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Evaluation of loss of earning power in pneumoconiosis patients with occupational lung disease

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Abstract

Occupational diseases are a category of diseases that are caused by exposure to risk factors. Pneumoconiosis is one of the occupational diseases. We aimed to analyze patients with pneumoconiosis whose diagnosis was finalized by the 3rd Forensic Medicine Specialization Committee (3rd FMSC) of the Forensic Medicine Institute (FMI). The study investigated various factors such as gender, diagnosis age, length of employment, workplace measurements of the causative agent, smoking history, pneumoconiosis subtypes, opacity types, Pulmonary Function Test (PFT) values, as well as decisions made by the Occupational Diseases Hospital (ODH), Social Security Institution (SSI), and Social Insurance High Health Board (SIHHB). Retrospective analysis was conducted on 369 patients with pneumoconiosis that received disability determination. All patients were male, with mean age at initial diagnosis of 44.25±11.86 years. The mean duration of occupational exposure was 16.32±7.54 years. Silicosis was the most common diagnosis. Occupational diseases were diagnosed in 95.7% of patients by the 3rd FMSC, with small opacity being the most prevalent subtype, particularly q2-p1 opacity among them, and B opacity being the most common among large opacities. Significant correlation was found between working hours and types of pneumoconiosis. However, no significant correlation was found between radiologically determined opacities by the 3rd FMSC and working duration. Examination of the decisions made by the 3rd FMSC, SIHHB, SSI, and ODH revealed the least agreement between ODH and other institutions. Regarding the diagnosis agreement of opacity densities between the 3rd FMSC, SIHHB, SSI, and ODH, the agreement between the 3rd FMSC and other institutions was the lowest. To evaluate disability caused by pneumoconiosis, it is recommended to utilize current technological advancements and provide comprehensive medical documentation. In the relevant regulations, it is suggested that a new regulation, involving branch specialists, should be developed to address the radiological, functional, and clinical aspects in comprehensive manner.r.

Keywords: Forensic Medicine, disability, occupational lung diseases, pneumoconiosis

Introduction

Occupational diseases are a category of diseases that are caused by exposure to risk factors directly related to work or specific activities [1]. These diseases are classified by various institutions and organizations worldwide, including our country, based on factors such as the disease agent, type of exposure, mechanism of formation, or the system affected by the causative agent. In our country, occupational diseases are grouped into five main categories according to the factor and system associated with the causative agent, as specified in Section 5, Article 18 of the Regulation on Determining the Rate of Loss of Working Power and Profitability Loss in Profession [Regulation on Determination of Loss of Working Power and Profitability in Occupation, Number: 27021, Date: 11/10/2008]. These categories include occupational diseases caused by chemical substances, occupational skin diseases, pneumoconiosis and other occupational respiratory system diseases, occupational

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infectious diseases, and occupational diseases caused by physical factors.

While occupational lung diseases used to rank first among all occupational diseases globally in studies conducted 10-15 years ago, the implementation of primary prevention measures has led to a decline in their prevalence, now placing them in the fourth or even fifth position [2,3]. Nonetheless, respiratory system diseases still remain the most common occupational diseases in our country [4].

Pneumoconiosis is a nonneoplastic lung parenchymal disease that occurs when various types of dust are inhaled and subsequently accumulate in the lungs, triggering a tissue reaction [5,6]. The occurrence and severity of the disease are influenced by the duration and intensity of dust exposure [3,6].

According to data from the Social Security Institution (SSI), pneumoconiosis is the most prevalent occupational respiratory system disease in our country [4].

The detection of occupational diseases and the determination of disability status are conducted by the SSI based on health board reports and relevant medical documents issued by authorized health service providers in accordance with the Social Insurance and General Health Insurance Law No. 5510. If there is an objection to this decision, the Social Insurance High Health Board (SIHHB) reviews the case and makes a decision regarding the detection of occupational disease and disability. If further objection is raised against the SIHHB decision, the case may be referred to court following the established guidelines of the Supreme Court Jurisprudence. In such instances, the court may request an opinion from the Forensic Medicine Institute (FMI) regarding the presence of an occupational disease. The Third Forensic Medicine Specialization Committee (3rd FMSC) is responsible for providing expertise in determining the existence of an occupational disease and calculating the disability rate associated with the disease and its onset date [Social Insurance and General Health Insurance Law, Number: 5510, Date: 31/05/2006].

The aim of our study is to contribute to the establishment of objective and precise criteria for the detection of pneumoconiosis as an occupational disease and the assessment of disability rates based on these criteria.

Material and Methods

Our study retrospectively analyzed 369 patients diagnosed with pneumoconiosis within the date range of 01/01/2015 to 31/12/2018. These patients were referred to the Forensic Medicine Institute 3rd FMSC for opinions on occupational disease, disability determination, and the disease's onset date. The study was approved by Education and Scientific Research Commission of the Forensic Medicine Institute (number: 21589509/2019/696).

Various factors were examined, including the patient's gender, age at pneumoconiosis diagnosis, provincial distribution of submissions, time from the onset of work to the initial diagnosis of the disease, length of employment, adherence to work obligations/duration, presence of pre-employment and follow-up examinations, workplace measurements of the causative agent, smoking history, presence of occupational and additional respiratory diseases, pneumoconiosis subtypes, opacity types, and their intensity, as well as Pulmonary Function Test (PFT) values. Additionally, analyses were conducted on the decisions made by the Occupational Diseases Hospital (ODH), Social Security Institution (SSI), and Social Insurance High Health Board (SIHHB). Comparative tables were created to present the results.

