

Factors Affecting the Designation of Cerebrovascular Diseases as Work-Related in Administrative Litigation

The purpose of this study was to identify factors that could be used as standardized criteria for evaluating occupational diseases in initial assessments or requests for examination. Using 100 administrative litigation cases on the work-relatedness of cerebrovascular diseases (CVDs) by the Seoul Branch of the Korea Labor Welfare Corporation (KLWC) from 1997 to 2002, we estimated the relationship between the investigated variables and designation of the work-relatedness of the CVD. As for the age, the odds ratio of the acceptance rate of a case as work-related in subjects over 60 yr of age was 0.08 (95% CI, 0.01-0.75), which was compared to subjects under 30 yr of age. Regarding working hours, the odds ratio of the acceptance rate of a case as work-related in CVDs in those over 56 hr was 9.50 (95% CI, 1.92-47.10) when compared to those less than 56 hr. As for the benefit type, the odds ratio of the acceptance rate of a case as work-related in medical benefits was 5.74 (95% CI, 1.29-25.54), compared to survivor benefits. As for the criteria for defining situations as work overload, the odds ratio of the acceptance rate of a case as work-related in injured workers was 12.06 (95% CI, 3.12-46.62), compared to that in non-injured workers. Our findings show that the criteria for defining situations of work overload played an important role in assessing the work-relatedness of CVDs in administrative litigation, and it is necessary to make the scientific evidence on judgement of work-relatedness on overwork.

Key Words : Administrative Litigation; Cerebrovascular Diseases; Work-Relatedness

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INTRODUCTION

In 1982, acceptance criteria for intracranial hemorrhage and cardiovascular diseases as occupational diseases were established in Korea. Since then, the number of work-related cerebrovascular diseases (CVDs) has continued to increase due to the rise in their acceptance and the expansion of the acceptance criteria caused by the burden of proof regarding the designations of arising from employment and occurring in the course of employment being placed on the insurer (Korea Labor Welfare Corporation, KLWC) (1). In 2004, a total of 2,285 work-related cerebrovascular and cardiovascular diseases occurred, accounting for 24.9% of all occupational diseases. Work-related cerebrovascular and cardiovascular diseases were ranked second following work-related musculoskeletal disease (32.2%) (2). Furthermore, the average accumulated insurance benefit for each injured worker has been estimated at KRW 75 million, which is thought to have a major impact on the financial stability of insurers (3).

KLWC classifies the work-relatedness of claims by insured workers based on acceptance criteria set forth in the Enforcement Regulations of the Industrial Accident Compensation Insurance Act. If a disease is not accepted as being work-related

in the initial judgment, the injured worker can pursue his or her case by requesting an examination, requesting a rehearing, or pursuing administrative litigation, which is the last resort. The occurrence of administrative litigation continues to increase annually. In 2000, 2,003 administrative litigation cases were presented to KLWC; by 2005, the number of cases had increased to 3,375. The number of administrative litigation cases for cerebrovascular and cardiovascular diseases increased from 531 to 853 over the same time frame.

The increase in the number of administrative litigation cases for the work-relatedness of cerebrovascular and cardiovascular diseases means that KLWC had different acceptance criteria for work-relatedness than the Judiciary Branch and that the Welfare Corporation applied those criteria differently. In fact, in 2000, 82 cases were accepted as being work-related in administrative litigation judgments involving cerebrovascular and cardiovascular diseases. These cases accounted for 36.1% of the total litigation cases. In 2005, 53 cases were so accepted, and accounted for 15.6% of the total. The number of litigation cases has increased annually, but the number of cases accepted and the acceptance rate have decreased.

Differences in judgments regarding the work-relatedness of diseases between KLWC and the Judiciary Branch may

undermine trust in the decisions of work-relatedness on the part of KLWC and may further cause mistrust in the campaign for industrial accident compensation insurance at the corporate level. Thus, it would be beneficial to explore the decision-making process by which KLWC and the Judiciary Branch evaluate the work-relatedness of CVDs and to provide standardized judgment criteria that can be used for the initial assessment and request for rehearing. Through standardization of the reasoning process, the time and costs for litigation can be minimized by reducing unnecessary administrative litigation, and further industrial accident compensation insurance benefits can be actively provided to injured workers based on the grounds provided.

The purposes of this study were to investigate the factors that prompted both KLWC and the Judiciary Branch to designate a CVD as work-related based on an analysis of administrative litigation cases and to provide data in preparing standardized criteria for discerning the work-relatedness of CVD cases.

