

OCCUPATIONAL SAFETY AND HEALTH AND ITS RELATIONSHIP WITH WORKPLACE ACCIDENTS IN INFORMAL MINING – HUANCVELICA – 2020-2021

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Abstract

This paper provides an approach related to the criteria for the development and implementation of a Health and Safety Plan for informal mining, based on the needs of workers in this sector. A proposal was developed for the ongoing implementation of preventive measures and new technologies to achieve maintenance and continuous improvement of expected future standards.

Workers or collaborators are considered the most important element within the various informal mining companies. They are always the main cause of accidents caused by human error, as well as those caused by the use of facilities and the handling of deficient or poorly maintained equipment and tools. These are the most important causes of the increased incident rates among personnel in the performance of their activities.

Considering the importance of safety in any field, this study focused on the relationship between the implementation of an Occupational Health and Safety Management System (OHSMS) and the minimization of occupational accidents in informal mining. The results of this proposal were adapted to improve safety in informal mining, given that any work activity represents a risk that can lead to incidents and accidents with undesirable consequences.

Furthermore, the study aims to strengthen awareness of prevention and compliance with national occupational health and safety regulations and standards in the country, which aim to optimize working conditions and establish a safety culture that enables appropriate and appropriate development for workers.

Keywords: Accident Rate, Occupational Health and Safety, Capacity Building, and Safety Culture.

INTRODUCTION

Since the beginning of civilization, people have seen the need to work to satisfy their needs, with this arise the risks associated with these jobs and mining does not escape these risks, where if more measures are not taken to regulate them, there will be human losses or temporary or permanent incapacitation by the personnel who are dedicated to these activities. which often do not have contracts that allow them to be remunerated if there is an accident. (Gómez G., A. et. all., 2015, p. 51). One of the first civilizations in the world to have advances in occupational safety and health was Egypt, where safety implements were used to work, they also had texts where they associated uncomfortable postures at work and body deformations (Iñiguez – Torres, L. P., 2017, p. 41). Between the fifteenth and sixteenth centuries, studies were carried out on diseases related to the work activity of employees, specifically beginning with research related to mining. In different bibliographic sources in Peru, occupational health was reviewed since colonial times, however, it was from the twentieth century when it was tried to instruct on this subject, in 1957 when the First National Seminar on Occupational Health was held, where they defined the term occupational health, thus marking the beginning of the bases for the care of the worker. The acceptable operation of a company must be characterized by providing its workers with certain conditions that allow them to work safely, avoiding immediate or future damage.

Peru's mining industry is characterized by having 27 to 73 fatal accidents annually, taking into account the period 2000 to 2019, where 1,040 deaths have been counted, according to figures from the Ministry of Energy and Mines of Peru. The generality of these issues or issues originate from a lack of awareness when carrying out this work of not taking into account health and safety in their work. In 2019, there were 40 fatal workplace accidents in mines according to statistics from the Ministry of Energy and Mines of Peru. One of the areas where there have been accidents in mining was in the department of Huancavelica where due to the lack of implementation of adequate safety measures, 4 workers died in different operations (OSINERMING, 2019)

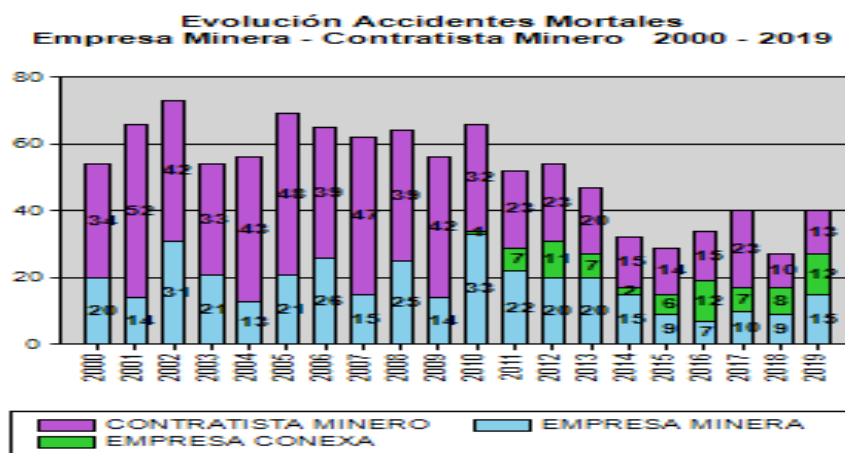


Figure 1. Evolution of fatal accidents.

