Aspects of Occupational Morbidity in The Mining Sector

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Abstract

Health and safety of workers have a special importance for the quality of working life even in the current situation of austerity and financial instability. In the general framework of the social determinants of health - the occupation leaves its mark on the employees' state, and occupational risk assessment aims to prevent and make the employee to be aware of the possible dangers, forming a culture of the work safety. Given the complexity of underground work system, the accidents at work and occupational diseases are dysfunctions that reduce the efficiency, productivity and profitability. Also, these dysfunctions have and some other effects - economic (increased costs with personnel and with security and occupational health), social (because they affect one or more workers, their families, and the other members of the organization) and psychological (the reaction towards risk, problems of inadequacy or incompatibility with the old job, the negative impact on the image of the industry). Considering the overall context of health status of the population and the peculiarities of our country, this paper analyzes comparatively the evolution of the main indicators of morbidity statistics that reflect the health of the employees of some organizations in the Romanian mining sector.

1. Introduction

As a finite energy resource (exhaustible by its nature) coal is from many years in the focus of concerns and controversies of researchers from different fields, practitioners, politicians and futurists. Each tries to argue and tip the balance for the future of coal mining or, by contrary, for the end of this field of activity.

Thus for instance, „an assessment of forecasts for coal use indicates that over the next 10 to 15 years (until about 2020), coal production and use in the United States are projected to range from about 25 percent above to about 15 percent below 2004 levels, depending on economic conditions and environmental policies. By 2030, the range of
projected coal energy use in the United States broadens considerably, from about 70 percent above to 50 percent below current levels.” (NRC, 2007a, p.2).

These controversies are reflected including by the "chaos" of Romanian energy strategies. Thus, coal mining sector role, structure and size have dramatically changed after 1990 – from one prevalent sector becoming one of "Cinderella" type, almost extinct. The number of underground mines for exploiting the hard coal reserves of Romania located in Jiu Valley was reduced to about half until present, being estimated to remain only 4 mines after 2018. But regardless the sector size, underground coal mining involves high risk and hard work conditions.

2. Health and safety at work in underground mining

Because of the many disasters that have occurred (Table 1) and latent dangers existing in underground coal mining, the concern for ensuring health and safety at work (OHS) is paramount. Even if improvements of regulatory norms have occurred rather as a result of such events, it is important that they exist and are continually refined to comply with this condition.

Table 1. Underground coal mine disasters, 1990 to 2011

| Type             | Number of events | Number of fatalities |
|------------------|------------------|----------------------|
| Explosion        | 421              | 10,4192              |
| Fire             | 35               | 727                  |
| Haulage          | 21               | 145                  |
| Ground fall/Bump | 14               | 92                   |
| Inundation       | 7                | 62                   |
| Other            | 17               | 199                  |

Source: Brnich & Kowalski-Trakofler (2010), cited by National Research Council, 2013, p.39.

"The Mine Safety and Health Administration define a disaster as an incident with five or more fatalities and classify disasters by cause and number of fatalities. Disasters due to haulage result from failures in the transportation of personnel, material, or equipment. Disasters due to ground fall or bump indicate the fall of roof rock or outward bursting of walls in an underground work area.” (NRC, 2013, p.39)

People are involved in all these events, people who work every day in the depths of the earth. Occupation plays an important role in the general framework of social determinants of health. In order to prevent such events, to maintain the health and well-being of the workers on the one hand, and safe working conditions on the other hand, within the complex system of underground work is necessary a model of prevention on three levels (Figure 1), respectively a risk management process (Figure 2) implemented in a responsible manner. Romanian legislation concerning OHS (Law No. 319 of 2006, updated in 2012, with related amendments and norms) aligns with the international norms in the field and stipulates the risk factors identification and assessment, thus creating a framework for awareness and preventive action.

The incidence of risk factors is commonly associated with increasing occupational morbidity (OM). OM analysis is an integral part of monitoring the health of employees obligatorily, having especial importance in decision-making within work and health systems. Morbidity (M) with temporary incapacity for work (TIW) is a concept generally related to the intensity of disease phenomenon within a collectivity, which allows the study on this phenomenon both as trend of evolution in time in the same collectivity, and between different collectivities.

Analysis of M with TIW aims to identify determinant factors that generated/favoured diseases of the workers, in order to establish technical and organizational measures of work protection, prophylactic health measures and for socio-professional rehabilitation. The basic tool for monitoring and analysis is the sick leave certificate (medical certificate) issued by the institution which provides curative and preventive health care services.
Potential pathway for individual and community action to influence global factors

Fig. 1. Determinants of Health: The 21st – Century Field Model
Source: Ratzan et al., (2000) cited in National Research Council, (2011, p.8)

Fig. 2. The risk-management process
Source: National Research Council, (2007 b, p.77)
As it result from the national M data in Romania, “analysing the distribution of new cases by occupation, the highest number of occupational diseases were reported for locksmiths (263 new cases) and miners (199 new cases)” (Todea & Ferencz, 2003, p.5). “Analysis of the numerical distribution of cases by industry shows that in Romania most cases of disease in 2011 were reported in manufacturing industry (504 cases - 54%), transport and storage (131 cases - 14%) and mining and quarrying (98 cases - 10.5%)” (Todea, Popescu & Călugăreanu, 2013, p.3).