MATERIALS AND METHODS

Subjects

This study consisted of 100 cases that had completed administrative litigation on the work-relatedness of CVDs by the Seoul Branch of KLWC; the litigation occurred from 1997 through 2002.

Methods

To identify factors that influence the designation of CVDs as work-related in judgments by the Judiciary Branch, the appeal document specifying the official designation of the case by KLWC and the ruling of the court were evaluated for shared variables. The dependent variable was whether the respective CVD was accepted as work-related. The independent variables were as follows: 1) risk factors of CVDs: sex, age, smoking, alcohol consumption, and chronic diseases; 2) factors related to the burdens placed on workers by their work: work type, working hours occurring in the course of employment, work overload due to a sudden situation or extreme change of the working environment, and work overload due to a temporary increase in the workload; 3) factors related to a worker's job: classification of occupation, industry, and type of work performed; 4) other factors: onset and closing time of litigation, type of CVD, type of benefits, and criteria for defining work overload.

The operational definitions of the variables used for this study were as follows: whether chronic diseases had been contracted was determined by whether medication was administered to cure more than one disease related to hypertension, diabetes, heart failure, atrial fibrillation, and renal failure before CVDs occurred and whether more than one disease was diagnosed.

The work type was categorized into daytime and shift work. Work other than daytime (e.g., night shift, second or third shift, and every second day shift) was categorized as shift work.

The working hours meant working time during last 1 week before occurring disease, and it was classified as less than 56 hr and over 56 hr depending on legal working time of present.

'Occurring in the course of employment' denotes activities performed during work or under the supervision of employers (e.g., meetings, picnics, and parties). Activities other than the ones described above were categorized as ones that are not considered to be occurring in the course of employment.

The criteria for accepting occupational diseases were as follows: in the event that the workload or working hours of workers increase by more than 30% compared to regular tasks for more than 3 days in a row before the occurrence of the disease or that the workload, work hours, and tasks changed to the extent that the average employee cannot adapt within 1 week before the occurrence of the disease. Work overload was judged based on whether these criteria were met and on the workload and work hours.

CVDs were categorized into hemorrhagic diseases (intracranial hemorrhage, subarachnoid hemorrhage, and other hemorrhagic diseases) and occlusive disorders (cerebral infarction and hypertensive cerebroopathy).

The classification of occupation and industry depended on standard Korean classifications of occupations and industries.

In consideration of the job performed by the subjects and risk of a work-related CVD based on a previous study (4), we reclassified subjects' occupations. They were categorized as building caretakers (watchmen), drivers (mobile plant operators), other labor workers, and non-labor workers.

The criterion for the designation of work overload involved identifying the comparison target group, injured workers or non-injured workers (average people and workers performing the same tasks), which was determined when work overload was assessed in the ruling by the Judiciary Branch.

Data analysis

The data were analyzed with a statistics program, SAS version 8.12. The significance of all statistical analyses was 0.05. Frequency analysis between related factors and the designation of CVDs as work-related was undertaken. Multiple logistic regression analysis was performed by setting the significance value ($p < 0.2$), sex, and age as independent variables.

RESULTS

For subjects with a chronic disease, the acceptance rate for designating a CVD as work-related was 54.1%. This was significantly higher than the 20.0% acceptance rate among those without chronic diseases ($p = 0.012$) (Table 1).

Among those working less than 56 hr during the last one

week, the acceptance rate for claims of a CVD as work-related was 72.0%, which was significantly higher than the 23.3% rate among those working over 56 hr ($p=0.001$). Among those performing tasks regarded as occurring in the course of employment, the acceptance rate for claims of a CVD as work-related was 59.4%. This was higher than the 44.1% acceptance rate in the event that tasks were not determined to be occurring in the course of employment; however, the

Table 1. Comparison between work-relatedness and characteristics of individuals

Variables		Work-relatedness		<i>p</i> value
		Approval	Non-approval	
Sex	Male	47 (49.0)	49 (51.0)	0.967
	Female	2 (50.0)	2 (50.0)	
Age	Less than 39	9 (52.9)	8 (47.1)	0.526
	40-49	15 (57.7)	11 (42.3)	
	50-59	19 (47.5)	21 (52.5)	
	More than 60	6 (35.3)	11 (64.7)	
Smoking	Yes	23 (60.5)	15 (39.5)	0.949
	No	8 (61.5)	5 (38.5)	
Alcoholic consumption	Yes	17 (50.0)	17 (50.0)	0.292
	No	5 (71.4)	2 (28.6)	
Chronic disease	Yes	46 (54.1)	39 (45.9)	0.012
	No	3 (20.0)	12 (80.0)	
Total		49 (49.0)	51 (51.0)	

