Evaluation of Occupational Health and Safety Implementation Protocols of the Mining and Petroleum Industries in Ghana

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DOI: https://doi.org/10.51244/IJRSI.2025.1215PH000172

Received: 04 October 2025; Accepted: 10 October 2025; Published: 07 November 2025

ABSTRACT

Occupational Health and Safety (OHS) is still a priority in extractive industries, as hazardous conditions are a threat both to workers' well-being and productivity. The research took into account the implementation of OHS procedures in the petroleum and mining sectors in Ghana, with specific reference to awareness, infrastructure in place, level of application, and limitation. The study was a cross-sectional study in a sample size of 286 respondents, comprising 143 petroleum workers and 143 mining workers. Descriptive statistics and chi-square tests were employed in data analysis on OHS awareness, training, and application infrastructure relationships.

Results indicated satisfactory awareness levels in both industries, with 88.1% in mining and 79.7% in petroleum acknowledging knowledge of policies of that sort. However, fewer among the respondents verified availability in written form (57.3% in mining; 53.1% in petroleum). Frequency in receiving training was strongly associated with levels of awareness ($\chi^2 = 18.439$, $p < 0.001$), with a frequency once a year being most dominant in both industries. The frequency in having OHS committees was also significantly different across industries ($\chi^2 = 12.725$, $p = 0.002$), with mining reporting a higher presence. Despite that, communication gaps, policy adequacy, and support by the management still existed, limiting effective implementation.

The study finds that OHS knowledge is widespread, yet systemic weaknesses in the form of poor training, weak managerial commitment, and poor resourcing forestall effective implementation. Enhancing the frequency of training, communication of policy, managerial accountability, and regulatory enforcement are crucial in promoting workplace safety. This study makes a contribution by presenting empirical evidence on OHS implementation in the extractive sectors in Ghana and points out industry-wide reforms as essential.

Keywords: Occupational Health and Safety, mining, petroleum

INTRODUCTION

Background of Study

In today's competitive corporate environment, business entities constantly have to deal with the increasingly evolving demands of accelerating product development and technological changes, staying ahead of the competition with rival businesses, deregulation and demographic changes in target markets, and the obvious need to survive by implementing policies and programs to cope with the ever-changing work environment (Cole, 2014). The issue of a safe and conducive workplace environment has recently gained prominence because labor experts believe that occupational health and safety measures are necessary to continue industrial production (Bentil, 2018).

The mining and petroleum industries are some of the most hazardous places to work in, where workers are often exposed to various physical, chemical, mechanical, biological, and psychosocial hazards (Aram et al., 2021). Ghana started producing oil in commercial quantities in 2009 under the Mills regime. Since then, the country has grown to become one of the significant oil producers in the continent, with the influx of heavy investments from several multinational oil and gas companies in the exploration and downstream petroleum sectors (Ablo, 2017). In the mining sector, the country since the pre-colonial era has been known to be a haven

of mineral resources. According to Owiredu (2018), Ghana has become a popular destination for mineral investment; with the legitimate mining industry accounting for more than 49% of the country's gross foreign exchange earnings.

Mining and oil exploration activities present the country with not only economic opportunities but also significant challenges, particularly in the area of occupational health and safety (OHS) for employees working in these industries. The significance of healthy workplaces is recognized worldwide as a broad concept influencing the quality of life of workers, and to a large extent, can have implications for public health (Helliwell & Putnam, 2018). Occupational health and safety (OSH) is a multidisciplinary concept focused on ensuring the promotion of health and safety among employees through the implementation of policies and protocols that minimize risks of injuries or accidents at the workplace (Bhagawati, 2015). It encompasses the worker's mental, emotional, and physical well-being concerning the conduct of his work and, as a result, is a critical topic of interest that has a positive impact on the achievement of organizational goals (Amponsah-Tawiah & Dartey-Baah, 2011). Data available show startlingly high rates of work-related deaths and injuries in both developed and developing countries. The (International Labour Organization (2021) estimates that 2.3 million people die each year owing to work-related accidents or illness, and 350,000 of these deaths are attributable to occupational accidents. Furthermore, there 264 million non-fatal accidents occur each year resulting in work-related illnesses and approximately 3 days of absence from work (ILO, 2017).

The mining and petroleum industries contribute significantly to the Ghanaian economy. The mining industry contributes about 16% of the country's GDP and employs a large number of people, whereas the petroleum industry is relatively new but has significant growth potential (Aram et al., 2021). However, these industries are inherently dangerous, and workers face a variety of hazards that can result in injuries, illnesses, or death.

Several studies have highlighted the importance of OHS protocols in Ghana's mining and petroleum industries. For example, Stemn (2019) found that mining accidents and injuries were a major cause of work-related fatalities in Ghana. The study revealed that between 2010 and 2016, about 34% of all fatal occupational accidents occurred in the mining sector. Similarly, Opoku et al., (2020) discovered that workers in the mining and petroleum industry were subjected to a variety of hazards, including toxic chemicals, fires, and explosions, with injury rates among mine workers reported to be higher than other major mining countries, such as Australia and the USA. The research bemoaned the poor state of occupational safety management practices in sites surveyed due to a lack of awareness and inadequate implementation of safety protocols but failed to provide a detailed comparison of the safety performance of Ghana's mining and oil industry with those of other countries.

These studies emphasize the critical need for companies in the mineral and petroleum resources exploration space to continuously develop and implement OHS protocols to ensure the safety and health of workers in the mining and petroleum industries in Ghana. The implementation of these protocols requires a concerted effort by industry stakeholders, including the government, employers, workers, and regulatory agencies.

In recent years, there have been notable efforts by various organizations to promote OHS in the mining and petroleum industries in Ghana. The International Labour Organization (ILO) has been involved in several initiatives aimed at improving OHS in these industries. The organization has collaborated with the government of Ghana and other stakeholders to develop OHS policies and guidelines for the mining and petroleum industries (ILO, 2017). The ILO has also provided technical support to the Ghanaian government in the development of a National Occupational Safety and Health Policy (ILO, 2015).

The Ghana Chamber of Mines, an industry association for mining companies in Ghana, has also been involved in promoting OHS in the mining industry. The chamber has developed a code of conduct for its members, which includes provisions for OHS management (Ghana Chamber of Mines, 2014). The chamber also organizes annual safety awards to recognize mining companies that have demonstrated exceptional commitment to OHS.

The petroleum industry in Ghana is regulated by the Petroleum Commission, which is responsible for ensuring that OHS protocols are implemented by industry players. The commission has developed regulations that

require petroleum companies to have OHS policies and procedures in place (Petroleum Commission, 2015). The commission also conducts regular inspections of petroleum facilities to ensure compliance with OHS regulations.

Despite the many efforts to promote OHS, accidents and work-related injuries are a daily occurrence in these highly hazardous industries. Numerous studies have been carried out on this subject but much of the research has concentrated on assessing the relationship between mine workers' perception of adequate organizational commitment to occupational health and safety management and work output (Amponsah-Tawiah & Mensah, 2016), the impact of physical well-being on the affective commitment of employees (Liu et al., 2020), and the mediating role of safety knowledge in the relationship between Occupational Health and Safety Management Frameworks (OHSMF) and workplace accidents and injuries among workers in oil and gas industries (Liu et al., 2020). This study aims to evaluate the implementation of OHS protocols in the mining and petroleum industries in Ghana. The study will use a mixed-methods approach, including surveys and interviews with industry stakeholders, to assess the effectiveness of OHS protocols in these industries.

Statement of the Problem

Despite the establishment of occupational health and safety (OHS) protocols across Ghana's mining and petroleum industries, the actual implementation and understanding of these guidelines remain critically inadequate. Workers in these sectors frequently lack sufficient awareness and comprehension of the very standards designed to protect them. According to Liu et al. (2020), the absence of adequate safety knowledge among employees serves as a key mediating factor between safety policy frameworks and accident prevalence. This disconnect between policy existence and employee awareness has contributed to the persistence of workplace injuries, illnesses, and fatalities, indicating that OHS systems in these industries are not achieving their intended protective outcomes.

Moreover, the implementation of OHS protocols is often ineffective due to several systemic and human factors challenges. For instance, Ablo (2017) highlighted how the lack of robust enterprise development and local content integration often results in compromised safety standards, especially in rapidly evolving petroleum environments. In the mining sector, regulatory enforcement is sometimes weak, leading to significant gaps in adherence to safety measures. These failures not only endanger worker lives but also reduce productivity and impose financial and reputational costs on companies and the nation.

In both sectors, there are overlapping safety challenges such as insufficient training, poor hazard communication, and inadequate use of personal protective equipment (PPE). Yet, these commonalities are rarely explored in a comparative manner, leaving potential policy synergies untapped. Additionally, the differences in how OHS protocols are operationalized in mining versus oil and gas extraction sites are not well understood, further complicating the work of oversight bodies such as the Minerals Commission and the Petroleum Commission. This lack of clarity weakens regulatory harmonization, data sharing, and coordinated response to occupational hazards.

Ultimately, the problem is not simply the presence or absence of protocols but the ineffective translation of these frameworks into practice, a challenge compounded by organizational, cultural, and institutional inertia. If left unaddressed, these gaps may continue to undermine worker safety, frustrate regulatory efforts, and erode confidence in Ghana's resource-based sectors. Therefore, a detailed investigation into the awareness, implementation effectiveness, shared safety issues, and comparative execution of OHS protocols in the mining and petroleum sectors is urgently required to guide evidence-based reforms.

Objectives of the study

The aim of the study is to evaluate the effectiveness of the implementation of occupational health and safety protocols in selected companies in the mining and petroleum sectors.

To achieve this, the research seeks to address the following specific objectives:

I. To assess the level of awareness and understanding of OHS protocols among workers in the mining and petroleum industries in Ghana.

II. To evaluate the effectiveness of OHS protocols in reducing the incidence of work-related injuries, illnesses, and fatalities in the mining and petroleum industries in Ghana.

III. To identify OHS issues that are common to both the mining and petroleum industries in Ghana

IV. To do a comparative evaluation of OHS implementation in the Oil and Mining Industry.

Research Questions

The following questions are framed to guide the study;

I. What is the level of awareness and understanding of OHS protocols among workers in the mining and petroleum industries in Ghana?

II. What are the OHS protocols currently operational in companies in mining and petroleum companies in Ghana?

III. To what extent have OHS protocols been effective in reducing the incidence of work-related injuries, illnesses, and fatalities in the mining and petroleum industries in Ghana?

IV. What are the key challenges and barriers to the implementation of OHS protocols in the mining and petroleum industries?

Significance of the study

The study will contribute to enhancing workers' safety in these industries by identifying any major challenges and barriers to the smooth implementation of OHS protocols in the mining and petroleum industries that will be surveyed. The study's findings will be shared with Labour Commission and other relevant stakeholders to inform policy and practice by suggesting strategies for overcoming these barriers and promoting the effective implementation of OHS protocols. It is hoped that the research will provide guidance to employers and regulatory agencies on the most effective approaches to ensuring worker safety and health in these industries.

Finally, the study will contribute to the existing body of knowledge on OHS in the mining and petroleum industries in Ghana. The study findings will fill the gaps identified in previous research and inform future research which may lead and to the development of effective policies and practices that promote worker safety and health in these industries.

Chapter Organization

This thesis is structured into six chapters. Chapter one covers the background of the study, the problem statement, the study's objectives and research questions, significance/rationale for the study, and the scope of the research. Chapter two extensively covers the literature review, focusing on theoretical review as well as empirical studies related to the specific research objectives. Chapter three provides methodological approaches used to carry out the study. Chapter Four presents the results as obtained from a thorough analysis of the data, while Chapter five provides in-depth discussions and interpretations of the results. Lastly, Chapter six concludes the thesis with conclusions and recommendations derived from the analysis and discussions.

LITERATURE REVIEW

Occupational Health and Safety (OHS) is a vital component of industrial operations, particularly within high-risk sectors such as mining and petroleum. In Ghana, these sectors contribute significantly to economic development but are often marred by occupational hazards, accidents, and health challenges due to limited enforcement of OHS protocols. This chapter synthesizes relevant literature to evaluate OHS implementation in Ghana's mining and petroleum sectors, highlighting global and local perspectives, theoretical frameworks, safety culture, legal frameworks, and challenges to effective implementation.

According to Shinde & Anjum (2007), the literature review is conducted to explore what is already known about a subject matter of interest, synthesize findings from published related works, and identify any knowledge gaps that a proposed research seeks to bridge. A review of empirical literature also helps to determine how the research can contribute to furthering the understanding of a phenomenon while also assisting in the development of hypotheses and framing the research question (Gentles et al., 2015). Thus, findings of related publications on the subject are examined critically, analyzed, and summarized, and gaps are identified based on study design, sample size, generalization, and context of the study. To retrieve literature relevant to the research topic, the Boolean method was used to search scientific databases such as Scopus, Medline, Biomed Central, PubMed, Wiley-online library, AJOL, and EBSCOhost using keywords such as "occupational safety", "oil and gas industry", and "Ghana".

The articles were scanned and evaluated before selection for the review. The literature was reviewed based on the study's objectives. The criteria used for selection included date of publication, evidence, reference, and whether it was reviewed. For the empirical studies, recent articles published from 2018 upwards were mostly selected. However, in areas with limited literature, some articles published over ten years were reviewed. The review begins by developing a theoretical framework that provides a conceptual grounding and linkage for the main concepts of the study, followed by a review of related literature organized into subsections in line with the specific objectives of the study.

Theoretical Model Underpinning the Investigation

Three main theories were considered applicable to this study. These include the risk theory/defense-in-depth theory, the accident model grounded in systems theory, and the actively caring model. These theories were chosen due to their applicability and relevance within the field of occupational health and safety.

The risk/defense-in-depth theory

The first theoretical model is the risk/defense theory. According to Reason (2010), risk defense in the organizational work setting passes through various layers of defense, barriers, and safeguards. Reason argues that adopting a defense-in-depth approach acknowledges the fallibility of all systems and suggests that by aligning multiple layers of defense, organizations can intercept, slow down, or eliminate risks before they fail.

Similarly, human risk factors exhibit a comparable trajectory, encompassing both active failures and latent conditions that accumulate over time, often culminating in adverse health outcomes and decreased productivity within the workplace. Implementing the Defense in Depth theory within an occupational health context involves exploring four critical layers of health defense, namely pre-employment health screening, health management (including surveillance, assessments, well-being initiatives, and absenteeism monitoring), injury management/rehabilitation (Workers' Compensation), and exit medical evaluations. Each of these layers serves to intercept, slow down, or eliminate risk, thereby reducing the likelihood of failure significantly (ILO, 2016).

However, in many organizations, these four critical health layers are managed by separate departments, leading to compartmentalized information that is not utilized holistically to enhance health outcomes. Aligning all health components and establishing communication channels between them becomes essential to unlock valuable, risk-based information that can greatly improve an organization's ability to identify health risk trends and proactively address them to mitigate adverse health outcomes and achieve tangible business and employee benefits. Utilizing the Defense in Depth model within an occupational health framework enables organizations to establish multiple layers of defense against failure. In the context of occupational health and safety, failure includes identifiable injuries, loss of productivity due to ill health, or post-employment claims.

The defense in depth model closely resembles the well-known Swiss cheese theory of organizational accidents, whereby every defense is depicted as one of the 'slices' with holes/weaknesses/failure allowing hazard penetration through all the defenses, kindling incidents. Well-coordinated with overlapping controls, however, the layers can prevent single-point failure. This system of cascading protection is critical in the high-risk,

intensively technically sophisticated industries of the sort like mining, petroleum, in which interfacing technical failure is accompanied by human as well as organizational factors in creating the negative outcomes.

For enforcement in the Ghana context, enforcement of specific layers is commonly fragmented. For instance, pre-employment screening can take place in isolation from continuous health surveillance or incident-based rehabilitation. Reflected in your reading of enforcement gaps (Annan et al., 2019; Eyiah et al., 2019), fragmented practices at the institutional level compromise a defense-in-depth system operating holistically. Such fragmentation emboldens embedded conditions as well as hurdles in the early identification of risk patterns, consequently compromising organizational resilience against workplace hazards

The accident model

The underlying philosophy of this model known as the Systems-Theoretic Accident Model and Processes (STAMP), posits that system theory offers a valuable framework for analyzing accidents, particularly those involving systemic failures (Ge et al., 2022; Zhang et al., 2021). According to this safety paradigm, accidents occur when the control system fails to adequately address external disturbances, component failures, or dysfunctional interactions among system components, thereby leading to insufficient control or enforcement of safety-related constraints during system development, design, and operation. In this context, the organization under examination is conceptualized as the system.

Safety is thus conceptualized as a control challenge, managed by a control structure integrated within an adaptive socio-technical system. The objective of the control structure, represented by the management of the mining company, is to enforce constraints on both system development (comprising the development process and resulting system design) and system operation to promote safe behavior. Consequently, understanding the root causes of accidents necessitates identifying the shortcomings of the control structure, while preventing future accidents entails designing a control structure capable of effectively enforcing the required constraints.

Within the framework of STAMP, systems are perceived as interconnected components maintained in a state of dynamic equilibrium through feedback loops of information and control. Contrary to a static design perspective, a system in this context is viewed as a dynamic process continually adapting to achieve its objectives and respond to internal and external changes. Hence, the initial design must not only impose appropriate constraints to ensure safe operation but also sustain safety amid evolving circumstances. The progression toward an accident, or loss event, can be elucidated through an adaptive feedback function that fails to uphold safety as performance changes over time to fulfill a diverse array of goals and values.

Rather than defining safety management solely in terms of averting component failures, it is perceived as an ongoing control endeavor aimed at imposing the necessary constraints to confine system behavior within safe bounds amidst changes and adaptations. Through this model, accidents are comprehended by scrutinizing why the existing controls failed to prevent or detect maladaptive changes, specifically by identifying the safety constraints breached and elucidating the inadequacies in control enforcement. Key concepts in STAMP include constraints, control loops, process models, and levels of control.

Recent STAMP literature demonstrates its use in high-hazard industries like oil and gas, chemical, and mining, in which moving control structures fail because of inadequate coordination, inadequate feedback, or inadequate supervisory constraints. In extractive industries in Ghana, systemic factors falter when communication among management, supervisors, and front liners is poor, as well as when safety feedback loops perform ineffectively—the situation confirmed by research findings on the lack of alignment of managerial perceptions with worker experiences (Fruhen et al., 2023; Opoku et al., 2020).