Against this context the paper examines main indicators of M statistics in Romanian mining sector. Main indicators of M statistics monitored at national level and used for the analysis are: Severity index (SI) = days number of TIW x 100 / average number of registered employees; Frequency index (FI) = number of initial medical certificates x 100 / average number of registered employees; Average duration index (ADI) = days number of TIW / number of initial medical certificates.

3. Analysis of morbidity in coal mining sector of Romania

The study was based on statistical research and analysis of policy documents and reports at national and sectorial level in 2011-2013.

Compared to the national average incidence (19.79%00 workers), the value in Hunedoara County (where is located Jiu Valley - the largest coal mining basin in Romania) is 45.76%00 workers (INSP, 2012, p.8).

Being the biggest producer of energy coal in Romania, the National Company of Hard Coal S.A. Petroșani (NCHC) from Jiu Valley had under suborder seven mine units (underground coal mines) during 2008-2012 period. Starting with the 18th of December 2012, after applying the measures established in The Strategy of Mining Industry 2012-2035 (ME, 2012) and other regulations (Law no.143/2012), NCHC was reorganized in the following structures which are now subordinated to the Ministry of Economy:

- The National Society of Hard Coal S.A. Petroșani (NSHC), which is composed of four viable mines (Livezeni, Lonea, Vulcan, Lupeni), Central Station of Mining Rescue Petroșani (SALVAMIN) and also the unit of Coal Preparation of Jiu Valley. Since June 2013 these compose the Mining Division of the Hunedoara Energy Complex (HEC);
- The National Society for Mine Closure Jiu Valley- Petroșani (NSCMJV) was founded according to OUG 119/2011 (Law no.143/2012), having as components the rest of the three nonviable mines (Petrila, Uricani, Paroșeni) that will be closed until 2018.

Therefore, the analysis of M that follows aimed this new organizational structure. The primary data used to calculate these M indicators are presented comparatively for the last two years, according to the data registered and reported by the three analysed units of the coal mining sector (table 2). The resulted values of the indicators are shown in the same manner in table 3. The structure by major groups of diseases which had as result TIW (in days) is shown in table 4, for each of the three considered organizations.

OM registered significant variations during the analysed period. Thus, compared with data from 2011, in 2012 was registered a decrease in the number of days of TIW, respectively less days for ordinary disease and more days (but not significant) for occupational diseases and accidents (with mention that number of days for accidents at work decreased). The values of M indicators SI and ADI have reduced, while FI insignificantly increased. The hierarchy of the main diseases registered shows that musculoskeletal disorders are in first place in the structure of the M with TIW, both in mining and in other industries, being the most common work-related health problems in the EU (INSP, 2012), followed by respiratory diseases, digestive diseases, cardiovascular diseases, tuberculosis and tumours.

Factors contributing to the occurrence of musculoskeletal disorders are: physical effort of high intensity caused by lifting and carrying large weights; repetitive movements, static effort extended by vicious positions, forced, imposed by jobs; action of vibration on the muscles, bones and joints - to those working with pneumatic hammer; unfavorable microclimate, with large temperature differences, air currents on galleries and high humidity. To the contributory factors are added other factors that could favour such diseases, depending on the body itself: shortcomings of the musculoskeletal system, endocrine disorders, obesity, infection outbreak, alcoholism.
Table 2. Evolution of registered primary data related to the indicators of morbidity statistics

|                      | NCHC Year 2011 | NCHC Year 2012 | Deviations | NSCMJV Year 2012 | NSCMJV Year 2013 | Deviations | Mining Division of HEC Year 2012 | Mining Division of HEC Year 2013 | Deviations |
|----------------------|----------------|----------------|-------------|------------------|------------------|------------|-------------------------------|-------------------------------|------------|
| Total days number of TIW, of which for: | 158561         | 149756         | -8805       | 48326            | 58931            | +10605     | 107928                        | 112850                        | +4922      |
| • Ordinary disease  | 123093         | 113150         | -9943       | 35939            | 47011            | +11072     | 82172                         | 88824                         | +6652      |
| • Occupational disease | 1161          | 1689           | +528        | 537              | 1559             | +1022      | 1193                          | 2156                          | +963       |
| • Accidents, of which: | 34307         | 34917          | +610        | 11850            | 10361            | -1489      | 24563                         | 21870                         | -2693      |
| - At work | 8018           | 7958           | -60         | 2340             | 2948             | +608       | 5728                          | 5188                          | -540       |
| Number of initial certificates | 11607       | 11309          | -298        | 3233             | 47011            | +11072     | 82172                         | 88824                         | +6652      |
| Average number of registered employees | 7923        | 7433           | -490        | 2442             | 2000             | -442       | 5360                          | 5046                          | -314       |