For patients whose pneumoconiosis subtypes were not specified, classification was performed based on their work line, and the distribution of the subtypes was determined accordingly.

The distributions of opacity types and intensities were established for patients with both small and large opacity types. These patients were then categorized according to disability rates corresponding to the relevant types and intensities.

Statistical analysis of the study data was conducted using the Statistical Package for the Social Sciences (SPSS), version 22 software. The data were expressed as numbers and percentages. Chi-square test and Kappa fit statistics were utilized for analysis, with a significance level set at $P<0.05$.

Results

The study included a total of 369 patients diagnosed with pneumoconiosis and evaluated by the 3rd FMSC. The mean age at initial diagnosis for these male patients was 44.25±11.86 years, ranging from 22 to 82. The most common age range at the time of diagnosis was 40-49, constituting the largest proportion with 149 patients (40.4%). The cases were predominantly referred by the courts, with Bilecik and Zonguldak being the provinces with the highest number of patients, with 81 and 80 cases, respectively.

The mean duration from the onset of work to the initial diagnosis was 20.66±13.58 years, with the highest number of patients (29.8%) falling within the 11-20 year range. The mean duration of exposure was 16.32±7.54 years, with the highest number of patients (19.8%) falling into the 16-20 year range. Among the patients, 263 (71.3%) were diagnosed within the period of work obligation, while 54 patients (14.6%) were diagnosed after the obligation period.

The study found that 340 patients (92.1%) did not undergo pre-employment health examinations, and 309 patients (83.7%) did not have any follow-up examinations. Additionally, 237 patients (64.2%) had a history of smoking.

In the decisions made by the 3rd FMSC, 353 patients (95.7%) were diagnosed with an occupational disease, while 16 patients (4.3%) did not have an occupational disease. Among the decisions made by SIHHB, 287 patients (77.8%) were diagnosed with an

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occupational disease, while 7 patients (1.9%) did not have an occupational disease. Similarly, in the decisions made by SSI, 312 patients (84.6%) were diagnosed with an occupational disease, while 8 patients (2.2%) did not have an occupational disease. In the decisions made by ODH, 336 patients (91.1%) were diagnosed with an occupational disease, while 2 patients (0.5%) did not have an occupational disease. Among the patients, 262 (71%) had silicosis, 90 (24.4%) had Coal Worker Pneumoconiosis (CWP), and 17 (4.6%) had siderosis pneumoconiosis.

Small opacity type was observed in 286 patients (77.5%) based on radiological evaluations by the 3rd FMSC. Among the small opacity types, q2 (23.8%) and p1 (13.3%) were the highest, respectively, while B opacity (7.3%) was the highest among the large opacity types.

In radiological evaluations by SIHHB, small opacity type was observed in 237 patients (64.2%). Among the small opacity types, q2 (20.9%) and p1 (11.7%) were the highest, respectively, while B opacity (4.6%) was the highest among the large opacity types.

Small opacity type was seen in 257 patients (69.6%) according to radiological evaluations by SSI. Among the small opacity types, q2 (20.9%) and p1 (19%) were the highest, respectively, while B opacity (5.1%) was the highest among the large opacity types.

Based on radiological evaluations by ODH, small opacity type was observed in 280 patients (75.9%). Among the small opacity types, q2 (22%) and p1 (15.7%) were the highest, respectively, while B opacity (5.7%) was the highest among the large opacity types.

Chronic Obstructive Pulmonary Disease (COPD) was the most prevalent condition among the 369 patients (10.8%). In 257 patients, no additional respiratory system diseases were observed apart from pneumoconiosis, which was the primary occupational disease. Among the patients, 190 (51.5%) had normal Pulmonary Function Test (PFT) values, while 82 (22.2%) exhibited restrictive respiratory dysfunction. Among the disorders detected in PFT, the mildest involvement was the most commonly observed, accounting for 18.1% of the cases.

The level of agreement between the decisions of the 3rd FMSC and SIHHB regarding the diagnosis of occupational disease was found to be moderate, with an agreement rate of 48.6%. The agreement between the diagnoses of occupational diseases was 98.9%, and the agreement between diagnoses without occupational diseases was 44.4%. Similarly, the agreement between the decisions of the 3rd FMSC and SSI regarding the diagnosis of occupational disease was moderate, with an agreement rate of 54.3%. The agreement between the diagnoses of occupational diseases was 99%, and the agreement between diagnoses without occupational diseases was 50%. In contrast, the agreement between the decisions of the 3rd FMSC and ODH regarding the diagnosis of occupational disease was very weak, with an agreement rate of 10.8%. The agreement between the diagnoses of occupational diseases was 99.7%, and the agreement between diagnoses without occupational diseases was 6.7%.

The level of agreement between the decisions of SIHHB and SSI regarding the diagnosis of occupational disease was good, with an agreement rate of 72.1%. The agreement between the diagnoses of occupational diseases was 99.6%, and the agreement between diagnoses without occupational diseases was 66.7%. However, the agreement between the decisions of SIHHB and ODH regarding the diagnosis of occupational disease was weak, with an agreement rate of 24.5%. The agreement between the diagnoses of occupational diseases was 100%, and the agreement between diagnoses without occupational diseases was 14.3%.

