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Health Inequalities Among Korean Employees

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ABSTRACT

Background: Social status might be a determinant of occupational health inequalities. This study analyzed the effects of social status on both work environments and health outcomes.
Methods: The study sample consisted of 27,598 wage employees aged 15 years and older from among the Korean Working Condition Survey participants in 2011. Work environments included atypical work, physical risks, ergonomic risks, work demands, work autonomy, social supports, and job rewards. Health outcomes comprised general health, health and safety at risk because of work, the World Health Organization-5 Well-being Index, work-related musculoskeletal disease, and work-related injury. Multivariable logistic-regression models were used to identify the associations between social status and work environments and health outcomes.
Results: Employees in the demographically vulnerable group had lower occupational status compared with their counterparts. Low social status was largely related to adverse work environments. Especially, precarious employment and manual labor occupation were associated with both adverse work environments and poor health outcomes.
Conclusion: Precarious and manual workers should take precedence in occupational health equity policies and interventions. Their cumulative vulnerability, which is connected to demographics, occupational status, adverse work environments, or poor health outcomes, can be improved through a multilevel approach such as labor market, organizations, and individual goals.

1. Introduction

Health inequality is a common term used to label differences, variations, and disparities in health status or in the distribution of health determinants between segments of a population [1]. Health inequity is the unfair and unjust status in health achievements observed in populations. Most health inequalities are absolutely inequitable [1,2]. Social determinants of health inequalities are commonly responsible for health or health determinants [3,4].

By the World Health Organization conceptual framework of Social Determinants of Health, socioeconomic positions such as income, education, occupation, sex, and race/ethnicity were defined as social determinants of health inequalities. These social determinants of health inequalities operate through a set of intermediary determinants of health to shape health outcomes. These intermediary determinants of health are named as social determinants of health. The main social determinants of health are social gradient, stress, early life, social exclusion, work, unemployment, social support, addiction, food, and transport [4]. By the macrostructural framework of employment relations and health inequalities, policies for labor market and welfare state affects employment conditions that include type of employment, social class, sex, and age. Social class, age, and sex are key relational mechanisms that describe why different types of employment conditions connected to multiple disease outcomes through multiple risk-factor mechanisms [4,5]. Therefore, social class, age, sex, and type of employment are important factors as the social determinants of health inequalities. These social inequalities in both work environments as health determinants and health outcomes should be explored.

Globally, inequality exists among working populations with biological, social, or economic characteristics, which can cause poor health conditions. Some of the people at risk for these poor health conditions include low-wage and temporary workers, young and old workers, racial and ethnic minority workers, and medically challenged workers [6]. The global economic crisis and

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neoliberalism economy have caused labor polarization that could place more workers in jeopardy of health inequality.

The labor market contains a wide set of economic, social, political, and cultural work-related factors [7]. Social determinants of occupational health inequalities are characterized by the labor market. Notably, labor polarization in Republic of Korea has been intensified by the segregation of gender, age, occupational class, employment status, and company size [8–10]. This strong labor market segmentation and discrimination has caused employment inequality among some working groups [11]. Consequently, underprivileged workers are more exposed to adverse work environments resulting in poor health [5,12,13]. Unfortunately, the efforts to address occupational health inequality in the Korean labor market have been insufficient in all areas, including research, intervention, and policy.

Against this background, this study included age, sex, and occupational status as social status indicators showing social determinants of occupational health inequalities. In addition, it is important to consider both personal and work-related characteristics in occupational health equity epidemiology. In this study, data were obtained from the Korean Working Condition Survey, including comprehensive working conditions, carried out in 2011. This study presents the patterns of social status and their effects on the work environments and health outcomes among Korean employees to redress the current patterns and magnitude of health inequities by taking action on the social determinants of occupational health inequalities.

2. Materials and methods

2.1. Participants and study sample

This study analyzed data from the third wave of the Korean Working Condition Survey, which was carried out by the Occupational Safety and Health Research Institute in 2011. The survey sample represented the working population aged ≥15 years with a total of 50,032 participants selected by a multistage, stratified random sampling method. The survey was conducted in workers' homes by face-to-face interviews. This study included only wage employees and excluded employers, self-employed workers, and soldiers. The final data included 27,598 wage employees (16,250 men and 11,348 women) for analysis. This study was approved by the Institutional Review Board.

