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Problem of Safety at Work: Etiology of Work Accidents in the CDM, Lubumbashi, DRC

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Abstract: ***This article aims to examine the causes of work accidents in the company CDM / Lubumbashi, to determine whether the accidents recorded are of human or organizational origin. It was based on the statistical data of work accidents collected at the National Institute of Social Security of Lubumbashi, for the period from 2012 to 2017 and the interviews of 30 enforcement agents. The data processing was done by means of percentage and Chi Pearson's statistical test of Karl Pearson. The main results of this field study show that the CDM / Lubumbashi company recorded 176 accident cases from 2012 to 2017, 55% of which are due to human errors and 45% to working conditions, while many Accident studies indicate that human errors account for at least 90% of accidents. This shows that the company CDM / Lubumbashi the issue of safety at work is not the top priority.***

Keywords: accident, accident at work, etiology of accidents

1. Introduction

Man to live, he must work however in the exercise of his work he faces situations that undermine his physical integrity that is called accidents. Occupational accidents are a major concern in mining companies. This is why a proactive company needs an effective workplace safety policy to reduce the occurrence of work-related accidents. An accident at work, whatever the cause, is the accident that occurred on the occasion of or at the time of the employment to any employee or work for any reason whatsoever for one or more employers or managers . Catilina P and Roure-Mariotti (2002. P.693),Saari, J.-P. (1992, pp. 55-66), "shows that careful analysis of accident reports provides insights into the fundamental relationships that are essential to understanding the causes of accidents. To accurately assess the magnitude of the problem, it is essential to determine the risk factors. To this end, it is necessary to analyze the detailed information contained in each accident file to find out where the workers and operators were at the critical moment, what they were doing or handling, and with what, what bodily or material injuries were suffered and the other circumstances of the accident. The analysis of accidents according to the inquisitorial approach, developed by Pignault&Magne (2014, p.2), according to these authors, this analysis is done by asking the following questions:

- "What" or "What happened" but are very poor in "why? Or what are the reasons why the man did not play the role of "catch-up".
- The question "why? « To understand the mechanism, the answers to this question can reduce the risk of the subsequent occurrence of an identical scenario leading to the accident.
- The "what? Refers to the "apparent culprit" where it is said that the guilty man did not react as he should have done or as he was expected to do. Is not he "apparent culprit" himself a victim of situations that led him to the error? the man victim of situation thrown as culprit in the media. In the analysis of work accidents, we also find the error and the fault:

For Guarnieri, F., Cambon, J., and Boissières, I. (2008, pp.67-76), "an error is a situation where a planned sequence of actions does not reach its goals. It is a deviation from an internal reference an error is never voluntary or external (objective, model, standard, rule. . .), whereas the person did not intend to deviate from this reference, an error is never voluntary ".

Keyser, V. (1989, p.1444-1445), "the main types of errors are related to the forms of reasoning, namely:

Some errors occur in the implementation of automatisms, "reasonings-action": they are failures. (it is believed to have engaged the button and it did not engage, or we touch the switch inadvertently), slips (we typed 17236 instead of 17326), perceptual confusion (we perceived F6 instead of S6).

These errors are extremely frequent (70 to 80% of all errors), but are mostly detected and recovered quickly by the person concerned or the work group.

According to Kirsten Jørgensen (2005, p.13), "stresses that whatever the level at which it starts, the analysis takes place in several stages, it is among others:

- Identification of the place where accidents occur at the chosen general level;
- Indication of where accidents occur at a more specific level, as part of the general level;
- setting objectives according to the frequency and severity of accidents;
- Description of sources of exposure or other harmful factors, ie direct causes of material and bodily injury;
- Review of the underlying causal relationship and its evolution.

2. Industrial accidents in industry

For Reason, J. (1997, p.292), "In industries, there are two types of accidents: those that affect people and those that occur at the organizational level. In the first case, accidents are more frequent but the consequences are limited, even if they can be serious for those concerned (eg, injuries or death of a worker). In the second case, accidents are rare but their consequences can be extensive and catastrophic.

Reason J. (1998, p.303), "eminent psychologist who studies the causes of accidents, has developed a model often known as the" Swiss cheese "model. It is used extensively to explain how the trajectory of an accident before it occurs in an organization. Reason's model supports the theory that organizational accident defense requires multiple layers of overlapping and self-supporting protection. Protective layers are means of technical, organizational or personal controls, such as technical devices, physical barriers, protective equipment, system design, monitoring of regulatory bodies, rules and procedures, training or supervision ".