The STAMP perspective also necessitates hierarchical control designs along with well-defined feedback loops. Ghanaian firms in practice might face challenges maintaining these designs given restricted institutional capability as well as patchy enforcement documented by Annan et al. (2019) as well as Boadu et al. (2021). Examples include failure of or late reporting of near-misses indicative of ineffectiveness of feedback loops of adaptive safety controls. Institutions can also lack specific action mechanisms upon receiving feedback, thus taking corrective action late when the constraint is violated.

The actively caring model

The Actively Caring Model originated from a collaborative session among safety leaders at Exxon Chemical Company, where Geller (2010) introduced the concept to denote a pinnacle objective in occupational safety: the sincere concern of employees for the safety of their colleagues, prompting proactive action. Put simply, individuals embodying actively caring behavior continuously monitor their surroundings for potential hazards and unsafe practices, taking corrective measures upon identifying any unsafe conditions or behaviors. Geller (2010) theorized that three key factors contribute to an individual's inclination to "actively care" (AC) for the safety or health of their peers. Those deemed most likely to engage in AC behavior are individuals with high self-esteem (i.e., feeling valued), optimism (i.e., believing they can effect positive change), and a sense of group belongingness or cohesion (e.g., feeling connected to their work team).

Geller's larger body of research also identifies five person states that foretell of Active Caring behavior: self-esteem, self-efficacy, personal control (perceived locus of control), optimism, and belongingness. All of these states contribute to motivating people to take action for the protection of others. For instance, people with high self-esteem feel that they themselves are valuable contributors, while people with higher self-efficacy feel able to perform effectively in safety situations.

Implementing the model in the workplace includes the creation of the five person states through behavior interventions, recognition systems, and team-building programs. In practice, Geller recommends the praising of safe behavior, broadening the workers' autonomy, allowing peer recognition, as well as team building.

For the Ghana mining and petroleum industries, the actively caring approach provides the complementary behavioral perspective to the above theories of systemic and structural views. While in the references, no Ghana specific studies on Actively Caring behavior exist, insights into cultural barriers to the participative safety culture (Opoku et al., 2020) as well as perceptual misalignment (Fruhen et al., 2023) indicate that workers lack the psychological conditions for becoming motivated safety ambassadors. Situations of weak trust, restricted recognition, as well as poor feedback, hold little potential for self-efficacy or sense of belongingness. Therefore, integrating the actively caring as part of safety culture a combination of training, behavioral reinforcement, as well as modeling at the leadership level could well bridge the gaps in worker involvement and peer-based hazard identification.

Conceptual framework

The researcher adapted concepts from these selected theories to develop a conceptual model that suitably underpins this study, given each of the above-discussed models has aspects that have relevance to the current study and can be applied to design constructs of the framework.

The risk theory/defense-in-depth theory is useful for explaining how the mining and petroleum companies under study may establish layers of defense to mitigate identifiable injuries to employees, productivity losses due to health/occupational hazards, or post-employment claims among their workforce who may suffer injuries in their line of duty. Secondly, the accident causation model with its underlying philosophy of Systems-Theoretic Accident Model and Processes (STAMP), posits that accidents occur when the control system fails to adequately address external disturbances, component failures, or dysfunctional interactions among system components, thereby leading to insufficient control or enforcement of safety-related constraints during system development, design, and operation. In this context, the organization under examination is conceptualized as the system. This construct helps to explain how organizational management can enforce behavioral changes in staff through OHS protocols to avert accidents among its workforce. Thirdly, the accident model grounded in the systems theory delineates how the organizational structures within mining and petroleum companies in Ghana can proactively implement OHS measures in their operational sites to prevent accidents among employees. Finally, the Actively Caring Model facilitates an examination of whether employees within the mining and petroleum Companies demonstrate concern for each other's well-being during fieldwork. This model will also help in exploring whether staff members possess intrinsic values such as self-esteem, optimism, and a sense of group cohesion.

Figure 2.1 is a conceptual framework illustrating how OHS protocols are implemented and maintained in the work environment.

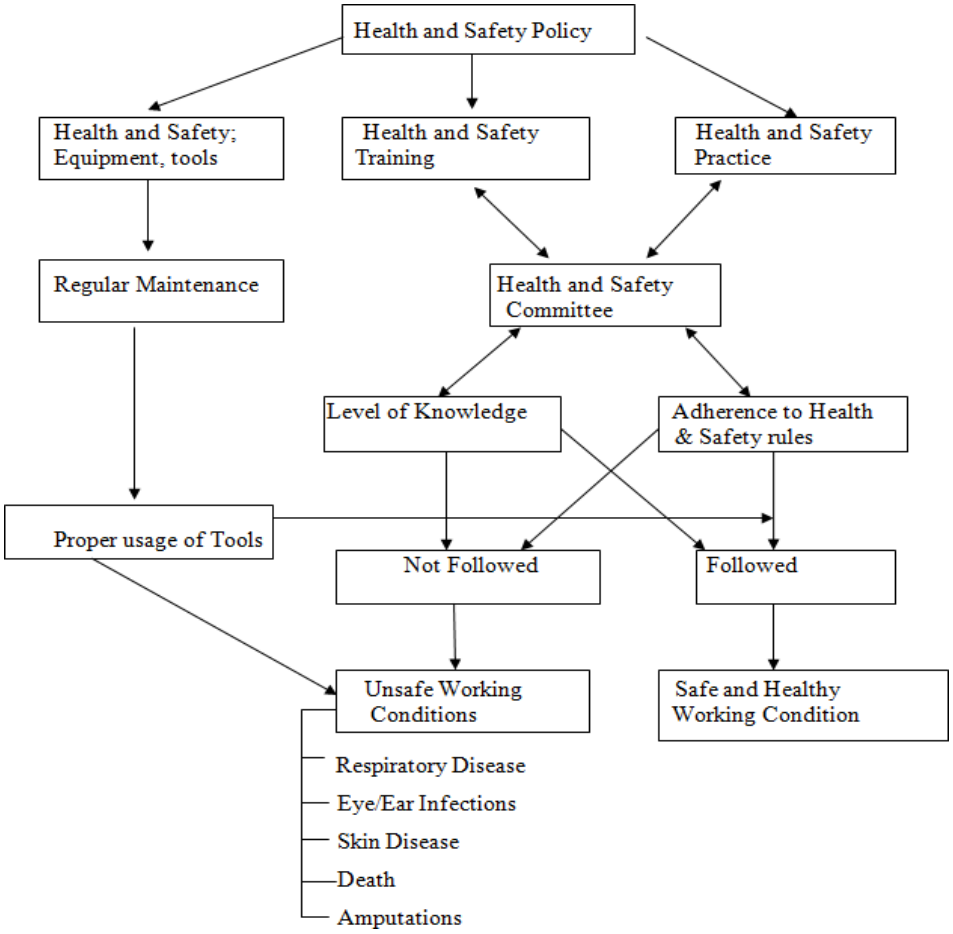

Figure 2.1: conceptual framework on occupational health safety policy implementation and practice, adapted from Geller (2006).

Empirical Review

Overview of the concepts of occupational health and safety

Concepts of occupational health and safety encompass a comprehensive understanding of the factors affecting workers' well-being and workplace safety. Occupational Health involves the systematic examination and management of environmental factors within the workplace that may lead to sickness, compromised health, or discomfort among workers or community members (Ivancevich, 2017). Conversely, Occupational Safety entails the thorough inspection and assessment of workplace conditions, equipment, and procedures to identify potential weaknesses and risks for accidents, followed by the implementation of corrective measures such as employee training, job redesign, and ongoing monitoring (Milkovich & Boudreau, 2016).

International bodies such as the World Health Organization (WHO) and the International Labour Organization (ILO), as well as labor laws of countries, have provided various definitions of occupational health and safety. Summarily, occupational health encompasses multidisciplinary efforts aimed at safeguarding workers' health, preventing occupational diseases and accidents, creating a healthy and safe work environment, enhancing workers' overall well-being and productivity, and contributing to sustainable development (WHO, 2019).

The fundamental issues in health and safety at the workplace revolve around hazard recognition, risk identification, and accident monitoring to minimize occurrences. Safety hazards pose immediate and sometimes severe harm or fatality risks, while health hazards gradually deteriorate workers' health. These hazards necessitate a comprehensive approach involving the participation of all stakeholders, including governments, trade unions, insurance companies, and the public (Liu et al., 2020; Pratt, 2019).

In the developed world, superior occupational health and safety systems are evident due to enhanced programs, better medical facilities, and active worker involvement in decision-making processes. Conversely, industries with high accident risks globally include mining, agriculture, forestry, logging, and construction (International Labour Organization, 2021; LaDou, 2010). However, in many developing countries, such as those in the third world, healthcare access for workers remains limited, and primary healthcare infrastructure requires substantial development to address prevalent health risks such as pesticide exposure, physical strain, and hazardous working conditions (Jafry & O'Neill, 2020).

The issue of underreporting accidents in African organizations underscores the low priority often given to health and safety concerns, driven by political or commercial considerations (Ivancevich, 2015), which points to an urgent need for greater attention to health and safety practices to ensure the well-being and productivity of workers across various industries. However, many studies suggest that workers in high-risk industries in developing sub-Saharan Africa are always reluctant to report minor accidents, which partially stems from the prevailing attitude among many organizations in Africa where health and safety considerations are often downplayed or overlooked for political or commercial expediency (Amponsah-Tawiah & Mensah, 2016; Annan et al., 2015; Bentil, 2018). This disregard for safety protocols not only compromises the well-being of workers but also undermines organizational sustainability and long-term productivity.

Worker participation is crucial in fostering a culture of safety within organizations. According to the International Labour Organization (ILO, 2011), empowering employees to identify hazards, report incidents, and contribute to decision-making processes regarding health and safety initiatives enhances overall workplace safety and reduces the likelihood of accidents Furthermore, fostering partnerships with local communities and stakeholders can facilitate the exchange of knowledge and resources to address occupational health and safety challenges effectively.

Awareness of OHS Protocols among Workers in the Mining and Petroleum Industry

Ivancevich (2015) stated that the success of occupational health and safety programs within high-risk work environments (such as mines) depends heavily on how well employees and supervisors cooperate in the implementation of the OHS policies and/or regulations. This implies that awareness of the frequency of periodical machines and guards' inspection at the workplace to ascertain the health and safety policies of the company is in good taste. This implies that it is important that workers have an adequate understanding of the workplace safety regulations to ensure compliance with the company's health and safety policies.

Workers in the mining and petroleum industries work in a hazardous environment, and thus, their knowledge of the safety policies of the company is key to the prevention of avoidable accidents. Hence, occupational health and safety policies in these industries require field workers to wear protective apparel whenever on duty at a site (Amponsah-Tawiah & Dartey-Baah, 2011; Aram et al., 2021; ILO, 2017). A cross-sectional study conducted by Bentil (2018), assessing the awareness of health and safety policies among AngloGold Ashanti Iduapriem Ghana Limited employees reported that a majority of respondents (57%) acknowledged the requirement to use appropriate personal protective equipment (PPE) consistently. Additionally, one-fifth (20%) mentioned accident reporting as a company policy, while 15% of participants cited maintaining cleanliness and tidiness in the workplace. The study found that mandatory use of appropriate personal protective equipment (PPE) at all times was one of the occupational health and safety policies strictly enforced by the company.

The International Labour Organization recommends that to guarantee the safety of workers, employers must take proactive steps to give employees continuous training on workplace safety (ILO, 2017). This requirement is even more relevant in the mining and petroleum industries which are regarded as having exposure to hazardous environments. Torrington & Hall (2011) argue that safety training enables employees to grasp the hazards present in the workplace and fosters an understanding of safety protocols, facilitating compliance. Similarly, Betts (2009) acknowledges that accidents often stem from insufficient experience and inadequate safety training, emphasizing the importance of incorporating proper task execution methods and risk management strategies into safety training. Effective safety training should aim to raise awareness and promote behavioral change among employees, with the success of such programs hinging on the ability to recognize health and safety hazards inherent to the mining industry

One other mechanism through which occupational health and safety managers ensure compliance with organizational safety standards in the work setting is creating a conducive OHS environment that fosters stronger emotional attachment, a sense of obligation, and overall commitment among workers (Amponsah-Tawiah & Dartey-Baah, 2011; Liu et al., 2020). A cross-sectional survey involving 370 workers of mining companies in Ghana examined the relationship between occupational health and safety (OHS) and employees' organizational commitment in Ghana's mining industry. The findings revealed a positive and significant correlation between OHS management and affective, normative, and continuance commitment, which highlights the significant impact of OHS on these dimensions of organizational commitment. Thus, the study emphasized the need for management in the Ghanaian mining sector to invest in robust OHS policies and practices to enhance organizational commitment among employees (Amponsah-Tawiah & Mensah, 2016). Similarly, Opoku et al., (2020) investigated the relationship between organizational safety culture and employee accidents in the mining industry in Ghana and reported that safety culture significantly predicted work safety, management safety practices, safety programs, co-worker safety, and supervisor safety. This implies that enhancing safety culture among workers can effectively improve workplace safety in the Ghanaian mining industry, hence HR managers need to prioritize initiatives aimed at cultivating a strong safety culture among all employees to mitigate accidents and injuries in the sector.

Occupational health and safety protocols in the mining and petroleum industries

The mining and petroleum industries have long been known as highly volatile in terms of the safety of the people who work at the site, as evidenced by the history of frequent disasters and accidents often resulting in a high rate of disabling injuries during its formative years. The health hazards associated with working in these industries stem from gases, dust, chemicals, noise, extreme temperatures, and various other physical factors that pose risks to workers, leading to numerous chronic ailments and occasionally fatal illnesses. Scholars such as Gyekye (2016) attribute this phenomenon to the exceedingly stressful working conditions endured by miners. Such fatalities, injuries, and accidents although less frequent in modern times due to improved technology, continue to occur in the mining industry.

The Labour Act of 2003 (Act 651) of the Republic of Ghana clearly outlines the roles and responsibilities of employers and employees concerning the management of Occupational Health, Safety, and Environment within the work environment. However, Gyekye et al., (2016) assert that the Act lacks specificity regarding accident and occupational illness reporting procedures, criteria for defining occupational illnesses, and the entity responsible for ensuring that industries in Ghana implement corrective actions. The lack of specificity may lead to ambiguity and inconsistency in addressing workplace accidents and illnesses, potentially compromising the well-being of workers and the overall safety culture within Ghanaian mining and petroleum industries. This raises concerns regarding effective occupational health and safety management in the nation's industries. There is a need for comprehensive legislative frameworks that provide explicit guidance on these critical aspects of occupational health and safety management, thereby promoting a safer and healthier work environment for all stakeholders.

Despite the existence of regulatory frameworks and safety initiatives, challenges persist in ensuring adequate OHS management in the mining and petroleum industries. Poor enforcement of regulations, inadequate training and supervision, and pressure to maximize production often undermine safety efforts (Owiredu, 2018). Additionally, the transient nature of work in these industries, characterized by contract employment and frequent turnover poses challenges in maintaining a strong safety culture (Mishra et al., 2019).

In Ghana, by law, reports on mining incidents and accidents are mandated to be submitted to the Inspectorate Division of the Minerals Commission. Hence, there should have been the existence of a comprehensive database documenting all reported incidents within the industry which will be readily accessible to the public. However, access to such data remains a significant challenge, which Stemn (2019) identified as the primary obstacle hindering research in this field. As a result, research into accidents and injuries within Ghana's mining and petroleum sectors has been limited, despite the industries' longstanding recognition as a safety-critical domain (Gyekye, 2016; Gyekye & Salminen, 2018).

Employee Involvement and Safety Culture in Occupational Health and Safety Implementation

The success of occupational health and safety (OHS) management in high-risk industries like mining and petroleum depends not solely on the soundness of OHS frameworks and implementation of same by management. The involvement of employees is indispensable element to the success of OHS policies. This view is supported by evidence in the literature which points the fact that technical controls alone are insufficient for achieving sustainable improvements in workplace safety unless supported by organizational culture and active worker participation (Annan et al., 2019; Liu et al., 2020).

For an organization to develop the right safety culture in its employees, there must be commitment in its leadership to enforce the OHS polices, and this commitment is demonstrated in how OHS is prioritized in the company's workplace procedures and processes. Safety culture refers to shared beliefs, practices, and attitudes that shape behavior concerning safety within an organization (Amponsah-Tawiah & Mensah, 2016). A growing body of evidence suggests that management commitment to safety not only influences the allocation of resources towards safety initiatives but also shapes employee perceptions and behaviors related to safety compliance (Bautista-Bernal et al., 2024; Fruhen et al., 2023).

According to Montes-Peon et al., (2019), high-level management commitment is expressed through visible leadership, allocation of adequate resources, and consistent communication about safety priorities. They further reported that in hazardous work environments (such as the petrochemical and mining industries), managerial support for safety initiatives significantly reduces workplace incidents and fosters trust among workers. Furthermore, Draghici et al., (2022) found that transformational leadership, which inspires employees to prioritize safety beyond mere compliance, has been associated with stronger safety climates in hazardous industries. Management's role extends to creating an environment where safety is integrated into core organizational values rather than treated as a regulatory obligation. When employees perceive that leadership genuinely values their safety, they are more likely to engage in proactive safety behaviors (Bautista-Bernal et al., 2024).

Employee involvement is another critical component of safety culture, with numerous studies highlighting the benefits of engaging workers directly in safety decision-making processes. Worker participation includes involvement in risk assessments, safety committees, incident investigations, and the development of safety policies (Fernández-Muñiz et al., 2014). Such participation not only enhances hazard identification and control but also fosters ownership and accountability for safety outcomes. A robust safety culture has been strongly linked to increased compliance with safety protocols and significant reductions in accidents and injuries. According to a study by Lu and Yang (2015), organizations with positive safety cultures in the construction sector observed a marked decrease in both the frequency and severity of workplace accidents. Safety culture influences compliance by shaping worker attitudes, perceptions of risk, and the perceived importance of adhering to safety procedures (Clarke, 2023).

Geller's (2017) Actively Caring for People model further expands this discourse by emphasizing the psychological and social factors that drive safety behaviors. Actively caring behavior involves individuals demonstrating concern for the well-being of their colleagues by taking initiative to prevent unsafe acts and conditions. This behavior is fostered by personal factors such as self-esteem, optimism, and group belongingness (Geller, 2016).

