

RESEARCH ARTICLE

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A Different Concept in Disability Assessment: Compulsory Individual Accident Insurance for Mine Workers

ABSTRACT

Objective: This study aimed to determine the reflection of the Mine Workers Compulsory Personal Accident Insurance (MWCPAI) on forensic medicine practices and to identify its possible deficiencies compared to the Regulation of Permanent Disabilities (RPD).

Method: The subject of the study was the cases for the recourse claim from the insurance company for the compensation paid by the workplace to the miners injured due to occupational accidents. The study encompassed cases submitted by judicial authorities requesting the determination of coverage percentage (CP) according to the MWCPAI.

Results: All cases (n = 18) were male, with a mean age of 36.05 ± 5.4 years. The two most common events were object fall or impact (n = 6, 33.3%) and crushing (n = 5, 27.8%), respectively. The most prevalent injury was lower extremity injury. Although 44.4% of the cases recovered without sequelae, half of these cases were deemed disabled according to RPD. When the cases were assessed based on the handicap coverage list (HCL) of the MWCPAI, it was found that eight cases (44.4%) who recovered without sequelae did not qualify for coverage. As 50% of the cases did not precisely match any categories in the HCL, they were chosen using a comparative method, and CPs were determined by discretion, considering the extent of functional limitation.

Conclusions: In response to the occupational accidents prevalent in the mining sector, it is imperative to develop MWCPAI. MWCPAI would not only furnish insurance coverage for miners but also play a pivotal role in fostering safe working environments within the mining sector. MWCPAI is attributable to its mandate for insurance companies to assess the risks inherent in mining operations.

Keywords: Mining, Occupational Accident, Insurance, Disability.

Maluliyet Değerlendirmesinde Farklı Bir Kavram: Maden Çalışanları Zorunlu Ferdi Kaza Sigortası

ÖZET

Amaç: Çalışmada Maden Çalışanları Zorunlu Ferdi Kaza Sigortası'nın (MÇZFKS) adli tıp uygulamalarına yansımaları ve maluliyet yönetmeliğine göre olası eksikliklerinin saptanması amaçlanmaktadır.

Yöntem: İş kazasına bağlı yaralanma sonucu madencilere ödenen tazminatın, işyerince kazanın yaşandığı dönemi içerisine alan MÇZFKS'yi yapan şirketten rücu istenmesine yönelik açılan dava dosyalarından MÇZFKS'ye göre teminat yüzdesi belirlenmesi istemiyle gönderilmiş olgular çalışmaya dahil edildi.

Bulgular: Olguların tamamı (n: 18) erkek olup, yaş ortalaması $36,05 \pm 5,4$ idi. En sık iki olay sırasıyla cisim düşmesi veya çarpması (n: 6, %33,3) ve ezilmeydi (n: 5, %27,8). En sık alt ekstremitelerde yaralanması olduğu belirlendi. Olguların %44,4'ünün yaralanmasının sekelsiz iyileşmesine rağmen bu olguların yarısının maluliyet yönetmeliğine göre karşılığı bulunduğu maluliyet oranı hesaplanmıştı. Olgular MÇZFKS sakatlık teminat listesine göre değerlendirildiğinde sekelsiz iyileşen 8 olgunun (%44,4) teminat yüzdesinin olmadığı saptandı. Olguların %50,0'sinin ise sakatlık teminatı listesinde tam karşılığı bulunmadığından kıyas yöntemi ile seçilerek fonksiyonel kısıtlılığı ölçüsünde takdir uygulanıp teminat yüzdesi belirlendi.

Sonuç: Madencilik sektöründe meydana gelen iş kazalarının göz önüne alınarak madencilerin hukuki kazanımları açısından MÇZFKS geliştirilmelidir. MÇZFKS, madencilere sigorta güvencesinin sağlanmasının yanında maden ocaklarının sigorta şirketlerince yaptırılacak risk incelemesini de içerdiğinden madencilik sektöründe güvenli çalışma ortamlarının sağlanmasına da katkı sağlayacaktır.

Anahtar Kelimeler: Madencilik, İş Kazası, Sigorta, Maluliyet.