3. Presentation of the problematic and of the hypothesis

The information collected at the National Social Security Institute of Lubumbashi in the DRC, we report that the company CDM / Lubumbashi recorded 176 cases of work accidents during the period from 2012 to 2017.And during our descent on the company site CDM / Lubumbashi, we found the absence of the policy of safety at work which can be summed up in these terms: the absence of training in health and safety at work, lack of adequate personal protective equipment, human dignity flouted and safety at work is not a major concern for the company. These elements constitute the problem on which this article focuses. It is this perspective that we formulate our concern as follows: Are the accidents that occur within the CDM / Lubumbashi Company caused by human error or by working conditions?

Referring to the observation made on the ground, we postulate that the work accidents in the company CDM / Lubumbashi would be caused by the working conditions, given that the safety of work is not a major concern.

4. Framework of the study and methodology

This article concerns the company CDM / Lubumbashi, it focuses on the enforcement agents which is the category most affected by the work accidents listed. The purpose of this study is to find out whether work-related accidents are caused by human errors or working conditions.

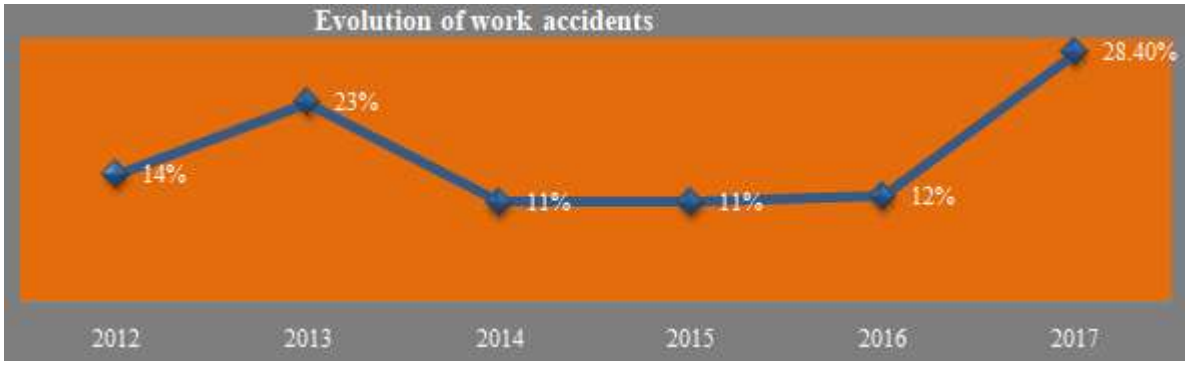
The data collection was carried out thanks to the survey method which allowed us to visit the working conditions of the agents, the interview technique allowed us to exchange with the employees and the documentary technique allowed us to consult the records of business and work accident statistics at the National Social Security Institute for the period 2012 to 2017. Data processing was done using content analysis, percentage and the Karl-Pearson chi-square statistical test.

5. Results and Discussion

The results of this research are based on the following aspects: statistics, causes of accidents at work and preventive measures at the company CDM / Lubumbashi.

5.1 Statistics Results and Causes of Accidents

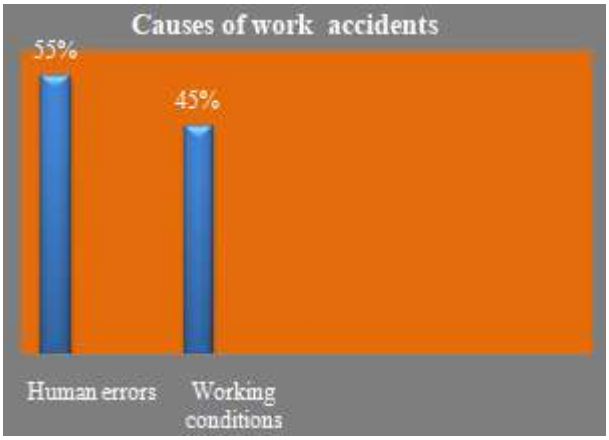
Referring to accident statistics, we wanted to see how the accident curve evolved during this five-year period. Thus the graph below gives us the annual evolution of work accidents.



This graph tells us that the CDM company recorded 25 accidents, is 14% in 2012, 40 accidents, is 23% in 2013, 20 accidents, is 11% in 2014 and 2015, 21 accidents, ie 12% in 2016 and 50 accidents, is 28%.

In light of this interpretation, we find that the curve was upward between 2012 and 2013, falling between 2013 and 2016, this could be explained by the implementation of a policy of awareness raising agents to redouble vigilance at work, and in 2017 the curve was more upward than the other years, which shows that the awareness against accidents at work has not continued for lack of an effective policy of safety at work.

