 (30.9)	308 (39.1)	8,339 (30.7)	
Occupation				< 0.001
Blue-collar workers	9,312 (33.3)	118 (15.0)	9,194 (33.8)	
Service/Sales worker	7,416 (26.5)	558 (70.9)	6,858 (25.2)	
White-collar workers	11,252 (40.2)	111 (14.1)	11,141 (41.0)	
Working hour per week				0.006
≤ 40	16,394 (58.6)	502 (63.8)	15,892 (58.4)	
41–52	7,646 (27.3)	198 (25.2)	7,448 (27.4)	
≥ 53	3,940 (14.1)	87 (11.1)	3,853 (14.2)	
Shift work				< 0.001
No	24,527 (87.7)	778 (98.9)	23,749 (87.3)	
Yes	3,453 (12.3)	9 (1.1)	3,444 (12.7)	
Handling angry clients				< 0.001
Rarely	21,327 (76.2)	499 (63.4)	20,828 (76.6)	
Sometimes	4,912 (17.6)	202 (25.7)	4,710 (17.3)	
Always	1,741 (6.2)	86 (10.9)	1,655 (6.1)	
Suppressing emotion				< 0.001
Rarely	5,911 (21.1)	104 (13.2)	5,807 (21.4)	
Sometimes	10,700 (38.2)	258 (32.8)	10,442 (38.4)	
Always	11,369 (40.6)	425 (54.0)	10,944 (40.2)	

Values are presented as number (%).

proportion of workers with mental problems was high among workers handling angry clients and suppressing their emotion at work.

The association between DC and mental health symptoms is shown in **Table 3**. After adjusting for socioeconomic status and working conditions, there was a statistically significant correlation between DC and mental health symptoms (OR [95% CI]: 1.52 [1.06–2.17]). In addition, our fully adjusted Model C shows that long working hours, shift work, handling angry customers, and suppressing one's emotion were significantly correlated with mental health symptoms.

Fig. 2 shows the results of stratified analyses. A statistically significant association was shown in the middle-aged (OR [95% CI]: 1.68 [1.10–2.54]), female (OR [95% CI]: 1.85 [1.20–2.84]), and low-income (OR [95% CI]: 3.18 [1.77–5.73]) workers. Finally, sensitivity analysis was conducted in which weighted unconditional logistic regression analyses were conducted which produced the same association (**Supplementary Table 1**).

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Table 2. Prevalence of mental health symptoms among the study sample

Characteristics	Dependent contractor					
	Yes		p-value	No		p-value
	Depression/Anxiety			Depression/Anxiety		
Yes (n = 40)	No (n = 740)	Yes (n = 984)	No (n = 26,209)			
Age					0.519	< 0.001
< 30	2 (7.1)	26 (92.9)	110 (2.9)	3,733 (97.1)		
30–39	3 (2.6)	113 (97.4)	182 (2.9)	6,101 (97.1)		
40–49	17 (6.3)	252 (93.7)	261 (3.8)	6,652 (96.2)		
50–59	22 (7.0)	291 (93.0)	260 (4.3)	5,826 (95.7)		
≥ 60	3 (4.9)	58 (95.1)	171 (4.2)	3,897 (95.8)		
Sex					0.611	0.854
Male	9 (4.9)	174 (95.1)	475 (3.6)	12,744 (96.4)		
Female	38 (6.3)	566 (93.7)	509 (3.6)	13,465 (96.4)		
Education level					0.660	< 0.001
Middle school or lower	2 (5.3)	36 (94.7)	171 (4.9)	3,289 (95.1)		
High school	25 (6.8)	343 (93.2)	345 (3.7)	9,022 (96.3)		
College	20 (5.2)	361 (94.8)	468 (3.3)	13,898 (96.7)		
Income category					0.079	0.003
Low	15 (9.7)	139 (90.3)	428 (4.0)	10,263 (96.0)		
Middle	15 (4.6)	310 (95.4)	251 (3.1)	7,912 (96.9)		
High	17 (5.5)	291 (94.5)	305 (3.7)	8,034 (96.3)		
Occupation					0.570	0.021
Blue-collar workers	6 (5.1)	112 (94.9)	356 (3.9)	8,838 (96.1)		
Service/Sales workers	32 (5.7)	526 (94.3)	267 (3.9)	6,591 (96.1)		
White-collar workers	9 (8.1)	102 (91.9)	361 (3.2)	10,780 (96.8)		
Working hours per week					0.491	0.001
≤ 40	31 (6.2)	471 (93.8)	521 (3.3)	15,371 (96.7)		
41–52	9 (4.5)	189 (95.5)	296 (4.0)	7,152 (96.0)		
≥ 53	7 (8.0)	80 (92.0)	167 (4.3)	3,686 (95.7)		
Shift work					0.958	0.020
No	47 (6.0)	731 (94.0)	835 (3.5)	22,914 (96.5)		
Yes	0 (0.0)	9 (100.0)	149 (4.3)	3,295 (95.7)		
Handling angry clients					< 0.001	< 0.001
Rarely	20 (4.0)	479 (96.0)	663 (3.2)	20,165 (96.8)		
Sometimes	14 (6.9)	188 (93.1)	214 (4.5)	4,496 (95.5)		
Always	13 (15.1)	73 (84.9)	107 (6.4)	1,548 (93.5)		
Suppressing emotion					0.001	< 0.001
Rarely	1 (1.0)	103 (99.0)	135 (2.3)	5,672 (97.7)		
Sometimes	8 (3.1)	250 (96.9)	340 (3.3)	10,102 (96.7)		
Always	38 (8.9)	387 (91.1)	509 (4.6)	10,435 (95.3)		

