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Cross-Sectional Study on Underground Mining: Relationship Between The Risks Identified by Workers and Those Established by Underground Mining Companies, Cundinamarca, 2014.

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ABSTRACT

Introduction: The mining sector is a source of economic and social development for Colombia (the Mining locomotive), therefore the study thereof in terms of occupational health becomes necessary.

Objective: To characterize preventive and work medicine, hygiene and industrial safety subprograms of underground coal mining companies and to determine the association between the risks identified by workers and those laid down by the company in the department of Cundinamarca.

Materials and methods

Cross-sectional study using two types of structured questionnaires: one for the company that characterized the status of the Occupational Health Program, and another aimed at the employees who identified the knowledge of the risks of exposure, the use of personal protection elements and the actions taken by the employer.

Results

The development of the Occupational Health Program in Cundinamarca is low, in the range of 25.26% to 38.85%. In the identification of the risk a relationship was observed between extreme temperatures (5.00%) and the use of sharp tools (58.8%). The use of personal protection equipment and the supply thereof was related to the use of facemasks (60.00%) and sling (94.70%).

Conclusions

The implementation of state controls to mitigate risks and comply with sound working conditions to decrease the rates of accidents and occupational diseases is required.

KEYWORDS : Mining, pneumoconiosis, knowledge, preventive medicine, occupational health, work-related risks.

Introduction:

In Colombia, the mining process is defined in the Government Plan as the "Mining Locomotive"[2,3,4,], being one of the economic pillarsof the country, however, research on the topic has focused in gold and coal opencast mining and in the more technical sector, while in the informal technological and handicraft sectors, research is emerging[6].

The mining industry is a fundamental core of the monitoring, control and regulation[7] of economic, social and environmental impacts, so much so that recently the International Labour Organization, in its publication titled "Prevention of occupational diseases", provides information on two key aspects: pneumoconiosis and muscle-skeletal and mental disorders, given the risks associated with underground coal mining. In this regard it indicates that of the 6,300 deaths calculated per day 5.550 are work-related and are the result of various types of occupational diseases, and each year there are 160 million cases of non-fatal work-related diseases. In this regard, 23,812 cases of occupational diseases caused by exposure to dust particles in the workplace were reported by countries such as China, Argentina reported that the main disorders that cause occupational diseases are the skeletal-muscle and respiratory pathologies and Japan had 7,779 cases related to lumbar disorders and pneumoconiosis[8].

In addition, millions of workers are endangered by pneumoconiosis[9,10] caused by generalized exposure to silica, coal, asbestos and other mineral powders, sometimes associated with other pathologies such as chronic obstructive pulmonary disease, silicotuberculosis and related cancers. Taking into account that such diseases have long latency periods, it is essential to diagnose them as well as to establish promotion and prevention measures to mitigate occupational disease rates, since in some countries the indemnifications pad therefor are high and are between 75% and 80%of the compensations paid each year[11].

The 2010-2013 Ibero-AmericanStrategy on Occupational Health and Safety, in the section of the Diagnosis in the field of occupational health and safety, explains that differentiated claims ranges are based on socioeconomic circumstances, cases of people who do not have optimal health since some industries still use old and dangerous machinery. Latin America reported 30 million work-related accidents, the construction, agricultural, mining and chemistry sector registered

140,000 deaths by work-related accidents and occupational diseases every year[12,13].

In Colombia, the mining and boiler industry shows a work accident rate in 2010 of 11,799 workers, 19,987 for 2011 and at March 2012 6,678 workers. Three agreements were formalized for improving mining and quarrying conditions with a total of forty-four Territorial Offices in the country[14,15] .

Colombia accounts for 0.8% of the world reserves of coal and of this percentage 1.5% corresponds to coke or metallurgical coal; in 2009 the country was ranked in the fourteenth place worldwide in terms of coal production and the department of Cundinamarca represented 37.42%of royalties with respect to the total departmental royalties and 0.26%with respect to total coal royalties in the country[16].

The country has conducted studies that have generated baselines to "improve" the legislation, on issues related to water, metal mining, coal mining, precious stones, but it is necessary to emphasize thereon, since the world economy sees mining in our country as a source of macroeconomic growth,[17] proof of this is reflected in the National Development Plan - Prosperity for All[18] that speaks of the Mining locomotive and its impact on socio-economic growth and the decrease in unemployment. This issue should not be addressed separately, therefore it is necessary to deepen in the knowledge of workers as to their occupation[19], and in the case that concerns us in particular, in underground coal mining, as it is one of the corners of the sector that must be opened the most.