Source . MEM (xls format). In original Spanish language

Currently, mining that is being carried out informally, is not considering in some cases, the damage caused to workers and it has been observed that they are not adequately trained in terms of occupational safety and health and the activities to be carried out when accidents occur. There is no constant training for personnel, as well as the necessary implements are not supplied to carry out their work safely and efficiently. Training in informal miners is necessary so that they are aware of the risks to which they are exposed in this work and create safe behaviors that minimize accidents.

Occupational health and safety is currently one of the most important facts of the activities carried out in companies or organizations of different activities or areas. The rules, legislation and/or regulation have currently been strengthened due to decisions and government actions of the country that demands that companies strictly comply with them, in this way it is avoided that a number of accidents or work incidents are caused and in cases unavoidable situations such as the death of workers.

For this reason, the study was focused on analyzing this problematic situation within companies, especially mining, centralized in informal and/or artisanal mining companies, located in the Huancavelica region, accustomed to acting without security and in any case with total impunity in which their actions are not formalized, they do not comply with the security established in their activities. The deficient culture of prevention implies that correct actions are taken in the face of inadequate working conditions, without awareness or knowledge that the work environment generates risky circumstances identified with the safety and health of workers.

The situation has been exacerbating this problem, analyzing the conditions of an appropriate design for occupational safety and health in contrast to adverse events or materialized accidents, in these conditions a proposal was reached to reform to improve the

basic and necessary conditions that covered within the matter of safety and especially in the reduction of occupational risks that occurred in the work environments that were subject to of this study.

Occupational health and safety are intended to mitigate the risks and therefore accidents that can affect people in their work area. Occupational safety and health in the department of Huancavelica has not had a previous study that relates it to the accidents that occur in informal mining, which is why it is important to establish the elements that help reduce accidents in this work.

The general question being addressed: To what extent is occupational safety and health related to occupational accidents in informal mining companies in Huaytará - Huancavelica, during the period 2020-2021? And through them there are specific questions such as:

- What are the conditions of safe conduct in informal mining companies?
- What is the level of knowledge of occupational safety and health in workers in informal mining companies?
- What is the status of OHS management plans or systems in informal mining workers? “
- What is the record of occupational accidents in informal mining companies?

The present study is justified from the theoretical point of view, which motivated the realization of this study was to provide statistical information on the importance of the good execution of safety standards that prevent accidents in informal mining and the consequences on the health of employees if the appropriate training for occupational safety and health is not provided. but also with the conceptual and theoretical analysis, it was possible to add terminology that would help to improve the approach to occupational safety and health in small-scale mining, focused on artisanal or informal, seeking its improvement.

And from the perspective of practical justification, it is essential to train personnel in the occupational safety and health of informal mining companies in the department of Huancavelica, as well as the relationship it has with occupational accidents, therefore, the need to improve the working conditions to which informal mining workers are often subjected was proposed. such as the lack of better training, which is a factor that influences the adequate performance of a worker and that are causes of increase in occupational risks in the mining sector, thus justifying in a practical way the elaboration of the following research, this proposal directly supported the management of occupational health and safety, incorporating a valuable criterion to safeguard the integrity of the people who work in the conditions from the studio.

The general objective of this study is: To determine the relationship between occupational safety and health and occupational accidents in the informal mining companies of Huaytará - Huancavelica, during the period 2020 – 2021 and its specific objectives were:

- To determine the conditions of safe conduct in informal mining companies in the Huaytará – Huancavelica region, 2020 – 2021.
- To identify the level of occupational health and safety knowledge in workers of informal mining companies in the Huaytará – Huancavelica region, 2020 – 2021.
- To establish the condition of OHS management plans or systems in informal mining workers in the Huaytará – Huancavelica region, 2020 – 2021.
- To generate a database of records of occupational accidents in informal mining companies in the Huaytará – Huancavelica region, 2020 – 2021.