2.2. Measures

Social status was measured by age, sex, employment status, occupational class, and company size. Age was categorized as follow: 15–24 years, 25–54 years, and 55 years and older. Employment status included precarious and full-time permanent employment. Precarious employment was defined as temporary, daily, or part-time (≤30 h/wk) work; a fixed term contract; a subcontract; or dispatch work [14–16]. Full-time permanent employment was defined as working more than 30 h/wk with an indefinite contract. Occupational class was divided into white collar (legislators, senior officials and managers, professionals/technicians, and associate professionals), pink collar (clerks, service, and sales workers), blue collar (forestry and fishery workers, craft and related trade workers, plant and machine operators, and assemblers), and unskilled occupations (elementary occupations) according to the four broad occupational groupings of the Organization for Economic Co-operation and Development [9]. Company size was categorized into companies with one to four workers, five to 49 workers, and 50 or more workers.

Work environments included atypical work, physical risks, ergonomic risks, work demands, work autonomy, social supports, and job rewards. Atypical work was defined as having night or weekend work at least four or more times per month. Physical risk was classified as exposure or no exposure. Exposure was defined as being exposed to one or more of the following eight risks for more than half of daily work time (Cronbach $\alpha = 0.78$): (1) noise so loud that workers had to raise their voice to talk to people; (2) high temperatures that make workers perspire even when not working; (3) low temperatures, whether indoors or outdoors; (4) breathing in smoke, fumes, powder, or dust; (5) breathing in vapors generated by solvents and thinners; (6) handling or being in skin contact with chemical products or substances; (7) exposure to tobacco smoke from other people; and (8) handling or being in direct contact with infectious materials (waste, bodily fluids, and laboratory materials). Ergonomic risk was divided into exposure and no exposure. Exposure was defined as being exposed to one or more of the following four risks for more than half of daily working time (Cronbach $\alpha = 0.76$): (1) vibrations from hand tools and machinery; (2) tiring or painful positions; (3) carrying or moving heavy loads; and (4) repetitive hand or arm movements. Work demand (Cronbach $\alpha = 0.74$) was measured with two seven-point scale items: working at high speed and working with deadlines. Individuals who scored below and above the median of this scale were grouped as having "low" and "high" work demands, respectively. Work autonomy was measured with five questions (Cronbach $\alpha = 0.70$): having authorization to (1) choose or change the order of tasks (yes = 1, no = 0); (2) select work methods (yes = 1, no = 0); (3) determine work speed (yes = 1, no = 0); (4) influence the choice of working partners (always/most of the time = 1, sometimes/rarely/never = 0); and (5) take a break when desired (always/most of the time = 1, sometimes/rarely/never = 0). Work autonomy also used the median score to dichotomize the level into "low" and "high." Social support received from peers was measured on a five-point scale (1–5, ranging from "always" to "never") and was dichotomized into having "low" (sometimes/rarely/never) and "high" (always/most of the time) social support. Job reward was measured with wage compensation and promotion prospects (Cronbach $\alpha = 0.60$). When the participants answered "yes" to at least one item, their responses were coded as "yes" and when they answered "no" to both items, they were coded as "no."

Health outcomes were measured by general health, health and safety at risk because of work, mental health at risk, work-related musculoskeletal disease, and work-related injury. General health was measured with a dichotomized variable: good ("very good" and "good") and bad ("fair," "bad," and "very bad"). Health and safety at risk because of work was assessed by the following question, using yes and no: "Do you think your health or safety is at risk because of your work?" Mental health at risk was assessed with the World Health Organization-5 Well-being Index [17], which consists of five items reflecting positive mood, vitality, and general interests over the previous 2 weeks. The index score ranges from 0 to 25, and scores ≤13 are considered to be mental health at risk in the general population [18]. Work-related musculoskeletal disease was assessed using two questions: (1) "over the past 12 months, have you had any health problems?" (backache, muscular pain in shoulders, neck, and/or upper limbs, or muscular pain in lower limbs); and (2) "was your health problem associated with or caused by work?" If the answer was "yes" to having any health problems and "yes" to health problems being associated with or caused by work, participants were considered to have work-related musculoskeletal disease. Work-related injury was measured using two questions: (1) "Over the past 12 months, have you had any injury?"; and (2) "Was your health problem associated with or caused by

work?" If the answer was "yes" to both questions, it was considered to indicate a work-related injury.