Empowering workers to take an active role in safety fosters a collaborative approach where safety is viewed as everyone's responsibility, not solely that of management or safety professionals. Recent studies have shown that participatory safety programs in the mining industry not only improve safety performance but also enhance employee satisfaction and morale (Zhang et al., 2020). In high-risk sectors such as mining and petroleum, where the consequences of accidents can be catastrophic, the presence of a mature safety culture can be the difference between operational continuity and disaster. Studies in the petroleum industry in particular have shown that when safety culture is deeply embedded, compliance with safety regulations becomes intrinsic, leading to fewer incidents and improved organizational resilience (Mashinchi et al., 2020).

Occupational Health and Safety in the Mining Industry

The mining industry in Ghana has been at the center of national economic growth, generating numerous jobs and foreign exchange earnings. Nevertheless, the industry also poses high levels of occupational health and safety (OHS) risk, notably in artisanal and small-scale mining (ASM) activities. Mining OHS in Ghana encompasses high rates of accidents, exposure to dangerous chemicals, as well as unfavorable working conditions that endanger the health of workers. This section includes a wide literature review covering the challenges, risk factors, compliance behavior, enforcement challenges, and organizational aspects of OHS in Ghana's mining industry based on given references only.

Stemn (2019) provides in-depth analysis of Ghana mine injury data, which indicates high rates of injury due to falls, mishandling of equipment, as well as structural collapses. Such injuries can often be preventable but remain an issue due to various system weaknesses, including insufficient risk analysis, substandard infrastructures, and insufficient compliance with safety protocols. Stemn advises specialized interventions in injury hotspots as one of the essential measures for addressing the hazards involved.

Ajith et al. (2020) also draw attention to the elevated injury rates in artisanal and small-scale mining operations, identifying significant risk factors such as lack of proper training, use of rudimentary tools, and non-compliance with PPE regulations. Their findings underscore the importance of structured training programs and monitoring mechanisms to mitigate the risks associated with ASM. The study also links the number of injuries to systemic issues such as informal employment arrangements and minimal governmental oversight.

A similar study, Aram et al. (2021) applied predictive probability modeling to predict the probability of PPE use in Ghana artisanal gold miners. PPE awareness was relatively high, but the practice of PPE was low due to behavior- and context-related factors such as feeling awkward, peer influence, along with risk misconceptions. Culturally appropriate health communication interventions along with behavior-change interventions were suggested by the authors for optimal PPE compliance.

Amponsah-Tawiah and Mensah (2016) explored the relationship between OHS practices and organizational commitment in the Ghanaian mining sector. Their study revealed a strong positive correlation between safety management systems and worker morale, job satisfaction, and productivity. The presence of effective OHS frameworks was associated with increased employee loyalty and lower turnover rates, suggesting that robust safety protocols can serve as both a health and human resource strategy.

Despite the availability of policies and guidelines, several studies note that OHS implementation in Ghana's mining sector remains weak. Boadu et al. (2021) argue that enforcement mechanisms are limited by resource constraints, poor coordination among regulatory agencies, and political interference. Their study identifies a gap between policy formulation and on-the-ground enforcement, often exacerbated by corruption and lack of training among inspectors.

Eyiah et al. (2019) add to this discussion by referencing similar enforcement challenges in the construction industry in Ghana, the regulatory paradigms of which overlap with the mining industry. The study identifies regulatory duplication, aging legislation, and insufficient consultation of stakeholders as barriers to enforcement. Such findings echo in the mining industry context and necessitate legislative reform and institutional improvement.

Empirical evidence is offered in the AngloGold Ashanti Iduapriem gold mine of Tarkwa, Ghana, in the case of Bentil (2018) for the gaps occurring between practice and knowledge of OHS. Although workers had sufficient knowledge of the safety protocols, the practice in the field was found to deviate. Indeed, lack of motivation, poor supervision, as well as complacency, were identified as the most crucial inhibitors in translating the knowledge into behavior. Training and supervision combined system is recommended in the paper to minimize the gap.

Gyekye (2016) and Gyekye & Salminen (2018) discuss the impact of worker attitudes on safety behavior. Perceptions of organizational justice, concern for safety from the management, as well as peer support, were

found to impact compliance with safety procedures considerably. In the mining context, in which peer norms largely determine behavior, promotingsafety measures must take group processes as well as organizational culture into consideration.

Khuthalo (2018) emphasizes the role of attitude as well as knowledge in enhancing safety practices in South African coal mines, which can generalize in the context of Ghana. Attitudinal change campaigns, in the presence of rigorous enforcement as well as capacity building, can considerably boost compliance, the study asserts.

Furthermore, the issue of informal labor in ASM complicates enforcement and safety compliance. As Siabi et al. (2022) note in their study on the Obuasi gold mining area, informal miners often operate outside the reach of formal regulations and lack access to training and PPE. Their findings call for tailored strategies that engage informal sector actors through community-based interventions and public-private partnerships.

Mensah et al. (2022) amplify this message by demonstrating that the informal miner in Ntotroso experiences numerous OHS challenges as a result of lack of controls, inadequate education, and restricted healthcare facility access. They posit that OHS interventions in the context of ASM need to be localized in order to suit the socio-economic conditions of the miner, mainly using community awareness, dissemination of PPE at reduced costs, as well as mobile healthcare delivery.

Liu et al. (2020) highlight the role of safety knowledge as a mediating factor between OHS frameworks and incident reduction in the oil and gas sector. Though focused on petroleum, their conclusions are applicable to mining, suggesting that strengthening workers' understanding of safety procedures can directly impact incident rates.

Institutional challenges such as poor governance, poor inter-agency coordination, and shortage of funding were cited by Annan et al. (2019) as being crucial barriers to the effective enforcement of OHS in Ghana. Their examination of the legal landscape found overlapping mandates and lack of consistent monitoring, further debilitating regulatory effectiveness in high-hazard sectors such as mining. ILO (2017) and WHO (2019) include global standards against which Ghana's performance in OHS implementation can be measured. According to the ILO, in the whole world, 2.3 million workers per year die of work-related diseases and accidents. Such global findings present the need for Ghana's OHS systems to enhance the protection of workers in dangerous industries further.

Occupational Health and Safety in the Petroleum Industry

The Ghana petroleum industry, although relatively new in comparison to the mining industry, has grown at high speed since the identification of commercial amounts of oil in the Jubilee Field in 2007. This growth has brought about numerous economic prospects but has brought along profound OHS challenges as well. Due to the offshore platforms, high-pressure conditions, and sophisticated logistics involved in the petroleum industry, it is, by virtue of these operational features, highly dangerous. This section provides in-depth literature review of the dynamics of OHS implementation in the petroleum industry in Ghana, with particular interest in safety knowledge, institutional arrangements, regulatory compliance, as well as enterprise growth. All the references applied come from the given bibliography.

Liu et al. (2020) carried out empirical research of the effectiveness of occupational health and safety management frameworks (OHSMFs) in Ghana's oil and gas sectors. Their research established that in theory, policies abound, but there is a wide gap between the formulation of policies at the policy formulation stage and implementation at the field level. More critically, the research established that safety knowledge has a mediating impact on the relationship between the existence of OHSMFs and the realization of workplace accident reductions in reality. The authors conclude that without rigorous training and knowledge transfer, even the most superior frameworks cannot yield desired safety outcomes. The research advises periodic, obligatory training meetings, better induction of new workers, as well as periodic refresher training in safety for long-serving workers.

When investigating the training character, Liu et al. (2020) found that compliance-based training is preferred over capacity-building for most firms, with implications for the long-term retention of the safety principles. Employees predominantly receive safety training to tick the boxes of compliance with regulatory requirements as much as for internalizing or practicing the lessons learned. This lack of adequate engagement with safety learning is one of the reasons why workplace accidents persistently re-emerge.

Ablo (2017) observed, in his research on the role of local content and participation in the Ghana petroleum industry, one crucial policy concern: the disparity between safety standards and the development of local enterprise. The need to afford opportunities for poor-ly prepared local enterprises, by themselves unable to attain global safety standards in their fields of operation, has often rendered safety measures unfulfilled. According to Ablo, although the aim of the policy on local content is to catalyze the growth of the domestic economy, it actually injects the hazard of safety when it is pursued without recourse to sufficient regulatory oversight, along with capacity-building measures.

Another observation of Ablo is the need for a more integrated approach to the implementation of local content that includes mandatory OHS training, certification, and mentorship for the new local businesses in the industry. Such interventions would ensure that enterprise development is not at the expense of the safety of the workers as well as operational efficiency.

Further emphasizing the knowledge gap in the petroleum sector, Mabika (2020) noted that many workers in African petroleum industries, including Ghana, lack foundational knowledge in hazard identification and emergency response. The absence of systematic safety orientation—particularly for contractors and temporary workers exposes the sector to significant risks. Mabika recommends the adoption of comprehensive orientation programs tailored to various operational roles within the sector.

Institutional and regulatory weaknesses also plague Ghana's petroleum sector. Annan et al. (2019) highlighted overlapping mandates among regulatory bodies such as the Petroleum Commission, Environmental Protection Agency (EPA), and Ghana National Petroleum Corporation (GNPC). This fragmentation leads to inconsistent enforcement of safety standards. Additionally, limited inter-agency communication and political influence undermine the regulatory process, allowing safety lapses to persist.

Benson et al. (2024) assessed the effectiveness of health, safety, and environmental interventions in the process industry. They conclude that even well-meaning interventions fall short based on inadequate design, failure to follow up, and insufficient involvement of workers at the planning phase. These issues echo in the Ghana petroleum industry, whereby the imposition of top-down safety policies without sufficient input from frontline workers results in weak ownership as well as poor compliance.

Opoku et al. (2020) while targeting the mining context, offer transferable lessons for improving workplace safety culture via participatory approaches. Their suggestions for inclusive safety planning, for the presence of continuous feedback mechanisms, as well as reinforcement of positive safety behavior, are extremely applicable in the case of the petroleum industry, whereby intricate activities call for everyone's accountability.

Globally, the International Labour Organization (ILO, 2021) estimates 2.3 million worldwide annual deaths caused by workplace accidents and diseases, of which a sizeable proportion is in hazardous industries such as the oil and gas industry. Ghana's challenge, however, is to bring global best practices to the domestic level by enhancing the institutional as well as legal capacity for the purposes of effectiveness in implementation.

Eyiah et al. (2019) reported similar regulatory inefficiencies in Ghana's construction industry, noting that institutional bottlenecks, corruption, and lack of inspectorate resources hinder enforcement. The petroleum sector suffers from the same limitations. To address these challenges, Eyiah et al. propose increased funding for regulatory bodies, capacity building for inspectors, and digitization of monitoring systems. Gyekye (2016) and Gyekye & Salminen (2018) provide useful behavioral insights, emphasizing that employee perceptions of managerial commitment to safety significantly influence compliance. In the petroleum sector, where workers are exposed to high-risk environments, visible leadership commitment to safety is essential. Regular safety audits, town-hall discussions, and safety performance incentives can reinforce a culture of accountability.

Fruhen et al. (2023) also bring to the fore the gap in safety culture perceived by senior managers versus frontline realities. Such a gap, if left unbridged, leads to unrealistic safety ambitions, inadequate resource allocation, as well as weak feedback loops. Their research indicates the necessity for broader-based leadership models that involve all levels of the organization in planning for, as well as evaluating, safety.

The safety climate, as noticed by Draghici et al. (2022), mediates the link between transformational leadership and safe behavior. This further shows that improving the leadership competencies of mid-level as well as chief managers can affect compliance with OHS in a positive way to a large extent. Safety leadership training must become the core requirement for all managerial staff working in petroleum firms.

Bautista-Bernal et al. (2024) conducted a longitudinal study that linked strong safety culture to improved financial performance. Their study provides an economic rationale for investing in safety, a message that resonates in Ghana's petroleum sector, where cost-cutting measures often jeopardize worker welfare. Companies should view safety as a value-driver rather than a regulatory burden.

LaDou (2010) placed occupational health in the global context and highlighted the worldwide interconnectedness of workplace health expectations. His research indicates that middle- and low-income nations such as Ghana experience restricted global safety information, which leads to antiquated practices. To remedy this information chasm, global partnerships with international entities, knowledge transfer programs, as well as computer-based learning platforms, must take place.

Jafry and O'Neill (2020) explored the application of ergonomics in rural development but their emphasis on contextual safety interventions is applicable to Ghana's petroleum sector. Many offshore and onshore sites operate in remote areas where environmental factors and isolation compound safety risks. Ergonomic considerations, including work-rest schedules, noise reduction, and equipment design, should be integrated into safety protocols.

Betts (2019), Cole (2018), and Ivancevich (2015) underscore the importance of aligning human resource management with OHS goals. Recruitment processes must include rigorous safety screening, and performance appraisals should incorporate safety metrics. These practices ensure that safety becomes embedded in organizational DNA rather than being treated as a standalone function.

With regard to measurement, Joseph and Rosemary (2013) call for the application of dependable instruments like Cronbach's Alpha in the measurement of behavior and perceptions in Likert scale questionnaires. Their research is in favor of the application of empirically tested tools in the measurement of the safety behavior and knowledge of petroleum workers.

WHO's (2019) strategy for occupational health requires worldwide universal coverage of OHS services, mainstreaming of OHS in national health systems, as well as increasing safe workplace environments. Ghana's petroleum sector can gain from this mainstreaming, most prominently by the partnership of petroleum companies with national health service providers.

Safety Culture and Performance

The relationship between safety culture and organizational performance has attracted rising academic interest in the past decades, particularly in high-hazard industries like mining and petroleum. Safety culture is not only the determinant of the lowered rates of incidents, but it has direct implications for financial performance as well, says Bautista-Bernal et al. (2024). In their five-year longitudinal study, the authors observed that the stronger the safety culture of the organization, the better the productivity, the less downtime, and the fewer legal exposures the company had.

Fernandez-Muniz et al. (2019) categorized the core dimensions of safety culture as: (1) management commitment, (2) employee involvement, (3) effective communication, (4) training and competence, and (5) continuous improvement. They argued that management's visible support for safety measures plays a vital role in shaping employee attitudes toward safe behavior.

For the Ghanaian context, Opoku et al. (2020) studied the issue of safety culture in the mining context and called for the application of participatory safety management practices. Their analysis demonstrated that the application of top-down methods of safety management has commonly failed to generate the desired behavior change among workers. Conversely, the application of participatory practices involving frontline workers in decision-making was more effective in developing the sense of ownership and responsibility for occupational safety.

Fruhen et al. (2023) extended this argument by exploring the perceptual gap between managerial staff and frontline workers concerning safety realities. Their findings showed that while top management often believed they were adequately supporting safety initiatives, workers reported a lack of tangible commitment and insufficient resource allocation. This misalignment not only affected the perception of safety culture but also impaired implementation fidelity.

Studies have shown that effective safety culture positively correlates with reduced injury rates and increased compliance with safety protocols. In organizations where safety values are ingrained, employees are more likely to report near-misses, participate in safety training, and comply with protective procedures. Conversely, in organizations where safety culture is weak, employees may prioritize productivity over safety, leading to underreporting of hazards and increased risk-taking behaviors.

For Ghana's mining and petroleum sectors, the financial need to achieve production goals frequently supersedes the concern for safe production practices. This "production before safety" mentality was cited as one of the major impediments in the achievement of a healthy safety culture. An amalgamation of weak training, insufficient employee participation, as well as absence of feedback channels, further compromises attempt at institutionalizing the norms of safety.

Safety training is a central component of safety culture. Bautista-Bernal et al. (2024) emphasize the need for continuous, targeted training that is tailored to specific job roles and risk exposures. Similarly, Opoku et al. (2020) found that routine safety drills and refresher courses were rare in most Ghanaian mines, leading to complacency and procedural lapses.

Another factor to take into consideration is leadership. Transformational leadership styles were discovered to be related to high safety cultures. Those managers who lead from the front and who positively model safe behavior themselves are likelier to introduce desirable safety practices amongst their staff. Conversely, autocratic styles of leadership have been related to fear-based culture as well as underreporting.

Of particular significance is the presence of learning-from-incident systems as part of safety culture too. High-reliability-oriented organizations embed learning from accidents and near-misses via root-cause analyses and safety audits. Such systems, however, are commonly absent in the Ghanaian small- and medium-scale industries, whose safety breaches are commonly corrected with punitive or ad-hoc measures, as opposed to learning-based improvement.

Legal and Institutional Frameworks

Occupational health and safety (OHS) in Ghana is governed by a galaxy of laws and policy tools, but enforcement challenges and policy incoherence remain. Annan et al. (2019) completed a critical analysis of legal architecture of OHS in Ghana, which revealed divergent regulatory mandates, antiquated legislation, and weak institutional capabilities as chief impediments to enforcement effectiveness.

The most important legal frameworks are:

- The Labour Act, 2003 (Act 651) – which provides broad provisions for employee welfare and safety.

- The Minerals and Mining Act, 2006 (Act 703) – which mandates the mining companies to adhere to health and safety standards.

• The Petroleum (Exploration and Production) Act, 2016 (Act 919) – which includes provisions for the environmental and safety considerations of petroleum activities.

Nonetheless, enforcement of the laws is weak as reported by Eyiah et al. (2019) as a result of regulatory jam, constrained human resource, as well as insufficient logistics support. These issues come out clearly in the extractive and construction sectors, where informality is high as well as regulatory control is weak.

Ghana's institutional framework for OHS is spread across several ministries and agencies, including the Ministry of Employment and Labour Relations, the Ghana Minerals Commission, and the Petroleum Commission. This multi-agency approach often leads to duplication of roles, poor coordination, and inefficiencies in enforcement.

The ILO (2021) and WHO (2019) provide global workplace safety standards, too, in the form of conventions and guidelines for workplace hazards, workers, and employers' obligations. Ghana has ratified many ILO conventions for occupational health and workplace safety, but translating these intentions into actionable national policies has been slow. Annan et al. (2019) state that the lack of one unified national OHS policy remains one of the central gaps.

Furthermore, the Petroleum Commission Regulations requires companies to prepare elaborate OHS plans and perform periodic audits, but compliance monitoring is largely reserved for the large multinationals, of which the locally based subcontractors fall between the cracks. Citing Ablo (2017), the absence of vigorous domestic enterprise development infrastructures widens these enforcement gaps since smaller firms lack the capacity or drive to implement sophisticated safety programs.