Occupational Health and Safety.

According to the ILO (2011), occupational safety and health (OSH) refers to a discipline that consists of preventing illnesses and injuries related to the work they do, it also deals

with protecting and promoting the physical and mental integrity of workers. And its objective is to improve the context and working conditions. Recognizing that occupational health considers promoting and maintaining the highest degree of well-being and mental and physical health of workers in all occupations, it is with this idea, the anticipation, consideration, evaluation and control of risks or hazards that result in a workplace and that would endanger the well-being and health of collaborators and/or workers considering the essential principles of the process that prevails in risk assessment and management. In addition, the effects that can occur on nearby communities and the environment must be considered. And it should be noted that the International Labor Organization in 2011, specifies the concepts of risk and danger and how they are related, which easily creates confusion. A hazard is the intrinsic potential or property of a product, process or situation to cause damage to things and have negative effects on people's health. And on the other hand, risk is the possibility that an individual will be injured and harmed if they are exposed to a risk or hazard, or that property will be damaged as well.

It is understood that mining is a very high-risk industry in which the SG-SST, which is a staggered, logical and coherent proposal, would be an efficient tool to mitigate occupational accidents and morbidity, especially of an occupational nature. Risks and hazards to the health and safety of workers must be identified, assessed and prioritized. With regard to hazard and risk, it is more important to eliminate them than to control them, reduce them and provide appropriate PPE, including free clothing, and that provision should be made for its use and maintenance.

and Art 25° of DS – 005 – 2012 - TR).

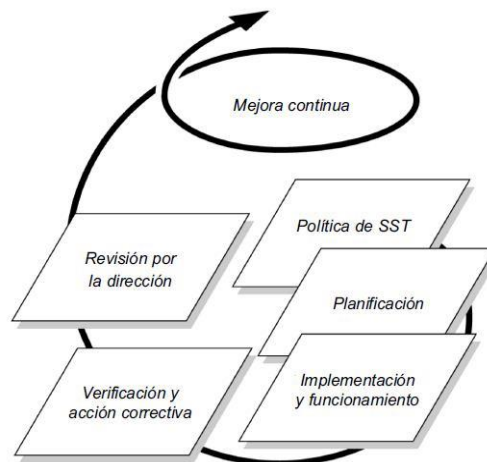


Figure 1: Back of an OHSMS. In original Spanish language

Source : <https://seguridadysalud.org/2012/08/07/la-importancia-de-los-sistemas-de-gestion-de-la-seguridad-y-salud-en-el-trabajo/>

Workplace accidents

D.S. No. 023-2017-EM, states the following: "An Occupational Accident (AT) is any event that occurs within the work environment that can cause a contusion or organic injury, functional discomfort, disability or death in the collaborator or employee". Those that occur by order of the employer and even outside their working hours are also recognized, also being outside their workplace. According to the seriousness of the facts, these are cataloged as follows:

- A. Mild, when it generates a rest with a maximum of 24 hours to the usual tasks of the position in which he works.
- B. Disabling: an event whose injury entails giving rise to rest for more than one day,

- justifying absence from work. Depending on what the disability means that it is generated in the worker, in these cases it can be: Partially temporary, Totally temporary, Partially permanent and Totally permanent. The law contemplates the protection of the worker, that he is not separated and is assigned tasks that he can perform in the recovery period temporarily or permanently, the company must have knowledge from the doctor what work he can perform.
- C. Fatal: or fatal and it is when the worker loses his life as a result of the injuries, it is important to establish the date and causes of death.