The agreement between the decisions of SSI and ODH regarding the diagnosis of occupational disease was found to be weak, with an agreement rate of 39.3%. The agreement between the diagnoses of occupational diseases was 100%, while the agreement between the diagnoses without occupational diseases was 25%.

The agreement between the radiological opacity evaluations of the 3rd FMSC and SIHHB was found to be good, with a rate of 65.1%. The agreement between the diagnoses of small opacity was 96.2%, the agreement between the diagnoses of large opacity was 6.7%, and the agreement between the diagnoses of large and small opacity was 83.9%. Similarly, the agreement between the radiological opacity assessments of the 3rd FMSC and SSI was also good, with a rate of 64.3%. The agreement between the diagnoses of small opacity was 98.3%, the agreement between the diagnoses of large opacity was 4.5%, and the agreement between the diagnoses of large and small opacity was 80%. The agreement between the radiological opacity evaluations of the 3rd FMSC and ODH was found to be good, with a rate of 61.3%. The agreement between the diagnoses of small opacity was 98.4%, the agreement between the diagnoses of large opacity was 0%, and the agreement between the diagnoses of large and small opacity was 79.4%.

The agreement between the radiological opacity assessments of SIHHB and SSI was found to be very good, with an agreement rate of 84.4%. The agreement between the diagnoses of small opacity was 99.5%, the agreement between the diagnoses of large opacity was 0%, and the agreement between the diagnoses of large and small opacity was 80.5%. The agreement between the radiological opacity evaluations of SIHHB and ODH was found to be good, with a rate of 78.8%. The agreement between the diagnoses of small opacity was 99.1%, the agreement between the diagnoses of large opacity was 0%, and the agreement between the diagnoses of large and small opacity was 74.4%.

The agreement between the radiological opacity assessments of SSI and ODH was found to be very good, with an agreement rate of 85.6%. The agreement between the diagnoses of small opacity was 98.3%, the agreement between the diagnoses of large opacity was 0%, and the agreement between the diagnoses of large and small opacity was 87.5%.

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The agreement between the radiologically detected opacity types and intensities of the 3rd FMSC and SIHHB was found to be moderate, with a rate of 60.5%. The agreement between A opacity diagnoses was 42.9%, B opacity diagnoses was 68.2%, C opacity diagnoses was 81.8%, Category 1 diagnoses was 89.3%, Category 2 diagnoses was 77.7%, and the agreement between Category 3 diagnoses was 50% (Table 1).

Similarly, the agreement between the radiologically detected opacity types and intensities of the 3rd FMSC and SSI was found to be moderate, with a rate of 47.5%. The agreement between A opacity diagnoses was 28.6%, B opacity diagnoses was 54.5%, C opacity diagnoses was 52.4%, Category 1 diagnoses was 91.8%, Category 2 diagnoses was 60%, and the agreement between Category 3 diagnoses was 37.3% (Table 2).

The agreement between the radiologically detected opacity types and intensities of the 3rd FMSC and ODH was also found to be moderate, with a rate of 55.0%. The agreement between A opacity diagnoses was 37.5%, B opacity diagnoses was 63.6%, C opacity diagnoses was 40%, Category 1 diagnoses was 79.5%, Category 2 diagnoses was 72.6%, and the agreement between Category 3 diagnoses was 58% (Table 3).

The agreement between the radiologically detected opacity types and intensities of SIHHB and SSI was found to be good, with a rate of 67.4%. The agreement between A opacity diagnoses was 50%, B opacity diagnoses was 80%, C opacity diagnoses was 55.6%, Category 1 diagnoses was 98.6%, Category 2 diagnoses was 69.3%, and the agreement between Category 3 diagnoses was found to be 69.6% (Table 4).

Table 1. Comparison of radiologically detected opacity types and densities of *3rd FMSC and **SIHHB

			SIHHB opacity type and density distribution							
			A opacity	**B opacity**	**C opacity**	**Category 1**	**Category 2**	**Category 3**	**p**	**kappa**
3rd FMSC opacity type and density distribution	**A opacity**	n	3	1	0	0	2	1	**<0.001**	**0.605**
		%	**42.9**	14.3	0.0	0.0	28.5	14.3		
	B opacity	n	3	15	0	0	3	1		
		%	13.6	**68.2**	0.0	0.0	13.7	4.5		
	C opacity	n	0	1	9	0	0	1		
		%	0.0	9.1	**81.8**	0.0	0.0	9.1		
	Category 1	n	0	0	0	67	8	0		
		%	0.0	0.0	0.0	**89.3**	10.7	0.0		
	Category 2	n	1	0	0	22	94	4		
		%	0.8	0.0	0.0	18.2	**77.7**	3.3		
	Category 3	n	1	0	0	0	21	22		
		%	2.3	0.0	0.0	0.0	47.7	**50.0**		

*3. Forensic Medicine Specialization Committee, **Social Insurance High Health Board

Table 2. Comparison of radiologically detected opacity types and densities of *3rd FMSC and **SSI

