



Workers' Compensation for Occupational Respiratory Diseases

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The respiratory system is one of the most important body systems particularly from the viewpoint of occupational medicine because it is the major route of occupational exposure. In 2013, there were significant changes in the specific criteria for the recognition of occupational diseases, which were established by the Enforcement Decree of the Industrial Accident Compensation Insurance Act (IACIA). In this article, the authors deal with the former criteria, implications of the revision, and changes in the specific criteria in Korea by focusing on the 2013 amendment to the IACIA. Before the 2013 amendment to the IACIA, occupational respiratory disease was not a category because the previous criteria were based on specific hazardous agents and their health effects. Workers as well as clinicians were not familiar with the agent-based criteria. To improve these criteria, a system-based structure was added. Through these changes, in the current criteria, 33 types of agents and 11 types of respiratory diseases are listed under diseases of the respiratory system. In the current criteria, there are no concrete guidelines for evaluating work-relatedness, such as estimating the exposure level, latent period, and detailed examination methods. The results of further studies can support the formulation of detailed criteria.

Keywords: Respiratory Tract Diseases; Occupational Diseases; Workers' Compensation; Korea

INTRODUCTION

Standards for the recognition of occupational diseases (ODs) have been little changed since their enactment in 1954. In 2013, significant changes were made to the specific criteria for OD recognition, which were established under the Enforcement Decree of the Industrial Accident Compensation Insurance Act (ED-IACIA) (1). The respiratory system is a major route of occupational exposure. Occupational respiratory diseases can be caused by repeated, long-term exposure or a single, severe exposure to hazardous particles, chemicals, vapors, or gases (2). Accordingly, occupational respiratory disease, a major OD, incorporates a variety of interstitial lung diseases as well as inflammatory airway diseases. Although there have been many respiratory hazardous agents and diseases, with the exception of pneumoconiosis, very few respiratory diseases have been compensable in Korea (3). We do not deal with respiratory cancer here because occupational cancer is described as a separate category.

In this article, the authors deal with the implications of the ED-IACIA amendment and changes to occupational respiratory diseases in Korea.

MATERIALS AND METHODS

The procedure for amending the specific OD recognition crite-

ria in ED-IACIA and the Enforcement Decree of the Labor Standard Act (ED-LSA) is described in Song et al. (4).

RESULTS

Trends of occupational lung disease as detected by compensation

In Korea, the numbers accredited by the Industrial Accident Compensation Insurance Act (IACIA) are considered official occupational lung disease (OLD) statistics; in 2012, there were 572 cases. According to the official statistics, between 2008 and 2012, there were 3,128 cases of OLDs or approximately 4.66 per 100,000 workers (Table 1).

Changes of structure (major contents of the revision)

Before the 2013 amendment to ED-IACIA, there was no category called occupational respiratory diseases because the previous criteria were based on specific hazardous agents and their health effects (Table 2). For example, asthma was described under the health effects of chemicals (such as wood dust, animal hair dust, and antibiotics), chromium and its compounds, and diisocyanates. Therefore, if someone diagnosed with asthma wanted to know about the compensation standards, they were required to read all related documents. Furthermore, the agent-based criteria were unknown to both workers and clinicians. To improve this situation, a major OD system-based struc-

Table 1. Number of cases of occupational lung disease as detected by compensation, 2008-2012

Year	OD	OLD	Proportion (%) of total ODs	OLD cases per 100 thousand workers
2008	8,760	733	8.37	5.35
2009	7,941	626	7.88	4.38
2010	6,986	543	7.77	3.88
2011	6,516	654	10.04	4.47
2012	6,742	572	8.48	5.43
Total	36,945	3,128	8.47	4.66

OD, Occupational disease; OLD, Occupational lung disease. Occupational lung diseases include pneumoconiosis, asthma, and asbestos-related diseases.

Table 2. Previous occupational respiratory disease list in the Enforcement Decree of Industrial Accident Compensation Insurance Act (only occupational respiratory disease among all 23 items)

Previous occupational respiratory disease list
3. Radiation-induced pneumonia (in physical factors)
4. Pneumothorax and hemothorax by dysbaric situation
7. Metal fume fever by zinc, copper, etc. Fluoride resin and acryl resin-induced airway mucosal inflammation. Wood dust, animal hair, and antibiotics-induced allergic rhinitis or asthma
8. Vinyl chloride-induced acute respiratory failure
10. Manganese-induced pneumonia or pneumonitis
13. Nasal septal perforation and ulcer, asthma, and acute respiratory disease by chrome
14. Cadmium-induced emphysema, pneumonia
16. Rhinitis by organic solvent
17. Trichloroethylene-induced rhinitis
18. Diisocyanate-induced asthma, reactive airway dysfunction syndrome, hypersensitivity pneumonitis
20. Asbestosis

ture was introduced (Table 3). However, pneumoconiosis remains separated in a special act (Act for the Prevention of Pneumoconiosis and Protection of Pneumoconiosis Workers).