METHODOLOGY

The research work described, proposed and interpreted through a survey the influence of occupational safety and health on occupational accidents in the department of Huancavelica between 2020 and 2021. For this reason, it is a type of Applied research, where Fidias, A. (2012), establishes: Descriptive research is the identification of the conditions or characteristics of a phenomenon, fact, individual or group, in order to determine its behavior or structure. This type of research is located at an intermediate level in the depth of the study of the facts and the generation of the necessary knowledge, being a cross-sectional non-experimental research design, where Edison Damián Cabezas Mejía, Diego Andrade Naranjo, Johana Torres Santamaría (2018), establish the following as a non-experimental design: In this type of research, the variables that are studied are not manipulated with intention, and the purpose of this research is to see the behavior of anomalous events in their natural environment, in order to proceed to carry out an analysis. In this sense, non-experimental research can be: longitudinal and cross-sectional. Where cross-sectional research is defined as: Research in which data is collected at a single time, and for a single time, to then describe the variables and analyze their incidence and interrelation at a given time. This research is like an "X-ray" at a given moment of the problem that is being developed and can be: descriptive or correlation, depending on how the problem is posed.

The study was aimed at informal mining workers, located in the department of Huancavelica, located in the center-west of the country, bordered by Junín, Ayacucho, Ica and Lima. The economically active population in 2018 in Huancavelica was 273,400 people, according to information provided by the National Institute of Statistics and Information of Peru.



Figure 2: Region in which the project is located. In original Spanish language
Source: ([https://www.ecured.cu/Departamento_de_Huancavelica_\(Per%C3%BA\)](https://www.ecured.cu/Departamento_de_Huancavelica_(Per%C3%BA)))
319 workers were selected through systematic sampling.

Techniques.

For this research, documentary analysis and observation techniques were used. Fernando Martos, Jesús Bermejo and Álvaro Muñoz (2005) establish that: "Documentary analysis is defined as the process of reading, synthesis and representation of a text". According to José Cegarra (2004), observation is defined as a mental process that allows differentiating the differential characteristics of things, situations, behaviors, objects of our attention. And on the other hand, observation needs a concentration on and on what is observed, in order to be able to discern between what is important and what is incidental.

Instruments.

The instrument used for the research was a survey, which according to Vidal Díaz de Rada: is a systematic search in which information is provided and that the researcher seeks from the investigated about the information sought to obtain the data and then "collects the information individually to achieve in the analysis of the aggregated data" (Mayntz et al., 1976: 133). A discrepancy with the rest of the interview strategies or the particularities of the survey that is carried out on the interviewees in terms of the questions, in the similar order, and in similar social situations.

The survey was examined and approved as reliable by Dr. Ricardo Andrade Caldas. The reliability analysis used with the SPSS was Cronbach's *alpha*, obtaining a 0.901, which implies a very satisfactory survey.

Table 1: Reliability statistics.

Reliability Statistics	
Cronbach's Alfa	N of elements
,901	14

Source: Prepared by the author.

The Analytical-Synthetic method was used in this degree project, which, according to

Bernal, C. 2010 defines as the method that studies the facts, and starts from the decomposition of an object of study into each of its parts in order to study them individually, and then integrate each part to study them in a complete and general way.

RESULTS

The study shows that the safe behavior of workers is deficient

In a summary of a survey carried out, we have:

- 65% do not comply with the rules in general,
- A 65 percent do not participate in security talks,
- 58% do not respect safety signs,
- 59% do not use personal protective equipment,
- 73% do not concentrate on work, are distracted,
- 73% do not comply or comply with safety regulations,
- 72% do not comply with the rest spaces,
- 79% do not comply with safe travel and
- 60% consume liquor during work.

In conclusion: The facts presented allow us to appreciate that informal mining workers do not manifest safe behavior, since their responses are unfavorable.

With respect to the knowledge of safe occupational safety and health in workers of informal mining companies, the following answers are available:

- 63.32% do not understand the need for occupational health and safety measures,
- 65,525 do not understand the need for preventive occupational health and safety measures.
- 60.50% do not know about occupational health and safety standards.
- 77.12% are unaware of the permanent use of PPE.
- 76.49% are unaware of the importance of signage.
- 71.16% are unaware of the importance of lighting.
- 89.03% are unaware of the importance of safety and health at work.
- 78% are unaware of the importance of supervision in occupational health and safety management.