Table 3. Evolution of the indicators of morbidity statistics

| Morbidity indicators | NCHC Year 2011 | NCHC Year 2012 | Deviations | NSCMJV Year 2012 | NSCMJV Year 2013 | Deviations | Mining Division of HEC Year 2012 | Mining Division of HEC Year 2013 | Deviations |
|----------------------|----------------|----------------|-------------|------------------|------------------|------------|-------------------------------|-------------------------------|------------|
| SI                   | 2001.27%       | 2014.75%       | +13.48%     | 1978.95%         | 2012.15%         | +3.45%     | 2013.58%                      | 2236.42%                      | +222.24    |
| FI                   | 146.50 %       | 152.15%        | +5.65%      | 198,35%          | 155.8%           | -0.42      | 159.18%                       | 182.12%                       | -22,94%    |
| ADI                  | 13.66          | 13.24          | -0.42       | 15               | 15               | 0          | 12,65                         | 12,28                         | +0.37      |

Table 4. The structure by groups of diseases which had as result TIW (in days)

| Group of disease                | NCHC Year 2011 | NCHC Year 2012 | Deviations | NSCMJV Year 2012 | NSCMJV Year 2013 | Deviations | Mining Division of HEC Year 2012 | Mining Division of HEC Year 2013 | Deviations |
|---------------------------------|----------------|----------------|-------------|------------------|------------------|------------|-------------------------------|-------------------------------|------------|
| Tuberculosis                    | 7522           | 5374           | -2148       | 2729             | 2475             | -254       | 2837                          | 3798                          | 961        |
| Tumors                          | 4955           | 5134           | +179        | 1327             | 2229             | 902        | 4342                          | 6315                          | 1973       |
| Neuropsychiatric diseases       | 4245           | 4071           | -174        | 1047             | 983              | -64        | 3191                          | 2819                          | -372       |
| Sense organs diseases           | 2558           | 2249           | -309        | 599              | 849              | 250        | 1701                          | 1872                          | 171        |
| Cardiovascular diseases         | 11114          | 8566           | -2548       | 2784             | 4444             | 1660       | 6069                          | 7319                          | 1250       |
| Respiratory diseases            | 17465          | 18695          | +1230       | 6629             | 8103             | 1474       | 13293                         | 14085                         | 792        |
| Digestive diseases              | 12899          | 11814          | -1085       | 3998             | 4594             | 596        | 8470                          | 8117                          | -353       |
| Skin diseases                   | 2504           | 3171           | +667        | 785              | 948              | 163        | 2529                          | 2277                          | -252       |
| Musculoskeletal diseases        | 51340          | 46721          | -4619       | 13573            | 19773            | 6200       | 34796                         | 35764                         | 968        |
| Genitourinary diseases          | 470 0          | 4435           | -265        | 1597             | 1294             | -303       | 3041                          | 3765                          | 724        |
| Others                          | 3791           | 2920           | -871        | 840              | 1319             | 479        | 2126                          | 2660                          | 534        |

At the NSCMJV we notice a large increase in day’s number of TIW for occupational and ordinary disease in 2013 compared to the same period of the precedent, while day’s number for accidents decreased per total, but increased for accidents at work. This large increase in the number of days is explained by the transfer of workers from the former company NCHC to the new society NSCMJV (workers with health problems and who had sick leave with TIW relatively long periods of time, until their dismissal in October 2013). The structure of diseases maintain the same hierarchy above mentioned.
For the same period (2013 comparative with 2012), the analysis of situation from Mining Division of HEC revealed a considerable increase in days number of TIW which could be explained by the increasing frequency of disease in a large part of staff close to retirement age with more chronic conditions requiring prolonged treatment and prolonged recovery to restore working capacity. It may note that days number of TIW for accidents decreased, but it increased for the occupational and ordinary disease. Values of M indicators SI and FI increased, while ADI has an insignificant decrease even in conditions of reducing average number of employees. Musculoskeletal disorders remain as the peak of M, recording a growth in days number of TIW, and hierarchy of diseases is almost the same for first places, except the tumours placed ahead of tuberculosis.

4. Conclusions and proposals

The paper shows relation between the hard working conditions of underground mining sector with numerous risk factors, and the high values for indicators of M with temporary disability of the employee. Based on the results of this analysis, the following measures are proposed: 1) Re-assessment of the problematic cases by the occupational physician, in order to restore health and prevent the complications (i.e. through removing the worker with problems from the harmful environment for a fixed or indefinite period); 2) Reporting the cases of occupational disease and those related to the profession according to the Law No. 319/2006 (the occupational physicians should fill the BP1 fiches and send them to the occupational medicine cabinet from SALVAMIN, in order to establish their professional character. The cabinet should report in writing to the employer of the subunits the suspected occupational disease. Notifying the cases of disease related to the profession is considered "event" and is reported to the OHS department of the subunits and to the Labour Territorial Inspectorate); 3) Creating a culture of safety at work, risk prevention, and trainings for workers in order to improve their skills to react under risk, by acting without stress and panic.

As well as in world, in Europe, mining sector of Romania is one of the most dangerous sectors with respect to occupational diseases.

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