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Strategies to Enhance Compliance to Health and Safety Protocols within the South African Mining Environment

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Abstract

Occupational health focuses on promotive and preventive and curative health. The occupational health practitioners have the responsibility to guide management and employees on the occupational legislative obligations aiming to safeguard legal compliance at the workplace. Additionally, it is the responsibility of the health professionals within the mining industry to provide primary, secondary and tertiary prevention strategies to improve the health and safety of workers. However, the prevalence of work-related diseases such as noise induced hearing loss, silicosis and the occurrence of accidents in the mining industry is an alarming factor. Systematic review method was adopted to identify and screen relevant citations. This book chapter aims to review and discuss existing literature on health and safety strategies to enhance safety compliance within the South African mining industry.

Keywords: Compliance, Health and Safety, Mining, Clinic

1. Introduction

Worldwide, the mining sector is classified as the most dangerous work and customarily ranks within the top 3 occupations for related diseases and fatal accidents [1–7]. The complete health of the miners includes physical, social, and psychological, including protection from injury or any occupational disease [8]. Whereas safety is associated with the physical mining environment and interventions done to reduce exposure to risk [8]. Within the context of this review, the authors are concerned that if mining remains unsafe as occupational health practitioners how can we improve and make sure a healthy and safe workplace? Smith et al. highlighted the necessity for mining corporations to accommodate international and national safety and health laws and laws, but there's a requirement to implement preventative strategies to accommodates those standards and laws [1]. In Africa, though several African states have comprehensive laws regarding activity health and safety standards and hours of labor, systems to make sure compliance, their observance is usually weak and under-resourced in several organizations [9, 10]. According to the African Union's Mining Vision and Bocoum, a lot stays to be done to carry mining

practices. Policies, regulatory capacity, and services associated with mine health need to be massively progressed, and standardized carrier shipping models want to be set up each nationally and domestically [10, 11].

The SA mine health and safety council have introduced pointers for compliance with the Mine Health and Safety Act (29 of 1996) [12]. However, the high rate of sub-standard performance has shown that accessible rules and policies have not led to the anticipated result [13]. Governmental and trade executives, policymakers, and material scientists voiced issues and conducted various reports stating matters and the risks of an offer crisis. Positively safety rules are necessary to form a healthy and safe work atmosphere, but it's of significant importance to explore the social relations within the employment context (organization), the individual factors (beliefs, attitudes, and behavior), and also the cultural processes that contribute to non-compliance with health and safety standards within the mining trade [14]. Given these gaps, there is an obligation to identify the ways that may enhance compliance with health and safety standards. Muchiri emphasized the necessity and the duty for the occupational health and safety professionals, employers, workers, agencies, and alternative stakeholders to incessantly develop and implement multi-faceted OSH ways [9]. Within the context of this review, compliance shall refer to the proper practice of the staff and also the organization following the health and safety standards within the mining industry [14].

2. Objectives

This review aims to analyze the present state of compliance with the health and safety regulations/standards, among the South African Mining industry and to highlight the importance of the implementation of preventative strategies through the occupational health clinic. The review additionally provides insights upon that a part of health and safety legislation standards would like an improvement. in addition, this review intends to create clear links between the studies and also the activity health and safety legislation and also the conclusions, confirm any controversies, weaknesses, and gaps with the compliance in the mining industry and generate information and data on the world strategies that may be used for compliance and making property health and safety atmosphere within the mining industry. This review adds worth to existing electronic databases through the integration of analysis results.

3. Systematic literature review method

The review adopted the systematic review technique that enabled the reviewers to discover and investigate the systematic evidence of both qualitative and quantitative research, government and private documentation, and also the laws bearing on occupational health and safety compliance. The subsequent systematic steps as outlined by Cronin, et al.; Ramdhani et al. were applied to cut back literature-review errors and bias and to supply a clear, structured, and comprehensive summary of the obtainable literature (**Figure 1**) [15, 16].

Step 1: Defining the research question.