To extend the scope of ODs, well-known representative etiologic agents were added in addition to one disease. Fifteen agents were added to the existing nineteen agents, one agent (vinyl chloride) was deleted, and chronic obstructive pulmonary disease (COPD) was added. Owing to these changes, in the current criteria, 33 types of agents and 11 types of respiratory diseases are listed under diseases of the respiratory system (Table 3). The disease-based descriptions are as follows:

Chronic obstructive pulmonary disease

The most notable change in occupational respiratory diseases under the 2013 amendment to ED-IACIA is that COPD was included in the list. Because of the large contribution of smoking to the incidence of COPD, occupational contribution has been overlooked despite the presence of strong evidence for occupational exposure as a non-smoking cause of COPD. A recent review estimated the population-attributable risk of occupation for COPD approximately 15% (5).

However, specific criteria for occupational COPD recogni-

Table 3. Revision of specific criteria for the recognition of occupational diseases in Enforcement Decree of Industrial Accident Compensation Insurance Act

Diseases of the respiratory system
A. Asbestosis due to asbestos
B. Asthma due to wood dust, grain dust, flour, animal hair dust, antibiotics, chromium or its compounds, diisocyanates, reactive dyes, nickel, cobalt, formaldehyde, aluminum, acid anhydride, and others, or aggravated by work
C. Reactive airway dysfunction syndrome due to diisocyanates, hydrogen chloride, hydrochloric acid, etc.
D. Hypersensitivity pneumonitis due to diisocyanates, epoxy resin, acid anhydride, etc.
E. Allergic rhinitis due to wood dust, animal hair, antibiotics, etc.
F. Metal fume fever due to metal fumes such as zinc and copper
G. Chronic obstructive pulmonary disease due to coal mine dust, cadmium fumes, etc.
H. Pneumonia due to manganese or its compounds, chromium or its compounds, cadmium or its compounds, etc.
I. Ulceration or perforation of the nasal septum due to chromium or its compounds
J. Respiratory diseases such as inflammation of the respiratory tract mucosa due to pyrolysis of synthetic resins, etc.
K. Rhinitis due to organic solvents

tion are limited to workers exposed to high concentrations of coal mine dust, silica, or cadmium fumes for prolonged periods because COPD is common among the general population.

Through a study of 3400 British miners over a 10-yr period, Marine et al. (6) demonstrated an exposure-related FEV1 reduction in coal miners irrespective of the smoking history. This result eventually became the basis for the current statutory compensation offered to COPD-affected coal miners in the UK (7). Underground miners and other workers who work with crystalline silica have an increased risk of airflow obstruction independent of radiological silicosis (8). Exposure to cadmium fumes increases the risk of COPD through the induction of pulmonary emphysema in a dose-dependent manner (9).

Asthma, reactive airway dysfunction syndrome (RADS), and hypersensitivity pneumonitis (HP)

Over 400 agents are known to cause occupational asthma. Well-known etiologic agents such as grain dust, flour, reactive dyes, nickel, cobalt, formaldehyde, aluminum, and acid anhydride were added to the existing list. Specific and detailed methods of diagnosing asthma due to diisocyanates, such as specific IgE, PEFV variability, and metacholine provocation test, were deleted because such methods are not confined to diisocyanate-induced asthma, and describing such diagnostic methods in the specific criteria is inappropriate. Furthermore, work-aggravated asthma was added to the criteria. Accordingly, if the condition of a person with asthma is aggravated by their working conditions, the person can claim compensation under IACIA. In the previous criteria, RADS was described as a disease caused only by diisocyanates. In the current criteria, RADS is described as an independent disease entity, and major etiologic agents such as chlorine, hydrogen chloride, and hydrochloric acid are included. HP was also described as a disease caused only by diisocyanates. However, in the amendment, well-known chemi-

cal agents such as epoxy resin and acid anhydride were added.