Values are presented as number (%).

DISCUSSION

Our current study suggests that working as a DC has a negative effect on mental health. The OR for working as a DC was still significantly elevated after adjustment for age, sex, and factors associated with socioeconomic status and psychological working conditions. Furthermore, this association was shown to differ by age group, sex, and income level.

Our results show that DCs accounted for 2.8% of all wageworkers. However, other studies using KWCS data reported that 6.2% and 7.3% of all wageworkers were classified as DCs. This considerable difference was a product of how DCs were defined. The KWCS classifies DCs according to whether the participant's earnings are performance-based or not, but this definition can overestimate the number of DCs because some regular employees are compensated according to incentive systems that work in similar ways.²⁴ Therefore, we limited DCs to those who could be classified as DCs by law and who were compensated

Table 3. Association between DC status and mental health symptoms

Covariates	Model A	Model B	Model C
Dependent contractor			
No	Reference	Reference	Reference
Yes	1.55 (1.10–2.18)	1.58 (1.10–2.26)	1.52 (1.06–2.17)
Education level			
Middle school or lower		Reference	Reference
High school		0.79 (0.60–1.06)	0.72 (0.54–0.96)
College		0.77 (0.55–1.07)	0.70 (0.51–0.98)
Income category			
Low		Reference	Reference
Middle		0.80 (0.65–1.00)	0.76 (0.61–0.94)
High		0.88 (0.70–1.11)	0.86 (0.69–1.08)
Occupation			
Blue-collar workers		Reference	Reference
Service/Sales worker		1.09 (0.88–1.36)	0.95 (0.76–1.18)
White-collar workers		1.01 (0.80–1.29)	1.06 (0.83–1.36)
Working hours per week			
≤ 40			Reference
41–52			1.26 (1.05–1.52)
≥ 53			1.40 (1.11–1.77)
Shift work			
No			Reference
Yes			1.29 (1.02–1.62)
Handling angry clients			
Rarely			Reference
Sometimes			1.31 (1.08–1.58)
Always			2.00 (1.56–2.55)
Suppressing emotion			
Rarely			Reference
Sometimes			1.69 (1.30–2.19)
Always			2.12 (1.66–2.71)

Values are presented as odds ratio (95% confidence interval). Statistically significant values are shown in bold type. Model A: age + sex (matched). Model B: Model A + socio-economic factors (educational level + income category + occupation). Model C: Model B + working conditions (working hours + shift work + handling angry clients + suppressing emotion).

according to a performance-based earnings system. Our proportion of DCs was similar to that calculated by the KNSO of 2.5% in 2017.²⁵

Unlike other wageworkers, female and service and sales workers constitute the majority of DCs, which was consistent with a previous study that showed that 71% of DCs were female.¹⁸ These findings show that there was occupational gender segregation in Korea such that female are overrepresented in non-standard and service and sales jobs.²⁶ The high proportion of DCs accounted for by service and sales workers explains why DCs are more exposed to psychological hazards than other types of workers. Service and sales workers are more likely to face angry customers and hide their emotions, which are causes of depression and anxiety.²⁷

Our findings correspond with those of a previous Korean study, which found a significant relationship between being a DC and mental health problems.²⁴ Although low incomes can cause mental health issues, DCs have relatively high incomes, so income is not the likely cause of their mental health problems. However, there are several possible factors that may explain this relationship.