			SSI opacity type and density distribution							
			A opacity	**B opacity**	**C opacity**	**Category 1**	**Category 2**	**Category 3**	**p**	**kappa**
3rd FMSC opacity type and density distribution	**A opacity**	n	2	2	0	3	0	0	**<0.001**	**0.475**
		%	**28.6**	28.6	0.0	42.8	0.0	0.0		
	B opacity	n	3	12	0	1	3	3		
		%	13.6	**54.5**	0.0	4.5	13.7	13.7		
	C opacity	n	1	5	11	0	2	2		
		%	4.8	23.8	**52.4**	0.0	9.5	9.5		
	Category 1	n	0	0	0	67	6	0		
		%	0.0	0.0	0.0	**91.8**	8.2	0.0		
	Category 2	n	0	0	0	48	75	2		
		%	0.0	0.0	0.0	38.4	**60.0**	1.6		
	Category 3	n	2	0	0	4	26	19		
		%	3.9	0.0	0.0	7.8	51.0	**37.3**		

*3. Forensic Medicine Specialization Committee, **Social Security Institution

Table 3. Comparison of radiologically detected opacity types and densities of *3rd FMSC and **ODH

			ODH opacity type and density distribution							
			A opacity	**B opacity**	**C opacity**	**Category 1**	**Category 2**	**Category 3**	**p**	**kappa**
3rd FMSC opacity type and density distribution	**A opacity**	n	3	1	0	0	1	3	**<0.001**	**0.550**
		%	**37.5**	12.5	0.0	0.0	12.5	37.5		
	B opacity	n	0	14	0	0	5	3		
		%	0.0	**63.6**	0.0	0.0	22.8	13.6		
	C opacity	n	0	6	8	0	3	3		
		%	0.0	30.0	**40.0**	0.0	15.0	15.0		
	Category 1	n	0	0	0	62	16	0		
		%	0.0	0.0	0.0	**79.5**	20.5	0.0		
	Category 2	n	0	0	1	28	98	8		
		%	0.0	0.0	0.7	20.8	**72.6**	5.9		
	Category 3	n	2	0	0	1	18	29		
		%	4.0	0.0	0.0	2.0	36.0	**58.0**		

*3. Forensic Medicine Specialization Committee, **Occupational Diseases Hospital

Table 4. Comparison of radiologically detected opacity types and densities of *SIHHB and **SSI

			SSI opacity type and density distribution							
			A opacity	**B opacity**	**C opacity**	**Category 1**	**Category 2**	**Category 3**	**p**	**kappa**
SIHHB opacity type and density distribution	**A opacity**	n	3	1	0	2	0	0	**<0.001**	**0.674**
		%	**50.0**	16.7	0.0	33.3	0.0	0.0		
	B opacity	n	2	12	0	0	0	1		
		%	13.3	**80.0**	0.0	0.0	0.0	6.7		
	C opacity	n	1	2	5	0	1	0		
		%	11.1	22.2	**55.6**	0.0	11.1	0.0		
	Category 1	n	0	0	0	72	1	0		
		%	0.0	0.0	0.0	**98.6**	1.4	0.0		
	Category 2	n	0	0	0	34	79	1		
		%	0.0	0.0	0.0	29.8	**69.3**	0.9		
	Category 3	n	0	0	0	0	7	16		
		%	0.0	0.0	0.0	0.0	30.4	**69.6**		

*Social Insurance High Health Board, **Social Security Institution

The agreement between the radiologically detected opacity types and intensities of SIHHB and ODH was found to be at a good level, with a rate of 71.8%. The agreement between A opacity diagnoses was 42.9%, B opacity diagnoses was 85.7%, C opacity diagnoses was 25%, Category 1 diagnoses was 85.4%, Category 2 diagnoses was 82.2%, and the agreement between Category 3 diagnoses was 88% (Table 5).

Similarly, the agreement between the radiologically detected opacity types and intensities of SSI and ODH was found to be good, with a rate of 62.2%. The agreement between A opacity diagnoses was 37.5%, B opacity diagnoses was 88.2%, C opacity diagnoses was 66.7%, Category 1 diagnoses was 64%, Category 2 diagnoses was 81.6%, and the agreement between Category 3 diagnoses was 91.7% (Table 6).

When examining the relationship between the radiologically detected opacity types by the 3rd FMSC and the duration of the study cases, no significant difference was found (Table 7).

No significant difference was found between the duration of the study groups with smoking and the classification based on the radiologically detected opacity types and PFT values by the 3rd FMSC.

However, when analyzing the relationship between length of employment and the type of pneumoconiosis, a significant difference was observed. It was determined that 50.6% of the patients with CWP had a length of employment of 21-30 years, and the majority of patients diagnosed with silicosis (75.3%) had a length of employment of less than 20 years. On the other hand, no employees with siderosis had worked for more than 20 years (Table 8).