In conclusion The answers in the aforementioned tables allow us to appreciate that informal mining workers do not know about occupational health and safety management because their answers are unfavorable.

There are no plans or systems for managing occupational health and safety in informal mining companies

- 92.79% indicate that Occupational Health and Safety Management Plans have not been implemented.

The record of workplace accidents is high in informal mining companies.

- The information indicates that there have been 296 accidents in one year.

Occupational safety and health is related to occupational accidents in informal mining companies in the department of Huancavelica, during the period 2020 – 2021, since:

- 1°. It can be seen that informal mining workers do not manifest safe behavior.
- 2°. The lack of knowledge of occupational safety and health on the part of informal mining workers is appreciated.
- 3°. There are no occupational safety and management plans in place.
- 4°. The accident record is high.

In conclusion:

Given the proven deficiencies, it is stated that occupational health and safety management is related since it generates accidents due to unsafe behaviors, knowledge about occupational health and safety and the lack of properly implemented plans.

DISCUSSION

Theses such as Gómez Cárdenas (2019), specifies that human behavior is essential to ensure safety in any company and artisanal miners must be trained in addition to identifying their knowledge about safety and prevention; in contrast, the study allows us to appreciate that workers do not have a favorable behavior to safety talks, respect for safety signs or abide by the rules and that has an impact on the materialization of accidents in informal mining activity, in addition Oyola Gómez (2019) in a study similar to the previous one, in which the use of Standards such as OHSAS 18001:2007, ISO 14001:2015 and the use of current legal standards that contribute to the Control of Occupational Health and Safety and Environment and its results demonstrate the change positive, and it is evident that favorable results were achieved in the company, with respect to occupational safety, in the case of the study informality is not involved with safety and health, the study highlights its importance, but it is appreciated in informal workers that between 70% and 95% do not give it the importance it has, on the other hand, Velásquez Atencio (2018) in the same sense of the previous studies in which it is appreciated that an Occupational Health Safety System has not been implemented, describes non-compliance in the conduct of workers, which exposes them to risks, the study detected many serious risks, in concentration at work, non-use of work equipment, non-compliance with safety regulations, unsafe movement in their work area, ignorance of the importance of preventive occupational health and safety actions, ignorance of the importance of preventive occupational health and safety measures, ignorance of the importance of safety signage and ignorance of the importance of the identification of risk and danger at work. **In conclusion:** Therefore, the risk situation in informal mining workers is critical due to the percentages evidenced of non-compliance or ignorance, on the other hand Salazar Orihuela (2019), in his study on safety and control in informal mining in which there are several deficient factors such as: safety and control; action and investigation; location and identification, geographical scope, impact on rivers and lands and methodologies and application, the same the care of the environment and the social cost are high and deficient, likewise the production and accident factor is deficient, in summary informal mining is very deficient in its management or performance, in this regard the study is related or corroborates the fact, since the problem is the deficiencies in the management of safety and control. Callupe Baldeón (2023) in a study on SBC and reduction of occupational accidents, in which the correlation between the statistical level significant between the SBC and the reduction of occupational accidents in a mining company stands out, related to the causes of accidents and accident indicators that are also highly significant in their relationship. It has been observed for reasons stated above that workers show negligence and ignorance of various occupational health and safety situations, which become factors that can trigger adverse events, that is, they are in a very critical situation, another study by Ibáñez et al (2022) recognizes that the activity alone is already a risk for people, for this reason it is vital to adapt to the standards, include technology and generate budgets or financing to control risky or higher risk activities, the incipient use of the IPERC Matrix persists, errors in the implementation of management, the induction program, training and training, control mechanisms are required and risks are minimized, which the company has not assumed. The thesis has proven that informal mining is conventional and immediatist or reactive, it does not appreciate preventive action, they have not assumed this situation with due seriousness, there is no management plan or if it exists it is outdated, they have even less proposed an IPERC matrix and training is reduced to preventive talks, that is, there is no responsibility on the part of workers or informal companies. Rivera Acuña (2021), in his study to determine responsibility for work accidents