As per Hempel, Xenakis, and Danz it's important to layout the requests to be addressed in occupational safety and health systematic review to recognize the point and extent of the survey [17]. Additionally forming the inquiries can coordinate the reader on the sort of information looked still up in the review. The examination question was illustrated through the conversation with the supervisor



Figure 1.
Systematic review steps adopted from: (Ramdhani et al., Hempel, Xenakis & Danz).

and co-supervisor, meeting with the master's word related wellbeing specialists to affirm that the audit has significance to genuine difficulties. The examination question was: What is the current situation with compliance with the health and safety guidelines /principles among the SA mining exchange and what are the procedures, which will be created to affirm the compliance with the health and safety enactment/norms among the SA mining industry?

Step 2: Setting for inclusion and exclusion criteria.

Shamseer, Moher Clarke, et al. laid out that setting for incorporation and prohibition measures guarantees that the survey is led in a coordinated manner [18]. Also, it accommodates the straightforwardness of how the qualities and restrictions were surveyed. Furthermore, the conceptual model in the current study guided the researcher through the review to explore the defined study question. The PICO (population, intervention, comparison, and outcome) format was followed [19]. The conceptual model defined the population which was the mine occupational health practitioners, safety representatives, occupational health clinics, miners, the mining organizational and the mine management, interventions, in this case, was the legislation, standards, and the preventative strategies that guide the employees to comply with the health and safety.

Step 3: Conducting a literature search.

The online database literature search enclosed a mixture of South African and international government OHS legislation, policies, standards, reports from the labor departments and international labor workplace, the qualitative, quantitative, and mixed- methods scientific journal articles, conference proceedings. Seven databases are enclosed PUBMED, EBSCOHOST, SEMATIC SCHOLAR, GOOGLE SCHOLAR, domain EDU, SAFE WORK AUSTRALIA. gray literature including conference proceedings, dissertations, theses, government information, and committee reports was retrieved from searches in web OF SCIENCE, ILO, WHO. HSELINE, NIOSHTIC, and from OSH UPDATE.

The search strategy adopted Boolean operators combined sets of keywords, using AND/OR terms for the selection of articles and reports [20]. The terms from the subsequent 7 categories were accustomed to search the articles and gray literature (Prevention, Compliance, health and safety, Occupational health practitioner, standards, legislation, and mining) (**Table 1**).

Step 3: Assessing the quality of literature included in the review.

This review enclosed all the articles, reports obtained when databases were integrated, duplicate articles were removed, and extra articles provided by content specialists had been identified. Secondary sources, including textbooks and review articles or descriptions or outlines by someone aside from the first investigator, were removed [20].

Only studies that were revealed between 1994 to July 2021 within the English peer- reviewed journal, report, or websites were reviewed to identify gaps within the compliance with the health and safety within the mining industry. Moreover, abstracts solely were not enclosed. The studies enclosed were those that explored the compliance and the preventative strategies for health and safety within the mining industry. in addition, the studies, that reported on the present state of compliance with the health and safety legislation and standards, the role of occupational health clinics and practitioners in promoting health and safety within the mining industry, and also the occupational interventions/strategies to reinforce the compliance.

Step 4: Analyze, synthesize and disseminate the findings.

The studies which have been protected were clustered and prepared by using ideas, which emerged as themes. To offer enough substance to a topic, standards from at the least 3 articles had been required. Five thematic domains emerged from the literature. Six thematic domains emerged from the literature: Global laws, legislation, and standards on health and safety compliance within the mining industry; African countries mining health and safety compliance literature; health and safety compliance literature within the South African mining industry; Legislations; preventative strategies to improve the health and safety compliance within the mining industry and occupational health practitioners role in improving health and safety standards compliance.

Step 4: Analyze, synthesize and disseminate the findings.

The analysis and synthesis process is shown below **Figure 2**.