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Table 5. Comparison of radiologically detected opacity types and densities of *SIHHB and **ODH

			ODH opacity type and density distribution							
			A opacity	**B opacity**	**C opacity**	**Category 1**	**Category 2**	**Category 3**	**p**	**kappa**
SIHHB opacity type and density distribution	**A opacity**	n	3	2	0	0	2	0	**<0.001**	**0.718**
		%	**42.9**	28.6	0.0	0.0	28.5	0.0		
	B opacity	n	1	12	0	0	0	1		
		%	7.1	**85.7**	0.0	0.0	0.0	7.2		
	C opacity	n	0	3	2	0	2	1		
		%	0.0	37.5	**25.0**	0.0	25.0	12.5		
	Category 1	n	0	0	0	70	12	0		
		%	0.0	0.0	0.0	**85.4**	14.6	0.0		
	Category 2	n	0	0	1	11	97	9		
		%	0.0	0.0	0.8	9.3	**82.2**	7.6		
	Category 3	n	0	0	1	0	2	22		
		%	0.0	0.0	4.1	0.0	8.0	**88.0**		

*Social Insurance High Health Board, **Occupational Diseases Hospital

Table 6 Comparison of Radiologically Detected Opacity Types and Densities of *SSI and **ODH

			ODH opacity type and density distribution							
			A opacity	**B opacity**	**C opacity**	**Category 1**	**Category 2**	**Category 3**	**p**	**kappa**
SSI opacity type and density distribution	**A opacity**	n	3	3	0	0	0	2	**<0.001**	**0.622**
		%	**37.5**	37.5	0.0	0.0	0.0	25.0		
	B opacity	n	1	15	1	0	0	0		
		%	5.9	**88.2**	5.9	0.0	0.0	0.0		
	C opacity	n	0	2	6	0	1	0		
		%	0.0	22.2	**66.7**	0.0	11.1	0.0		
	Category 1	n	0	0	0	73	40	1		
		%	0.0	0.0	0.0	**64.0**	35.1	0.9		
	Category 2	n	0	0	2	4	84	13		
		%	0.0	0.0	1.9	3.9	**81.6**	12.6		
	Category 3	n	0	0	0	0	2	22		
		%	0.0	0.0	0.0	0.0	8.3	**91.7**		

*Social Security Institution, **Occupational Diseases Hospital

Table 7. Comparison of opacity types detected radiologically by *3rd FMSC and cases according to working time groups

			Study time grouping of cases				
			3-10	11-20	21-30	30↑	
3rd FMSC opacity type	**Small opacity**	n	62	115	75	3	0.205
		%	24.3	45.1	29.4	1.2	
	Large opacity	n	7	4	8	0	
		%	36.8	21.1	42.1	0.0	
	Large and small opacity	n	11	18	10	2	
		%	26.8	43.9	24.4	4.9	

*3. Forensic Medicine Specialization Committee

Table 8. Comparison of pneumoconiosis types and working time groups of cases

			Study time grouping of cases				
			3-10	11-20	21-30	30↑	p
Pneumoconiosis type	*CWP	n	4	32	41	4	<0.001
		%	4.9	39.5	50.6	4.9	
	Silicosis	n	76	98	55	2	
		%	32.9	42.4	23.8	0.9	
	Siderosis	n	4	12	0	0	
		%	25.0	75.0	0.0	0.0	

*Coal worker pneumoconiosis

Discussion

When it comes to occupational diseases, there is a perception that it involves a technical subject requiring the proof of the occupational factor and the link to the disease in the medical field. The diagnosis stage is primarily approached from a medical standpoint, and legal processes become prominent after the diagnosis. It is commonly perceived by labor organizations or individual workers as part of the compensation law process. However, when we evaluate the incidence of occupational diseases, the causes of pathology, and the diagnosis process, we can see that it is closely related to various concepts and practices within the social structure, particularly production relations [1,7].

While the specific numbers may vary across countries, according to the Harrington Theory, an estimated 4-12 new cases of occupational diseases are expected per thousand workers per year [8]. World Health Organization/International Labour Organization reported in 2016 that 89.72 million people worldwide suffer from work-related diseases annually, resulting in 1.880 million deaths each year [9]. According to the year-end data of the Turkish Statistical Institute (TURKSTAT) in 2016, there are approximately 27 million individuals employed in our country, with 14 million working under employment contracts governed by the Labor Law No. 4857 [10]. Considering the expected rate of 4-12 new cases of occupational diseases per thousand workers, it would mean that between 108,000 and 324,000 workers would be affected by occupational diseases each year in our country. However, according to the data from the Social Security Institution (SSI), only 597 insured employees were diagnosed with an occupational disease in 2016 [4]. Based on those who work under employment contracts, the rate of occupational diseases is not 4-12 per thousand but rather approximately 4 per hundred thousand. This situation can be attributed to various factors such as underreporting, shortcomings in the social security system, limited awareness of occupational diseases within the healthcare system, and individuals with health issues being unaware of the connection to their work.

Occupational lung diseases, which used to be the leading category of occupational diseases worldwide 10-15 years ago, have significantly declined in prevalence due to the implementation of primary prevention measures [11]. In Japan, a prominent world economy, pneumoconiosis was the primary cause of work-related mortality and morbidity until the 1980s. However, the prevalence of pneumoconiosis decreased from 17.4% to 1% following the enactment of the Pneumoconiosis Act in 1960 and the continuous improvement of Workplace Health Management [10]. Similarly, in our country, according to SSI data, a total of 691 insured employees were diagnosed with an occupational disease in 2017, with 236 cases being occupational lung diseases, out of which 205 were pneumoconiosis [4]. These statistics indicate that pneumoconiosis is the most common occupational disease in our country.

In a study by Liman focusing on the forensic approach to occupational diseases, it was reported that 71% of the patients were referred from Zonguldak by the relevant courts [12]. In our study, we observed that 22% of the patients were sent by the courts from Bilecik, and 21.7% were from Zonguldak. This distribution by provinces in our study can be attributed to the increased awareness regarding the detection of occupational diseases that may arise in provinces other than Zonguldak.