difference was not significant ($p=0.154$). Among those experiencing work overload, the acceptance rates of a CVD as work-related in cases due to a sudden situation or extreme change in the work environment or to a temporary increase in the workload were both 100%. These rates were significantly higher than the 32.0% and 37.0% acceptance rates among those who experienced a CVD without a sudden change in the work environment or temporary increase in workload ($p<0.001$). A significant relationship was not detected between the classification of an occupation and decision of work-relatedness. Moreover, no significant relationship was observed between the classification of the industry and the decision of work-relatedness. Although the acceptance rate of a case as work-related among drivers (mobile plant operator) was 61.9%, no significant relationship was found compared to building caretakers (watchmen) or other labor or non-labor workers (Table 2).

The acceptance rate of a case as work-related was 62.3% in cases of occlusive disorders, which was significantly higher than the 34.0% rate for cases of hemorrhagic disorders ($p=0.005$). The acceptance rate of a case as work-related with medical benefits was 58.1%, which was significantly higher than the 23.1% rate for survivor benefits ($p=0.002$). The acceptance rate, depending on the criteria for defining work overload in injured workers, was 65.0%, and this was significantly higher than the 50% rate for workers doing the same work and the

Table 2. Comparison between work-relatedness and job characteristics

Variables		Work-relatedness		<i>p</i> value
		Approval	Non-approval	
Work type	Shift work	12 (41.4)	17 (58.6)	0.329
	Day work	37 (52.1)	34 (47.9)	
Working hour during last 1 week	≤ 56	10 (23.3)	33 (76.7)	0.001
	>56	18 (72.0)	7 (28.0)	
Occurring in the course of employment	Yes	19 (59.4)	13 (40.6)	0.154
	No	30 (44.1)	38 (55.9)	
Overload-sudden situation (or extreme change) of work environment	Yes	25 (100.0)	0 (0.0)	0.001
	No	24 (32.0)	51 (68.0)	
Overload-temporary increase of workload	Yes	19 (100.0)	0 (0.0)	0.001
	No	30 (37.0)	51 (63.0)	
Classification of occupation	(General) Managers	9 (64.3)	5 (35.7)	0.215
	Clerks	5 (41.2)	7 (58.3)	
	Drivers (mobile plant operators)	13 (61.9)	8 (38.1)	
	Elementary occupations	11 (34.4)	21 (65.6)	
	Others	11 (52.4)	10 (47.6)	
Classification of industry	Manufacturing	7 (43.8)	9 (56.2)	0.548
	Construction	7 (63.6)	4 (36.4)	
	Transport	12 (60.0)	8 (40.0)	
	Real estate and renting and leasing	4 (36.4)	7 (63.4)	
	Business activities	7 (36.8)	12 (63.2)	
	Others	12 (52.2)	11 (47.8)	
	Building caretakers (watchman)	5 (31.3)	11 (68.7)	
Reclassification of occupation based on the job performed by the subject	Drivers (mobile plant operators)	13 (61.9)	8 (38.1)	0.329
	Other labor workers	12 (41.4)	17 (58.6)	
	Non-labor workers	19 (55.9)	15 (44.1)	
	Total	49 (49.0)	51 (51.0)	

Table 3. Comparison between work-relatedness and other characteristics

Variables		Work-relatedness		<i>p</i> value
		Approval	Non-approval	
Onset of litigation	1997	4 (33.3)	8 (66.7)	0.337
	1998	12 (46.2)	14 (53.8)	
	1999	17 (63.0)	10 (37.0)	
	2000	14 (50.0)	14 (50.0)	
	2001	2 (28.6)	5 (71.4)	
Judgment time-close of litigation	1999	1 (50.0)	1 (50.0)	0.330
	2000	11 (36.7)	19 (63.3)	
	2001	12 (63.2)	7 (36.8)	
Type of disease	2002	25 (51.0)	24 (49.0)	0.005
	Cerebral infarction	33 (62.3)	20 (37.7)	
Type of insurance benefit	Cerebral hemorrhage	16 (34.0)	31 (66.0)	0.002
	Medical care benefits	43 (58.1)	31 (41.9)	
Criteria of overload	Survivor benefits	6 (23.1)	20 (76.9)	0.002
	Average people	1 (9.1)	10 (90.9)	
	Worker doing same work	5 (50.0)	5 (50.0)	
Total	Injured worker	39 (65.0)	21 (35.0)	
		49 (49.0)	51 (51.0)	

9.1% rate for average people ($p=0.002$). No significant relationship was observed between the onset time or the closing time for litigation and the decision regarding the work-relatedness of a case (Table 3).