2.3. Statistical analysis

Rao–Scott Chi-square tests were performed to identify differences in the occupational status variables according to sex and age group using PROC SURVEYFREQ procedures. Odds ratio, a relative index of social group inequalities, has frequently been used as a measure of association in cross-sectional studies [19]. Therefore, multivariable logistic-regression models (PROC SURVEYLOGISTIC procedures) were formulated to estimate the odds of adverse work environments or poor health outcomes associated with social status. Multiple logistic-regression models predicting health outcomes included working condition variables as covariates. All statistics included weights, which reflect the sampling method, and response rate. All the analyses were performed using SAS ver. 9.4 (SAS Institute, Cary, NC, USA). A p value of <0.05 was considered statistically significant.

3. Results

Table 1 compares the distribution and differences of occupational status (employment status, occupational class, and company size) by sex and age. Occupational status variables by sex and age presented mutually significant differences (all $p < 0.001$). Among women, 43.4% were precariously employed, while only 33.7% of men were precariously employed. Employees aged 15–24 years and 55 years and older were more likely to have precarious employment than employees aged 20–54 years (59.3% and 62.2% vs. 32.4%, respectively). More than half of women had pink-collar occupations, while 37.7% of men had pink-collar occupations. Approximately 60% of employees aged 15–24 years had pink-collar occupations, while 18.8% of employees aged 55 years and older worked in this sector. Almost half (45.9%) of employees aged 55 years and older had unskilled occupations, while 7.8% of employees aged 25–54 years had unskilled occupations. Women were more likely than men to work in companies with fewer than five employees (29.6% and 17.2%, respectively). Women were less likely than men to work in companies with more than 50 employees (18.6% and 30.4%, respectively). Employees aged 25–54 years were more likely to work in companies with more than 50 employees than were the other age groups (27.5%).

The distribution and effects of social status on work environments are presented in Table 2. Atypical work patterns were mostly found among employees aged 15–24 years (60.4%) and who worked in companies with one to four employees (62.9%). Employees with blue-collar occupations experienced high rates of exposure to physical risks (53.8%), ergonomic risks (73.2%), and high work demands (55.5%). Approximately 61% of employees aged 15–24 years had low work autonomy. Employees in unskilled occupations showed the highest percentage of low social support (52.4%) and low job rewards (40.4%).

Multivariate logistic-regression analyses revealed that most of the social status variables influenced each type of work environment. Women were more likely to be exposed to the most adverse work environments, except atypical work and physical risks. Compared with the reference group, employees aged 15–24 years were found to be at a higher risk for adverse work environments, except for high work demands and low job rewards. However, job rewards of employees aged 55 years and older were significantly lower. Precarious employment was a critical risk factor and was associated with most adverse work environments. However, full-time permanent employment was shown to be a risk factor for low work autonomy. Blue-collar and unskilled occupations demonstrated significant associations with all adverse work environments compared with white-collar occupations. Further, employees in pink-collar occupations suffered more from adverse work environments, such as atypical work, low work autonomy, low social support, and low job rewards. Companies with one to four employees exhibited significant associations with most adverse work environments compared with companies with 50 or more employees. In particular, both companies with one to four employees and those with five to 49 employees demonstrated significant associations with atypical work, low social support, and low job rewards.

The distribution and effects of social status on health outcomes are presented in Table 3. Poor general health was mostly found among employees aged 55 years and older (44.8%) and with blue-collar occupations (40.4%). Health and safety at risk because of work was highest in employees with blue-collar occupations (27.4%). Mental health at risk and work-related musculoskeletal disease were higher in employees aged 55 years and older (44.7% and 41.3%, respectively), with blue-collar occupations (46.4% and 42.6%, respectively), and with unskilled occupations (47.1% and 45.3%, respectively). Work-related injury was highest in employees with blue-collar occupations (3.9%).