Occupational health and safety- related search terms	Mining health, medical surveillance, mining safety, occupational health, safety behavior, safety culture
Health and safety compliance search terms	Adherence, legislations, guidelines, standards, policy, preventative strategies
Occupational health search terms	Occupational health practitioners, health and safety representatives, occupational diseases, occupational injury, and accidents, safety culture
Mining health strategies related search terms	Prevention levels, occupational health interventions,

Table 1.
Search terms.

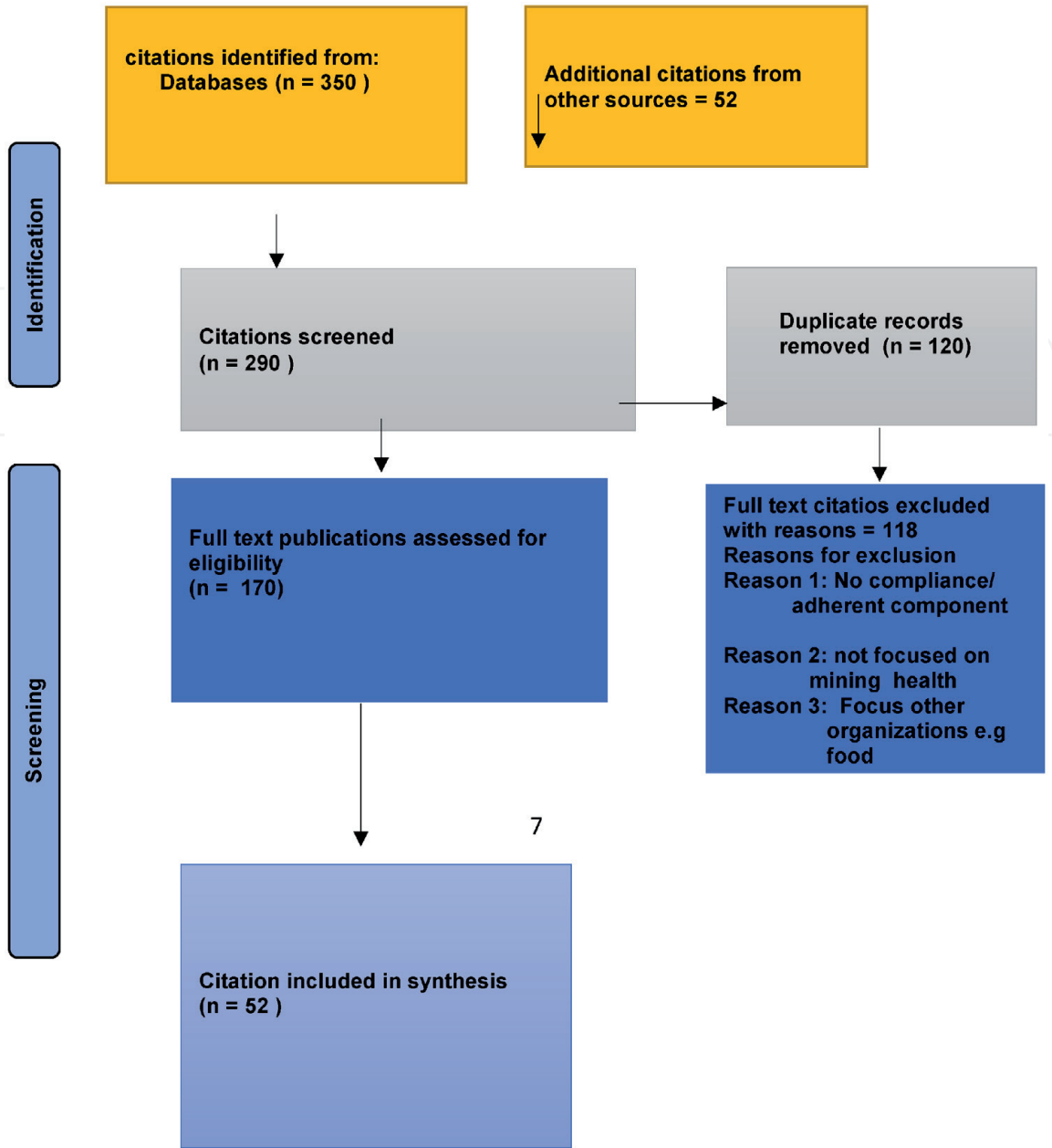


Figure 2.
A flow diagram (literature).