Therefore, it is important that workers report their working conditions, which must be assessed and compared[20] with the actions of small and medium-sized enterprises, to formalize the occupational baselines that allow extrapolating corrective actions, preventive actions and conceptual consistence for the exercise of the new regulations, because "occupational health research is a crucial element to effectively promote public and private policies on occupational health and safety issues." [21]

It is a need of the country that is reflected through the population exposed, accident rates, macroeconomic records, and particularly the General Comptroller of the Nation through recent publications where it shows the importance of legislating, reveals the fragility of departmental government and the vulnerability of the population, reflecting on the effects on the health and backwardness in the quality of life with respect to people with other types of economic activity in the country[22,23,24,25].

With this in mind, this research project characterized the activities of preventive and occupational medicine, hygiene and industrial safety subprograms, implemented by underground coal mining enterprises and that determined the relationship between the risks identified by workers and those laid down by the company in the respective industrial safety and hygiene subprograms.

Materials and methods:

A cross-sectional study[26] was conducted which included the companies affiliated to the Occupational Risk Manager "Positiva" of the department of Cundinamarca in the municipalities of Tausa, Sutatausa, Lenguazaque, Guacheta and Cucunuba in 2014, which were classified according to their size in large (with over 100 employees), medium (between 51 and 99 workers) and small (between 1 and 50 employees).

The Occupational Risk Manager "Positiva" provided listings of its 161 companies and 5,711 affiliates in the department of Cundinamarca. The sample was probabilistically stratified with a proportional and random allocation and a two-stage conglomerate: it was stratified by municipality and the conglomerates were the company (primary sampling unit) and the worker (secondary sampling unit). Eleven companies participated in the first stage and 215 workers in the second stage [27,28,29,].The sample size was calculated with a confidence of 80%, a significance level of 99% and an expected prevalence of 50%.

The criteria for inclusion were workers over the age of 18 years, with seniority in the mining sector higher than or equal to 10 years, who at the time of the fieldwork were carrying out activities for the companies selected and who voluntarily agreed to participate. Those who had active respiratory diseases or were under other treatments were excluded.

The main variables of the study were: occupational variables such as ergonomic, biological, physical, facility-related and chemical risks, work at heights and use of personal protection equipment, which were measured both in the company and on workers. Socio-demographic variables were also measured.

The team in charge of the collection of information and the survey was trained in order to ensure standardization during the application of structured questionnaires, as well as in obtaining and processing informed consents.

Two types of structured questionnaires were used[33,34] the first for the company where the condition of the Occupational Health and Safety Management System was characterized through closed ended questions –formerly Occupational Health Program –in which information was collected in accordance with Resolution 1016/1989 whereby the program is regulated [35,36]. It included the following four components: Occupational Health and Safety Management System, Preventive and Occupational Medicine, Industrial Hygiene and Basic Sanitation and Industrial Safety.

The second questionnaire was aimed at employees where knowledge about the risks to which the worker is exposed, the use of personal protection equipment and the actions carried out by the employer were identified, for the mitigation of the same. These were applied both to the company and the worker through interviews. A test was conducted to evaluate the instruments in order to subsequently make the necessary adjustments to the same.

The quality of the data reported was ensured by controlling the entry of 100% of the questionnaires into the database.

Statistical Analysis

Absolute and percentage frequency distributions were used in the description of the qualitative variables; quantitative variables were calculated using measures of central tendency such as average, median and mode, measures of variability and dispersion such as range, variance and standard deviation with their respective variation coefficients for measuring the homogeneity of data.[37,38] A bivariate and multivariate analysis was used for ascertain the relationship[39]. Pearson's asymptotic Chi square test,[40] Fisher'sexact test[41] and likelihood tests were used in the bivariate relationship for expected values under five and nonparametric tests, considering the variance of the sample (with a probability of occurrence of 5.7%) and the variance of the population (estimated error of 10%).