INTRODUCTION

The International Labour Organization (ILO) reports that approximately 3 million employees lose their lives each year due to work-related occupational diseases and accidents, according to its latest global estimates. In addition to the suffering experienced by workers and their families, work-related deaths also impose an economic burden at both national and international levels. According to ILO data, disruptions in production, compensation, lost workdays, and health expenditures account for 3.94% of the global annual GDP (1,2). The country with the highest occupational death rate is Cuba, while Costa Rica emerges as the country with the highest rate of non-fatal occupational injuries. Turkey ranks high with a 6.3 occupational death rate and a 2,459 non-fatal occupational injury rate per 100,000 workers (3). In 2022, 1,517 workers in Turkey died in work accidents, while 588,823 workers experienced work-related accidents. Reports indicate that workers who died due to work accidents in Zonguldak accounted for 0.9% ($n = 14$) of the total work-related fatalities (4). According to the report (4,5), 8.2% of the employees in Zonguldak have had work-related accidents.

The Regulation of Permanent Disabilities (RPD), published in the Official Gazette on 11th October 2008 with the number 27021, is used to determine the disability rate (DR) for compensation cases due to tort for physical injuries and death that occurred after this date as a result of occupational accidents (6,7). Compensation for work accidents is calculated through an actuarial formula that considers the DR of the victim.

Miners working in unhealthy environments underground may face many hazards. Despite technological advances, workplace hazards persist, making occupational health and safety (OHS) a continuing concern for the public. There is a positive correlation relationship between economic development and the implementation of OHS measures and practices. Developed countries provide a broader perspective on organization and legislation in OHS. ILO provides financial support for measures aimed at preventing occupational accidents and diseases. Insurance is one of the ILO's financial instruments for OHS (8). Due to the high-risk nature of mining areas, individuals and legal entities operating in the mining sector were obliged to obtain Mine Workers Compulsory Personal Accident Insurance (MWCPAI) through the Council of Ministers Decision No. 2015/7249 published in the Official Gazette on 6th February 2015 (9). Accordingly, institutions or organizations employing personnel in the mining sector obtain insurance policies from insurance companies to cover their personnel against the consequences of work accidents that may occur during mining activities.

MWCPAI is a fixed sum insurance. Consequently, the sum insured must be paid if the risk materializes. In case a miner faces a work accident that results in their death within two years, the miner's family is provided with compensation in the form of death benefits. If the miner becomes disabled, they are entitled to receive disability benefits per the disability types and rates mentioned in the relevant terms and conditions (9).

This study aimed to determine the reflection of the MWCPAI on forensic medicine practices and to identify its possible deficiencies compared to the RPD. This issue has not been previously addressed in forensic medical literature. Despite the limited number of cases in the study, the uniqueness of the topic adds significance to our findings.

MATERIAL AND METHODS

The subject of the study was the cases for the recourse claim from the insurance company for the compensation paid by the workplace to the miners injured due to occupational accidents between 2016 and 2019. This study adhered to the ethical guidelines outlined in the Declaration of Helsinki and obtained approval by the local ethics committee (Decision number: 01). We conducted a retrospective analysis of cases forwarded to us by the judicial authorities, requesting a determination of coverage percentage (CP) according to the MWCPAI. The data set included sociodemographic information, the type of accident, the type of injury, whether the patient underwent surgery due to the accident, the cause of disability, if any, DRs, and the percentage of insurance coverage. The data from the study were analyzed using SPSS 22.0 software for descriptive statistics such as mean, median, minimum, maximum, standard deviation, and frequency.

RESULTS

All 18 patients were male, with a mean age of 36.05 ± 5.4 (SD) years (minimum 22, maximum 45) at the time of the event, with a median age of 36.5 years. The results indicated that 66.7% ($n = 12$) of the cases were in the 31-40 age group, 22.2% ($n = 4$) were in the 41-50 age group, and 11.1% ($n = 2$) were in the 21-30 age group.

The subject of all cases was recourse compensation, and they were all filed in the civil court of first instance, functioning as the commercial court of first instance (CCFI). The two most prevalent types of accidents were falling or impacting by an object ($n = 6$, 33.3%) and crushing ($n = 5$, 27.8%), respectively (Table 1).

Table 1. Distribution of cases according to accident type

Accident	n	%
Falling or impacting objects	6	33.3
Crush	5	27.8
Jamming	4	22.2
Fall (from the same level)	2	11.1
Falling from a height	1	5.6
Total	18	100.0

Seven cases exhibited multiple work-related accidents. However, upon closer examination, the injury locations differed from those observed in other cases within the same case group. A total of 17 cases (94.4%) exhibited injuries from a single anatomical localization, while one case (5.6%) exhibited injuries from both the shoulder and ankle. Upon analysis of the distribution of traumatic lesions according to anatomical sites, it was determined that 57.8% of cases involved lower

extremity injuries (n = 11), 31.6% involved upper extremity injuries (n: 6), 5.3% involved both lower and upper extremity injuries (n = 1), and 1 case involved eye injuries (5.3%). The largest group among lower extremity injuries was foot/ankle localization (n = 6, 54.5%). Table 2 illustrates the distribution of cases according to the affected body region, as per the malfunction list in Schedule A of the RPD annex. The dominant side of all cases with upper extremity injuries was right.