Significant variables for the work-relatedness of CVDs in the multiple logistic regression analysis were age, working hours, benefit type, and criteria for defining work overload. Regarding age, the odds ratio of the acceptance rate of a case as work-related in CVDs in those older than 60 was 0.08 (95% CI, 0.01-0.75) when compared to those under 30 yr old. Regarding working hours, the odds ratio of the acceptance rate of a case as work-related in CVDs in those over 56 hr was 9.50 (95% CI, 1.92-47.10) when compared to those less than 56 hr. As for the benefit type, the odds ratio of the acceptance rate of a case as work-related in CVDs for medical benefits was 5.74 (95% CI, 1.29-25.54), compared to that for survivor benefits. Regarding the criteria for applying work overload, the odds ratio of the acceptance rate of a case as work-related in CVDs for injured workers was 12.06 (95% CI, 3.12-46.62), compared to that for non-injured workers (Table 4).

DISCUSSION

Differences do exist in the ways that data are interpreted in the legal process and in medicine and science. Unlike medicine, the legal process is not concerned with an exhaustive search for a causative understanding, but instead is concerned with a particular resolution of a legal dispute. The law, unlike science, attempts to obtain a final disposition of conflicts. The legal system, in assessing expert medical or scientific testimo-

Table 4. Odds ratios of approval rate according to independent variables using multiple logistic regression

Variables (comparative variable)		Odds Ratio	95% Confidence Interval
Sex (Female)	Male	0.18	0.01-2.89
Age (Under 39)	40-49	0.36	0.05-2.56
	50-59	0.18	0.03-1.13
	Over 60	0.08	0.01-0.75
Alcohol consumption (No)	Yes	0.44	0.12-1.61
Chronic disease (No)	Yes	5.62	0.92-34.42
Occurring in the course of employment (No)	Yes	1.85	0.53-6.04
Work type (day work)	Shift work	0.30	0.06-1.43
Working hour (less than 56)	Over 56	9.50	1.92-47.10
Type of disease (cerebral hemorrhage)	Cerebral infarction	1.77	0.52-6.04
Type of insurance benefit (survivor benefit)	Medical care benefit	5.74	1.29-25.54
Criteria of work overload (non-injured worker)	Injured worker	12.06	3.12-46.62

ny, has its own priorities (5). Therefore, in regard to the work-relatedness of CVDs, the role of medicine and science is to produce evidence of the relationship between work-relatedness and factors of a case.

In this study, the factors that affected the decision as to the work-relatedness of a CVD case were investigated based on analyses of administrative litigation. The significant variables at $p<0.2$ in the univariate analysis were chronic diseases, work overload, applied diseases, benefit type, and criteria for applying work overload. In a multiple logistic regression analysis, age, working hours, benefit type, and criteria for defining work overload were identified as significant variables.

The reason why the acceptance rate was lower for those older than 60 compared to those younger than 30 was that the risks of old age were emphasized in the occurrence of CVDs when work-relatedness was assessed. With advancing age, from subjects younger than 30 yr old to those in their 40s, 50s, and 60s, the acceptance rate became lower. These results are similar to the corporate assessment for the relationship of CVDs to work (6).

When work-relatedness in CVDs was assessed, the results differed slightly depending on the variables related to health such as gender, smoking, alcohol consumption, and chronic diseases and on the variables related to the burden placed on a worker by their work such as work type and occurring in the course of employment. The results also depended on the variables related to a worker's job such as the classification of occupation, classification of industry, and type of work performed; however, no statistically significant differences were detected. The known risk factors of CVDs did not greatly affect the judgment of work-relatedness in administrative litigation whose targets were cases that had been rejected in the initial judgment or request for rehearing by KLWC.

This study showed that long working hours was a significant variable on work-relatedness. There were some retrospective epidemiologic studies that pointed out the causal relationship between long working hours and health problems, especially cardiovascular functions (7-9). Nevertheless, the physiologic mechanism or dose-response relationship were not clear until now. In this study, the odds ratio of the acceptance rate of a case as work-related in CVDs in those over 56 hr was 9.50 (95% CI, 1.92-47.10) when compared to those less than 56 hr. However, those who had the same occupation and similar long working time showed different results. For example, among 10 workers whose occupation were classified as a building takecares, and worked 72 hr, only 5 workers were approved as work-relatedness. And the rejection rate of building takecares was higher than that of other occupations without a significance. These results could reflect that occupation itself as chronic overload was not accepted as evidence for the decision of work-relatedness.