The committees of the National Health Institute and Universidad del Rosario gave their technical and ethical approval; the study was classified as of minimal risk according to Resolution 8430/1993 issued by the Ministry of Health[42,43,44,45]

Results

The sample under study included 215 workers from underground mines and 11 companies from the department of Cundinamarca. The distribution of the sample by municipality was 26 workers from Cucunuba (12.10%), 83 from Guacheta (38.6%), 25 from Lenguazaque (11.60%), 66 from Sutatausa (30.70%) and 15 from Tausa (7.00%). The distribution of workers according to the size of the companies was 46 workers from large (21.40%), 113 from medium (52.13%) and 56 from small companies (26.00%). The distribution of the companies under study in the Department of Cundinamarca is as follows: 3 large (27.30%), 5 medium (45.50%) and 3 small companies (27.30%).

The socio-demographic characteristics of the population subject matter of the study is shown in table No. 1, with an average age for the group evaluated of 46 years old with a range of 23.76, standard deviation of 9.5% and an interval of 95% (44.3-46.9), with the highest percentage in the age group from 40 to 49 years old, in socioeconomic level 2, predominantly unmarried people and with complete and incomplete primary education level. (Table No. 1).

Table No. 1. Frequency and percentage distributions of the socio-demographic variables of workers from underground mines in the department of Cundinamarca. 2014

Socio-demographic variables	Description	Frequency	Percentage
Age groups	20-29.9	10	4.70
	30-39.9	49	22.80
	40-49.9	73	34.00
	50-59.9	70	32.60
	>=60	13	6.00
	Total	215	100.00
Gender	Masculine	209	97.20
	Feminine	6	2.80
	Total	215	100.00
Socioeconomic level	1	8	3.70
	2	125	58.10
	3	68	31.60
	4	12	5.60
	5	2	0.90
	Total	215	100.00
Marital status	Unmarried	26	12.10
	Married	81	37.70
	Common-law marriage	93	43.30
	Divorced	12	5.60
	Widowed	3	1.40
	Total	215	100.00
Education level	None	4	1.90
	Incomplete primary	83	38.60
	Complete primary	79	36.70
	Incomplete Secondary	29	13.50
	Complete Secondary	17	7.90
	Incomplete Technical	0	0.00
	Complete Technical	1	0.50
	Complete College	2	0.90
	Total	215	100.00

With respect to occupational exposure, it was determined that the tasks carried out by workers were respectively: chopper with 50.20% (108), reinforce with 13.50% (29), pit supervisor with 9.80% (21), frontman with 6.50% (14), driver and unloading with 12.00% (26) and supplies, winchman and locomotive operator with 7.90% (16).

The characterization of the seniority of workers is presented in the following ranges: 125 employees with less than 25 years of service (57.70%), 35 workers from 25 to 29 years of service (16.30%), and 56 employees with more than 30 years of service (26.00%). The average seniority was 21.70 years with standard deviation of 9.993 and a range of 47 (10-57).

As to the characterization of the preventive and occupational medicine, hygiene and industrial safety subprograms with respect to the management of the company, the analysis was made with information collected from the structured company questionnaire in its four components (Table No. 2).

The component of the occupational health and safety management system that involves policies, persons responsible for the program and documentary references, shows the lower compliance level of medium-sized companies with a value of 11.00%.

As to preventive and occupational medicine that involves medical monitoring and controls by para-clinical staff, the highest compliance level corresponds to medium-sized companies in 31.11%and the lower to small businesses with a value of 14.81%.

Regarding industrial hygiene and basic sanitation, lower compliance levels were found in small companies with 35.71%and the highest compliance level of 49.29% in medium-sized enterprises.

In the industrial safety component the compliance level is between 22.20% and 48.15%, noting that large enterprises show have greater compliance in the development of this component.

Fisher's asymptotic Chi-square test was used for the determination of the relationship between individual and company variables; 215 individual questionnaires and 11 company questionnaires were applied to establish such relationship. The results are shown in Table No. 3 where the relationship between the risks identified by workers and those reported by the company is established. A significant relationship was found between extreme temperatures (5.00%) and the use of sharp tools (58.80%).

The risks reported by the company and those mostly identified by workers were as follows: blows from falling or moving objects (78.20%) and exposure to substances (70.70%).

The risks reported by the company and not identified in a larger percentage by workers were the following: use of sharp tools (77.80%), condition of facilities (76.90%) and entrapment (74.70%).

Table No. 4 shows the results of the relationship between the use of personal protective equipment and the supply thereof by the employer, finding a significant relationship for breathing protective mask (60.00%) and lifeline - sling (94,70%).