in a mine, informal mining is not important for the government, because it has become a focus of crime, which does not promote development, which ignores human rights and generates misery, in addition to diseases such as silicosis, since safety and health measures are not applied. less is financed and an efficient process of formalization of mining has not been implemented and the rights of the worker are not fulfilled. The study has expressed the problems that exist that are related to what has been seen below and it can be seen that there have been no actions on ergonomics at work, there is no interest in actions on hygiene at work, they do not know the importance of supervision actions, there are no management plans for safety and health at work, or they are not appropriate, they have not been implemented, nor are occupational health and safety protocols, nor are they technical aspects or included risks and hazards identified in the Management Plan, the study allows us to appreciate that informality is critical. Arenas Rodríguez (2019) in a study on the causes of workplace accidents in a mining camp, in which it is identified that workers know about PPE and personal health and safety regulations, but not about emergency plans, only half accept prevention, all have suffered at least one accident, of these, more than half have been serious, they do not consider it important to prevent diseases, most have not received any training and even less use PPE; The study proves this and relates it to almost 296 incidents or accidents that have occurred in the year, the situation was critical and the variety of risks is high and accident reporting is important, these are lives without insurance and without compensation, they are exposed to all kinds of crises. Fajardo and Cerrón (2020) that there is a high risk of contracting pneumoconiosis is high due to the time of exposure, informality is a structural problem of mining activity and is a barrier to the existence of an occupational safety and health program and it was determined that they did not receive training or guidance on preventive measures either. The study was able to verify that the occupational health and safety problem is informality and it is a very critical situation and requires urgent attention

CONCLUSIONS

- The conditions of safe conduct in informal mining companies in the Huaytará – Huancavelica region, 2020 – 2021 according to the survey, it is possible to verify that informal mining workers are deficient in that they do not comply with the rules; they do not understand the importance of safety signs, they do not consider the use of PPE, safe working conditions do not exist or are practiced.
- That workers in informal mining companies in the Huaytará – Huancavelica region, 2020 – 2021 are unaware of the basic occupational health and safety criteria and that exposes them to existing risks and accidents.
- The condition of the OHS management plans or systems in informal mining workers in the Huaytará – Huancavelica region, 2020 – 2021 is deficient since they have either not been implemented or are not appropriate, nor have management tools, safety and health protocols been implemented at work, in general terms safety planning is deficient.
- The record of occupational accidents in informal mining companies in the Huaytará – Huancavelica region, 2020 – 2021 denotes that they are high and critical since it affects workers, there have been fatal, moderate, minor accidents and incidents in up to 296 in one year, which reveals that the situation is critical.
- Given the facts, finally, it can be said that they are concomitant factors, the implementation of plans, the level of knowledge of occupational health and safety and the unsafe behaviors manifested, has an impact on the records of high accident rates. There is a relationship between both variables, which has been proven in the

analysis and presentation of the facts, both in the specific, as in general.

RECOMMENDATIONS

- Training should be considered as a fact that guarantees occupational safety and health, for the integrity of informal mining workers, in issues such as safety measures, safety protocols, safety actions, which can be replicated later for other realities.
- Update and/or improve occupational health and safety management plans or systems so that they are appropriate, in this way they would be disseminated in the form of specific infographics to control risk and reduce accidents that frequently occur, including management tools and occupational health and safety protocols.
- Keep the register of occupational accidents in informal mining companies updated, not only in the Huaytará – Huancavelica region, but throughout Peru, in order to have a justifying element to undertake preventive measures responsibly.
- Promote the formalization of informal mining and thus improve occupational health and safety conditions and guarantee the integrity of those who are dedicated to this work.
- Strategies must be generated to promote the implementation of occupational health and safety management in informal mining, raising awareness of its use in favor of the peace of mind of informal mining workers.

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