After being informed of the evolution of accidents, we go to the stage of covering the causes, if they are of human and organizational origin. So the graph below gives us light when at that.



Of 176 accidents reported to the National Social Security Institute (INSS) / Lubumbashi during the period 2012 to 2017, 97 or 55% were due to human errors and 79 or 45% were caused by the conditions of job. These results highlight the inadequacy of the CDM / Lubumbashi Company in the organization of work, which does not take into account the issue of safety and working conditions that cause problems not only for employees, but also for employees. all the surrounding population. In addition, we did not find any employee training materials, to update their skills, and also occupational health and safety training, as these are the issues that are emerging in the field of workplace safety. .

5.2 Results on Occupational Risk Management at CDM

Table 1: Risk identification

Responses	Frequencies
Yes	25
No	5
Total	30

It is apparent from the table that 25 agents say they are not used to identifying the risks associated with their daily tasks; they work as if the risks and accidents did not exist. So 5 agents on the other hand say that the identification of the risks to CDM is demoted by what they speak of the risks before working.

Given the difference in the answers given by the employees, we use Karl Pearson's chi-square statistical test, the formula

$$x^2 = \sum \frac{(fo - fe)^2}{fe}$$

of which is to decide between them

After calculating the chi-square test, we find Calculated value of $X^2 = 12$ much larger than the observed value of $X^2 = 3.84$, with dl = 1 at the threshold of .05. We reject the null hypothesis. This allows us to remember that the work is done in the facilities of CDM / Lubumbashi without a prior identification of risks, which exposes employees to accidents at work.

Table 2: Risk Assessment

Responses	Frequencies
Yes	0
NO	30
Total	30

This table shows us that all the employees of CDM / Lubumbashi have stated that the risk assessment is not done, to consider the appropriate protective measures that are why there are all these accidents of work.

Table 3: Preventive measures against risks

Responses	Frequencies
Yes	9
No	21
Total	30

It follows from this table that 21 agents said that preventive measures against risks are never envisaged within the company CDM / Lubumbashi, and 9 agents said that preventive measures against risks exist. Given this difference, we resort to the calculation of Chi-square.

The calculation reveals that the calculated value of $X^2 = 3.2$ slightly less than the observed value of $X^2 = 3.84$, with the dl of 1 at the threshold of .05. We accept the null hypothesis. We note that the preventive measures against the risks exist although weak to face the accidents of work.

5.3 Discussion of results

The information gathered from employees and the finding made within the company CDM, allowed us to find that the company recorded 176 accident cases from 2012 to 2017, of which 45% were caused by human error and 55% by working conditions. Parallel to Guarnieri, F., Cambon, J., and Boissières, I. (2008, pp.67-76), who say that "an error is a situation where a planned sequence of actions does not reach its goals. . It is a deviation from an internal reference an error is never voluntary or external (objective, model, norm, rule ...), whereas the person did not intend to deviate from this reference, an error is never voluntary ". In many studies of work-related accidents, results like Heinrich's show that 90% of it is caused by human errors, contrary to the results of our investigation.

Regarding risk management in the company CDM / Lubumbashi, the results show that the work is done in the facilities of CDM / Lubumbashi without a prior identification of risks, no risk assessment and preventive measures against accidents which exposes employees to work-related accidents. (Andeol, Guillemy and Leroy, 2010, p.9). The risk assessment is based on a good knowledge of the regulations and standards with which the company must comply. Auduberteau and Gavino (2003, p.13) propose us, in particular, the following periodic verifications.

Table 4: Regulatory Periodic Audits (non-exhaustive list)

		Periodicity
Fire	Evacuation drill and equipment tests	6 months
	alarm system	6 months
Electricity	All installations	1 year
Work environment	Noise exposure measurement	3 years
	ventilation system	1 year
Lifting equipment	Handling trucks, mobile cranes on vehicles, aerial lifts	6 months
	Mechanically installed and permanent handling equipment (overhead cranes, winches, gantry cranes ...)	1 year

Source: S. Auduberteau and K. Gavino, 2003, p.13

6. Conclusion

This article focused on the etiology of work-related accidents at the CDM / Lubumbashi Company, it was based on the statistics of work accidents from 2012 to 2017, and the data collected from employees, thanks to semi-directive interview. Data processing is done using percentage and Karl Pearson's Chi-square statistical test. The results show that work accidents are caused by working conditions. And risk management is not well insured to prevent work accidents. This shows the need to put together a good policy of secure at work well structured.

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