4. Occupational health and safety compliance in mining

Health and Safety compliance is the volume to which personnel adheres to health and safety standards, techniques, jail responsibilities, and wishes. It's furthermore accomplice diploma absence of injuries and incidents within the geographic component [21]. The majority of mine fitness and safety government international agree that the fundamental causes of mine accidents and fatalities are dangerous conditions, terrible control, and mainly non-compliance with the health and protection standards [22]. Furthermore, Vassem, Fortunato, Bastos, and Balassiano documented that the excessive incidence charge of accidents inside the mining enterprise calls for the information of interpersonal family members within the employment context (corporation), the individual factors (beliefs, attitudes, and behavior) that contribute to non-compliance with health and safety standards within the mining industry [23]. On the opposite hand the venture with the implementation of occupational legislation and requirements is that miners understanding of occupational regulation is confined and adherence is as a result impaired [24]. Therefore, to

make certain compliance with fitness and safety requirements occupational fitness occupational health practioners have a duty to increase cognizance of health risks that impact the people' health and safety, as well as the measures which can mitigate the dangers [25].

The SA mining industry is under the spotlight with an increase in accidents and fatalities. In 2019 SA reported a total of 2406 injuries and 51 deaths in the mining industry [26]. This are a serious concern considering that In 2016, the chamber of mines signed a declaration of actions pledge as a change to improve the mining industry occupational health and safety to zero harm by 2024, aiming to generate a culture change in an industry that will transform the behavior of people at all levels [27].

5. Global laws, legislation, and standards on health and safety compliance within the mining industry

Occupational health and safety standards plays important role in guiding all the miners on health and safety-related issues focusing more on prevention. However though there are available standards, the occurrence of injuries and occupational diseases remains to be a challenge worldwide. The literature revealed that globally in every 15 seconds a miner dies [28, 29]. World Health Organization (WHO)outlined occupational health and safety as 'the advancement and maintenance of the most significant level of physical, mental and social health of miners in all occupations by preventing health risks and controlling danger and the adaption of work to miners and their positions [30]. Furthermore, it is of utmost importance to note that a safe and healthy working environment influences the quality of life at the individual level to substantial impacts on public health at the societal level [30].

Globally, the health and safety of the miners have raised serious concerns. In the United States (US) the former chief executive director of the upper big branch coal mine was sentenced to a year in prison for the death of 38 miners who were killed after a coal explosion [31]. He was convicted for a workplace safety violation by putting profits of the company ahead of the safety of miners and creating a culture of non-compliance within the organization [31]. Dragan, Georges, and Mustafa's study in Canada indicated that cultural factors within the organization especially from the management focusing on performance and efficiency and neglecting safety plays a key role in creating conditions for triggering major accidents [32]. More particularly from the administration with more emphasis on the execution and productivity and dismissing the safety and wellbeing of miners.

Different countries have laws and regulations in place at the workplace aiming to protect the health and safety of individuals in their occupations. Occupational health and safety laws across nations share many similarities highlighting that the health and safety of employees must be secured through the assessment, analysis, adjustment and reducing the risks and hazards for illness and injury at the workplace [33, 34]. Occupational health and safety compliance shapes the required or desirable behavior in the workplace. Furthermore, compliance is linked to the safety culture or climate in the organization, which is believed to shape employee behavior through expectations [35].