Table 2. Distribution of cases by injured body parts

Sequelae list*	n	%
Pelvis and lower extremities malfunctions	11	57.8
Fingers of the hand malfunctions	5	26.3
Wrist and hand malfunctions	1	5.3
Shoulder and arm malfunctions	1	5.3
Eye malfunctions	1	5.3
Total**	19	100.0

*According to the RPD. **In one case, fractures of both the talus and humerus occurred.

It was determined that 44.4% (n = 8) of the patients underwent surgery for the injury, and the others (n = 10, 55.6%) were treated conservatively. After all the treatments were applied, there was finger functional limitation or amputation in four cases, ankle functional limitation in three cases, knee functional limitation in two cases, and decreased vision in one case. The mean DR of the operated cases was 7.75, with a mean CP of 3.68. In contrast, the mean DR of the conservatively followed cases was 5.72, with a mean CP of 2.64. Comparative analysis of cases in terms of DR and CP revealed that DR and CP were the same in 4 (22.2%) cases, DR was higher in 12 (66.7%) cases, and CP was higher in 2 (11.1%) cases. Although eight cases (44.4%) had healed without functional residuals, four (50.0%) had a DR calculated according to RPD. The remaining four cases (50.0%) were found to have no disability. The average DR of the cases with a sequelae was 8.5. Upon evaluation of cases according to the handicap coverage list (HCL) of the general conditions of MWCPAI, it was determined that eight cases (44.4%) who recovered without leaving sequelae did not have a CP. Nine cases (50.0%) did not have a direct equivalent in the HCL of the general conditions of MWCPAI. Therefore, the coverage item was selected through a comparative method, and the CP was determined by applying discretion based on the extent of functional limitation. Only one case (5.6%) was to have an exact equivalent in the said list. The average CP of the cases whose CP was determined was 6.5. Table 3 presents information on the type of injury, functional limitations, DR, and CP of the cases.

DISCUSSION

Despite the advancements in technology and the implementation of rigorous safety measures, underground coal mining remains a high-risk occupation concerning accidents and fatalities. In

small-scale enterprises in certain countries, the number of individuals engaged in informal mining activities may surpass those employed in the formal mining sector. Due to the non-adherence to international and national standards in small-scale enterprises, accident rates can be approximately 6-7 times higher than in larger mining enterprises, even within developed countries (10). Moreover, the prevalence of unofficial mines, such as those in Zonguldak, poses a significant and inevitable danger. The high number of work-related accidents in Zonguldak and Manisa provinces, despite their relatively minor populations, can be explained by the harsh working conditions in the mining sector (11).

Mining constitutes only 1% of the global workforce yet accounts for approximately 8% of fatal occupational accidents (10). According to data from July 2022, Turkey employs 222,067 workers in mining and quarries (5). According to recent reports, workers in the mining industry experience occupational accidents at a rate over six times higher and a fatality rate over seven times higher than workers in other sectors across the country (12). Figure 1 illustrates the occupational accidents that occurred in Turkey between 2016 and 2022, specifically highlighting those that transpired within the challenging coal mining sector.

In our study, all cases were male. According to the Working Life Statistics 2021 report, 94.83% of individuals who experienced occupational accidents in our country were male, while 5.17% were female (5). Furthermore, it was reported that nearly all miners (n = 4949) who suffered occupational accidents in hard coal mining in 2022 were male, with only a small fraction (n = 2) being female (4). Reviewing the literature, a study assessing occupational accidents treated in emergency departments found that approximately 90% of cases were male (13).