The following results were obtained with respect to the supply of personal protection elements (EPP) by the company and the use of the same by workers: helmet (100%) cartridge breathing protection (94.70%), lifeline - sling (94.70%), hearing protectiveplugs (90.00%) and belt with lamp holder (80.00%).

As for personal protection elements that are not used by workers, the most relevant data were: steel toe boots (99.00%) and hide gloves (98.50%).

The risk levels by exposure to particulate material were also studied and the threshold limit value of 0.019625 mg/m3 for crystalline silica established by the American Conference of Governmental Industrial Hygienists (ACGIH) was taken as reference criterion, corrected to 8 hours of work during 6 days a week.Five risk levels were defined: low (relationship obtained / corrected TLV of less than 0.5) medium (between 0.5 and 1), high (between 1 and 2), and severe (greater than 2 but lower than 5), and critical (greater than 5);statistically significant differences were found ($p < 0.000$) for risk levels. For coal dust (bituminous coal), the threshold value corrected to 8 hours of work 6 days a week is 0.7065 mg/m3;four low (relationship obtained / corrected TLV lower than 0.5), medium (from 0.5 to 1), high (greater than 1 but lower than 5), and severe (greater than 5) risk levels were defined, finding statistically significant differences ($p<0,000$) between risk levels. Such adjusted TLVs were obtained using the Brief &Scala pharmacokinetic method[46].

When applying the scale to the results obtained from the measurement of the exposure to coal dust (bituminous coal) and silica dust, the concentration arose in the high risk level with 86 employees

(40.00%) and in the severe risk level with 93 workers (43.30%), respectively.

Table No. 5. Distribution of risk level depending on the concentration of coal dust (bituminous coal) and silica dust in the department of Cundinamarca

Risk Level	Concentration				
	Coal dust (bituminous coal)		Silica dust		P
	Frequency	Percentage	Frequency	Percentage	
Critical	---	---	51	23.70	0,000
Severe	66	30.70	93	43.30	
High	86	40.00	12	5.60	
Medium	13	6.00	24	11.20	
Total	15	7.00	35	16.30	
Total	215	100.0		100.0	

Discussion

Coal is one of the most important energy sources on the planet, it is used to produce nearly 40% of the world's electric power. Poland obtains 94% of its electric power from coal sources, South Africa 92%, China 77%, and Australia 76%. This mineral has become the fastest-growing power source in recent years, higher than gas, oil, nuclear energy, hydropower and renewable sources.[47]

Colombia is currently ranked 14 in coal production. The Ministry of Mines and Energy proposed that by 2019, the Colombian mining industry will become the most important in Latin America and will representationally expand its share in the international economy.[48]

Colombia's coal production in the first half of 2013 was 40,528,032.48 tons and showed a decrease of 13.25%versus the 46,718,607.97 tons produced in the same period of year 2012, i.e. a decrease of 6,190,575.49 tons. The main use of coal in Colombia is for thermal power generation and the departments in the country that stand out in terms of their mining share are Boyaca with 3.29% and Cundinamarca with 3.37%. The strike occurred in the Cerrejon project during the first half of 2013 caused a decrease of 4,655,349 tons and increased coal extraction in Cundinamarca, said growth was of 79.93%, going from 759,611 tons to 1,366,799 tons, covering the export deficit of this mineral, which demonstrates the mining potential of Cundinamarca.[49]

The country's legal system in the subject of Occupational Health is based on the issuance of Decree 614/1984 on the improvement and maintenance of health conditions of workers. Subsequently, the National Government issued Decree 1295/1994 whereby the organization and administration of the Occupational Hazards System were determined (nowadays work-related hazards) with an emphasis on establishing activities for the promotion of health and the prevention of diseases in the working population; its development through Resolution 1016/1989 regulated the organization, operation and form of Occupational Health Programs and their components in terms of Preventive Medicine, Occupational Medicine, Hygiene and Industrial Safety.[50,51,52]

Additionally, the country has a specific mining safety regulatory framework, which regulates various aspects of mining operations and includes: the design of mines, atmospheric underground mining conditions, the use of transport equipment and means, the responsibilities of the operator as directly responsible for ensuring acceptable mining safety conditions, among other aspects. Specifically,Decree 1335/1987 or Underground Safety Regulationis in place.[53,54,55,56,57,58]

In Colombia, the main emphasis is on the control of risk factors in the mining sector, focused on reducing the incidence and prevalence of "coal miner's pneumoconiosis" and "silicosis", as a result of the various studies and forecasts made since 1994 to 2005, where the affiliation and coverage by Professionals Risk Managers (ARP) were consolidated (currently Occupational Hazards Managers).[59]

In the sample of 215 workers from underground coal mines in Cundinamarca, from 11 companies affiliated to the Occupational Risk Manager "Positiva", the study showed that the average age of workers was 46years old, that the highest percentage is in the 40-49 year old age group, that the educational level is complete and incomplete primary school, common-law marriage and mostly belong to the second socioeconomic level.