Statute law may uphold extra obligations, start explicit obligations, and structure government bodies with the power to direct work environment wellbeing and medical problems. As set by Spada and Burgherr; Mabika, reinforcing the wellbeing controller is required, upheld by the authoritative approaches [36, 37]. Such drives can save the existence of mine accidents and occupational diseases in both developed and undeveloped countries [37]. United Kingdom (UK) is one of the created

nations with a fruitful record of wellbeing and safety practices in the mine. As indicated by Uyanusta Kucuk and Ilgaz, wellbeing and safety laws in the UK have been in existence for more than 200 years [38]. Moreover, the laws came because of political reactions to social issues emerging from the unsettling influences of the industrial revolution [38]. Among other enactments, the mines and safety act 1954 was the broadest safety enactment in the UK. The demonstration set down legal obligations on mine chiefs and offered.

6. African countries mining health and safety compliance literature

A triangulation study led by Kheni and Braimah; Mustapha, Aigbavboa, and Thwala conducted in Ghana looking at the institutional and lawful conditions identifying with health and safety management referred to helpless coordination of activities related to health and safety standards, absence and unwanted degree of consistency with significant H&S enactment as the serious issues [39, 40].

The greater part of the African nations is known for deprived safety and health practices [41, 42]. Takala and Saarela featured that low-pay nations in Africa and Asia have recorded raised paces of injuries and fatalities contrasted with created nations, for example, Europe and America [43]. Besides, it has been assessed that 54000 fatality related to occupational accidents happen in Sub-saharan Africa yearly contrasted with 16000 fatalities in Europe and America. Boniface, Maseru, Munthali and Lett study results on Occupational injuries and fatalities in Tanzania highlighted the requirement for improving health and safety principles systems in the mines [44].

7. Health and safety compliance literature within the South African mining industry

The South African mining industry does not have a good reputation for health and safety due to recurrent accidents and fatalities. One of the largest mining companies in SA with a major interest in both platinum and gold mining (Sibanye) outlined that one of the causes of fatalities was non-compliance by miners and management as people try to take shortcuts [45]. On the contrary, the union representatives within the mining industry blame the high pressure to reach production targets means that miners remain in unsafe working conditions and environment [39].

The South African mining Act, 1996 (Act 29 of 1996) was endorsed to improve health and safety performance and great emphasis was placed on adherence to mine standards [46]. Furthermore, different types of legislation were passed to assist in the transformation and “improvement of the safety standards in the mining sector, among others, the Skills Development Act of 1998 (SDA), Broad-Based Black Economic Empowerment Act, 2013 (BBEEA), (Minerals Petroleum Resources and Development Amendment Bill 2013 (MPRDAB), Compensation for Occupational Injuries and Diseases Act, 1997 (COIDA), Occupational Diseases in Mines and Works Amendment Act, 2002 (ODMWAA), Labour Relations Act, 1996 (LRA), Basic Conditions of Employment Act of 1997, Mining Charter 2010, and the Constitution of the Republic of South Africa, 1996”.

The Society for Mining, Metallurgy and Exploration (SME) Mining Engineering Handbook, expresses that all mining tasks are needed to adhere to local, provincial, and governmental guidelines that indicate mine health and safety guidelines and norms, environmental protection, and work relations. The nature, degree, and toughness of these guidelines, at last, administer the mining activity [45].

Lack of emphasis on the promotion of health of mine-workers made the Commission to endorse to improve the state of the safety standards in the mining sector, among others, the enactment of a new Mine Health and Safety Act 29 of 1996 (hereinafter referred to as MHSA), which started operating from January 1997.¹⁴⁰ The Act (MHSA) has established a council known as Mine Health and Safety Council (MHSC), that contemplates the status of health and safety in the mining sector, recommends policy and legislation, commissions' research, and offers suitable advice to the Minister of Mineral Resources.

The Department of mineral resources and energy South Africa is responsible to promote and regulate the minerals and mining sector in SA. Furthermore, the Department also has the responsibility to ensure that all the mining companies in SA follow and comply with the health and safety legislation. They also have an obligatory role to take action when the mining companies do not implement and comply with the regulations. Laws and standards. The mineral resource department can close/terminate the mining activities or take the mining companies to the Court of Justice if they fail to comply. The following regulations guide all the mines in SA on health and safety.

8. Mine health and safety act (MHSA, act no 29 of 1996)

The MHSA regulates the mining sector focusing on the health requirements in the mining industry.