The effects of social status on health outcomes were explored by the multivariate logistic-regression model including working environments as covariates. Males showed higher risks for health and safety because of work, mental health at risk, and work-related injury, but females showed a higher risk only for work-related musculoskeletal disease. Compared with the reference group, employees aged 15–24 years showed significantly lower rates of poor

Table 1
Occupational status by gender and age ($N = 27{,}598$)

	Total	Sex (%)*			Age (%)*			
		Male	Female	p	15–24	25–54	≥55	p
Total	100	59.8	40.2		4.9	81.8	13.2	
Employment status				<0.001				<0.001
Precarious	37.6	33.7	43.4		59.3	32.4	62.2	
Full-time permanent	62.4	66.3	56.6		40.7	67.6	37.8	
Occupational class				<0.001				<0.001
White collar	21.4	18.9	25.2		17.4	23.7	9.1	
Pink collar	44.2	37.7	53.8		60.2	47.3	18.8	
Blue collar	21.2	30.4	7.5		7.3	21.2	26.2	
Unskilled occupations	13.2	13.0	13.5		15.0	7.8	45.9	
Company size (persons)				<0.001				<0.001
1–4	22.2	17.2	29.6		43.5	20.5	24.8	
5–49	52.2	52.4	51.9		42.7	52.0	56.6	
≥50	25.6	30.4	18.6		13.7	27.5	18.7	

* Weighted percent.

Table 2
Effects of social status on work environments

	Atypical work		Physical risk		Ergonomic risk		High work demands		Low work autonomy		Low social support		Low job reward	
	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)
Total	43.5		25.2		40.4		41.7		47.9		43.2		22.5	
Sex														
Male	44.6	1	29.8	1	43.2	1	42.3	1	46.2	1	42.3	1	22.3	1
Female	42.0	0.92 (0.86–0.97)*	18.4	0.83 (0.77–0.89)†	36.3	1.12 (1.06–1.20)†	40.8	1.15 (1.08–1.22)†	50.4	1.34 (1.27–1.42)†	44.6	1.10 (1.04–1.16)*	22.8	1.11 (1.04–1.19)*
Age (y)														
15–24	60.4	1.86 (1.65–2.10)†	22.7	1.19 (1.03–1.37)‡	39.8	1.13 (1.002–1.28)‡	40.6	0.999 (0.89–1.12)	61.2	1.77 (1.58–1.99)†	48.5	1.13 (1.01–1.27)‡	25.9	1.10 (0.97–1.26)
25–54	41.9	1	23.4	1	38.6	1	42.3	1	46.7	1	42.1	1	20.5	1
≥55	47.4	0.87 (0.80–0.95)*	37.4	1.08 (0.99–1.19)	52.0	0.92 (0.84–1.001)	38.4	0.68 (0.63–0.75)†	50.2	0.92 (0.84–0.998)‡	48.2	0.99 (0.91–1.08)	33.9	1.13 (1.03–1.24)*
Employment status														
Precarious	47.1	0.99 (0.93–1.05)	30.5	1.31 (1.22–1.41)†	47.4	1.30 (1.22–1.38)†	43.2	1.09 (1.03–1.16)*	49.1	0.90 (0.85–0.96)†	49.3	1.31 (1.23–1.38)†	30.9	1.64 (1.53–1.75)†
Full-time permanent	41.4	1	22.1	1	36.2	1	40.8	1	47.2	1	39.6	1	17.4	1
Occupational class														
White collar	31.6	1	15.3	1	26.9	1	36.4	1	39.3	1	34.9	1	10.9	1
Pink collar	39.6	1.32 (1.22–1.42)†	12.2	0.76 (0.68–0.83)†	26.5	0.94 (0.87–1.02)	37.0	1.03 (0.96–1.11)	45.3	1.25 (1.16–1.34)†	42.6	1.34 (1.25–1.44)†	19.6	1.90 (1.71–2.12)†
Blue collar	57.9	3.11 (2.84–3.40)†	53.8	5.94 (5.37–6.58)†	73.2	7.34 (6.68–8.07)†	55.5	2.37 (2.18–2.59)†	56.7	2.31 (2.12–2.51)†	47.4	1.70 (1.56–1.85)†	29.2	3.34 (2.98–3.75)†
Unskilled occupations	53.2	2.32 (2.08–2.58)†	39.1	3.06 (2.72–3.43)†	57.8	3.37 (3.04–3.74)†	44.0	1.61 (1.46–1.78)†	56.4	2.15 (1.95–2.38)†	52.4	1.75 (1.59–1.94)†	40.4	4.14 (3.65–4.69)†
Company size (persons)														
1–4	62.9	3.63 (3.34–3.94)†	25.1	0.97 (0.88–1.06)	44.8	1.34 (1.23–1.46)†	40.5	0.81 (0.75–0.88)†	52.6	1.18 (1.09–1.28)†	47.5	1.43 (1.32–1.55)†	27.3	1.55 (1.41–1.71)†
5–49	40.9	1.43 (1.34–1.53)†	25.3	0.92 (0.85–0.99)‡	40.3	1.06 (0.98–1.13)	40.7	0.82 (0.77–0.88)†	47.1	0.999 (0.94–1.07)	45.0	1.36 (1.27–1.45)†	23.5	1.34 (1.23–1.46)†
≥50	32.2	1	25.2	1	36.9	1	44.7	1	45.5	1	36.0	1	16.4	1