In fact, this study dealt with occupation, industry, work type, and working hours as proxy indicators of chronic overwork. Working hours was a significant variable, but the others were not. The reason why occupations, industries, and work type did not have a significance was not clear. Some assumptions would be presented. First, the sample size was too small to show a statistical significance between chronic overload and health problem, especially CVDs. Second, cases of this study were not approved as work-relatedness in initial judgement at KLWC. Lastly, it was clear that categories of chronic overload were unlikely to be universally applicable to decision of work-relatedness in administrative litigation, but rather would depend on the other factors such as personal, work, or environmental factors. So, this study warrants us to develop a method to measure the chronic overload and to investigate the health effect of it through a well-designed prospective study.

The benefit type and criteria of work overload were more significant variables. First, the acceptance rates were significantly higher for medical care benefits, compared to survivor benefits. It was relatively difficult to prove work-relatedness in cases involving death due to one precedent, which established that the relationship of an accident to work should be provided by the asserting party (10), and another precedent, which established that the medical possibilities of death caused even by work overload should be proven (11). Second, opinions regarding the comparison target for judging work overload differed due to a contradiction in the provisions of laws. For example, Clause 1, Article 39 of the Enforcement Regulations of the Industrial Accident Compensation Insurance Act defines chronic fatigue as changes in workload, work hours, work intensity, tasks, and work environments to the extent that the average employee cannot adapt, while Clause 2 sets forth that KLWC shall consider the gender, age, health, and physical constitution of injured workers in addition to the criteria of Clause 1 when judging whether an accident occurred

in relation to work or not in cases of work-related diseases or death caused by work-related diseases. The extent to which the characteristics of injured workers in addition to the criteria (e.g., average people) of Clause 1 should be considered is not clear. Based on these results, corporations did not accept the work overload level of injured workers due to the use of an average employee as the standard for industrial work overload of Clause 1, while the Judiciary Branch accepted the overload level of injured workers as industrial work overload by considering the characteristics of injured workers. Thus, the end results were different. It is necessary to determine the work-relatedness of a disease by expanding the criteria for work overload from the average employee to injured workers in future initial judgments or requests for rehearing based on the present study and that of Kim (12), which found that corporations tend to judge work overload based on average employees rather than injured workers (e.g., age, diseases, and health status). Moreover, the application and relationship of the two regulations must be differentiated.

Chronic disease, the type of work performed, and the litigation time were not significant variables in this study. The role of underlying chronic disease in assessing work-relatedness in CVDs was divided. First, a CVD should be accepted as an occupational disease if a related factor such as work overload, which could have aggravated the underlying chronic disease, existed. Without an underlying disease, the work overload, for example, could not cause CVD. Second, a CVD should not be accepted as an occupational disease even with the existence of a co-occurring factor, such as work overload. That is, a CVD is the result of a natural course followed by the aggravation of underlying disease. The former comes under *karoshi* (death due to work overload), which was specified by Uehata (13), and typical *karoshi*-type due to extreme overwork and maladaptation-type due to dramatic changes in job characteristics in the classification of work-related CVDs designed by Park (14). The latter comes under job stress type due to inherent characteristics (14).

In univariate analysis, for those with a chronic disease, the acceptance rate of work-relatedness was significantly higher (54.1%) than the acceptance rate (20.0%) among those with no chronic disease. This result is different from a previous study (15), which dealt with worker's compensation claims. Ryoo *et al.* (15) reported that the acceptance rate of work-relatedness with a chronic disease was 66.5% and that of work-relatedness without a chronic disease was 67.4% (statistically not significant). These values were higher than the results of the present study. Another study on *karoshi*, which was accepted as an occupational disease, revealed that 49.8% of the cases had an underlying disease (16). In the present study, 93.9% (46/49) of approved subjects had an underlying disease.

A sudden situation or extreme change in the work environment or temporary increase in the workload comprised the guidelines of work overload. For cases involving work overload, the acceptance rate of work-relatedness was 100.0%.

Considering the fact that subjects who had work overload were not approved as workers who had an industrial accident in the initial assessment or request for rehearing, this result showed that work overload was an essential factor for the acceptance of the work-relatedness of a CVD in administrative litigation.