According to SSI data, silicosis (65.4%) and Coal Worker Pneumoconiosis (CWP) (10.7%) were the most common types of pneumoconiosis among the 205 workers diagnosed with pneumoconiosis occupational disease in 2022 [4]. In our study, we found silicosis in 71% of the patients and CWP in 24.4% of the patients, which aligns with the existing literature on the subject.

The occurrence and severity of pneumoconiosis are known to be dependent on the duration and intensity of dust exposure [3,6]. Studies conducted by Çımrın et al. and Çevik have shown that the incidence of pneumoconiosis increases with longer years of work [13,14]. In our study, we found that the majority of patients (38.5%) had a working period of 11-20 years, with an average of 16.32 years. When examining the relationship between the patients' working time and the types of pneumoconiosis, a significant difference was observed. 50.6% of patients with Coal Worker Pneumoconiosis (CWP) had a working period of 21-30 years, while the majority of patients with a diagnosis of silicosis (75.3%) had a working period of less than 20 years. Additionally, patients with a diagnosis of siderosis were not employed for more than 20 years. These results are consistent with the study conducted by Öztürk et al., which showed that the majority of workers diagnosed with silicosis had a working period of less than ten years [15]. It is known that patients with CWP predominantly work in the Turkey Hard Coal Institution (THCI), whereas those with silicosis typically work in the private sector. The difference in employment status between these two groups leads to variations in working hours. Liman's study reported that patients had a maximum working period of 20-30 years, with an average of 20.44 years [12]. Another study by İçmeli, which evaluated disability rates in coal worker pneumoconiosis cases, found that the average working time in the mines was 23 years [11]. Similarly, Beder's study on pneumoconiosis cases whose liability period expired revealed an average working period of 23.51 years [16]. These differences in working time can be attributed to the predominance of CWP patients in the studies of Liman, İçmeli, and Beder, while the majority of patients in our study had a diagnosis of silicosis.

In our study, when the relationship between the working time of the patients and the radiologically detected opacity types was examined, no significant difference was observed. In the study of Saygun et al., entitled "Evaluation of Radiological Findings, PFT, Electrocardiography (ECG), and Arterial Blood Gases in Pneumoconiosis Cases," no significant difference was found in the distribution of opacity types according to working time in 321 people diagnosed with pneumoconiosis [17]. Similarly, in Liman's study, no significant relationship was observed between the type of opacity found in pneumoconiosis patients and the duration of the study [12].

In İçmeli's study, it is understood that 71% of the patients were diagnosed with an occupational disease while working actively and within the period of obligation after working [11]. It was determined that 71.3% of the patients in our study were diagnosed with an occupational disease within the period of obligation. It is thought that this situation determined in our study is an expected result.

It is known that smoking causes an increase in dust accumulation in the lungs by disrupting the mucociliary defense system that ensures the excretion of dust in the respiratory system. In the study of Kibeltis et al., it was stated that chronic bronchitis increases mortality and morbidity in coal workers, and smoking plays an important role in the etiology of chronic bronchitis [18]. In the study of Bohning, it was stated that the use of tobacco products inhibited particle cleaning and increased the effect of coal dust synergistically with silica dust, causing the development of CWP [19]. In our study, it was determined that 64.2% of the patients had a history of smoking, 10.8% were non-smokers, and no record of smoking history could be found in 24.9% of them. In addition, there was no significant difference between the smoking habits of the patients and the opacity types detected radiologically. In Liman's study, it was stated that 52.9% of the patients who were asked about the disability rate to the 3rd FMSC were smokers, 18.8% were non-smokers, and 28.3% did not have a record of smoking history [12]. In the study titled "Silicosis in Ceramic Factory Workers" by Şakar et al., the rate of smoking among workers exposed to silica was found to be 79.5% [20]. In the study of Çevik, it was reported that the frequency of smoking was 70.1% and there was no statistical significance between smoking and simple or complicated types of pneumoconiosis [14]. In all the mentioned studies, it was observed that smoking is quite high in pneumoconiosis patients compared to the normal population.

In our study, we found that a significant majority of patients did not undergo pre-employment health examinations (92.1%) and follow-up examinations (83.7%). İçmeli's study also highlighted the absence of employment and periodic follow-up examinations among patients [11]. The lack of such examinations is a notable concern observed in our study and the mentioned study. Pre-employment health examinations and chest X-rays play a crucial role in determining whether the claimed occupational disease is a result of the working environment in question. Implementing regular follow-up examinations and routine chest radiographs can enable early diagnosis of pneumoconiosis occupational diseases and provide an opportunity to work in a dust-free environment by reducing dust exposure. These measures are vital in ensuring the health and well-being of workers and preventing the development and progression of occupational diseases.

According to a study examining the prevalence and characteristics of COPD in pneumoconiosis patients, the incidence of COPD was found to increase with longer durations of underground work, particularly among individuals who had worked for up to 30 years [21]. Similarly, Çevik reported that a significant proportion of patients with comorbidities alongside pneumoconiosis had COPD [14]. In our study, we observed that among the 112 patients with additional respiratory system diseases, COPD accounted for the highest proportion (36%) aside from pneumoconiosis as an occupational disease. These results align with the existing literature, further supporting the association between pneumoconiosis and COPD.