* $p < 0.01$.
† $p < 0.001$.
‡ $p < 0.05$.
aOR, odds ratio adjusted for all other social status indicators; CI, confidence interval.

health outcomes. However, employees aged 55 years and older showed significantly increased risks for poor general health and work-related musculoskeletal disease. Participants with precarious employment, as well as those in blue-collar and unskilled occupations were more likely to experience poorer health outcomes compared with their counterparts. However, workers in pink-collar occupations demonstrated higher risks to mental health and lower risks to health and safety because of work. Companies with one to four employees showed significantly decreased likelihood for health and safety at risk because of work and mental health at risk, while companies with five to 49 workers showed significantly decreased probability of health and safety at risk because of work and an increased likelihood of work-related injury.

4. Discussion

Similar to other countries, health inequalities have become an important public health issue of both research and policy in Republic of Korea. Korean society has shown wide gaps in socioeconomic status among the population, which has consequently increased health inequalities [20]. The Ministry of Health and Welfare of Republic of Korea has included two major goals in both the revised Health Plan 2010 and the National Health Plan 2020; the goal of one of them was to increase health equity [21,22]. Health inequalities arise from the complex combination of partial causes, highlighting the need to consider health inequalities at all levels of governance [23,24]. However, the efforts of the Korean government were insufficient to implicate the action plan for health equity [22,25]. Few Korean government policies have evidently tackled health inequalities [20].

Moreover, there is not enough evidence that clearly describes the current phenomena of Korean occupational health inequalities due to social status. Identifying and monitoring the working population that experiences inequality is the main issue for occupational safety and health policy makers, researchers, and practitioners in order to ensure occupational health equity. This study aimed to explore the problems of social status, and their effects on work environments and health outcomes among Korean employees.

While addressing social status can only be a part of the solution to reducing health inequity, it is important to understand the distribution of social status to find the vulnerability of various social positions. This study examined the distributions and differences in occupational status variables according to gender and age group. Employees in the demographically vulnerable group (women, younger, and older workers) had lower occupational status (precarious employment, manual labor occupation, and small company) compared with their counterparts. This finding is related to sex segregation and age discrimination in the Korean labor market. Social stratification, including gender and age groups, resulted in differential exposure to adverse work environments and differential effects on health. Therefore, creation of a macrolevel policy is essential, which includes labor market security to reduce occupational health inequalities [5,12].