8.1 Objectives of the act

The goals of this act are to accommodate the wellbeing of the workers and different people at mines: support consistent with the standards of health and safety; take into account the execution of health and safety measures; accommodate suitable frameworks of the employee, employer, and state participation in health and safety matters; build up delegate three-sided organizations to audit enactment, advance wellbeing and upgrade appropriately designated research; accommodate compelling observing frameworks and assessments, to guarantee that there are examinations and requests to further develop health and safety; advance preparing and HR improvement; manage businesses' and workers' obligations to recognize hazards and prevent, control and limit the danger to health and safety; settle in the option to decline to work in hazardous conditions, and to offer impact to the public worldwide law commitments of the Republic identifying with mining health and safety [12].

8.2 The role of the occupational medical practitioner (OMP) in ensuring the health and safety of employees in the mine

Section 13 of MHSA outlines the legal requirement for all the mining organizations in SA to have an OMP either on a full-time or part-time basis. The OMP has legal duties and ethical duties when ensuring the overall health of the miners [12, 28, 46]. They play a major role in preventative medicine, determining the fitness and ensuring that every person in the mine (both the employer and the miners undergo medical surveillance. Medical surveillance is a scheduled program that includes medical examinations, conducting different tests depending on the job that the miner applied for such tests includes audiometry, spirometry, and vision screening. The purpose of medical surveillance is to ensure that all the miners are fit to perform their duties without endangering their health and

safety. Medical problems that may arise due to workplace exposure are also identified [12, 28]. The occupational medical practitioner must ensure that the medical surveillance must be suitable and be planned in such a way that it affords the miners to gain knowledge that can be used to the information that employees can use to eradicate, govern and reduce risks and hazards related to health and safety [28, 46]. This is achieved through continuous health education providing information to the miners related to their medical results e.g. education related to audiometric test results on hearing loss. Medical surveillance includes the following types of medical examinations:

- Pre-placement/baseline medical examination

It is a legal requirement for all mining organizations to conduct a pre-placement examination to be done before the miner can be appointed and placed in a job. The examination assists in the assessment of the miner's suitability for the position applied and also the work environment that will be exposed to. More importantly pre-employment is also done to ensure the safety of the miners and others ensuring that the new employee does not pose risk [28].

- Periodic medical examination

This examination is done every year or six months depending on the risk that the miner is exposed to. The examination is also done if the exposure risk increases or there is deterioration noted in the test results, when the miner is transferred from one department to another, after being involved in a serious injury or sickness [28].

- Exit medical examination

This examination is performed before the miners leave their current employment. It is a legal requirement for the miners to produce their exit fitness certificate to their new employer. The exit medical examination safeguards the organization against future medical claims. The records are kept for 40 years [28].

9. The occupational health and safety act (OHS act No 85 of 1993) as amended by the occupational health and safety amendment Act (OHS act NO 181 of 1993)

9.1 Objective of the act

The target of the demonstration is to accommodate the wellbeing and safety of miners at work, particularly regarding the utilization of apparatus (South Africa, 1993). Moreover, the Act accommodates the safety of miners against dangers to wellbeing and safety emerging from or regarding the exercises of people at work. This act recognized settled an advisory council on occupational and safety [47]. The overall obligations of the business and the miners in the work environment are likewise specified [47].

9.2 The role of health and safety representatives in ensuring compliance

All the mines must appoint a health and safety team including health and safety representatives where there are 20 or more employees. Whereas if the mine has 100 or more miners the health and safety committee should be established. The health

and safety representatives have the following major roles to play in ensuring the safety of the miners:

- Review health and safety measures whether they are effective or not
- Identifying possible hazards and the occurrence of incidents
- They represent all the miners concerning health and safety and investigates all the complaints related to the safety of miners.
- They do workplace inspections to identify potential health and safety risks
- They participate in the inspection of the mine by the inspectors and provide safety- related information when needed.
- They form part of the health and safety committee and participate in the internal health and safety audit.
- They also investigate health and safety accidents [28, 47].