First, in terms of employment relationships, a high level of insecurity was reported among DCs compared to regular employees.²⁸ Job insecurity has been found to have a negative

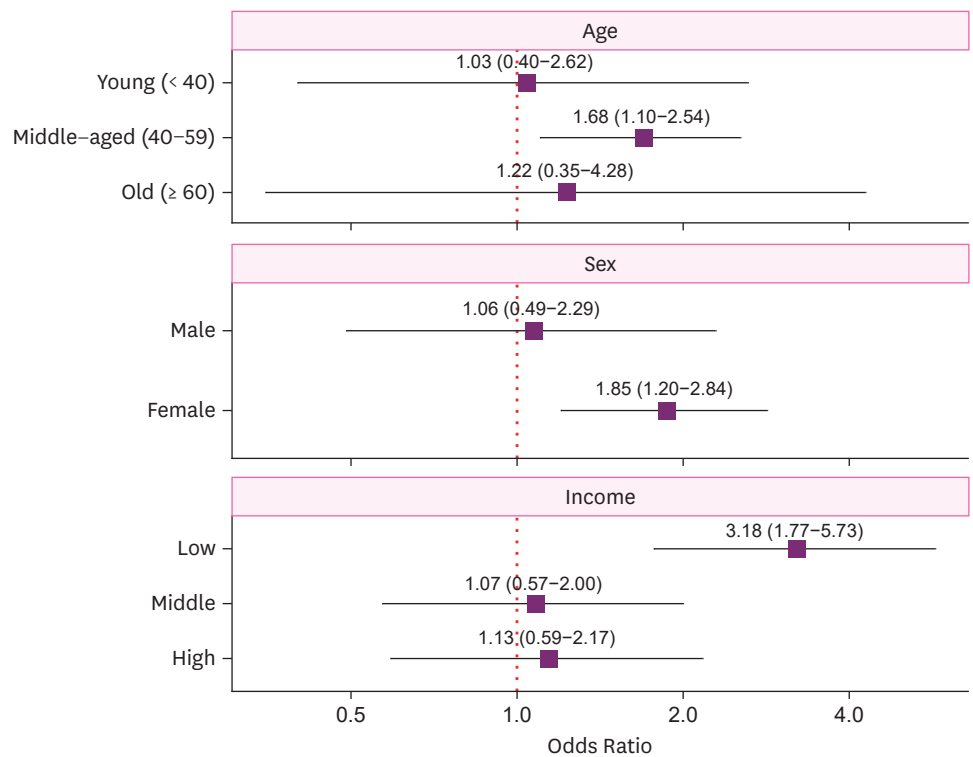


Fig. 2. Results of the stratified analyses of the relationship between dependent contractors and mental health symptoms by age, sex, and income level using the fully adjusted model.

impact on mental health in several longitudinal studies and a review article,^{23,29} indirectly by causing financial difficulties and directly by causing depression and anxiety.³⁰ Thus, employment insecurity has been addressed as a key factor in other research on DCs' sleep and mental health problems.^{24,31}

The second factor is DCs' income instability. Income instability is negatively correlated with psychological health.^{32–34} DCs' earnings are performance-based, so they are more volatile than those of other types of workers.¹⁷ For example, during the coronavirus disease 2019 (COVID-19) pandemic, DC and freelance workers suffered the greatest declines in income.³⁵

Third, due to their ambiguous legal position, DCs have not been classified as employee so that they were in a situation of lack of legal protection or social security. Lack of right and social protection could have a negative impact on the mental health of workers.^{11,36} Mostly, DCs work independently and adequate safety risks and protocols are not often provided or shared with them.³⁷ Thus this lack of safety information made DCs more vulnerable to job stress as well as occupational accidents.¹⁹ In addition, DC has been excluded from legal policy to protect psychological health of customer-facing workers until recently.³⁸ It has been shown that DCs are less provided with a manual on emotional expression while they are more frequently exposed to emotional labor,³⁷ putting them at higher risk of depression.³⁹ Moreover, employment insurance of Korea has not covered DC until recently. Concerning employment insurance plays an important role in mitigating financial hardship and thus results in better mental health,¹¹ the lack of social security could negatively affect DC's psychological well-being.