One of the bigger complaints against the legal system is the fact that it is too reactionary. Laws are commonly applied after a large-scale accident has taken place. Few people see proactive monitoring, risk identification, and preventive surveys in the smaller, non-mechanized mining communities or in the countryside.

Public awareness and education on occupational rights are also limited. Workers are often unaware of the legal protections available to them or lack the empowerment to demand safer working conditions. The establishment of workers' safety committees, as required by the Labour Act, is not uniformly implemented across sectors.

Another new area of concern is the protection of workers against diseases of occupation, as well as against the effects of long-term exposure to harmful substances at the workplace. Ghana's existing OHS policies pay much less attention to chronic conditions like respiratory diseases, loss of hearing, or mental health conditions resulting from stressful workplace experiences.

OHS in Ghana is regulated by various laws and policies, although enforcement is always lacking. Annan et al. (2019) critically analyzed Ghana's legal demands, which revealed significant gaps in policy compliance and enforcement. Eyiah et al. (2019) also outlined regulatory impediments in the construction field, which can be applied in the mining and petroleum sectors as well.

The ILO (2021) and WHO (2019) provide international benchmarks that Ghana attempts to align with, but institutional weaknesses undermine such efforts. The Ghana Minerals and Mining Act and the Petroleum Commission Regulations are examples of policy instruments needing better enforcement mechanisms.

Challenges in Implementing Occupational Health and Safety (OHS) Protocols in Ghana

The implementation of occupational health and safety (OHS) protocols in Ghana, particularly in high-risk industries such as mining and petroleum, faces numerous challenges. While global advancements have highlighted the importance of comprehensive safety management systems, the translation of these systems into practice within the Ghanaian context remains limited due to multifaceted barriers. These challenges ranging from resource constraints to regulatory and cultural issues undermine the effectiveness of OHS implementation and expose workers to significant occupational hazards.

Resource Constraints: Financial, Human, and Technological Limitations

One of the most significant barriers to effective OHS implementation in Ghana is the persistent shortage of resources—financial, human, and technological. Financial limitations restrict the ability of organizations to invest in essential safety equipment, training programs, and modern technologies that are critical for hazard detection and accident prevention (Liu et al., 2020; Opoku et al., 2020) (Oppong et al., 2019). Many small and medium-sized enterprises (SMEs) within the mining and petroleum supply chains operate on limited budgets, often prioritizing production over safety investments (Adu-Amankwah et al., 2021).

The shortage of skilled OHS professionals further exacerbates this problem. In many organizations, safety officers either do not exist or lack specialized training in modern OHS management practices (Mensah et al., 2020). The absence of advanced technology for risk monitoring and communication such as real-time hazard detection systems and digital incident reporting also weakens safety management systems, making workplaces more vulnerable to preventable accidents.

Gaps in Knowledge, Attitudes, and Practices of Workers and Management

A critical challenge in the effective implementation of OHS protocols lies in the widespread gaps in knowledge, attitudes, and practices (KAP) among both workers and management. Studies in Ghana's industrial sectors indicate that while some employees may have basic awareness of safety regulations, many lack a deeper understanding of hazard identification, risk assessment, and safe work procedures (Eyiah et al., 2019). This knowledge gap is often compounded by negative attitudes towards safety, where workers perceive safety protocols as an obstacle to productivity rather than a necessary component of workplace operations. For instance, Siabi et al., (2022) assessed the knowledge and practices of occupational safety and health (OSH) among workers in the artisanal and small-scale gold mining (ASGM) sector in Obuasi, Ghana. It they reported that although most of the workers had relatively limited work experience, implementation of health and safety measures (such as safety training, education, safety committees, and facility improvements) positively influenced the workers' knowledge and safety awareness. Despite these positive associations, the general working conditions observed did not meet acceptable occupational health and safety standards.

Similarly, managerial attitudes toward safety are often influenced by short-term economic considerations. In many instances, managers are reluctant to enforce strict safety measures for fear of reducing productivity or incurring additional costs (Segbenya & Yeboah, 2022). Furthermore, inadequate training programs, irregular safety drills, and limited communication between management and workers weaken the overall safety climate, thereby increasing the risk of accidents and occupational illnesses.

Weak Enforcement of Safety Regulations

Despite the presence of national safety regulations such as the Factories, Offices and Shops Act (1970) and the Minerals and Mining Act (2006), enforcement remains a persistent challenge in Ghana. Regulatory bodies, including the Department of Factories Inspectorate (DFI) and the Environmental Protection Agency (EPA), often lack the necessary capacity both in terms of human resources and logistical support—to conduct regular inspections and enforce compliance (Siabi et al., 2022).

Corruption, bureaucratic inefficiencies, and political interference have also been cited as contributing factors to regulatory weakness (Amponsah-Tawiah & Mensah, 2016; Gyekye & Salminen, 2018). Consequently, many companies, especially in the informal sector—operate without effective oversight, allowing unsafe practices to flourish unchecked. The weak enforcement of penalties for non-compliance further undermines the credibility of regulatory institutions and reduces the incentive for companies to prioritize safety.

Cultural Factors Influencing Safety Behavior

Cultural beliefs and practices play a significant role in shaping safety behavior in the Ghanaian workplace. In many communities, fatalistic attitudes towards accidents where injuries or deaths are perceived as inevitable or "acts of God" reduces the perceived value of OHS interventions (Boateng & Antwi, 2019). This cultural

fatalism can lead to complacency among workers, reducing their willingness to adhere to safety protocols or report unsafe conditions.

Furthermore, hierarchical workplace cultures, where employees feel unable or unwilling to challenge unsafe instructions from superiors, hinder the development of open safety communication (Fening & Amaria, 2020). In some cases, fear of job loss or retaliation prevents workers from reporting safety concerns, particularly in the context of temporary or precarious employment common in the mining and petroleum sectors.

Additionally, low levels of formal education among some segments of the workforce present challenges in communicating complex safety procedures effectively. This necessitates the development of culturally sensitive and literacy-appropriate training methods to improve understanding and compliance.

Barriers to Effective Occupational Health and Safety (OHS) Implementation

Despite increasing awareness of Occupational Health and Safety (OHS) as a critical element of industrial productivity and worker well-being, several barriers continue to undermine effective implementation in resource-constrained settings like Ghana. According to Opoku et al., (2020), many mining companies engaged in small-scale mining operations in Ghana and some local petroleum subcontractors operate under budget constraints which makes it difficult for them to invest in essential safety infrastructure such as personal protective equipment (PPE), regular maintenance of machinery, and comprehensive safety training programs.

Another challenge related to budgetary constraints is the limited funding that regulatory agencies have to be able to enforce their mandate in ensuring optimal compliance with OHS regulations in the operations of mining and petroleum corporations. This usually affect the ability of regulatory agencies to conduct inspections and enforce compliance as it constrains their capacity of regulatory agencies to effectively implement, monitor, and enforce Occupational Health and Safety (OHS) standards (Abdi & Hareru, 2024; Boadu et al., 2021).

It has been reported that insufficient funding of regulatory agencies leads to situations where inspections are either delayed or occur infrequently, allowing unsafe practices to persist undetected. A study by Eyiah et al., (2019) found that in Ghana's industrial sectors, inspection officers are often unable to visit high-risk facilities regularly due to logistical challenges such as a lack of transportation, fuel, or functional equipment. This gap creates a regulatory vacuum in which employers may prioritize productivity over safety, especially in sectors such as mining, construction, and oil and gas. Weak enforcement resulting from these financial and logistical challenges ultimately undermines the deterrent effect of OHS regulation. Employers are less likely to adhere to safety standards when they perceive regulatory oversight to be inconsistent or ineffective (Benson et al., 2024).

Human resource limitations compound this issue. A shortage of trained safety officers, occupational hygienists, and inspectors makes it difficult to maintain safety standards across worksites. In many cases, safety roles are either left vacant or delegated to untrained personnel who lack the technical competence to implement or monitor safety procedures effectively (Boateng et al., 2020).

Cultural and attitudinal factors also play a significant role in hindering OHS compliance. In Ghana's mining and petroleum sectors, safety is often perceived as secondary to productivity. Workers may disregard safety procedures in the interest of meeting production targets or earning bonuses. In artisanal and small-scale mining (ASM), for instance, the informal nature of operations and a prevailing culture of risk normalization led to dangerous work practices, such as working without helmets or gloves and entering unstable mine shafts (Siabi et al., 2022). Additionally, there is often resistance to change, with some workers and supervisors viewing new safety policies as unnecessary or intrusive.

Language and literacy challenges further complicate safety communication and training. Ghana is a multilingual country with varying levels of literacy among industrial workers, particularly in the ASM sector. Safety protocols and hazard signs written in English are not always understood by all workers, especially those with low levels of formal education (Njororai et al., 2023). Such a disconnect leads to misinterpretations and poor adherence to safety instructions. According to Liu et al., (2020), effective communication is foundational

to safety compliance, and without translation or the use of pictorial signs, many safety messages fail to reach the intended audience.

Effective OHS Implementation Challenges

The implementation of Occupational Health and Safety (OHS) practices within Ghana's mining and petroleum industries is fraught with challenges that span legal, institutional, behavioral, and organizational domains. Although policy frameworks and regulations exist to guide OHS implementation, compliance and enforcement remain inconsistent, particularly in environments where informal work dominates and oversight mechanisms are weak. Drawing on the literature, this section presents a detailed examination of the challenges impeding effective OHS implementation in Ghana, specifically within the mining and petroleum sectors.

Structural challenges in OHS implementation are rooted in the fragmented regulatory landscape and limited enforcement capacity. Annan et al. (2019) argue that in Ghana, the multiplicity of institutions with overlapping mandates has led to policy incoherence and weakened enforcement. Regulatory bodies operate in silos, with minimal coordination, making comprehensive oversight nearly impossible. Similarly, Eyiah et al. (2019), although focused on the construction sector, reveal parallel deficiencies in enforcement mechanisms, including inadequate staffing, outdated laws, and logistical constraints, which significantly impede the monitoring of compliance. These limitations allow small-scale operators in the mining and petroleum sectors to avoid scrutiny, contributing to high levels of non-compliance and workplace hazards.

Behavioral and Cultural Barriers

Behavioral as well as cultural aspects also largely inhibit the effectiveness of OHS implementation. Among the most evident of the behavioral issues is the ongoing knowledge-practice gap. Bentil (2018) identifies that although workers know the safety procedures, the implementation of the same is negligible. This gap is typically mediated by factors of motivation, lack of supervision, as well as perceived non-relevance of safety practices in the performance of daily activities. Aram et al. (2021) corroborate the assertion, noting that artisanal gold miners commonly avoid the use of personal protective equipment (PPE) in favor of comfort as well as the influence of peers, noting further that the compliance is mediated by the social as well as cultural factors, as distinct from the regulatory factor in isolation.

Moreover, the absence of congruence between safety culture and leadership exacerbates the issue further. Opoku et al. (2020) suggest that efforts at safety management in the top-down approach typically receive workers' input, leading to weak safety ownership and unsuccessful implementation of the measures. Fruhen et al. (2023) further report the existence of the perceptual gap between the frontline workers and the management, with the latter commonly overestimating the success of the OHS policies while the workers report weak participation and lack of support. Such disparity makes the policies inert or ignored.

Organizational Barriers

At the organizational level, leadership commitment and internal safety culture play crucial roles in shaping OHS outcomes. According to Amponsah Tawiah and Mensah (2016), a strong correlation exists between organizational commitment to safety and employee morale. However, in many Ghanaian firms, this commitment remains rhetorical. Where leadership fails to model safe behavior or reward compliance, the safety culture becomes superficial and ineffectual. Bautista Bernal et al. (2024) further illustrate that firms with strong safety cultures tend to achieve better financial performance and lower accident rates. However, many organizations in Ghana prioritize short-term financial goals over long-term investments in safety, thereby compromising both worker welfare and organizational sustainability.

In addition to leadership challenges, limited training opportunities further constrain effective OHS implementation. Ajith et al. (2020) emphasize that inadequate and irregular safety training in the artisanal and small-scale mining (ASM) sector contributes significantly to rising injury rates. The frameworks suggested by Yamane (1967) and Creswell (2005, 2007, 2009) advocate for systematic, well-sampled training interventions to ensure long-term knowledge retention and behavioral change, elements often missing in Ghana's occupational health strategies.

Socio-economic and Informal Sector

Ghana's high level of informality in both mining and petroleum sectors presents a unique challenge to OHS enforcement. Mensah et al. (2022) document that operators in Ntotroso and similar communities often lack formal education, regulatory awareness, and access to PPE. These deficits, coupled with minimal state oversight, foster hazardous working environments where workers are unaware of, or disregard, basic safety practices. Siabi et al. (2022) echo these findings in Obuasi, emphasizing that informal miners typically evade formal safety training, thus remaining outside the reach of conventional safety systems. In such settings, standard OHS models often fail, necessitating the design of tailored interventions that reflect local socio-economic realities.

Institutional Capacity and Resource Constraints

Another major issue is the restricted institutional capability of enforcement agencies. According to Boadu et al. (2021), the government departments that oversee occupational safety are inadequately staffed and equipped in the long term. Such weaknesses inhibit frequent inspections, particularly in inaccessible or unstructured environments. In addition, Annan et al. (2019) indicate that overlapping mandates of institutions cause duplication of mandates as well as role confusion, resulting in enforcement inertia. Limited funding also inhibits the uptake of updated safety technologies as well as in-real-time monitoring systems, keeping the enforcement departments on the backward, not the forward, foot.

Legal and Policy Gaps

The legal and policy backdrop for OHS in Ghana is no less daunting. Although there are laws such as the Minerals and Mining Act and various Petroleum Commission regulations, enforcement is poor. ILO (2021) and WHO (2019) promote the sort of broad-based OHS legislation founded on global norms, but existing frameworks in Ghana fall short too often. Annan et al. (2019) indicate most of the existing laws as outdated or unclear, resulting in patchy enforcement. Major legal provisions, notably for the protection of the rights of workers in the informal economy, remain unused or unestablished, which compromises their protective effect and leaves most workers vulnerable.

Environmental and Health Monitoring Deficiencies

Environmental and occupational health monitoring systems in Ghana are largely underdeveloped. Stemn (2019) highlights the absence of a centralized occupational injury and illness database, which severely limits the government's ability to track trends and implement responsive interventions. The fragmented nature of recordkeeping means that injuries are often underreported or misclassified. Moreover, the focus of existing systems is predominantly on acute injuries, with little attention paid to chronic occupational diseases such as silicosis, chemical poisoning, and noise-induced hearing loss. As a result, major health issues linked to long-term occupational exposure remain undocumented and unaddressed.

Intervention and Safety Program Challenges

Interventions designed to improve OHS outcomes often fail due to poor contextual alignment. Benson et al. (2024) find that many OHS programs are generic or imported from different socio-cultural settings, resulting in limited local relevance. These interventions often do not consider the specific challenges faced by Ghanaian workers, such as literacy levels, cultural beliefs, and informal work arrangements. Fruhen et al. (2023) and Opoku et al. (2020) emphasize the need for continuous program evaluation and adaptation, pointing out that most safety programs in Ghana lack feedback mechanisms. Without ongoing monitoring and revision, even well-intentioned interventions risk becoming obsolete.

Human Factors and Training in OHS implementation

Occupational health and safety (OHS) performance is profoundly influenced by human factors and the extent and quality of training provided to workers. In Ghana's extractive industries, particularly mining and petroleum, these challenges are especially pronounced due to systemic, behavioral, and infrastructural

limitations. This section delves into the existing literature on how human factors and training limitations hinder effective OHS implementation.

Human factors involve the organizational, psychological, as well as cognitive aspects, which impact workers' performance, decision, and safe behavior in the workplace. In the Ghana mining setting, Fruhen et al. (2023) identified essential gaps between the manager's views and the frontline experience. Managerially, there was the assumption of compliance as well as the understanding of the safety protocol by workers, whereas in practice, numerous employees were uninformed or inadequately informed. This discrepancy caused unsafe behavior as well as undermined the safety culture in most sites.

Similarly, Aram et al. (2021), in their study on Ghanaian gold miners, identified behavioral determinants of personal protective equipment (PPE) use, including risk perception, perceived behavioral control, and social norms. Their predictive probability model demonstrated that miners with low-risk awareness or peer support were significantly less likely to use PPE consistently. This underscores how individual attitudes and social environments can directly undermine safety protocols, even when policies are in place.

Moreover, the research of Fruhen et al. (2023) found that high-grade OHS management has the tendency to oversimplify nuances of human behavior in the workplace, such as fatigue, motivation, and cognitive load. Such pitfalls can lead to lowered hazard reporting, mistaken risk assessment, as well as inadequate workplace response to incidents. If the OHS systems lack human-oriented design, with consideration for the daily predicament and experience of frontline workers, these ultimately remain unsuccessful in their intentions.

Another important concern in the performance of OHS systems in Ghana is training. While OHS systems can exist in policy, effectiveness depends on continuous and pertinent capacity building in context. Liu et al. (2020) in the evaluation of the petroleum industry found an essential mediating role of safety knowledge in the reducing of accident rates. Their study revealed that inadequate safety training not only lowered awareness but also filled the gap between policy and practice, where workers were practicing in unsafe conditions based on lack of information or misinformation.

Ajith et al. (2020) also emphasised that in Ghana's artisanal and small-scale mining (ASM) industry, numerous workers had no formal training in the identification of hazards and mitigation of risks. Lack of STANDARDSED onboarding procedures as well as refresher training resulted in wide-scale occupational injuries. This was further exacerbated by the issue of languages, poor literacy, as well as the usage of technical terminologies in the communication of safety—the inclusions of which made training interventions ineffectual for the bulk of the workforce.

Amponsah-Tawiah and Mensah (2016) placed particular stress on the contribution of training in the creation of organizational commitment to safety. They reported that companies that made investments in systematic and frequent safety training were more likely to gain employee buy-in and positive engagement in OHS policies. This was, however, the exception rather than the norm. Many businesses, particularly smaller contractors in the petroleum and mining value chains, did not have the financial or technical capabilities to implement prolonged training programs. This vulnerability was further reinforced by weak supervision by regulatory agencies, as reported by Boadu et al. (2021) as well as Eyiah et al. (2019).