9.3 Occupational health practitioner role in health and safety standards compliance

According to the Mine Health and Act (29 of 1996), all organizations must employ a practitioner who is in the position of qualification in occupational medicine recognized by the Interim National Medical and Dental Council of South Africa or the South African Interim Nursing Council [12]. The occupational health practitioners are the largest single group of the multidisciplinary health care team at the workplace. Therefore, OHN is the frontline in protecting and promoting the health of the working population.

The occupational health practitioner is gifted in injury or diseases preventative skills and interventions. The OHP might recognize the requirement for, survey, and plan mediations to, alter working conditions, frameworks of work, or change working practices to decrease the danger of exposure to hazards [48]. Moreover, OHP experts are skilled in thinking about factors, like human conduct and habits about real working practices. They additionally team up in the origination, and rectification of work factors, decision, and quality of protective equipment, protection of miners from injury and illnesses, just as giving guidance in issues concerning the assurance of the climate [28, 48]. The OHP close relationship with the workers, and involvement with the management, they are in a decent situation to distinguish early changes in unsafe working practices, recognize miners challenges over health and safety, and present these to management in an independent objective manner can be the catalyst for changes in the workplace that lead to primary prevention by present these to the executives in a free target way can be the motivation for changes in the work environment that lead to essential counteraction [48].

The occupational health professionals inform on a wide reach concerning medical problems, and especially on their relationship to working capacity, wellbeing, and safety at work or where alterations to the work or workspace can be made to assess the changing wellbeing status of representatives [28]. In many regards, organizations are not exclusively worried about just those conditions that are straightforwardly brought about by work however, they need occupational health professionals to assist with attending to any wellbeing related issues that might emerge that may impact the miner's participation or execution at work, and

numerous representatives like this degree of help being given to them at the work environment since it is so advantageous for them [43]. Specifically, the improvement of medical care administrations for miners at the workplace. With regards to this survey, the OHP plays a significant part in guaranteeing the health and safety of the miners through primary, secondary, and tertiary avoidance [49].

10. Preventative strategies

Different scholars have acknowledged that there is a gap in the literature on the management of compliance with the health and safety strategy. Moreover, scholars have also raised a concern that the impact of legal non-compliance is even more scarce in the literature [49, 50]. Previous research done by Tibane and Niemand on challenges experienced by employees relating to safety compliance emphasized the importance of the development of strategies to reduce safety threats caused by poor compliance as a result of unsafe acts [51]. The question is that if they are safety regulations available and miners are aware of the dangers, what is the rationale behind poor compliance with the health and safety standards [52, 53].

The strategies are aimed at can be named preventive and treatment mediations. Precaution mediations are typically presented to every one of the excavators helping them to take on well-being conduct and sound way of life unconstrained and without incidental effects fuming them to search for help. On the other hand, Bagherpour et al. argue that preventive strategies need to be applied before the incidents, but preparative adjustments must be implemented both before and after the occurrence [6]. Preventive interventions, accordingly, are named as a primary, secondary, or tertiary counteraction.

Preventative strategies are normally offered to all the miners assisting them to adopt a safe behavior and healthy lifestyle spontaneous and without side effects seething them to look for help. More importantly, the literature revealed that compliance with health and safety law involves the development and implementation of an effective health and safety preventative system and building a positive health and safety culture at work [54]. Preventive mediations, thusly, are named as primary, secondary, or tertiary prevention [55].