In our study, we found that among the patients diagnosed with pneumoconiosis, 51.5% had normal pulmonary function test (PFT) values, 22.2% exhibited restrictive respiratory dysfunction, and 11.9% showed obstructive respiratory dysfunction. These results are consistent with previous studies. For instance, Şener et al. conducted a study comparing chest radiography and high-resolution computed tomography (HRCT) in pneumoconiosis patients. They found that 50.6% of the patients had normal PFT values, 9.6% had restrictive respiratory dysfunction, and 4% had obstructive respiratory dysfunction [22]. Similarly, Saygun et al. evaluated radiological findings, PFT, electrocardiography (ECG), and arterial blood gases in pneumoconiosis cases. They reported that among 321 patients diagnosed with pneumoconiosis, 49.5% had normal PFT values, 37.5% had obstructive respiratory dysfunction, and 0.8% had restrictive respiratory dysfunction [17]. In another study conducted by Çevik et al., PFT values were examined in patients with coal worker pneumoconiosis (CWP). They found that 41% of the patients had normal PFT values, 11.9% had obstructive respiratory dysfunction, and 5.6% had restrictive respiratory dysfunction [14]. Additionally, Dik conducted a study investigating the relationship between radiological pneumoconiosis stage and pulmonary function parameters in miners who were admitted for disability [23]. The results of the studies mentioned consistently indicate that PFT values are mostly normal in patients with pneumoconiosis. We speculate that in cases of simple pneumoconiosis, there may be either no functional impairment or a minimal effect within the normal range of PFT values. Furthermore, respiratory dysfunction patterns vary depending on the type of pneumoconiosis. In patients with coal worker pneumoconiosis (CWP), respiratory dysfunction is predominantly of the obstructive type, whereas patients with silicosis commonly exhibit restrictive respiratory dysfunction. This can be attributed to the greater fibrinogenic properties of silica compared to coal dust [24]. In both our study and the study by Şener, the most prevalent respiratory dysfunction was of the restrictive type. In contrast, the studies by Saygun, Çevik, and Dik reported a higher frequency of obstructive respiratory dysfunction. It is worth noting that the majority of patients diagnosed with CWP were included in the studies by Saygun, Çevik, and Dik, while the majority of patients diagnosed with silicosis were included in our study and the study by Şener. This difference in results may be attributed to the specific types of pneumoconiosis examined in each study population.

In the study conducted by Saygun et al., no significant difference was found between the patients' PFT values and their duration of employment, as well as between the types of opacity and PFT values [17]. Similarly, in our study, no statistically significant difference was observed between the patients' PFT values and their duration of employment. These results align with the existing literature.

According to the assessments made by different entities, occupational diseases were identified in 95.7% of the patients by the 3rd FMSC, 77.8% by SIHHB, 84.6% by SSI, and 91.1% by ODH. On the other hand, no occupational disease was observed in 4.3% according to the 3rd FMSC, 1.9% according to SIHHB, 2.2% according to SSI, and 0.5% according to ODH. In some of the prepared reports, it was noted that 20.3% did not have SIHHB decisions, 13.3% did not have SSI decisions, and 6.8% did not have ODH decisions. In İçmeli's study, it was found that 92% of individuals had an occupational disease according to hospital reports, 88% according to SIHHB decisions, and 94% according to the 3rd FMSC decisions [11]. Similarly, in Liman's study, it was reported that 67.3% had an occupational disease according to the 3rd FMSC, 62.9% according to SIHHB, and 80% according to ODH, while 30.6% did not have an occupational disease according to the 3rd FMSC, 26.5% according to SIHHB, and 12.7% according to ODH [12]. In our study and in İçmeli's study, it is evident that patients were diagnosed with occupational diseases at a higher rate. It should be noted that while all the patients in İçmeli's and our studies were diagnosed with pneumoconiosis, in the study by Port, 17.3% of the patients were diagnosed with diseases other than pneumoconiosis. This difference may be attributed to challenges in establishing a causal link between other diseases (such as COPD, asthma, musculoskeletal system diseases, etc.) and occupational diseases.

In Liman's study, it was reported that there was "mainly agreement" between the decisions of the 3rd FMSC and SIHHB, "moderate agreement" between the 3rd FMSC and ODH, and "insignificant agreement" between ODH and SIHHB decisions [12]. Similarly, in our study, regarding occupational diseases, a moderate agreement (48.6%) was found between the decisions of the 3rd FMSC and SIHHB, a moderate agreement (54.3%) between the decisions of the 3rd FMSC and SSI, and a very weak agreement (10.8%) between the decisions of the 3rd FMSC and ODH. A good agreement (72.1%) was observed between the decisions of SSI and SSI, a weak agreement (24.5%) between the decisions of SIHHB and ODH, and a weak agreement (39.3%) between the decisions of SSI and ODH. Both studies indicate that the concordance between ODH and other institutions is the lowest. In 2008, the total number of occupational diseases diagnosed by ODHs in Ankara, Istanbul, and Zonguldak was approximately 3500, while the SSI data reported 539 cases in the same year [4,15]. Once a clinician diagnoses an occupational disease, it is a legal requirement to have it recognized by the relevant units of SSI in order for it to be considered an occupational disease in the legal sense in our country. Based on the studies conducted, we believe that the discrepancy between ODH and other institutions can be attributed to differences in the criteria used to determine a medical occupational disease versus a legal occupational disease.