The combination of human constraint and weak training not only compromises safety behavior at the microlevel but also degrades organizational systems. Opoku et al. (2020) provided evidence that strategies of engaging workers in the design and implementation of safety procedures were more effective in filling the gaps in behavior. These strategies, however, are still insufficiently implemented in Ghana, where the safety is mostly perceived as the managerial mandate, not the mutual obligation of all workers.

Moreover, the persistence of human factor challenges and training deficiencies reflects deeper institutional weaknesses. As noted by Annan et al. (2019), Ghana's legal and institutional frameworks for OHS are fragmented and lack coordinated enforcement. This limits accountability and allows firms to bypass or minimize training investments, especially in sectors with high informal employment such as ASM.

Summary of Literature Gaps

Literatures reviewed highlight the complexities of OHS implementation, but research on integrated safety management systems in the mining as well as the petroleum industries in Ghana is scarce. Sector-wide comparative studies, applying the mixed-methods research paradigms, need to be conducted in order to evaluate the policy as well as the practice strands alike.

Conclusion

The research provides essential insights into implementation of OHS in the mining and oil industries in Ghana. Policies are in place, but enforcement is poor. Safety culture, leadership, human behavior, and institutional capacity hold the key to effectiveness in implementation. This review underscores the need for the present study to assess implementation protocols in enhancing safety outcomes in the high-risk industries.

METHODOLOGY

The methodology is explained as the planned activities in research that involve gathering the necessary information or materials for a particular study (Bryman, 2016; Robson, 2002). This aspect of the proposal presents a brief description of the research area, the research design and approach, the target population, sample size sampling techniques, data collection tools and procedures, how the data will be managed and analyzed, and the steps the researcher will take to ensure ethical rules are not breached in the process of the data collection.

Study Design

Creswell (2007) defines research design as the conceptual structure within which research is conducted. The researcher's ability to be as efficient as possible in gathering important information for a study is aided by the type of research design adopted (Kothari, 2004). A descriptive cross-sectional design will be used to collect data on the current status of OHS implementation protocols in the mining and petroleum industries in Ghana. This study design is appropriate for collecting data at a single point in time and can provide a snapshot of the current state of OHS implementation in the industries. A cross-sectional study design involves looking at the data from a population at one specific point in time (Polit & Beck, 2008). This approach is considered appropriate for the study because it is relatively quick and easy to conduct, and data on all key variables of interest can be collected at once which makes it possible to be able to gather data to measure all the variables of interest at the same time. For this reason, a cross-sectional survey has the advantage of wider application as it allows data to be collected on a large population within a short space of time.

Target population

A research population according to (Bryman, 2016), is a sampled group of study participants. (Sekaran & Bougie, 2016) also argue that the population of a study refers to the overall membership of a group of individuals, incidents, or a phenomenon of concern into which the researcher is looking. The target population for this study includes the workers and management of petroleum and mining companies, and regulatory agencies in charge of ensuring compliance with OHS measures in these industries.

Sample Size

A sample is a group of people, objects, items, or units taken from the larger population by selecting a portion of the population to represent the entire population (Jooste, 2010). A researcher’s choice of sample size is informed by the size of the population under study, the variation in the characteristics being measured, the number of ways data can be stratified, and the parameters the data seeks to measure (Creswell, 2005). The sample for this study is drawn from five main companies in the petroleum and mining sectors respectively

using the Yamane (1967) formula for determination for quantitative research. According to Yamane, a sample size can be calculated using the formula below if the population of the target group is known.

$$n = \frac{N}{1+N(e)2}$$

Where:

- n is the sample size
- N is the total number of accessible staff population (assumed to be 200)
- e is the margin of error, estimated at 5% (at 95% CI)

using the above variables, $n = \frac{1000}{1+1000(0.05)2} = 285.714 \approx 286$

Therefore, 330 staff were recruited from various mining and petroleum companies for the study.

Sampling Techniques

Sampling enables researchers to reduce the amount of data they need to collect from the target population through a methodical process that a few members of the study population in a manner that gives every member an equal chance of being selected to participate in the study (Bryman, 2016). The sample will be stratified based on industry type, location, and company size to ensure representativeness. The study would aim to include a diverse range of participants to ensure that the findings apply to a broad range of contexts and perspectives within the mining and petroleum industries in Ghana.

The stratified sampling technique will help minimize bias in the sampling process. Before selecting elements for the sample, the sampling frame will be organized into relatively homogeneous groups (strata), and the samples chosen based on the percentage of population data. This step, according to Creswell et al. (2009), increases the likelihood that the final sample is representative of the stratified groups.

Data Collection Procedures

The study will use both quantitative and qualitative methods to collect data. A survey questionnaire will be administered to workers to assess the effectiveness of OHS protocols in reducing work-related injuries, illnesses, and fatalities. The survey will include questions about the workers' awareness of OHS protocols, the extent to which these protocols are followed, and the impact of these protocols on their health and safety. Qualitative data will be collected through focus group discussions and in-depth interviews with key informants, including leaders of workers' unions in these industries, management members, and heads of regulatory agencies. FGDs and in-depth interviews will be used to assess the awareness and understanding of OHS protocols, identify challenges faced in implementing these protocols, and evaluate the role of regulatory agencies in enforcing OHS regulations.

Reliability and validity

Validity and reliability in research refer to the consistency level that is used to measure the research instrument and the level at which biases are involved in conducting a study. One of the most important criteria for measuring the quality of research work is the validity and reliability of the instruments used to collect the data (Joseph & Rosemary, 2003). Reliability requires that the result of research has a high level of reproducibility. The greater the reliability of the scale, the smaller the standard error it measures (Creswell, 2009). In this study, the validity of the data collection instruments will be achieved through pretesting of the instruments on respondents in one mining company and an oil & gas company before the commencement of the actual study. During the pretest, any question items identified to be inconsistent with the objectives of the study will be tweaked or expunged. After data collection, the researcher will use Cronbach's alpha coefficient to test the

reliability and validity of the quantitative data collected data using the questionnaires as it is one of the common methods to do so.

Data Analysis Plan

The study adopted a mixed-methods approach, combining both quantitative and qualitative data analysis techniques to comprehensively address the research objectives. Quantitative data collected through structured questionnaires were entered into IBM SPSS version 26 and analyzed. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic information and responses related to the level of awareness, understanding, and perceived effectiveness of OHS protocols. These analyses addressed Objectives I and II: assessing the level of awareness and understanding of OHS protocols among workers and evaluating the effectiveness of these protocols in reducing work-related injuries, illnesses, and fatalities in the mining and petroleum industries in Ghana.

To examine differences between workers in the mining and petroleum industries, inferential statistical tests were conducted. Independent samples t-tests were employed to compare mean scores between the two groups, while chi-square tests assessed associations between categorical variables such as training received and adherence to safety standards. In cases where comparisons involved more than two groups, one-way Analysis of Variance (ANOVA) was used. Additionally, logistic regression analysis was performed to determine the predictors of effective OHS practices, considering variables such as educational level, frequency of training, and years of work experience. These inferential analyses supported Objective IV: conducting a comparative evaluation of OHS implementation in the oil and mining industries.

Qualitative data obtained from in-depth interviews and open-ended questionnaire items were transcribed and analyzed thematically using Nvivo software. Thematic content analysis involved coding the data to identify recurrent patterns, meanings, and themes related to safety practices and perceptions. This analysis provided deeper insights into the contextual challenges and perceptions of OHS implementation, particularly addressing Objective III: identifying OHS issues that are common to both the mining and petroleum industries in Ghana. The qualitative findings also enhanced the comparative evaluation required under Objective IV.

The integration of quantitative and qualitative findings allowed for triangulation, enhancing the depth, credibility, and reliability of the results. The combined analysis offered a comprehensive understanding of OHS implementation in Ghana's mining and petroleum sectors and informed the recommendations proposed for improving safety performance and compliance in these industries

Ethical Considerations

Ethical approval will be sought from the Ethical Review Board of the university before the commencement of data collection. The researcher will abide by the tenets of the university's research rules in carrying out this study. Written informed consent will also be sought from all participants before they are interviewed for the study. Participants will be assured of utmost confidentiality and anonymity. No participant will be forced or coerced to take part in the study. Respondents will be urged to participate of their own volition without conditions attached (i.e., respondents will be briefed on the research and the indirect benefits to be offered, then left to decide whether to participate in the interview or not). Furthermore, respondents will be made aware that there are no incentives for participation, and that they can withdraw at any time during the study. They will also be assured of suffering no or minimal harm both physically and mentally as a result of their participation in the study. Respondents will be informed that the data generated will be used for academic purposes only, and that under no circumstances shall the data be used for any other purposes unless another ethical clearance is acquired.

RESULTS AND DISCUSSION

This chapter presents the findings achieved during the research on OHS implementation in the mining and petroleum industries. The findings are presented in accordance with study aims and are also illustrated in light of previous literature in order to reveal significant patterns and gaps.

Socio-demographic characteristics of respondents

Table 4.1 presents socio-demographic details of petroleum and mining workers. The mean age, in petroleum, was 39.03 with a standard deviation of 11.40 and was similar in the mining industry, 38.91 and a standard deviation of 11.42, which suggested a similar age profile in both sectors. In both sectors, a large proportion of workers were in the 30–49 age range. The mining sector, however, exhibited a greater proportion in the 40–49 age range (30.1%) compared with petroleum (25.9%) and petroleum exhibited a greater proportion in the younger age range 20–29 years (23.1%) compared with mining (28.7%).

In terms of gender composition, both sectors were male-dominated, with men accounting for 76.9% in petroleum and 80.4% in mining. Females were less prevalent in both industries, but their percentages were quite comparable (23.1% in petroleum and 19.6% in mining).

In reference to the educational level, secondary school certification (SSCE/WASSCE) was most common in both industries (47.6% in petroleum and 45.5% in mines). But the mining industry housed a higher percentage of postgraduates compared to petroleum (21.0% and 12.6%, respectively), and petroleum exhibited a relatively higher percentage in first-degree holders compared to mines (11.9% and 9.8%, respectively).

Work history patterns indicated petroleum workers were substantially more likely to have limited experience of 1–5 years (38.5%) compared with mining workers (45.7%). Conversely, a greater percentage of mining workers were found with 6–10 years' experience (32.2%) compared with petroleum workers (27.3%). Both industries shared similar distributions among workers with 11–15 years' experience (34.3% petroleum; 32.2% mining).

Table 4.1: Socio-demographic characteristics of respondents

Variable	Industry	
	Petroleum	**Mining**
Age(years)	***Mean=39.03, Sd= 11.40***	***Mean=38.91, Sd=11.42***
20-29	33(23.1)	41(28.7)
30-39	39(27.3)	31(21.7)
40-49	37(25.9)	43(30.1)
50-59	34(23.8)	28(19.6)
Gender		
Male	110(76.9)	115(80.4)
Female	33(23.1)	28(19.6)
Level of Education		
Basic	40(28.0)	34(23.8)
SSCE/WASSCE	68(47.6)	65(45.5)
First Degree	17(11.9)	14(9.8)
Post Graduate	18(12.6)	30(21.0)
Work experience		
1-5	55(38.5)	51(45.7)
6-10	39(27.3)	46(32.2)
11-15	49(34.3)	46(32.2)

Source: field Survey (2025)

Objective I: Level of awareness and understanding of OHS protocols among workers

Occupational Health and Safety Awareness Among Respondents

Table 4.2 indicates how well the respondents were informed regarding occupational health and safety (OHS) in the petroleum and mining industries. The data indicated that by a vast majority, workers in both industries were informed about OHS policies, with a somewhat greater figure among mining respondents than among

petroleum ones (88.1% and 79.7%, respectively). Relatively fewer workers, however, assured that their companies had a written OHS policy, with 53.1% in petroleum and 57.3% in mining assuring as such.

In policy adequacy, 60.8% of petroleum and 66.4% of mining firms answered that the policies were adequate and could provide protection, but over a third in both industries did not share a similar opinion. In OHS implementation committee availability, 50.3% of petroleum employees and 62.2% of mining employees confirmed their availability, leaving near half of petroleum firms reporting a lack of availability of such mechanisms.

Less than half the participants indicated having been issued a copy of their company's OHS policy during recruitment (49.9% petroleum; 57.3% mining). Both sectors also emphasized periodic, in contrast, to frequent, training. Annual training was most popular (37.8% petroleum; 49.7% mining), followed by quarterly training (25.9% petroleum; 28.0% mining). Monthly and weekly trainings were mentioned by lower percentages, notably weekly trainings (4.2% petroleum; 2.8% mining).

Even if there was a great OHS policy consciousness in both sectors, there were gaps in policy communication, adequacy, and frequency in training, and mining showed somewhat greater implementation systems compared to petroleum.

Table 4.2: Occupational Health and Safety Awareness Among Respondents

Variable	Industry	
	Petroleum	**Mining**
Heard of OHS policy		
Yes	114(79.7)	126(88.1)
No	29(20.3)	17(11.9)
Company has OHS policy		
Yes	76(53.1)	82(57.3)
No	67(46.9)	61(42.7)
Policy adequate for protection		
Yes	87(60.8)	95(66.4)
No	56(39.2)	48(33.6)
OHS implementation committee		
Yes	72(50.3)	89(62.2)
No	71(49.7)	54(37.8)
Given company OHS policy at employment		
Yes	70(49.9)	82(57.3)
No	73(51.0)	61(42.7)
Frequency of OHS training		
Weekly	6(4.2)	4(2.8)
Monthly	46(32.2)	28(19.6)
Quarterly	37(25.9)	40(28.0)
Annually	54(37.8)	71(49.7)

Source: field Survey (2025)

Channels of OHS education in the Petroleum and Mining Sector

The channel analysis of Occupational Health and Safety (OHS) education in petroleum and mining industries demonstrated various approaches by industries as indicated in Table 4.3.

In the petroleum industry, 78 workers (54.5%) claimed OHS education through seminars in contrast with 67 (46.9%) in the mining industry, while 65 (45.5%) and 76 (53.1%) in the petroleum and mining industries, respectively, claimed no education through seminars. Notice boards were a popular medium, with 81 workers

(56.6%) in the petroleum industry and 73 (51.0%) in the mining industry referring it as a source of OHS education, while 62 (43.4%) and 70 (49.0%) referred otherwise.

One-to-one education was also prevalent, reported by 73 workers (51.0%) in the petroleum sector and 78 (54.5%) in mines, and 70 (49.0%) and 65 (45.5%) did not obtain OHS education through this medium. Union meetings aided OHS education among 77 workers (53.8%) in petroleum and 70 (49.0%) in mines, and 66 (46.2%) and 73 (51.0%) did not make use of the channel.

These findings suggest that all four modes are utilized in both sectors, but notice boards and seminars are somewhat more popular in petroleum, and mining prefers individual interactions.

Table 4.3 Channels of OHS education in the Petroleum and Mining Sector

Variable	Industry	
	Petroleum	**Mining**
OHS education via seminar		
Yes	78(54.50	67(46.9)
No	65945.50	76(53.1)
OHS education via notice board		
Yes	81(56.6)	73(51.0)
No	62(43.4)	70(49.0)
OHS education via one-on-one		
Yes	73(51.0)	78(54.5)
No	70(49.0)	65(45.5)
OHS education via union meeting		
Yes	77(53.8)	70(49.0)
No	66(46.2)	73(51.0)

Source: field Survey (2025)

Overall Awareness of OHS of protocols

Figure 4.1 illustrates general knowledge or awareness on OHS procedures by the respondents. The data shows that a greater portion of the respondents (188, 66%) showed a high knowledge or awareness on OHS procedures compared to a smaller portion (98, 34%) showing low knowledge or awareness. This indicates a general widespread knowledge or awareness among the workers on OHS procedures, with two-thirds among all workers having a high knowledge and understanding. However, the fact that over a third among the working class still shows low knowledge or awareness presents a deficiency that necessitates corrective action in form of specific training and sensitization plans in order to achieve universal adoption and compliance with OHS standards.

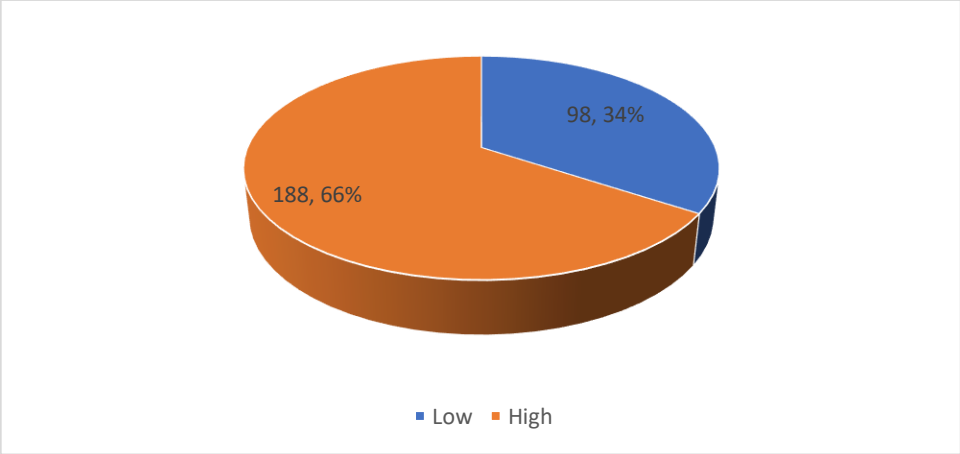

Figure 4.1 Overall Awareness of OHS of protocols

Objective II: OHS protocols currently operational in companies

OHS facilities among petroleum and Minig Industries

Figure 4.2 demonstrates the availability levels of Occupational Health and Safety (OHS) centres in petroleum and mining industries in reference to the desired target. The results demonstrate that Personal Protective Equipment (PPEs) was most available in both industries, with petroleum (39.2%) ever minimally above mining (32.9%). First Aid was most available in petroleum (18.2%) compared to mining (14%), whereby Fire Extinguishers and Accident Alarms were ever minimally higher in mining (18.9% and 19.6%, respectively), compared with petroleum (14% and 12.2%, respectively). Accordingly, Emergency Assembly Points were realized at 17.5% in petroleum and 14.7% in mining.

Overall, though the most provided-for safety facility was the PPEs, provision of other basic facilities, namely first aid, extinguishers, accident alarms, and emergency points for assembly, was low in both industries relative to the desired target. This means that despite progress made in the provision of basic protection equipment, there remains a lack in the general availability of safety facilities, particularly in petroleum, in which accident alarms lag significantly behind mining.