10.1 Primary preventive strategies

In occupational health primary, preventative strategies are aimed at eradicating risks and exposures at the workplace before they occur. This level of prevention is important because the effect has not yet occurred yet the extent of the risk is visible [56]. In the occupational health clinic, primary prevention focuses on health promotion and protection within the context of a safe and healthy work environment [21]. This is achieved through continuous health education, conducting medical surveillance, and monitoring of chronic diseases thereby enhancing employees' morale and maintaining optimal health. However, in the mining sector, the following health promotion programs are essential to promote good health and to prevent occurrences of accidents and diseases, this may include such elements as continuous health education on health and safety-related topics such as noise-induced hearing loss, chronic disease monitoring, and management, accident prevention, the importance of personal protective equipment's, medical surveillance to identify and prevent the occurrences of health-related illnesses that might be caused by the work environment. Part of primary prevention is the assessment of health risks, this is achieved through continuous inspection by the occupational health practitioners and the safety team to identify and observe the work environment and working

practices that might put the miner's health at risk [21, 47]. More importantly, the health promotion activities have the potential to change the miner's health practices such as choice of a healthy diet, exercising more frequently to prevent occurrences of chronic diseases. Additionally, the primary prevention activities have the potential to reduce the incidence of injuries and accidents because miners will be having more knowledge on health-related risks that might endanger their lives.

The implementation of an educational and training programme in the mine with a specific focus on creating a culture of safety among miners and more focus on safe working conditions can therefore help overcome the challenges of non-compliance [55, 56]. Moreover, since the mining environment is considered hazardous, all the mining organization needs to conduct medical surveillance as a primary preventative strategy as stipulated by Mine Health and Safety Act (29 of 1996) [12]. The medical surveillance is done before employment, annually or bi-annually and when the miner leaves the company, this is done according to the exposure levels in a different occupation and remedial actions are initiated based on the fitness status [28].

10.2 Secondary prevention

In secondary prevention, the main aim of occupational health is to diminish the impact of sickness or injury that has effectively occurred [47]. Additionally, this level of prevention put more emphasis on reinforcement and decreasing the reaction to the occupational disease or illness caused by the mining environment, thereby intensifying resistance through the provision of treatment [55]. This is achieved by distinguishing and regarding illness or injury at the earliest opportunity to end or slow its progression, encouraging safety strategies to prevent re-injury or recurrence, and implementing programs to return people to their original health and function to prevent long-term problems [56]. The secondary interventions include a regular medical examination and screening tests such as audiometry, spirometry, and vision screening. During the screening process, once the deterioration is identified further interventions such as referral to the specialist and recommendations for the removal of a miner to the occupation which will not have a further effect on the identified problem are done. The chronic disease management programme also forms part of the primary prevention strategy by constantly monitoring compliance through blood pressure and blood glucose monitoring to ensure compliance. Moreover, secondary prevention also included the advocacy to place a miner in a suitably modified work so injured or ill workers can return safely to their jobs [56].

10.3 Tertiary prevention

In occupational health, tertiary anticipation intends to diminish the effect of a continuous sickness or injury that has enduring impacts. This is finished by assisting individuals with overseeing long-haul, frequently complex medical issues and injury (for example ongoing sicknesses, long-lasting impedances) to work on however much as could reasonably be expected their capacity to work, their satisfaction, and their future [56]. Secondary prevention activities in the mining environment include a Hearing conservation program to support and rehabilitate those who have already lost their hearing due to noise exposure. These activities include modification of personal protective equipment, job placement to a less noisy area zone. The miners are also referred to a different specialists such as the audiologist, occupational speech therapy for rehabilitation purposes. This assists the miners to adapt to new jobs and also in their changed health status so that they can cope.

11. Conclusion

The results of this review revealed that there are limited studies addressing the interventions to improve safety compliance. Furthermore in South Africa though there are several legislations to guide in safety and health compliance is still documented as poor with more focus on production. This review also demonstrated that combination of primary, secondary, and tertiary mediations is fundamental to accomplish a significant level of prevention and adherence in mining safety. The role of the OSH professional within the mining organization focusing more on addressing the challenges of none adherence requires further attention. None of the studies identified in the present review focused on the role of the OSH professional in ensuring compliance with the health and safety standards. Occupational health and safety is a human right issue that has got to be given legal, social, and ethical concerns. In SA there's a requirement for the SA mining business to make an OHS culture that's strong enough to manage most of OHS problems at each the national and sector levels.

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