Our stratified analysis showed that the mental health symptoms of middle-aged DCs were significantly affected by their employment type. This result was similar to that of previous studies that showed that middle-aged workers had stronger reactions to job insecurity because they have more family obligation.^{14,15} Specifically, middle-aged workers often have more responsibility to support their parents and children. This explanation is supported by the facts that job insecurity is significantly correlated with poor mental health for workers who have children⁴⁰ or are heads of household⁴¹ but not for other workers, regardless of gender.

Regarding sex differences only female workers' mental health symptoms were correlated with DC status. The results of studies examining how precarious employment correlates with mental health by sex are inconsistent. Some studies have a significant correlation between these 2 variables only in male workers,^{16,42} others only in female workers,^{43,44} and others in both male and female workers.⁴⁵ Explanations for these results often refer to cultural characteristics. Our study's result contradicts the result that would be expected by traditional perceptions of gender roles in which men are would be more strongly affected by employment status than women because they perceive themselves as breadwinners and women are less job-oriented. Rather, our finding can be supported by the fact that job insecurity significantly intensifies depression in workers with high levels of domestic responsibilities.⁴⁴ This assumption is supported by a recent interactive study that showed that job insecurity had a significantly strong effect on depression among workers with high domestic responsibility.⁴⁶ Thus, in the case of women, psychological stress from insecurity of work may be more severe when the work-family balance is disrupted due to high household workloads. Furthermore, in case of female DC, they often encounter angry customers or suppress emotion while they have not been properly protected from hazardous psychological environment by labor protection policies.³⁸

Finally, there was a significant effect of DC status on poor mental health in low-income workers. Workers with low incomes are more vulnerable to the detrimental impacts of job insecurity and income volatility than workers with higher incomes.^{14,32,42} This vulnerability would likely be increased by the legal status of DCs in Korea who have not been covered by unemployment benefits because they were considered to be self-employed,⁴⁷ and still have less coverage than that of regular employees. Unemployment benefits mitigate the financial hardships of unemployment, making perceptions of it less stressful, which in turn improves mental health.¹¹ Thus, low-income DCs know that they will have fewer unemployment benefits, making the effects of precarious employment more serious.

Concerning that service and sales workers are overrepresented in female and middle-aged workers while blue-collar workers in male and old workers, the results of stratified analyses should be interpreted with caution. Even though our model adjusted for psychological job demands and occupations, considerable difference in occupational distribution according to age and sex groups could have influenced our findings. Also, unlike employees, DC provides services through a work consignment contract rather than an employment contract. Therefore, to compare job insecurities between these 2 different contract types, more detailed survey item will be needed in further studies.

Our study had some limitations. The first limitation was that our study was cross-sectional. Longitudinal research could identify causal associations between DC status and mental health symptoms. The second limitation was that we did not define DCs to include occupations that are socially but not legally recognized as DCs, such as caregivers and

telemarketers. Therefore, this study's results may not be generalized. The third limitation was that the health outcomes were self-reported, so more reliable and valid measurements of depressive or anxiety symptoms would be required in further studies.

Nonetheless, our study does have notable strengths. First, this study reconfirmed the findings observed in prior studies even after applying strict criteria for DC classification. Next, while previous study on mental health of DC in Korea²⁴ did not consider psychological working conditions, our study found that DC status was consistently associated with increased depression/anxiety even after adjusting for workers' psychosocial job demands. Finally, our research is the first to suggest that the influence of DC status can vary with age, sex and income level.

CONCLUSIONS

Our study's results reinforce those of other studies that found that DCs are frequently exposed to psychological hazards and that working as a DC itself is correlated with poor mental health. In addition, our study's results showed that these relationships are stronger among middle-aged, female, and low-income DCs. Appropriate policies should be implemented to improve DCs' psychological well-being.

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SUPPLEMENTARY MATERIAL

Supplementary Table 1

Association of dependent contractor and mental health symptoms by weighted unconditional logistic regression

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