In relation to this study,it is evidenced that basic legal compliance with the development of the Occupational Health Program in the Department of Cundinamarca is very low, with an average of 38.85% in larger enterprises, for medium-sized companies it was 30.07% and in small companies the average was 25.26%; this value is quite low since the questionnaire only measured what was required by the law for the sector.

Regarding the identification and knowledge of risks by workers and the reports made by employers, a relationship was only found in respect of two risks: physical - extreme temperatures (5.00%) and mechanical hazards — use of sharp tools (58.80%); however, the greatest risks to which workers are exposed are ergonomic and mechanical hazards, caused by repetitive movements, falls at height, falls at different height and work at heights.

In the relationship between the use of personal protection equipment and the provision thereof by employers, the indicator is not more favorable, because it only identifies the relationship between the use and the supply of the protective breathing mask (60%) and sling (94.70%).

When associating the results of socio-demographic variables with the identification of the risk and the use of personal protection element by workers, it is found that although the company identifies chemical risks - exposure to coal dust (bituminous coal), workers do not notice it but do use cartridge breathing protection; which suggests that the low education level does not influence the recognition of such risk.

Another factor worth mentioning is that the concentration of the risk level caused by exposure to coal dust (bituminous coal) was at a high level of 86 (40.00%) and for silica dust 93 employees (43.30%), meaning that workers, in relation to their seniority in the mining sector and their permanence in the same, due to the effects of the concentration of these particles,may develop work-related diseases such as pneumoconiosis and silicosis, among others.

It is important to mention that information and memory biases were considered, and standardized questionnaires were applied both to workers and the company with closed ended questions to offset them, and the time per question was less than 6 months in order to mitigate low memory span.[60]

In conclusion and on the basis of the behavior of the coal mining market and the results of the study in the department of Cundinamarca, it is necessary to implement occupational health follow-ups and controlsin order to mitigate risks, comply with proper working conditions and monitor industrial accident and occupational disease indicators in the future, which will ultimately result in the effective investment of capital in the sector and the development of the "mining locomotive" in the country, as a source of economic and social funding. [61,62]

The fulfillment of the proper implementation of the regulations of the Occupational Health Program (Occupational Health and Safety Management System), will result in actions that allow improving the relationship between the identification of the risks to which the worker is exposed and the use of personal protection elements for the control and mitigation thereof.

Given the available information of the sector and its potential in the country, it may be established that small and artisanal mining must be formalized to avoid the precariousness of working conditions,in addition to introducing industrial safety practices. State monitoring is particularly necessary for regulatory compliance withlabor standards, which foster the promotion of health of mining employees and work-

ers in the country.

It is necessary to continue characterizing the Colombian mining sector in order to obtain information of its potential, environmental liabilities and job creation, since it is of vital important from the economic, political and social point of view.

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The research group states that it has no conflicts of personal or economic interests that may influence its judgments or actions or that may generate biases in the preparation of this article.

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Table No. 2. Frequency of the components of the Occupational Health and Safety Management System, according to the size of the underground mining company in Cundinamarca, 2014.

Component	Size and number of companies								
	Large n=3			Medium n= 5			Small n=3		
	Total questions per component	Average affirmative answers	Percentage	Total questions per component	Average affirmative answers	Percentage	Total questions per component	Average affirmative answers	Percentage
1. Occupational Health and Safety Management System	20	6.00	30.00	20	2.20	11.00	20	5.06	25.33
2. Preventive and Occupational Medicine	9	2.66	29.63	9	2.79	31.11	9	1.33	14.81
3. Industrial hygiene and basic sanitation	28	13.33	47.62	28	13.80	49.29	28	9.99	35.71
4. Industrial safety	27	15.00	48.15	27	7.8	28.89	27	5.99	22.22
Total average*	84	38.99	38.85	84	26.59	30.07	84	22.97	25.26

*Average: reflects the adjusted average per affirmative answer and percentage.