Asbestosis

Asbestosis is defined as parenchymal fibrosis due to asbestos exposure. In general, fibrosis manifests clinically within 20 yr of the onset of exposure. Asbestos exposure lasting more than 1 yr is necessary for defining occupational exposure to asbestos. However, even sufficiently intense short-term exposure for less than a month can result in asbestosis (10). Chest radiography is the primary tool for asbestosis diagnosis. Upon chest radiography, small and irregular opacities are evident in the mid and lower lung zones. However, in some cases, asbestosis cannot be detected by chest radiography, and high-resonance computerized tomography (HRCT) is helpful for diagnosis in such cases. So, HRCT is recommended for diagnosing asbestosis (11).

Other occupational respiratory diseases (allergic rhinitis, metal fume fever, and other agent-based list)

Wood dust, animal hair, and antibiotics were added as etiologic agents for allergic rhinitis. Further, many agents such as wheat flour (12), metal working fluid (13), grain dust (14), and diisocyanate (15) can also cause allergic rhinitis. However, it is impossible to describe all possible agents that can cause allergic rhinitis. Therefore, previously, only three agents were listed as examples. Zinc and copper were added as agents that induce metal fume fever. This list is the same as that in the previous criteria. In general, metal fume fever occurs in 4-8 hr after exposure to metal fumes, and it is eliminated in 1 or 2 days. Additional treatment is not necessary, except for exposure management. Manganese, chromium, and other organic solvents can cause diverse inflammations of the upper airway. These chemicals were included in the list as agent-based descriptions. Chemical pneumonitis due to metal fumes, ulceration of the nasal septum due to chromium, inflammation of the respiratory tract mucosa due to pyrolysis of synthetic resins, and rhinitis due to many organic solvents are examples of these criteria.

Pneumoconiosis

In cases where a worker desires to receive medical care benefits and/or pneumoconiosis compensation annuity for work-related pneumoconiosis, the worker requests payment through the Korea Workers' Compensation and Welfare Service (KCOMWEL). Upon receipt of such a medical care benefit payment request from a worker, KCOMWEL requests the health examination service to conduct the necessary medical examinations for confirming pneumoconiosis. The health examination service conducts the necessary medical examination for diagnosing pneumoconiosis and submits the examination results to KCOMWEL. KCOMWEL then deliberates on and determines the type and spectrum of pneumoconiosis, presence and type of complications, level of cardiopulmonary function, etc., of the

concerned worker after the Pneumoconiosis Examination Council's assessment. The radiological findings of pneumoconiosis are divided by the profusion of small opacities as Category 1 (1/0, 1/1, 1/2), Category 2 (2/1, 2/2, 2/3), and Category 3 (3/2, 3/3, 3/+), and in the presence of large opacities as Category 4 (4A, 4B, 4C). Cardiopulmonary function is divided into 4 grades according to spirometry results. Pneumoconiosis disability grades are determined by combinations of pneumoconiosis type and cardiopulmonary function. A pneumoconiosis-affected worker can get Pneumoconiosis Compensation Annuity, which is the sum total of "basic annuity" and "pneumoconiosis disability annuity." The criteria for medical care benefits are complications such as active pulmonary tuberculosis, pleurisy due to infection, bronchitis, bronchiectasis, pneumothorax, emphysema (accompanied by impairment of forced vital capacity (FVC) to less than 70% of the predicted value or the forced expiratory volume in the first second (FEV₁) of less than 70% of the predicted value and an FVC/FEV₁ ratio of less than 70%), cor pulmonale, nontuberculous mycobacterial infection, and primary lung cancer (in the mining industry).

DISCUSSION

Occupational respiratory disease is considered a major OD for several reasons. First, historically, lung diseases such as pneumoconiosis have been reported continuously in most industrialized countries. Second, causative agents that induce lung diseases can be comparatively recognized easily. Through occupational history, radiologic findings, and specific challenge tests, causative agents can be verified for occupational respiratory diseases such as asbestosis, silicosis, and asthma. Third, the respiratory tract is a major route of occupational exposure to toxic chemicals. Therefore, occupational respiratory diseases are included on the OD list in most countries.

In the former criteria, agent-based descriptions were common on the OD list. However, such descriptions were incompatible with occupational respiratory diseases because clinical confirmation is the first step for evaluating work-relatedness in the case of an occupational respiratory disease. Furthermore, workers are more familiar with the disease-based approach as opposed to the agent-based approach. A few agent-based descriptions remain in the current list because the authors thought that focusing on agents continues to be meaningful.