Table 3. Demographic and sequela characteristics of the cases

Case no	Age/Sex	Type of injury	Cause of disability	Disability rate	Comparably selected collateral item	Percentage of insurance coverage
1	40/M	Knee ligament rupture	Functional limitation	14.1	Ankylosis of the knee joint	2.9
2	39/M	Amputation of the 4th digit from the DIP joint	Amputation	7	Complete loss of the ring finger alone	2.7
3	41/M	4th digit phalangeal fracture	Functional limitation	7.2	Complete loss of the ring finger alone	4
4	43/M	Tibia fracture	Uncomplicated recovery	5.1	No comparable electable equivalent	0
5	35/M	Radius fracture	None	0	None	0
6	38/M	Knee ligament rupture	Functional limitation	14	Ankylosis of the knee joint	4
7	31/M	Femur fracture	None	0	None	0
8	22/M	4th digit phalangeal fracture	None	0	None	0
9	33/M	Tibia-fibula fracture	Uncomplicated recovery	4.3	No comparable electable equivalent	0
10	41/M	Humerus-talus fracture	Uncomplicated recovery	9.1	No comparable electable equivalent	0
11	33/M	1st toe SFT	None	0	None	0
12	30/M	Tibia fracture	Functional limitation	4.2	Ankylosis of the ankle joint	3.8
13	33/M	Ocular trauma	Functional limitation	7.1	Enucleation of one eye or loss of half of the vision in both eyes	3.6
14	45/M	Tibia fracture	Functional limitation	20.2	Ankylosis of the ankle joint	15
15	37/M	1st digit SFT	Functional limitation	4.3	Complete loss of the index finger alone	10
16	35/M	Talus fracture	Functional limitation	10.3	Ankylosis of the ankle joint	9
17	37/M	Tibia fracture	Uncomplicated recovery	4.3	No comparable electable equivalent	0
18	36/M	1st digit phalangeal fracture	Functional limitation	8	Amputation of the thumb alone	10

DIP: distal interphalangeal; SFT: soft tissue trauma

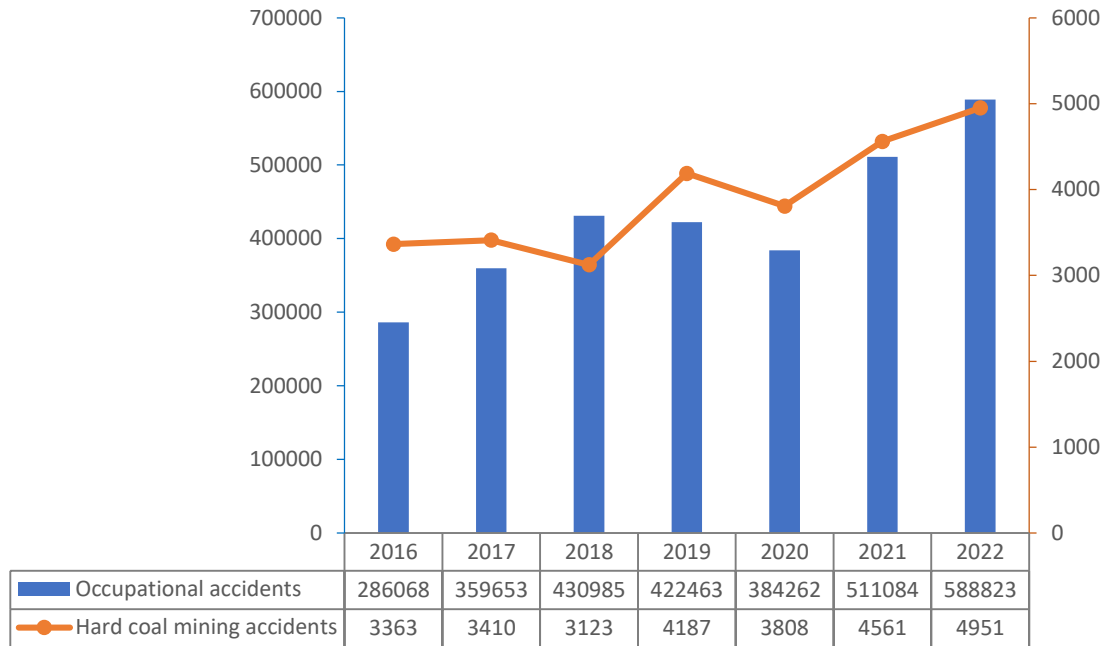


Figure 1. Occupational accidents (total) and hard coal mining accidents, Türkiye, 2016-2022 (4)

Similarly, in a survey conducted by Acara et al., 90.6% of cases were male (14), and in another study by Kadioğlu et al., 89.3% were male (15). This male predominance in gender distribution is believed to stem from the higher involvement of males in the workforce, particularly in hazardous and physically demanding sectors like mining, as observed in our study, leading to increased susceptibility to occupational accidents.