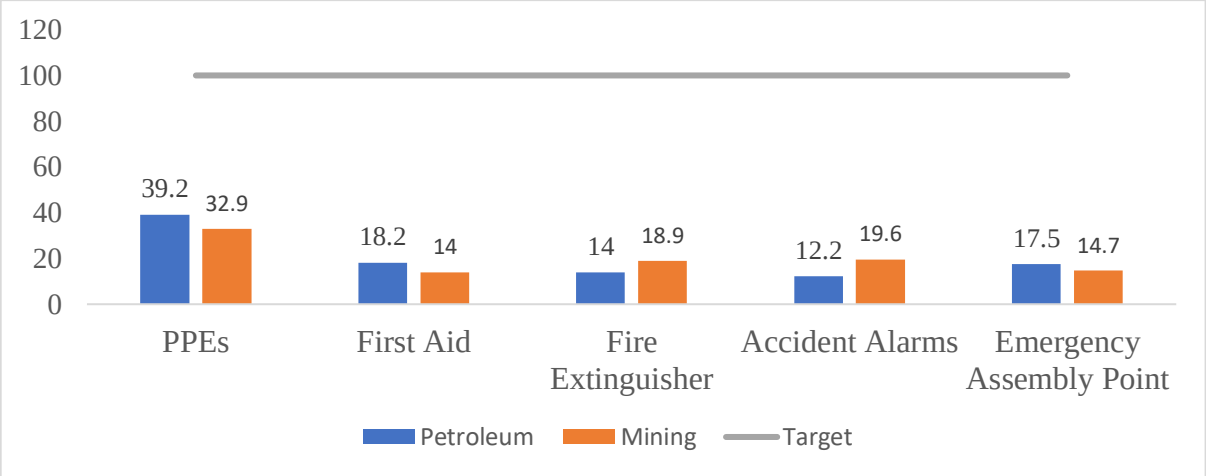

Figure 4.2 OHS facilities

Hazard Exposure

Table 4.4. Distribution by workers' exposures to petroleum and mining sectors' hazards during interviews. The outcome was that a small fraction above half the petroleum workers (51.7%) and mining workers (52.4%) interviewed referred to having adequate amenities. When it came to specific hazards, 55.2% petroleum workers interviewed referred to scorching heat compared with 44.8% in mining workers. Conversely, chemicals exposure (58.7% compared with 50.3%) and falling debris (56.6% compared with 50.3%) were greater in mining workers relative to petroleum workers.

Explosion exposures were nearly identical between industries (44.1% in the petroleum and 46.9% in mining industries). Long standing was more characteristic of petroleum (49.0%) than mining (39.2%), and long sitting was moderately higher among petroleum workers (55.2%) relative to mining workers (50.3%). The results overall are that despite having comparable occupational exposures, the nature and severity are different, with petroleum workers having higher exposure to heat and longer sitting, and mining workers having higher exposure to chemicals and falling objects

Table 4.4 Hazard Exposure

Variable	**Industry**	
	Petroleum	**Mining**
Adequacy of facilities		
Yes	74(51.7)	75(52.4)
No	69(48,3)	68(47.6)

Heat		
Yes	79(55.2)	64(44.8)
No	64(44,8)	79(55.2)
Chemicals		
Yes	72(50.3)	84(58.7)
No	71(49.7)	59(41.3)
Falling objects		
Yes	72(50.3)	81(56.6)
No	71(49.7)	62(43.4)
Explosions		
Yes	63(44.1)	67(46.9)
No	80(55.9)	76(53.1)
Prolong standing		
Yes	70(49.0)	56(39.2)
No	73(51.0)	87(60.8)
Prolong sitting		
Yes	79(55.2)	72(50.3)
No	64(44.8)	71(49.7)

Source: field Survey (2025)

Perceived Cause of Accidents

Table 4.5. Participants' perception regarding reasons for accidents in petroleum and mining industries.

The findings indicate that in both sectors, more than half indicated ever having been in an accident, 53.1% in petroleum and 50.3% in mining. Fatigue was considered a cause by 53.8% in petroleum and 54.5% in mining. Laziness was less frequently considered a cause, supported by 49.7% in petroleum and 42.0% in mining. Negligence showed a large inter-industry difference, 61.5% in petroleum considering it a cause and 39.2% in mining.

Poor supervision was equally common in both industries (49.7% petroleum; 50.3% mining). Poor amenities were cited by nearly half the employees responding (49.9% petroleum; 47.6% mining), and faulty machinery was observed more in petroleum (47.6%) than in mining (40.6%). Similarly, lack of knowledge was cited by nearly half the employees in both industries (51.7% petroleum; 51.0% mining). Last, lack of training was considered a cause by 49.7% petroleum workers and 43.4% mining workers.

The results are that negligence is significantly associated with accidents in the petroleum industry, and the other suspected causes, that is, fatigue, inadequate supervision, and lack of knowledge, are ever-present in both industries.

Table 4.5 Perceived Cause of Accidents

Variable	**Industry**	
	Petroleum	**Mining**
Ever involved in accident		
Yes	76(53.1)	72(50.3)
No	67(46.9)	71(49.7)
Fatigue		
Yes	77(53.8)	78(54.5)
No	66(46,2)	65(45.5)
Laziness		
Yes	71(49.7)	60(42.0)
No	72(50.3)	83(58.0)

Negligence		
Yes	88(61.5)	56(39.2)
No	55(38.5)	87(60.8)
Poor supervision		
Yes	71(49.7)	72(50.3)
No	72(50.3)	71(49.7)
Poor facilities		
Yes	70(49.9)	68(47.6)
No	73(51.0)	75(52,4)
Faulty equipment		
Yes	68(47.6)	58(40.6)
No	75(52,4)	85(59.4)
Lack of awareness		
Yes	74(51.7)	73(51,0)
No	69(48.3)	70(49.0)
Lack of training		
Yes	71(49.7)	62(43.4)
No	72(50.3)	81(56.6)

Source: field Survey (2025)

Knowledge on what to do in the event of accident

Figure 4.3 and Figure 4.4 suggest workers' recognition of how they should react in the event of an accident in the petroleum and mining industries. In the petroleum industry (Figure 4.3), 82% of the respondents indicated they recognized the response procedures in the event of an accident, while 18% did not recognize them. In the mining industry as well (Figure 4.4), a large portion of workers reported recognizing accident response procedures, but there was a small portion that did not.

These findings reflect that both industries have significantly improved in informing and educating workers on accident response procedures. However, the reality that there are workers (almost a twentieth in petroleum and fewer in mining) who lack the knowledge in this aspect reflects a potential safety vulnerability capable of disrupting effective emergency response and risk management. Enhanced sustained safety education and accident response drills reinforcement could be applied in filling gaps in such sectors.

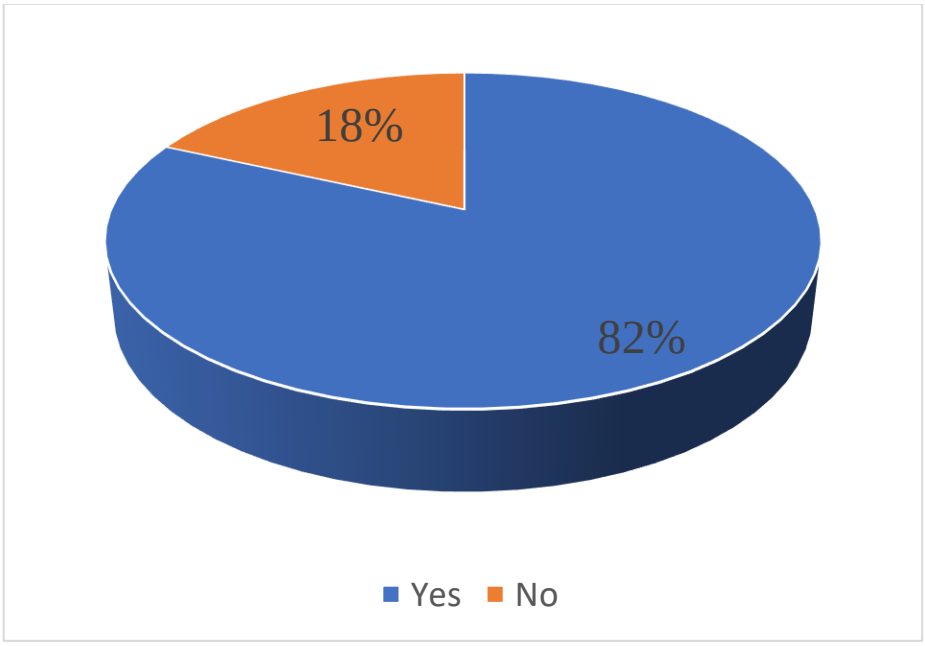

Figure 4.3 Knowledge on what to do in the event of *accident (Petroleum)*

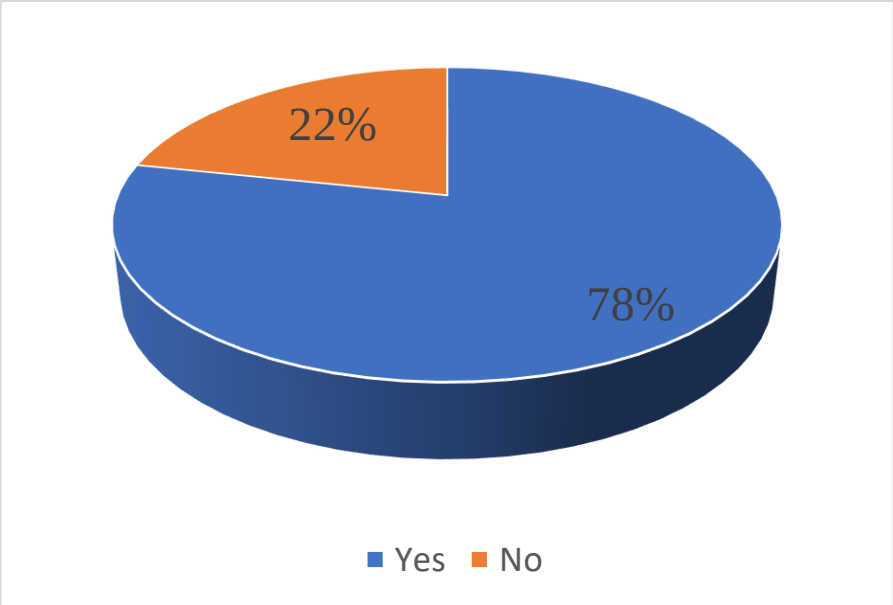

Figure 4.4 Knowledge on what to do in the event of accident r(mining)

Personal Protective Equipment: Petroleum and Mining Industries compared

Table 4.6. Usage by workers in the petroleum and mining industries of personal protective equipment.

The findings registered that a greater portion of workers in both industries self-reported actually utilizing PPE, 67.1% in petroleum and 70.6% in mines. But there was inconsistent adherence among particular gear. The petroleum workers, for instance, were more likely to wear earplugs than miners were (52.1% vs. 40.8% respectively), yet miners were more likely to wear overall coats than petroleum workers were (48.5% vs. 48.9% respectively).

The use of hand gloves was comparable among industries, 55.3% in petroleum and 49.5% in mining. The use of goggles was also among 55.3% petroleum workers and 52.4% mining workers. The use of helmets was greater in the mining industry (53.4%) compared to petroleum (46.8%). The use of boots was, in turn, more among petroleum workers (53.2%) compared to mining workers (46.6%).

These findings indicate that, overall, both industries have a high level of PPE wear, but there is variability in the type of protection most emphasized, revealing points of potential improvement in compliance and enforcement.

Table 4.6 Personal Protective Equipment

Variable	**Industry**	
	Petroleum	**Mining**
Use of PPE		
Yes	96(67.1)	101(70.6)
No	47(32.9)	42(29.4)
Earplug		
Yes	49(52.1)	42(40.8)
No	45(47.9)	61(59.2)
Overall coat		
Yes	46(48.9)	50(48.5)
No	48(51.1)	53(51.5)
Hand gloves		
Yes	52(55.3)	51(49.5)
No	42(44.7)	52(50.5)

Goggles		
Yes	52(55.3)	54(52.4)
No	42(44.7)	49(47,6)
Helmet		
Yes	44(46.8)	55(53.4)
No	50(53.2)	48(46.6)
Boots		
Yes	50(53.2)	48(46.6)
No	44(46.8)	55(53.4)

Source: field Survey (2025

Workers' Safety Practices in Petroleum and Mining Industries

The results in Table 4.7 are that petroleum and mining workers in general approved the usefulness of personal protective equipment (PPE), since most scored it as either very important (petroleum: 55, 38.5%; mining: 63, 44.1%) or important (petroleum: 69, 48.3%; mining: 60, 42.0%).

Few referred to it as less important (petroleum: 11, 7.7%, mining: 14, 9.8%) or as unimportant (petroleum: 8, 5.6%, mining: 6, 4.2%). In reporting defects promptly, approximately half in both industries said they advised on such matters (petroleum: 76, 53.1%, mining: 75, 52.4%), and close to equal percentages said that they did not do so (petroleum: 67, 46.9%, mining: 68, 47.6%).

In terms of reporting accidents, most common among petroleum workers was complaints to management (62, 43.4%) followed by reporting to the immediate supervisor (52, 36.4%), protesting (27, 18.9%), and least by a choice not to report at all (2, 1.4%). Among mining workers, reporting directly to the immediate supervisor was most common (60, 42.0%) followed by complaints to management (52, 36.4%) and protesting (31, 21.7%), with no workers reporting a choice not to report at all (0, 0.0%).

These findings suggest that regardless of the general appreciation by employees in both industries of the worth of PPE and reporting of defect and accidents, there existed subtle differences in accident reporting channels favored, with petroleum workers favoring complaints via management, and mining workers via direct bosses.

Table 4.7 Workers' Safety Practices in Petroleum and Mining Industries

Variable	**Industry**	
	Petroleum	**Mining**
Importance of PPE		
Very important	55(38.5)	63(44.1)
Important	69(48.3)	60(42.0)
Less important	119(7.7)	14(9.8)
Not important	8(5.6)	6(4.2)
Workers report defects promptly		
Yes	76(53.1)	75(52.4)
No	67(46.9)	68(47.6)
Means of reporting accidents		
Telling immediate supervisor	52(36.4)	60(42.0)
laying a complain to management	62(43.4)	52(36.4)
Protesting	27(18.9)	31(21.7)
I don't report at all	2(1.4)	0(0.0)

Source: field Survey (2025)

Association between socio-demographic characteristics and OHS awareness

The results in Table 4.8 demonstrate the association among socio-demographic characteristics and OHS consciousness in petroleum and mining workers. In petroleum, age was not significantly linked with OHS consciousness, χ^2= 3.997, p = .26, with OHS consciousness typically being high irrespective of age groups (20–29 years: 75.8%; 30–39 years: 59.0%; 40–49 years: 70.3%; 50–59 years: 55.9%). Similarly, in mining, no significant association was observed in age and OHS consciousness, χ^2= 2.892, p = .41, yet higher OHS consciousness was observed in 30–39 (71.0%) and 40–49 (72.1%) age groups compared to younger workers (56.1%) and older workers (67.9%). Gender, however, showed no association in petroleum, χ^2= 2.076, p = .150, and mining, χ^2(= 0.511, p = .475. Nevertheless, in both sectors, men displayed a tendency towards having somewhat higher OHS consciousness compared to females, with petroleum men having 68.2% and mining men having 67.8% compared to petroleum females, 54.5%, and mining females, 60.7%).

The level of education was also never significantly associated with OHS awareness in either petroleum, χ^2 = 1.472, p = .689, or mining, χ^2= 2.132, p = .545. Nevertheless, workers having basic education revealed relative OHS awareness levels (petroleum: 70.0%; mining: 70.6%) similar to workers having postgraduate education (petroleum: 55.6%; mining: 70.0%). Work experience was never significantly associated with OHS awareness in petroleum, χ^2= 0.726, p = .696, or in mining, χ^2= 0.662, p = .718. OHS awareness levels were invariably on a higher score range in all levels of experiences (petroleum: 61.2–69.1%; mining: 63.0–70.6%). Comparing relative strengths, the result shows that socio-demographic features such as age, sex, education, and work experience were never significantly linked with OHS awareness in either petroleum or mining industries in Ghana, despite minor percentage differences within the various levels.

Table 4.8 Association between socio-demographic characteristics and OHS awareness

	Petroleum			**Mining**		
	OHS awareness			**OHS awareness**		
Variable	**Low**	**High**	**χ^2(^{p}-value)**	**Low**	**High**	**χ^2(^{p}-value)**
Age(years)			3.997(0.26)			2.892(0.41)
20-29	8(24.2)	25(75.8)		18(43.9)	23(56.1)	
30-39	16(41.0)	23(59.0)		9(29.0)	22(71.0)	
40-49	11(29.7)	26(70.3)		12(27.9)	31(72,1)	
50-59	15(44.1)	19(55,9)		9(32.1)	19(67.9)	
Gender			2.076(0.150)			0.511(0.475)
Male	35(31.8)	75(68.2)		37(32.2)	78(67.8)	
Female	15(45.5)	18(54.5)		11(39.3)	17(60.7)	
Education			1.472(0.689)			2.132(0.545)
Basic	12(30.0)	28(70.0)		10(29.4)	24(70.6)	
WASSCE	23(33,8)	45(66.2)		22(33.8)	43(66.2)	
First Degree	7(41.2)	10(58.8)		7(50.0)	7(50.0)	
Post Graduate	8(44.4)	10(55.6)		9(30.0)	21(70.0)	
Work Experience			0.726(0.696)			0.862(0.596)
1-5	17(30.9)	38(69.1)		15(29.4)	36(70.6)	
6-10	14(35.9)	25(64.1)		16(34.8)	30(65.2)	
11-15	19(38.8)	30(61,2)		17(37.0)	29(63.0)	

Source: field Survey (2025)

Association between OHS protocol and awareness

The OHS protocol and awareness relationship analysis indicated similarities and differences in the petroleum and mining industries.

Having heard an OHS policy, petroleum workers who said that they heard the policy significantly possessed higher OHS awareness (high 73.7%) compared with workers who never heard, 31.0%, and was statistically

significant, $\chi^2 = 18.49$, $p < .001$. In mines, however, the workers who heard the policy also showed higher awareness, 66.3%, it was statistically nonsignificant, $\chi^2 = 1.58$, $p = .209$.