The International Labor Organization (ILO)'s OD list describes respiratory diseases as an independent disease system among ODs by target organ system (16). It is comprised of 11 types of diseases and 1 comprehensive regulation that considers other work-related respiratory diseases. The European Schedule of Occupational Diseases published by the European Commission (EC) in 2009 (17) deals with occupational respiratory diseases under a section of diseases caused by the inhalation of

Table 4. Comparison of occupational diseases list between International Labor Organization and European Commission, focusing on respiratory diseases

International Labor Organization (2010)	European Commission (2009)
Occupational diseases by target organ systems	Diseases caused by the inhalation of substances and agents
Respiratory diseases	Diseases of the respiratory system and cancers
1. Pneumoconioses caused by fibrogenic mineral dust (silicosis, anthraco-silicosis, asbestosis)	1.11 Silicosis
2. Silicotuberculosis	1.12 Silicosis combined with pulmonary tuberculosis
3. Pneumoconioses caused by non-fibrogenic mineral dust	1.21 Asbestosis
4. Siderosis	1.22 Mesothelioma following the inhalation of asbestos dust
5. Bronchopulmonary diseases caused by hard-metal dust	1.31 Pneumoconioses caused by silicate dust
6. Bronchopulmonary diseases caused by dust of cotton (byssinosis), flax, hemp, sisal or sugar cane (bagassosis)	2. Complication of asbestos in the form of bronchial cancer
7. Asthma caused by recognized sensitizing agents or irritants inherent to the work process	3. Broncho-pulmonary ailments caused by dusts from sintered metals
8. Extrinsic allergic alveolitis caused by the inhalation of organic dusts or microbially contaminated aerosols, arising from work activities	4.01 Extrinsic allergic alveolites
9. Chronic obstructive pulmonary diseases caused by inhalation of coal dust, dust from stone quarries, wood dust, dust from cereals and agricultural work, dust in animal stables, dust from textiles, and paper dust, arising from work activities	4.02 Lung diseases caused by the inhalation of dusts and fibers from cotton, flax, hemp, jute, sisal, and bagasse
10. Diseases of the lung caused by aluminum	4.04 Respiratory ailments caused by the inhalation of dust from cobalt, tin, barium, and graphite
11. Upper airway disorders caused by recognized sensitizing agents or irritants inherent to the work process	4.05 Siderosis
12. Other respiratory diseases not mentioned in the preceding items where a direct link is established scientifically, or determined by methods appropriate to national conditions and practice, between the exposure to risk factors arising from work activities and the disease(s) contracted by the worker	4.06 Allergic asthmas caused by the inhalation of substances consistently recognized as causing allergies and inherent to the type of work
	4.07 Allergic rhinitis caused by the inhalation of substances consistently recognized as causing allergies and inherent to the type of work
	5.01 Cancerous diseases of the upper respiratory tract caused by dust from wood
	6. Fibrotic diseases of the pleura, with respiratory restriction, caused by asbestos
	7. Chronic obstructive bronchitis or emphysema in miners working in underground coal mines
	8. Lung cancer following the inhalation of asbestos dust
	9. Broncho-pulmonary ailments caused by dusts or fumes from aluminum or its compounds
	10. Broncho-pulmonary ailments caused by dusts from basic slags

substances and agents (Table 4); the EC includes cancers of the respiratory system in the same section. However, the ILO describes occupational cancer in a separate section comprised of agents only, but not the corresponding cancers. Occupational cancers are not covered in this article.

Smoking is the largest contributing factor to respiratory diseases, and the smoking rate among Korean workers is very high (18). Smoking increases the risk of malignant tumors and various types of respiratory diseases due to the synergistic effects associated with work-related harmful substances. Consequently, determining the effect of smoking on occupational respiratory disease is a complicated issue. This issue is highlighted in the COPD work-relatedness evaluation. In this revision, the inclusion of COPD in the list was the most notable change.

The former criteria did not reflect the results of recent studies, so the current revision tried to apply recently revealed agents and evidences. In the current criteria, however, concrete guidelines for evaluating work-relatedness, such as estimation of the exposure level, latent period, and detailed examination methods, have not been described. The results of further studies can be used to formulate detailed criteria.

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DISCLOSURE

The authors declare that they have no conflicts of interest to disclose.

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