The mean age of the study sample was 36.05 years. The highest incidence of accidents was observed during the third decade of life, which was consistent with findings from studies evaluating cases admitted to healthcare institutions due to occupational accidents: Oğuzlar et al. (13) reported the highest number of occupational accidents occurring within the 28-37 age range, while Orhan et al. (16) and Acara et al. (14) reported it to be within the 25-34 age range. In a survey study involving miners working in underground coal mines, more than half of the participants (50.8%) were between the ages of 26-40 (11). Although age group classifications vary across the literature, it can be inferred that occupational accidents primarily affect individuals aged 21-40. This pattern may be attributed to the active engagement of this age group in the workforce, coupled with the inexperience of those newly entering the workforce, propensity for risk-taking behavior among the younger demographic, and a more socially active lifestyle prone to various traumas. Additionally, in the mining sector, which comprises the sample group of our study, a significant decline in employment rates at older ages is natural due to the strenuous working conditions and heightened risk of occupational diseases or accidents. A study

examining fatal fall-related occupational accidents in the United States of America reported that while young individuals experienced more accidents, older individuals generally suffered more severe injuries (17). In our study, the fact that the decrease in working capacity was higher in relatively older patients supports this finding.

They were all filed in the civil court of first instance, functioning as the CCFI. The legal authority responsible for adjudicating commercial disputes is the CCFI. Given that cases stemming from insurance law fall within the scope of commercial matters, such disputes are resolved by the CCFI. In jurisdictions lacking a dedicated CCFI, commercial cases are adjudicated by the civil court of first instance, functioning as the CCFI (18).

Looking at the distribution of the type of injury of occupational accidents that occurred in Turkey in 2022, it was reported that 44.9% were wounds and superficial injuries, 15.1% were dislocations, sprains, or strains, 4.3% were bone fractures, and 0.1% were amputations (4). A study on occupational accidents reported that most of the injuries are so mild that they can be remedied by a simple medical intervention (19). Another study analyzing occupational accidents admitted to the Social Security High Health Committee reported fractures (28.8%) and amputations (24.8%) as the most common types of injuries in the construction, furniture, and equipment manufacturing, as well as coal mining industries (20). Similarly, a study on occupational accidents in Denizli found that the most common cause of presentation was soft tissue trauma, followed by fractures (21). In our study, fractures accounted for 66.7% of the cases. While there are

sectoral variations in these studies, it is evident that severe injuries can occur in high-risk working environments such as the mining sector.

The study observed that the two most common accidents were falling or impacting objects (33.3%) and crushing (27.8%). Occupational accidents may occur in mines due to falling or slipping of materials, nail penetration, and falls. The strength, grip, and anti-slip or abrasion properties of boots are crucial for personal protection against injuries caused by falls. It has been reported that over three-quarters of occupational accidents in underground mines occur because hand, foot, and wrist protectors, which are essential personal protective equipment, do not fully meet the required standards (22).

Our study observed that all patients (94.4%) except one, who sustained an eye injury due to a stone impact, experienced injuries to the extremities in terms of anatomical regions. The most prevalent injury was lower extremity injury, with foot/ankle localization constituting the largest subgroup ($n = 6$, 54.5%). A thesis study assessing occupational accidents reported that around 70% of lower extremity traumas were related to the foot and ankle (21). There is a consistency in the frequency of injury sites in occupational accidents, as reported in the literature. In two separate studies analyzing occupational accidents presented at the emergency department, extremity trauma emerged as the most prevalent injury site (15,23). However, there were proportional differences when the extremities were categorized into upper and lower extremities. Studies reported upper extremity injuries as the largest group, with lower extremity injuries as the second most common (14,15,24). The higher incidence of lower extremity injuries in our study may be due to the difference in the lines of work and the work performed between our research and other studies.

Çolak et al. reported that approximately 90% of patients received medical treatment, while the remaining underwent surgery (23). Conversely, in this study, it was found that 44.4% of cases required surgery. This variance is presumed to be attributable to differences in the study population. It was observed that the mean DR and the mean CP were higher in cases that underwent surgery compared to those managed conservatively. Surgical applications come to the forefront in deplased or complicated fractures or injuries with high severity (25,26).

In approximately one-fourth of cases (22.2%), the DR and the CP were found to be identical. Remarkably, this concordance between DR and CP was observed solely in cases that had healed without sequelae, a category not encompassed by either list. The RPD has disability provisions for uncomplicated healed patella, calcaneus, talus, fibula, and tibia fractures. Half of

the patients who recovered without functional limitations were assigned a DR in the present study.