Corresponding to whether the company possesses an OHS policy, there was a large and robust association in both sectors. In petroleum, workers in firms having a policy demonstrated higher levels of awareness (78.9%) compared with firms without a policy (49.3%), $\chi^2 = 13.81$, $p < .001$. Correspondingly, in mining, workers from firms having a policy demonstrated higher levels of awareness (80.5%) compared with firms without a policy (47.5%), $\chi^2 = 17.03$, $p < .001$.

Protection policy adequacy was also significantly associated with industry consciousness. In petroleum, employees whose perception was that the policy was adequate were more aware compared to 50.0% among employees whose perception was otherwise, $\chi^2 = 9.15$, $p = .002$. The relationship was also similar in mining, 74.7% of employees whose perception was that the policy was adequate were aware compared to 50.5% among employees whose perception was otherwise, $\chi^2 = 8.75$, $p = .003$.

The presence of an OHS implementation committee was strongly linked with awareness in both sectors. In petroleum, workers in companies with an implementation committee reported higher awareness (76.4%) compared to workers without a committee (53.5%), $\chi^2 = 8.22$, $p = .004$. As was also the case in mining, employees with an implementation committee showed higher awareness (76.4%) compared with workers without a committee (50.5%), $\chi^2 = 10.51$, $p = .001$.

Accordingly, a company OHS policy on recruitment was significantly linked in both industries. In petroleum, workers who were provided with the policy on recruitment were significantly more aware at 80.0% compared with 50.7% in workers who were not, $\chi^2 = 13.51$, $p = .001$. Among mining employees, the similar trend was observed, with 75.6% awareness among workers provided with the policy relative to 54.1% among workers who were not provided, $\chi^2 = 7.26$, $p = .007$.

Finally, OHS frequency of training was not significantly associated with awareness in either sector. In petroleum, awareness levels were somewhat varied by frequency of training schedule (66.7%–76.1% weekly/monthly compared with 59.3%–59.5% quarterly/annually), but it was nonsignificant, $\chi^2 = 3.78$, $p = .287$. Similarly, in mining, awareness levels were 60.7%–75.0% across frequencies, and there was no significant association, $\chi^2 = 0.79$, $p = .852$.

Table 4.9 Association between OHS protocol and awareness

Variable	**Petroleum**		**χ^2(p-value)**		**Mining**	**χ^2(p-value)**
	OHS awareness				**OHS awareness**	
	Low	**High**		**low**	**High**	
Heard of OHS policy			**18.49(<0.001)**			1.58(0.209)
Yes	30(26.3)	84(73.7)		40(31.7)	86(66.3)	
No	20(69.0)	9(31.0)		8(57.1)	9(52,9)	
Company has OHS policy			**13.81(<0.001)**			**17.03(<0.001)**
Yes	16(21.1)	60(78.9)		16(19.5)	66(80.5)	
No	34(50.7)	33(49.3)		32(52.5)	29(47.5)	
Policy adequate for protection			**9.15(0.002)**			**8.75(0.003)**
Yes	22(25.3)	65(74.7)		24(25.3)	71(74.7)	
No	28(50.0)	28(50,0)		24(50.0)	24(50.5)	
OHS **implementation committee**			**8.22(0.004)**			**10.51(0.001)**
Yes	17(23.6)	55(76.4)		21(23.6)	68(76.4)	
No	33(46.5)	38(53.5)		27(50.0)	27(50.5)	
Given company OHS policy at employment			**13.51(0.001)**			**7.26(0.007)**
Yes	14(20.0)	56(80.0)		20(24.4)	62(75.6)	

No	36(49.3)	37(50.7)		28(45.9)	33(54.1)	
Frequency of OHS training			3.78(0.287)			0.79(0.852)
Weekly	2(33,3)	4(66.7)		1(25.0)	3(75.0)	
Monthly	11(23.9)	35(76.1)		11(39.3)	17(60.7)	
Quarterly	15(40.5)	22(59.5)		14(35.0)	26(65.0)	
Annually	22(40.7)	32(59.3)		22(31.0)	49(69.0)	

Binary Logistic Regression on Association between OHS protocol and awareness

Table 4.9.1 presents the results of the binary logistic regression analysis examining the association between OHS protocol indicators and OHS awareness among workers in the petroleum and mining industries. The findings show that several components of occupational health and safety (OHS) protocols significantly influence workers' level of awareness in both sectors.

In the petroleum industry, workers who had heard of their company's OHS policy were about six times more likely to demonstrate high OHS awareness compared to those who had not (AOR = 5.921, 95% CI: 2.41–14.55, $p < 0.001$). Similarly, workers in organizations that had a formal OHS policy were nearly four times more likely to exhibit higher awareness levels (AOR = 3.732, 95% CI: 1.67–8.36, $p = 0.001$). The adequacy of the policy for protection was also a significant predictor, as workers who perceived the policy as adequate were 2.8 times more likely to report higher OHS awareness (AOR = 2.843, 95% CI: 1.39–5.83, $p = 0.004$). Moreover, the existence of an OHS implementation committee increased the likelihood of OHS awareness by more than three times (AOR = 3.416, 95% CI: 1.46–7.98, $p = 0.005$). Lastly, workers who were given a copy of the company's OHS policy upon employment were about four times more likely to have higher OHS awareness than their counterparts who were not (AOR = 4.102, 95% CI: 1.78–9.45, $p = 0.001$). In the mining industry**,** a similar pattern emerged. Workers from companies that had a formal OHS policy were about 3.5 times more likely to have high OHS awareness (AOR = 3.457, 95% CI: 1.52–7.89, $p = 0.003$). Those who considered their company's OHS policy adequate for protection were approximately 2.6 times more likely to exhibit higher awareness (AOR = 2.566, 95% CI: 1.29–5.12, $p = 0.007$). The presence of an OHS implementation committee was also a strong predictor of awareness (AOR = 3.601, 95% CI: 1.49–8.73, $p = 0.004$), while being given a company OHS policy at the point of employment increased the odds of awareness by nearly three times **(**AOR = 2.984, 95% CI: 1.33–6.69, $p = 0.008$).

Table 4.9.1 Association between OHS protocol and awareness

Predictor Variable	**Petroleum Industry**	**p-value**	**Mining Industry**	**p-value**
	AOR (95% CI)		**AOR (95% CI)**	
Heard of OHS policy (Yes)	5.921 [2.41–14.55]	<0.001	—	—
Company has OHS policy (Yes)	3.732 [1.67–8.36]	0.001	3.457 [1.52–7.89]	0.003
Policy adequate for protection (Yes)	2.843 [1.39–5.83]	0.004	2.566 [1.29–5.12]	0.007
OHS implementation committee (Yes)	3.416 [1.46–7.98]	0.005	3.601 [1.49–8.73]	0.004
Given company OHS policy at employment (Yes)	4.102 [1.78–9.45]	0.001	2.984 [1.33–6.69]	0.008
Constant	—	0.001	—	0.002

Association between OHS education channels and OHS awareness

The research uncovered certain connections among OHS education media and workers' understanding in petroleum and mining industries.

Participants in seminars, among petroleum workers, evidenced significantly more OHS knowledge (78.2%) compared with non-participants (49.2%), $\chi^2 = 13.09$, $p < .001$. In mines, on the other hand, knowledge was greater among attenders also (73.1% in contrast with 60.5%), though statistically nonsignificant, $\chi^2 = 2.54$, $p = .11$.

In notice board communication, the society was statistically nonsignificant in petroleum (71.6% vs. 56.5%), $\chi^2 = 3.55$, $p = .06$, but significant in mines, where the notice board-exposed groups were having higher awareness in relation to the ones without, 78.1% vs. 54.3%, $\chi^2 = 9.07$, $p = .003$.

Both industries registered substantial and positive relationships in the instance of one-on-one education. In petroleum, the workers with one-on-one education exhibited significantly greater awareness, 83.6% compared to 45.7% among workers without one-on-one education, $\chi^2 = 22.51$, $p < .001$. The mining trend was the same, with higher awareness among workers with one-on-one education, 79.5%, compared with 50.8% among workers without, $\chi^2 = 13.11$, $p < .001$.

At union meetings, there was higher knowledge among both sectors' participants. In petroleum, 74.0% of workers who were education-exposed by union, indicated a higher knowledge compared to 54.5% among non-participants, $\chi^2 = 5.93$, $p = .02$. Similarly, in mining, there was higher knowledge among attendees at union meetings (80.0%) compared to 53.0% among non-participants, $\chi^2 = 11.31$, $p = .001$.

Finally, in availability of OHS facilities, there were variable patterns by facility type. In petroleum, the overall relationship was statistically nonsignificant ($\chi^2 = 7.07$, $p = 1.32$), yet awareness was greater among workers having access to PPEs (73.2%) and emergency assembly points (68.0%) than among workers having access only to fire extinguishers (45.0%) or accident alarms (50.0%). In mining, on the other hand, availability of OHS facilities was significantly associated with awareness ($\chi^2 = 11.72$, $p = .02$), and the highest level of awareness was among workers having access to PPEs (78.7%) and emergency assembly points (76.2%) compared with workers having access only to first aid (50.0%) or accident alarms (46.4%).

Table 4.10 Association between OHS education channels and OHS awareness

OHS education	**Petroleum**		**χ^2(^{p}-value)**	**Mining**		**χ^2(^{p}-value)**
	OHS awareness			**OHS awareness**		
	Low	**High**		**low**	**High**	
Seminar			**13.09(<0.001)**			2.54(0.11)
Yes	17(21.8)	61(78.2)		18(26.9)	49(73.1)	
No	33(50.8)	32(49.2)		30(39.5)	46(60.5)	
Notice board			3.546(0.06)			**9.07(0.003)**
Yes	23(23.4)	58(71.6)		16(21.7)	57(78.1)	
No	27(43.4)	35(56.5)		32(45.7)	38(54.3)	
One-on-one			**22.51(<0.001)**			**13.11(<0.001)**
Yes	12(16.4)	61(83.6)		16(20.5)	62(79.5)	
No	38(54.3)	32(45.7)		32(49.2)	33(50.8)	
Union meeting			**5.93(0.02)**			**11.31(0.001)**
Yes	20(26.0)	57(74.0)		14(20.0)	56(80.0)	
No	30(45.5)	36(54.5)		34(46.6)	39(53.0)	
OHS facilities available			7.07(1.32)			**11.72(0.02)**
PPEs	15(30.8)	41(73.2)		10(21.3)	37(78.7)	
First Aid	8(30.8)	18(69.2)		10(50.0)	10(50.0)	
Fire Extinguisher	11(55.0)	9(45.0)		8(29.7)	19(70.4)	
Accident alarms	8(50.0)	8(50.0)		15(53.6)	13(46.4)	
Emergency Assembly Point	8(32.0)	17(68.0)		5(23.8)	16(76.2)	
Adequacy of facilities			2.93(0.08)			**4.794(0.03)**
Yes	21(28.4)	53(71.6)		19(25.3)	56(74.7)	
No	29(42.0)	40(58.0)		29(42.6)	39(57.4)	

Association between OHS education channels and OHS awareness

Table 4.10.1 presents the binary logistic regression analysis showing the relationship between different OHS education channels and the level of OHS awareness among workers in the petroleum and mining industries.

The results demonstrate that several educational approaches significantly predict OHS awareness, though the strength of association varies across the two industries. In the petroleum industry**,** workers who reported receiving OHS education through seminars were almost four times more likely to demonstrate high OHS awareness compared to those who did not (AOR = 3.926, 95% CI: 1.75–8.80, p = 0.001). Likewise, those who had access to one-on-one OHS education were about five times more likely to have higher awareness levels (AOR = 5.438, 95% CI: 2.49–11.87, p < 0.001). Participation in union meetings where OHS issues were discussed also increased the odds of OHS awareness by more than two and a half times (AOR = 2.613, 95% CI: 1.14–5.99, p = 0.023). These findings indicate that interactive and participatory education methods, such as seminars and direct engagement, are strong predictors of OHS awareness in the petroleum sector.

In the mining industry, similar trends were observed, though with some variations in the channels of influence. Workers who received OHS information through notice boards were nearly three times more likely to exhibit high OHS awareness (AOR = 2.964, 95% CI: 1.42–6.19, p = 0.004). One-on-one OHS education again emerged as a strong predictor, increasing the likelihood of awareness by almost five times (AOR = 4.782, 95% CI: 2.23–10.28, p < 0.001). Similarly, those who participated in union meetings discussing safety issues were about three times more likely to report high awareness (AOR = 3.421, 95% CI: 1.52–7.69, p = 0.003). Moreover, the availability of OHS facilities (AOR = 2.836, 95% CI: 1.28–6.28, p = 0.010) and their adequacy (AOR = 2.482, 95% CI: 1.09–5.64, p = 0.030) were also significant predictors, suggesting that visible and functional safety infrastructure reinforces OHS learning and awareness among miners.

Table 4.10.1 Association between OHS education channels and OHS awareness

Predictor Variable	**Petroleum Industry**		**Mining Industry**	
	AOR (95% CI)	**p-value**	**AOR (95% CI)**	**p-value**
Seminar (Yes)	3.926 [1.75–8.80]	0.001	—	—
Notice board (Yes)	—	—	2.964 [1.42–6.19]	0.004
One-on-one education (Yes)	5.438 [2.49–11.87]	<0.001	4.782 [2.23–10.28]	<0.001
Union meeting (Yes)	2.613 [1.14–5.99]	0.023	3.421 [1.52–7.69]	0.003
OHS facilities available (Yes)	—	—	2.836 [1.28–6.28]	0.010
Adequacy of facilities (Yes)	—	—	2.482 [1.09–5.64]	0.030
Constant	—	0.001	—	0.002

Association between hazard exposure and OHS awareness

The work exposure-OHS knowledge relationship exhibited inconsistent results in both the petroleum and mining industries.

For heat exposure, no significant difference in awareness was observed in either industry. In petroleum, 64.6% and 65.6% among workers who were and were not exposed, respectively, exhibited a high level of awareness, $\chi^2 = 0.02$, p = .89. And in mining, 65.6% and 67.1% exhibited a high level, respectively, among workers who were and were not exposed, $\chi^2 = 0.34$, p = .85.

The chemical exposure was not significantly associated in petroleum, whereby 66.7% and 63.4% of workers exposed and uneexposed, respectively, indicated high awareness, $\chi^2 = 0.17$, p = .68. The chemical exposure was significantly associated with awareness in mining, though, as 67.9% and 64.4% of workers exposed and uneexposed, respectively, indicated high awareness, $\chi^2 = 3.40$, p = .002.

No significant relationships were found in either industry for dropped objects. In petroleum, 66.4% and 63.4% of the exposed and unexposed workers, respectively, were aware, $\chi^2 = 0.17$, p = .68. In mining, awareness levels were also similar (67.9% and 64.5%) $\chi^2 = 0.18$, p = .60.

For explosions, there were divergent results in different industries. In petroleum, there was a significant association of exposure with awareness, $\chi^2 = 5.45$, p = .001, with 65.1% of workers exposed having higher awareness as compared to 65.0% among workers not exposed. In mining, it was close to significance, χ^2 =

3.82, p = .05, with high awareness lower among workers exposed compared with workers not exposed (58.2% vs 73.7%).

Both sectors showed significant relations with prolonged standing. In petroleum, exposure to prolonged standing was linked with reduced awareness in comparison with workers without exposure, 61.4% versus 68.5%, $\chi^2 = 7.34$, p = .002. Similarly, in mines, exposure was linked with reduced awareness in comparison with workers without exposure, 64.3% versus 67.8%, $\chi^2 = 4.19$, p = .04. In prolonged sitting, no significant relations were observed. In petroleum, awareness was practically identical in both exposed, 65.8%, and in workers without exposure, 64.1%, $\chi^2 = 0.48$, p = .83. Mining results were nonsignificant, 62.5% among workers who were exposed and 70.4% among workers without exposure were aware, $\chi^2 = 1.01$, p = .32.

Table 4.11 Association between hazard exposure and OHS awareness

Variable	**Petroleum**		**χ^2(P-value)**	**Mining**		**χ^2(P-value)**
	OHS awareness			**OHS awareness**		
	Low	**High**		**Low**	**High**	
Heat			0.02(0.89)			0.34(0.85)
Yes	28(35.4)	51(64.6)		22(34.4)	42(65.6)	
No	22(34.4)	42(65.6)		26(32.9)	53(67.1)	
Chemicals			0.17(0.68)			3.40(0.002)
Yes	24(33.3)	48(66.7)		27(32.1)	57(67.9)	
No	26(36.6)	45(63.4)		21(35.6)	38(64.4)	
Falling objects			0.17(0.68)			0.18(0.6)
Yes	24(33.3)	48(66.4)		26(32.1)	55(67.9)	
No	26(36.6)	45(63.4)		22(35.5)	40(64.5)	
Explosions			**5.45(0.001)**			**3.82(0.05)**
Yes	22(34.9)	41(65.1)		28(41.8)	39(58.2)	
No	28(35.0)	52(65.0)		20(26.3)	56(73.7)	
Prolong standing			7.34(0.002)			**4.19(0.04)**
Yes	27(38.6)	43(61.4)		20(35.7)	36(64.3)	
No	23(31.5)	50(68.5)		28(32.2)	59(67.8)	
Prolong sitting			0.48(0.83)			1.01(0.32)
Yes	27(34.2)	52(65.8)		27(37.5)	45(62.5)	
No	23(35.9)	41(64.1)		21(29.6)	50(70.4)	

Source: field Survey (2025)

Binary Logistic Regression on Association between hazard exposure and OHS awareness

Table 4.11.1 presents the binary logistic regression analysis examining the association between hazard exposure and OHS awareness among workers in the petroleum and mining industries**.** The results indicate that certain occupational hazards significantly predict the level of OHS awareness across both industries, although the nature and strength of these associations vary.

In the petroleum industry, workers who were exposed to explosions were found to be 3.23 times more likely to have higher OHS awareness compared to those who were not exposed (AOR = 3.230, 95% CI: 1.38–7.55, p = 0.007). This finding suggests that the high-risk nature of explosive-related hazards may prompt employees to be more attentive to safety protocols and emergency procedures. Similarly, workers who experienced prolonged standing were about 2.66 times more likely to demonstrate greater OHS awareness (AOR = 2.660, 95% CI: 1.24–5.70, p = 0.012), implying that physical discomfort or fatigue-related risks may increase attentiveness to occupational safety measures.