Table No. 3. Relationship between the risks identified by workers and those reported by underground mining companies in Cundinamarca, 2014.

Relationship between the risks identified by workers and those reports by companies		Yes		No						
Individual and company surveys		Frequency	Percentage	Frequency	Percentage	Unilateral exact significance	OR	Lower limit	Upper limit	Relationship
Biological	Biological	10	8.40	6	7.40	1.000	1.147	0.400	3.280	NO
Ergonomic	Posture	6	3.40	3	6.2	0.949	0.575	0.532	2.478	NO
	Repetitive movements	7	4.70	4	7.70	0.461	0.899	0.247	3.124	NO
	Handling of loads	9	6.10	3	5.90	1.000	1.058	0.288	3.885	NO
Physical	Noise	3	2.60	1	1.20	0.648	2.088	0.211	20.648	NO
	Ionizing radiation	68	100.00	132	100.00					*
	Non-ionizing radiation	49	100.00	181	100.00					*
	Extreme temperatures	4	5.00	0	0.00	0.028	2.099	2.152	3.055	SI
	Vibrations	2	1.70	0	0.00	0.288	1.882	1.527	1.800	NO
	Illumination	14	11.90	9	11.10	0.529	1.077	0.433	2.403	NO
Facilities	Condition of facilities	92	82.30	40	78.90	0.057	0.493	0.338	1.018	NO
	Order and cleaning	18	10.1	3	5.80	0.261	1.842	0.511	6.640	NO
Mechanical	Falls from height	46	38.7	28	34.60	0.331	1.193	0.662	2.148	NO
	Falls from different height	47	39.5	30	37.00	0.431	1.11	0.62	1.986	NO
	Entrapment	82	81.4	74	74.70	0.090	0.837	0.288	0.984	NO
	Blows by falling or moving objects	93	78.2	54	66.70	0.051	1.788	0.948	3.378	NO
	Use of sharp tools	70	88.8	63	77.80	0.004	0.408	0.218	0.775	SI
Chemical	Coal dust explosion	39	28.4	13	28.00	0.600	1.078	0.519	2.239	NO
	Exposure to substances	41	70.70	27	61.20	0.136	1.535	0.789	2.946	NO
Work	At heights	2	3.00	1	0.80	0.356	4.125	0.367	46.34	NO
	Hot works	1	1.30	0	0.00	0.380	2.653	2.218	3.172	NO
	In confined spaces	0	0.00	3	2.80	0.232	1.859	1.488	1.835	NO

*Norelationship was calculated for the contingency table. At least one variable of each 2-way table in respect of which the relationship was calculated is constant.

Table No. 4. Relationship between EPP used by workers and that supplied by underground mining companies in Cundinamarca. 2014

Relationship between EPP used by workers and that supplied by the company	Yes		No		Unilateral exact significance	Advantage ratio OR	Lower limit	Upper limit	Relationship
	Frequency	Percentage	Frequency	Percentage					
Helmet	150	100.00	65	100.00	.	.	.	.	*
Breathing protective mask	5	60.00	20	11.20	0.000	13.932	0.477	64.733	Si
Cartridge breathing protection	142	94.70	58	93.50	0.466	1.234	0.355	4.234	NO
Hide gloves	146	97.30	64	90.80	0.833	0.57	0.060	5.394	NO
Leather gloves	-	-	3	1.40	.	.	.	.	*
Hearing protective plugs	105	90.00	32	100.00	0.094	0.771	0.709	0.844	NO
Hearing protective cups	4	10.80	3	2.60	0.066	4.553	0.938	22.418	NO
Polychrome goggles	14	100.00	6	100.00	-	-	-	-	*
Mesh goggles	-	-	20	100.00	-	-	-	-	*
Belt with lamp holder	120	80.00	58	80.00	0.579	1.000	0.483	2.070	NO
Rubber boots	.	.	209	97.20	-	-	-	-	*
Leather boots	-	-	7	-	-	-	-	-	*
Steel toe boots	16	100.00	150	96.00	0.848	0.88	0.884	0.888	NO
Lifeline (sling)	72	94.70	41	28.80	0.000	48.054	14.748	155.933	Si

* No relationship was calculated for the contingency table. At least one variable of each 2-way table in respect of which the relationship was calculated is constant.

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