It was determined that the cases that healed without functional disability did not have a provision in the disability coverage list of the general conditions of the MWCPAI. While the literature underscores the limitations of the RPD (27–29), it is evident that the disability coverage list within the MWCPAI requires further elaboration to mitigate the risk of mine workers losing their entitlements.

In compensation law, when evaluating permanent bodily damages, there are instances where the exact equivalent of a person's impairment may not be explicitly listed. This situation may lead to the selection of the closest defect to the sequelae in the person by comparison and to assess the extent of the functional limitation of the person (30). In our study, half of the cases had their CP determined by selecting from the HCL through a comparison method and applying discretion regarding the rate of functional loss. This approach may result in contradiction among report preparers in cases where sequelae do not precisely match any listed impairments. We argue that updating the HCL for the MWCPAI to encompass a broader range of clinical conditions encountered in practice would ensure standardization.

Actuarial calculation is essential in determining compensation in financial compensation cases filed due to death or bodily injury. The calculation considers active and passive period earnings the disability and fault rates, if applicable. It is critical to meticulously examine all medical records to ascertain any sequelae forming the basis of the DR, leaving no room for doubt. Determining disability in cases where an individual has previously sustained injuries for any reason poses challenges (31). When determining the DR and the CP for the same functionally affected area in different incidents, it is necessary to calculate the difference between pre- and post-trauma. In our study, although seven cases involved multiple occupational accidents, the injury localizations differed from each other on a case-by-case basis. Hence, a calculation method based on differential calculation was not required. Yet, a detailed reexamination of cases necessitating difference calculation is crucial. The availability of pre-incident medical records can aid in distinguishing sequelae caused solely by the incident. Moreover, thorough performance of re-employment and periodic examinations can ensure accurate assessments in determining the amount of compensation due to the DR in cases of occupational diseases or accidents.

Hand injuries frequently occur due to failure to comply with occupational safety principles (32). Studies examining hand injuries have reported that the dominant side is often affected, given its increased usage during work (32–34). Furthermore,

hand injuries typically necessitate prolonged treatment and commonly result in functional impairment (35). Our study shows that the dominant side of all patients with upper extremity injuries was right, and most recovered with sequelae reinforces the literature. As the RPD specifies DR for the dominant upper extremity, a 1/5 discount is applied for sequelae in the non-dominant extremity during DR calculations. Similarly, the HCL for the MWCPAI highlights rates for the dominant upper extremity. Hence, it is evident that both lists are arranged in favor of the dominant side.

Limitations: One limitation of the study is that it was limited to recourse cases, excluding others. Since it was a retrospective study, information on the factors leading to accidents and working conditions could not be obtained. Being single-centered poses a challenge in generalizing the findings to the broader population. One possible reason for the low number of cases is the existence of an unregistered labor force, which is also known to the public as the invisible tip of the iceberg.

CONCLUSION

Based on a proactive approach, OHS aims to prevent occupational accidents by conducting risk analyses that may cause the accident to occur. Despite being inherently high-risk environments, it is asserted that nearly all accidents in mines are preventable (11). Statistical data presented in OHS studies can contribute significantly to understanding the root causes of accidents and diseases and facilitate the implementation of necessary preventive measures (8). However, despite the obligation imposed on mining companies to comply with the MWCPAI, the upward trend in occupational accidents in hard coal

mining has persisted since 2015. This suggests that regulatory measures alone are insufficient to mitigate the adverse effects of occupational accidents. Given the classification of the mining sector as highly hazardous according to OHS hazard classifications, it is essential to provide comprehensive training to miners tailored to the specific hazards they may encounter and create a safe working environment. Such measures are believed to be crucial in effectively reducing the severity of work accidents in the mining sector (12).

There is a need to improve OHS policies in the mining sector in light of global developments. The MWCPAI provides insurance coverage to miners and requires risk assessments in the mining sector. The primary goal should be the minimization of occupational accidents in mining operations. However, we contend that there is a need for improvement in the general conditions, disability classifications, and principles outlined in the MWCPAI to ensure legal protection for miners in the event of unavoidable accidents. Additionally, as the MWCPAI represents a relatively new form of insurance, the number of such cases is expected to increase as awareness among the mining workforce grows.

Declarations:

Funding: No funding was received for conducting this study.

Ethics: This study adhered to the ethical guidelines outlined in the Declaration of Helsinki and obtained approval by the Ethics Committee of Zonguldak Bülent Ecevit University (Decision number: 2024/01).

Conflicts of Interest: None.

Authorship Contributions: This study is entirely author's own work and no other author contribution.

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