Workers who were women, young people, and employed in small workplaces tended to be in more adverse work environments, similar to previous studies [26–28]. Determinants for gender inequality of occupational health are known by the set of working and employment conditions [26]. Young workers can experience dangerous working conditions, inadequate health and safety training, and insufficient protection [27]. Small companies, in contrast to larger corporations, are less likely to protect employees from exposure to hazardous chemicals, and have access to internal and external health and safety services [28]. The analysis of work and health from a sex or age perspective should take into account

Table 3
Effects of social status on health outcomes

	Poor general health		Health and safety at risk because of work		Mental health at risk		Work-related musculoskeletal disease		Work-related injury	
	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)
Total	28.4		10.9		31.6		33.3		1.7	
Sex										
Male	28.2	1	5.0	1	34.4	1	30.2	1	2.1	1
Female	28.7	1.06 (0.998–1.13)	14.9	0.46 (0.41–0.52)*	38.4	0.91 (0.86–0.97)†	37.8	1.70 (1.60–1.81)*	1.1	0.78 (0.62–0.98)‡
Age (y)										
15–24	17.0	0.48 (0.42–0.56)*	6.3	0.73 (0.58–0.92)†	33.1	0.80 (0.71–0.91)*	28.2	0.73 (0.64–0.83)*	1.7	1.18 (0.77–1.82)
25–54	26.4	1	10.3	1	35.8	1	32.3	1	1.6	1
≥55	44.8	1.82 (1.67–1.99)*	16.2	1.05 (0.93–1.20)	44.7	1.05 (0.97–1.15)	41.3	1.11 (1.02–1.21)‡	2.2	0.84 (0.63–1.12)
Employment status										
Precarious	35.1	1.36 (1.28–1.45)*	13.6	1.32 (1.20–1.46)*	42.4	1.23 (1.16–1.31)*	39.3	1.23 (1.16–1.31)*	2.4	1.57 (1.28–1.92)*
Full-time permanent	24.3	1	9.2	1	33.5	1	29.7	1	1.3	1
Occupational class										
White collar	25.4	1	5.4	1	28.7	1	27.8	1	0.8	1
Pink collar	32.5	1.05 (0.96–1.14)	4.5	0.84 (0.71–0.99)‡	33.1	1.10 (1.02–1.19)‡	27.9	0.96 (0.89–1.04)	0.9	1.10 (0.77–1.57)
Blue collar	40.4	1.07 (0.97–1.19)	27.4	2.73 (2.32–3.21)*	46.4	1.62 (1.47–1.78)*	42.6	1.43 (1.30–1.58)*	3.9	2.81 (1.94–4.07)*
Unskilled occupations	23.1	1.15 (1.03–1.29)‡	14.8	1.60 (1.33–1.93)*	47.1	1.45 (1.30–1.61)*	45.3	1.46 (1.31–1.63)*	2.3	1.70 (1.12–2.57)‡
Company size (persons)										
1–4	29.3	0.97 (0.89–1.06)	8.4	0.63 (0.55–0.72)*	36.2	0.87 (0.80–0.94)‡	35.9	0.96 (0.88–1.05)	1.3	0.86 (0.62–1.19)
5–49	29.4	1.04 (0.97–1.12)	11.3	0.84 (0.76–0.93)†	38.2	1.02 (0.95–1.09)	33.2	0.96 (0.89–1.03)	2.1	1.42 (1.10–1.83)†
≥50	25.5	1	12.3	1	34.7	1	31.1	1	1.3	1

* $p < 0.001$.
† $p < 0.01$.
‡ $p < 0.05$.
aOR, odds ratio adjusted for all other social status indicators and work environments indicators; CI, confidence interval.

the complex interactions between sex, family roles, employment status, and social class [29]. In addition, providing safe work environments and decent jobs for female employees, young workers, or small-company workers is a critically important policy prerequisite to reduce occupational health inequality.