In our study, small opacity types were observed in different percentages among the different institutions. In the 3rd FMSC, small opacity types were seen in 77.5% of the patients, with q2 (23.8%) and p1 (13.3%) being the most common among them. Among the large opacity types, B opacity (7%) was the most prevalent [3]. Similarly, in SIHHB, small opacity types were seen in 64.2% of the patients, with q2 (20.9%) and p1 (11.7%) being the most frequent. Among the large opacity types, B opacity (4%, 4%) was detected [6]. In SSI, small opacity types were observed in 69.6% of the patients, with q2 (20.9%) and p1 (19.9%) being the highest among them. Among the large opacity types, B opacity (5.1%) was detected [6]. Lastly, in ODH, small opacity types were seen in 75.9% of the patients, with q2 (22%) and p1 (15.7%) being the most prevalent. Among the large opacity types, B opacity (5.7%) was the most common [6]. In İçmeli's study, it was reported that radiological small opacities were found in 75% of the hospital reports, 71% of the SIHHB decisions, and 77% of the 3rd FMSC decisions. The most common small opacity types were p 1/2, p/s 2, and small and large opacities were found together in 16 patients [11]. In the study by Saygun et al., the radiological opacity distribution of 321 pneumoconiosis patients was examined, and rounded opacities (p-q-r types) totaled 274, while irregular opacities (s-t-u types) totaled 47. Among the rounded opacities, 39 were p types, 182 were q types, and 53 were r types. Among the irregular opacities, 12 were s types, 19 were t types, and 16 were u types. Additionally, in advanced cases of type A-B-C, 8 people had advanced pneumoconiosis, with four having type A, three having type B, and one having type C [17]. In Beder's study, among 1068 pneumoconiosis patients, p-type and q-type opacities were the most common in 43.9% of cases, respectively. Type C opacities were found in 2.7% of cases, while type B and type A opacities were found in 2% of cases each [16]. Şakar et al. reported the detection of p- and q-type opacities in 24 patients with pneumoconiosis [20]. The results in our study were consistent with the literature.

In our study, we examined the diagnostic agreement regarding opacity types and intensities among the different institutions. The results showed that there was a moderate agreement between the 3rd FMSC and SIHHB (60.5%), between the 3rd FMSC and SSI (47.5%), and between the 3rd FMSC and ODH (55.0%). On the other hand, there was a good agreement between SIHHB and SSI (67.4%), SIHHB and ODH (71.8%), and SSI and ODH (62.2%). It is important to note that ODH, SSI, and SIHHB are responsible for assessing the insured individuals' loss of earning capacity due to occupational diseases, and in case of objections, the judicial process comes into play. During this legal process, the 3rd FMSC is requested to evaluate the loss of earning capacity in the respective profession based on the decisions made by ODH, SSI, and SIHHB, following the established Supreme Court Jurisprudence. However, it is known that the judicial process tends to take longer than standard practices in our country. Moreover, pneumoconiosis is a progressive disease, and this progression can lead to variations in the radiological images obtained throughout the legal process. Naturally, new radiological images taken for evaluation by the 3rd FMSC may differ from the initial findings used in the decisions made by other institutions. We believe that the lack of agreement between the 3rd FMSC and other institutions is primarily attributed to this reason.

Conclusion

Pneumoconiosis, being the most common occupational disease in our country, accounts for a significant portion of disability cases related to occupational diseases. However, the determination of disability rates for pneumoconiosis requires comprehensive medical documentation including employment examinations, chest X-rays, periodic control examinations, final status examinations, and other relevant tests. Unfortunately, in our study, we found that a majority of patients lacked these essential medical records, and some even did not undergo pulmonary function tests (PFTs). These deficiencies pose challenges in accurately determining disability and contribute to prolonged litigation processes. To address this issue, integrating current technological advancements with the National Judiciary Informatics System could facilitate easier access to medical documents, thus expediting the overall process.

Regular measurement and monitoring of dust levels in workplaces, ensuring they remain below the criteria specified in relevant regulations, would significantly reduce the occurrence of pneumoconiosis. As a preventable disease, pneumoconiosis heavily relies on dust exposure levels, and strict adherence to these limits can effectively mitigate its prevalence.

High rates of smoking were observed among pneumoconiosis patients. Besides the impact of pneumoconiosis itself, smoking is known to exacerbate respiratory impairments. Therefore, it is crucial to provide education and support for smoking cessation in individuals diagnosed with pneumoconiosis.

In our country, the Regulation on Determination of Working Power and Profession Loss of Profitability, published in the Official Gazette on 11/10/2008 (numbered 27021), is used to assess disability rates associated with pneumoconiosis occupational disease. However, it is advisable to consult relevant experts in the field to ensure a comprehensive evaluation considering radiological, functional, and clinical aspects. This approach will help eliminate legal and social grievances and facilitate the preparation of scientifically sound, objective, reliable, and convincing opinions or reports. Considering national and international classifications and involving stakeholders, it may be beneficial to develop a new regulation that can be regularly updated to address emerging needs.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

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Ethical Approval
The study was approved by Education and Scientific Research Commission of the Forensic Medicine Institute (number: 21589509/2019/696).

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