Working as a driver is known to be a risk factor of work-related cerebrovascular and cardiovascular disease (4). Based on the reclassification of occupations by the type of work performed, drivers had a 61.9% acceptance rate of work-relatedness; this was the highest acceptance rate of the occupations investigated, but the differences were not statistically significant. This result meant that driving itself was not a guaranteed factor for an assessment of work-relatedness. We had to consider that the subjects in this study were not designated as workers who had industrial accidents in the initial assessment or request for rehearing.

The processing period of the litigation, from 1997 to 2002, occurred during the 1997 Asian Financial Crisis. The relative strength of the labor force increased and the relationships between management and labor were strained. This might have affected the incidence of CVDs. Finally, the general weakness of the social security network encouraged workers who had experienced a CVD to institute a claim for its work-relatedness. However, the onset time and closing time of the litigation did not affect the decision of work-relatedness in this study.

The designation of cerebrovascular and cardiovascular diseases as occupational diseases is still controversial. Japan, Taiwan, and the United States as well as Korea have accepted cerebrovascular/cardiovascular diseases as occupational diseases. Japan, Taiwan, and Korea have regulations for this acceptance, while the United States does not have a set of regulations, and acceptance in potential cases is thus determined based on court precedents. Germany and the United Kingdom have more extensive lists of occupational diseases than Korea; however, cerebrovascular and cardiovascular diseases are not included in those lists (4).

In Korea, the work-relatedness of cerebrovascular and cardiovascular diseases has been studied in a limited manner. Using the data on initial judgments or requests for rehearing from KLWC, the current criteria were applied to diseases related to work only. It has been proposed that new criteria are required after studying chronic fatigue syndromes, such as stress, based on epidemiological and statistical data (16). Furthermore, factors relating to the causes of *karoshi* were investigated by Busan (17). Because an excessive number of tasks regarded as 'occurring in the course of employment' may impair judgment, it was proposed that the mechanisms of overload or stress as related to cerebrovascular and cardiovascular diseases be classified into four types and that criteria for accepting each mechanism be established (14). Recently, Kim (18) pointed out that there was not consistency between approval and non-approval in administrative litigation on CVD as work-related among those who performed shiftwork, night-

work, prolonged work, business trip work, and drivers, and suggested that there was a need to survey on chronic overwork and to make a scientific evidence on decision of work-relatedness.

It was natural that there was a considerable causal relationship between causal factors including chronic overload and work-relatedness in administrative litigation. However, the Judiciary Branch did not have the proper standard of judgement on causal relationship and lacked consistency in its general standard. In addition, since inquiry of chronic overload was confined to some components such as work type or work contents of worker, there were few objective evidences such as quantification of chronic overload, dose-response relationship, and so on. Furthermore, subjective judgement with insufficient evidence on decision of work-relatedness might damage the authority of the Judiciary Branch and stability of law.

In this study, related factors in the decision to designate CVD cases as work-related were discovered based on the results of administrative litigation. The differences in the decisions between KLWC and the Judiciary Branch can be reduced by producing and applying a standard protocol for the judgment of work-relatedness in CVDs.

Nevertheless, this study had several limitations. First, the results of administrative litigation for work-related CVDs for one regional head office at a specific period were used rather than those of all the administrative litigation cases; thus, the ability to generalize these results may be limited. However, no difference exists in the occurrence of CVDs regionally or with time, so this issue would not be an obstacle for the generalization of these study results. Second, a limited number of variables were investigated as related factors. In fact, factors such as obesity, hyperlipidemia, and direct stress due to work were not included. However, the work-relatedness of the CVDs was determined based solely on the factors presented in the documents. Third, the grounds upon which the work-relatedness were proposed in this study were not directly related to work, and work-related factors that could be used to judge work-relatedness were not proposed. This issue may not be important in administrative litigation if insurance beneficiaries determine the factors related to work for their judgment of work-related CVDs in the initial assessment or request for rehearing. Clearer grounds for the relationship between work-related factors and occupational diseases can be established by comparing accepted cases with those that were not accepted in the initial judgment or request for rehearing as well as in administrative litigation. Fourth, the decision regarding the work-relatedness of the initial judgment or request for rehearing depends on the inclination of the branch or headquarters of KLWC. In addition, the decision of the work-relatedness of the administrative litigation depends on the inclination of the court. Some factors, such as regional differences, which were not controlled in this study, could affect the decision of the work-relatedness in administrative

litigation. Further studies will clarify the effects of these factors.

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