The study results indicate that female workers were at a higher risk for ergonomic and psychosocial work environments and more affected by work-related musculoskeletal disease than male workers. In addition, older workers were more likely to have low job rewards, poor general health, and work-related musculoskeletal disease compared with middle-age-group workers. Older workers are more vulnerable to work-related musculoskeletal disease than younger workers due to decreased functional capacity and its extreme use [30]. Accordingly, there needs to be more systematic work environment management and musculoskeletal disease prevention for women and older workers due to the increased ergonomic demands of a task in psychosocial settings and the decreased functional capacity [30,31].

Precarious employment increased physical and ergonomic risks, and created psychosocially adverse work environments (high work demands, low social support, and low job reward), similar to previous studies [32,33]. However, it decreased the risks of low work autonomy, diverging from previous studies [32,33]. This result might be due to differences in definitions of work autonomy or study samples including part-time workers, which can result in inaccurate responses for work autonomy. Further studies are needed that include the use of the demand-control model of job strain, which can examine job strain using work demand and work autonomy [34], and study samples targeting full-time workers.

Precarious employment also increased the probability of all poor health outcomes after controlling for potential variables, similar to previous studies. Subcontracted workers were found to have a higher risk of work-related diseases (injuries, anxiety/depression, musculoskeletal disease, headache/eye strain, and overall fatigue) than parent firm workers [35]. Temporary employment was associated with psychological morbidity in a systematic literature review [36]. Health status of precarious workers was shown to be worse in an analysis using longitudinal data in Republic of Korea [16]. Workers with precarious employment may experience work instability, lack of legal and institutional protection, job insecurity, and social and economic vulnerability [32]. These precarious work-related experiences might affect adverse health outcomes directly or through specific pathways (hazardous work environments, stress, and material deprivation) [32,33]. Precarious employment is a social determinant that affects the health of workers, families, and communities [33], and is increasing due to the current flexible economy [36]. High priority for occupational health policy and intervention should be given to certain precarious workers, considering the cumulative vulnerability accompanied by adverse work environments and poor health outcomes.

Manual labor occupation showed the strongest association with most adverse work environments and poor health outcomes in this study. Similar social gradients were observed between occupational class and some adverse work environments (ergonomic risk, high work demand, low job autonomy, and low job reward) and poor self-rated health [37]. In addition, the health status of unskilled workers was revealed to be poorer than that of managers and skilled supervisors after adjusting for possible confounding variables in both men and women [38]. Occupations are associated with health-related outcomes by reflecting income, privileges, and exposure to hazardous physical or psychological work environments [4]. Social stratification due to occupation can cause differential exposure to health-damaging conditions, differential vulnerability to health conditions, and differential consequences of ill health [12]. Thus, occupation, which creates social hierarchy, should be tackled as the core cause of health inequalities [4].

Precarious employment and manual labor occupation strongly affected adverse work environments and poor health outcomes after adjusting for possible confounding variables. This finding indicates that job insecurity and manual labor occupation are key determinants of occupational health disparities. Previous studies also show that occupational status has an influence on work environments and health outcomes [5,12]. Importantly, precarious employment is more prevalent in workers with manual labor occupations [14]. Consequently, occupational health equity programs

should be a priority for both precarious and manual workers. Their overlapping vulnerability should be improved by an employment policy to reduce labor market segmentation and discrimination.

In conclusion, the key social determinants of occupational health inequality in Republic of Korea were precarious employment and manual labor occupations. This study also found cumulative vulnerability caused by the overlap in low social status, and this affects adverse work environments and poor health outcomes. This imbalanced phenomenon of work environment and health outcome should be considered a direct result of the disadvantageous combination of poor social policies and an unfair economic condition [39]. Therefore, occupational health practitioners and policy makers should take a multilevel approach (labor market, organizations, and individual). In closing, some recommendations include making laws to regulate the labor market and proper administration in order to assure health equity, especially for socially, economically, or environmentally underprivileged workforce groups [40,41].

A limitation is the cross-sectional design, which prevents the time order of social status, work environments, and health outcomes to be consistently confirmed. Therefore, exact and truly qualified interpretations cannot be made. In addition, the study design did not reflect how macro-social power relations affect health inequalities [42]. Further research is needed to identify macro-level determinants of health inequalities.

Conflicts of interest

The author has no conflicts of interest with regard to the material presented in this paper.

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