In the mining industry, exposure to explosions also showed a significant positive association with OHS awareness, with workers being about 2.18 times more likely to exhibit higher awareness levels (AOR = 2.180, 95% CI: 1.03–4.60, p = 0.040). Likewise, exposure to prolonged standing increased the likelihood of high

OHS awareness by almost twofold (AOR = 1.990, 95% CI: 1.01–3.95, p = 0.047). Additionally, workers exposed to chemicals were approximately 2.59 times more likely to report high levels of OHS awareness (AOR = 2.590, 95% CI: 1.15–5.81, p = 0.021), emphasizing the importance of chemical safety and hazard communication practices in mining environments.

Table 4.11.1 Association between hazard exposure and OHS awareness

Predictor Variable	Petroleum Industry		Mining Industry	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Explosions (Yes)	3.230 [1.38–7.55]	0.007	2.180 [1.03–4.60]	0.040
Prolonged standing (Yes)	2.660 [1.24–5.70]	0.012	1.990 [1.01–3.95]	0.047
Chemicals (Yes)	—	—	2.590 [1.15–5.81]	0.021
Constant	—	0.001	—	0.005

Association between OHS awareness and perception on causes of accident

As indicated in Table 4.12. The OHS awareness and perceptions on accident causes relationship revealed generally nonsignificant findings in both industries, with a single variable having statistical significance in the Petroleum sector.

Fatigue showed no important relationship with awareness was observed in both industries. In petroleum, 62.3% among the attendants who mentioned accident causes as a case of fatigue claimed greater awareness compared with 68.2% who did not, $\chi^2 = 0.53$, p = .47. Similarly, in mining, 67.6% who mentioned accident causes as a case of fatigue claimed greater awareness compared with 64.6% who did not, $\chi^2 = 0.18$, p = .67.

For laziness, results were also nonsignificant. In Petroleum, 63.4% of workers citing laziness as a cause had high awareness compared with 66.7% of workers who did not, $\chi^2 = 0.17$, p = .68. In mining, the trend was the same, 68.3% of workers observing laziness as a cause having high awareness compared with 65.1% of workers who did not, $\chi^2 = 1.67$, p = .68.

With reference to negligence, no significant association was noted in either industry, though a somewhat higher tendency was noted in mining. In Petroleum, 63.6% reporting negligence as causative were in the high-awareness group compared with 67.3% who did not, $\chi^2 = 0.19$, p = .66. In mining, accident causation by negligence, however, was linked with higher accident-reporting awareness among workers (75.0%) in comparison with workers not linking causation in this manner (60.9%), though the relationship did not reach statistical significance, $\chi^2 = 3.03$, p = .08.

Poor supervision was associated with no significant relationship. In Petroleum, 62.0% connecting poor supervision and accidents showed high awareness in contrast with 68.1% who did not, $\chi^2 = 0.58$, p = .45. In mining, 61.1% connecting poor supervision showed high awareness as compared with 71.8% who did not, $\chi^2 = 1.84$, p = .18.

Among poor facilities, proportions in the high-awareness groups were similar within industries and groups. In petroleum, 67.1% who cited poor facilities as a cause were in the high-awareness group compared with 63.0% who did not, $\chi^2 = 0.27$, p = .61. In mines, 67.6% who cited poor facilities were in the high-awareness group compared with 65.3% who did not, $\chi^2 = 0.09$, p = .77.

The association was significant in the case of faulty equipment, $\chi^2 = 3.45$, p = .002, with 63.2% who mentioned faulty equipment as a cause having high awareness compared with 66.7% among workers who did not mention it. The association was nonsignificant in mining, with a lower level of high awareness among workers who mentioned faulty equipment (62.1%) compared with 69.4% among workers who did not mention it, $\chi^2 = 0.83$, p = .36.

Absence of knowledge as a cause, no significant association was observed. In petroleum, 67.6% of employees observing it as a cause showed greater awareness compared with 62.3% among those who did not, $\chi^2 = 0.43$, df = 1, p = .51. In mining, the tendency was observed in sample groups reporting (67.1%) and not reporting

(65.7%) the factor, $\chi^2 = 0.03$, df = 1, p = .80. Third, in absence of training, awareness was not significantly different in either industry. In petroleum, 69.0% reporting lack of training as a cause compared with 61.1% reporting it as not a cause, was significantly different in awareness, $\chi^2 = 0.98$, p = .32. In mining, awareness was nearly the same among both reporting (66.1%) and not reporting (66.7%) this aspect, $\chi^2 = 0.05$, p = .94.

Table 4.12 Association between OHS awareness and perception on causes of accident

Causes of accident	Petroleum		χ^2(p-value)	Minging		χ^2(p-value)
	OHS awareness			OHS awareness		
	Low	High		Low	High	
Fatigue			0.53(0.47)			0.18(0.67)
Yes	29(37.7)	48(62.3)		25(32.1)	53(67.6)	
No	21(31.8)	45(68.2)		23(35.4)	42(64.6)	
Laziness			0.17(0.68)			1.67(0.68)
Yes	26(36.6)	45(63.4)		19(31.7)	41(68.3)	
No	24(33.3)	48(66.7)		29(34.9)	54(65.1)	
Negligence			0.19(0.66)			3.03(0.08)
Yes	32(36.4)	56(63.6)		14(25.0)	42(75.0)	
No	18(32.7)	37(67.3)		34(39.1)	53(60.9)	
Poor supervision			0.58(0.45)			1.84(0.18)
Yes	27(38.0)	44(62.0)		28(38.9)	44(61.1)	
No	23(31.9)	49(68.1)		20(28.2)	51(71.8)	
Poor facilities			0.27(0.61)			0.09(0.77)
Yes	23(32.9)	47(67.1)		22(32.4)	46(67.6)	
No	27(37.0)	46(63.0)		26)34,7)	49(65.3)	
Faulty equipment			***3.45(0.002)***			0.83(0.36)
Yes	25(36.8)	43(63.2)		22(37.9)	36(62.1)	
No	25(33.3)	50(66.7)		26(30.6)	59(69.4)	
Lack of awareness			0.43(0.51)			0.032(0.8)
Yes	24(32.4)	50(67.6)		24(32.9)	49(67.1)	
No	26(37.7)	43(62.3)		24(34.3)	46(65.7)	
Lack of training			0.98(0.32)			0.05(0.94)
Yes	22(31.0)	49(69.0)		21(33.9)	41(66.1)	
No	28(38.9)	44(61.1)		27(33.3)	54(66.7)	

Source: field Survey (2025)

Association between Hazard Exposure and OHS awareness

In petroleum, PPE knowledge was also high, with 67.7% having high knowledge and 66.0% having low knowledge. The Chi-square test showed no significant association between the use and knowledge of PPE, $\chi^2 = 0.45$, p = .83. In mining, however, a larger percentage of workers who used PPE (78.9%) showed high knowledge against 21.1% who did not. The Chi-square test in our case showed a significant association, $\chi^2 = 9.44$, p = .002, and we therefore suspect that use of PPE significantly correlated with increased knowledge in mining but did so in petroleum also.

In petroleum, there was a slight increase in awareness among earplug-using workers compared to non-users (58.5% vs. 41.5%). The relationship was borderline significant, $\chi^2 = 3.39$, p = .06. In mines, 45.2% of the users showed a sense of high awareness against 54.8% among non-users, with no significant association, $\chi^2 = 2.04$, p = .15. This indicates that the use of earplugs significantly affected awareness in petroleum but not in mines.

In oil, 44.6% of coat-wearing workers were aware compared with 55.4% of coat-less workers, with no significant association, $\chi^2 = 1.57$, p = .21. In mines, awareness levels were the same among the user groups (49.3%) and never-users (50.7%) with no significant association, $\chi^2 = 0.60$, p = .81. The general coat availability in the two industries did not thus impact on awareness.

In the petroleum, 53.8% of user wearers of gloves reported high awareness compared with 46.2% user non-wearers, χ^2= 0.18, p = .67. In the mines, findings were also similar, 50.7% and 49.3% user and non-user wearers, respectively, reported high awareness, χ^2= 0.14, p = .71. Hence, the glove wear was not associated with awareness in both sectors.

In petroleum, there was a balanced distribution in levels of awareness among both user and non-user groups, 55.4% and 44.6%, respectively, with no significant association, χ^2= 0.00, p = .95. Also in mining, 50.7% among user groups and 49.3% among the non-user groups expressed a high level of awareness, χ^2 = 0.31, p = .58. Goggle use thus did not

In petroleum, wearers were somewhat more aware (52.3%) compared with non-wearers (47.7%), but the association was nonsignificant, χ^2= 2.56, p = .11. In mining, 50.7% of wearers and 49.3% of non-wearers were aware at a high level, χ^2 = 0.74, p = .39, and there was no suggestion that helmets were linked with awareness in either industry.

In petroleum, 47.7% of boot adopters were found to have a high level of awareness compared to 52.3% among non-users. Chi-square test showed a significant relationship, χ^2= 2.51, p = .01, and thus indicated that boots were associated with awareness in petroleum. But in mining, there was nearly an equal distribution among user and non-users, 46.6% and 53.4%, respectively, and no significant relationship, χ^2 = 0.00, p = .99.

Table 4.13 Association between PPE usage and OHS awareness

PPE use	**Petroleum**		**χ^2(p-value)**	**Mining**		**χ^2(p-value)**
	OHS awareness			**OHS awareness**		
	Low	**High**		**Low**	**High**	
Use of PPE			0.45(0.83)			***9.44(0.002)***
Yes	33(66.0)	63(67.7)		26(54.2)	75(78.9)	
No	17(34.0)	30(32.3)		22(45.8)	20(21.1)	
Earplug			3.39(0.06)			2.04(0.15)
Yes	11(37.9)	38(58.5)		9(30.0)	33(45.2)	
No	18(62.1)	27(41.5)		21(70.0)	40(54.8)	
Overall coat			1.57(0.21)			0.60(0.81)
Yes	17(58.6)	29(44.6)		14(46.7)	36(49.3)	
No	12(41.4)	36(55.4)		16(53.3)	37(50.7)	
Hand gloves			0.18(0.67)			0.14(0.71)
Yes	17(58.6)	35(53.8)		14(46.7)	37(50.7)	
No	12(41.4)	30(46.2)		16(53.3)	36(49.3)	
Goggles			0.00(0.95)			0.31(0.58)
Yes	16(55.2)	36(55.4)		17(56.7)	37(50.7)	
No	13(44,8)	29(44.6)		13(43.3)	36(49.3)	
Helmet			2.56(0.11)			0.74(0.39)
Yes	10(34.5)	34(52.3)		18(60.0)	37(50.7)	
No	19(65,5)	31(47.7)		12(40.0)	36(49.3)	
Boots			**2.51(0.01)**			0.00(0.99)
Yes	19(65.5)	31(47.7)		14(46.7)	34(46.6)	
No	10(34,5)	34(52.3)		16(53.3)	39(53.4)	

Source: field Survey (2025)

Association between Personal Protective Equipment and OHS awareness

Table 4.14. Correlation between occupational safety and health consciousness and personal protective equipment in petroleum and mining industries.

Significance of PPE was not significantly associated with level of consciousness in both industries, χ^2= 2.51, p = .47 in petroleum, and χ^2= 1.14, p = .76 in mining.

In petroleum, 72.7% of the participants who viewed the use of PPE as very important were found to be having a high level of awareness, compared with 60.9% who viewed it as important, 54.5% who viewed it as less important, and 62.5% who viewed it as not important. In mining, 69.8% who viewed the use of PPE as very important were found to have a high level of awareness, compared with 65.0% who viewed it as important, 64.3% who viewed it as less important, and 50.0% who viewed it as not important. Prompt defect reporting was also not significantly linked with awareness, χ^2 = 0.04, p = .84 in petroleum and χ^2= 2.93, p = .08 in mining. In petroleum, 65.8% who promptly reported defects compared with 64.2% who did not, and in mining, 60.0% who promptly reported compared with 73.5% who did not, all were aware.

Accident reporting procedures did not significantly predict awareness in both sectors, χ^2 = 6.35, p = .96 in petroleum and χ^2 = 1.85, p = .39 in mining. In petroleum, there was a high level of awareness among 59.6% reporting to the supervisors, 66.1% who complained at the management, 77.8% who protested, and 0% who did not report at all. In mining, 71.7% reporting to the supervisors, 59.6% who complained at the management, and 67.7% who protested exhibited a high level of awareness.

Table 4.14 Association between Personal Protective Equipment and OHS awareness

Variable	**Petroleum**		**χ^2(P-value)**	**Mining**		**χ^2(P-value)**
	OHS awareness			**OHS awareness**		
	Low	**High**		**low**	**High**	
Importance of PPE			2.51(0.47)			1.14(0.76)
Very important	15(27.3)	40(72.7)		19(30.2)	44(69.8)	
Important	27(39.1)	42(60.9)		21(35.0)	39(65.0)	
Less important	5(45.5)	6(54.5)		5(35.7)	9(64.3)	
Not important	3(37.5)	5(62.5)		3(50.0)	3(50.0)	
Workers report defects promptly			0.04(0.84)			2.93(0.08)
Yes	26(34.2)	50(65.8)		30(40.0)	45(60.0)	
No	24(35.8)	43(64.2)		18(36.5)	50(73.5)	
Means of reporting accidents			6.35(0.96)			1.85(0.39)
telling immediate supervisor	21(40/4)	31(59.6)		17(38.3)	43(71.7)	
laying a complain to management	21(33.9)	41(66.1)		21(40.5)	31(59.6)	
Protesting	6(22.2)	21(77.8)		10(32.3)	21(67.7)	
I don't report at all	2(100.0)	0(0.0)		0(0.0)	0(0.0)	

Source: field Survey (2025)

Objective III: Effectiveness of OHS protocols in reducing work-related incidents

OHS Protocols and Safety Responsibility in Petroleum and Mining Industries

Table 4.15 presents OHS protocol implementation and supervisory and safe conduct responsibility levels among petroleum and mining industries. The findings are that a very large percentage of the respondents confirmed that OHS protocols were in place in both sectors, with somewhat higher knowledge in the mining sector (97.2%) compared with the petroleum sector (95.8%). This would suggest both sectors have effective OHS systems in place, with somewhat higher implementation in mining.

For supervisory role, results showed that in both industries, it was shared in a fair manner by operators, supervisors, and managers. However, most typically, supervisors were mentioned in the mining industry (36.4%), while managers were most prevalent in the petroleum industry (35.7%). This reflects modest differences in how both industries distribute supervisory tasks in assuring safety.

In share of safety responsibility, the division was again fairly equally among operators, supervisors, and managers in both industries. Supervisors were more associated with safety responsibility in both petroleum (38.5%) and mining (35.0%) industries than operators and managers were. This suggests in both industries that supervisors are considered important figures in facilitating work practices that are safe, although managers and operators both have a great deal of responsibility.

These findings demonstrate that OHS protocols are widely implemented across both industries, with relatively balanced perceptions of supervisory and behavioral safety responsibilities, though subtle variations exist between petroleum and mining.

Table 4.15 OHS Protocols and Safety Responsibility in Petroleum and Mining Industries

Variable	**Industry**	
	Petroleum	**Mining**
OHS protocol implementation in place		
Yes	137(95.8)	139(97.2)
No	6(4.2)	4(2.8)
Responsibility for supervision		
Operator	44(30.8)	44(30.8)
Supervisor	48(33.6)	52(36.4)
Manager	51(35.7)	47(32.9)
Responsibility for safe behavior		
Operator	44(30.8)	46(32.2)
Supervisor	55(38.5)	50(35.0)
Manager	44(30.8)	47(32.8)

Source: field Survey (2025)

Descriptive Statistics for OHS protocols Effectiveness

Table 4.16 gives descriptive statistics on occupational health and safety (OHS) procedures among petroleum and mining workers. The participants rated various aspects of OHS on a five-point Likert scale from 1 = strongly disagree to 5 = strongly agree.

The results indicate fairly moderate levels of adherence on a variety of different indices. The highest rated was application of the correct personal protective equipment (PPE), with a mean rating of 4.51 (SD = 0.86), which would indicate workers were strongly consistent in conforming in regard to application of PPE. In line with this, application of correct appliances (M = 4.36, SD = 0.97), machinery guarding (M = 4.17, SD = 1.19), and periodic equipment checking (M = 4.12, SD = 1.21) were strongly rated, and strongly support conformity in regard to application of technical safety procedures.

Moderately high levels of effectiveness were observed in staff knowledge on hazards (M = 3.81, SD = 1.17), working area cleanliness (M = 3.94, SD = 1.26), and emergency readiness (M = 4.08, SD = 1.01), which suggests that the safety culture in organizations is generally good but requires improvement.

However, comparatively lower effectiveness was found in staff training (M = 3.34, SD = 1.39), staff adherence to rules (M = 3.44, SD = 1.33), and minimizing unwarranted exposure (M = 3.00, SD = 1.40). These findings suggest implementation gaps in behavioral aspects of OHS, particularly continuous training, strict adherence to rules, and proactive actions in restricting harmful exposure.

The findings support that equipment and technical OHS procedures are most effective, and behavioral and training-related ones require enhancement in a bid to ensure robust workplace safety.

Table 4.16: Descriptive Statistics for OHS protocols Effectiveness(n=276)

OHS Protocols	Min.	Max.	Mean	Std. Dev.
Staff properly trained	1	5	3.34	1.388
Staff comply with rules	1	5	3.44	1.332
Staff aware of hazards	1	5	3.81	1.173
Machinery guarded	1	5	4.17	1.188
Equipment inspected	1	5	4.12	1.211
Correct appliances used	1	5	4.36	.968
No unnecessary exposure	1	5	3.00	1.401
Correct PPEs used	1	5	4.51	.863
clean working area	1	5	3.94	1.264
Emergency readiness	1	5	4.08	1.013

Source: field Survey (2025)

Overall OHS protocols Effectiveness

Figure 4.5 presents the overall effectiveness of OHS procedures among the respondents. The statistics reveal that a majority (63%) of the respondents showed a high effectiveness of OHS procedures, and a small percentage (37 %) showed low effectiveness. This indicates that OHS protocol effectiveness is quite universal among workers, with two-thirds of workers having a high level of knowledge and understanding. However, as a fact, still over a third of workers remain low in levels of awareness, and it remains important to address through specific sensitizations and trainings in a bid to ensure universal uptake and compliance with OHS standards.

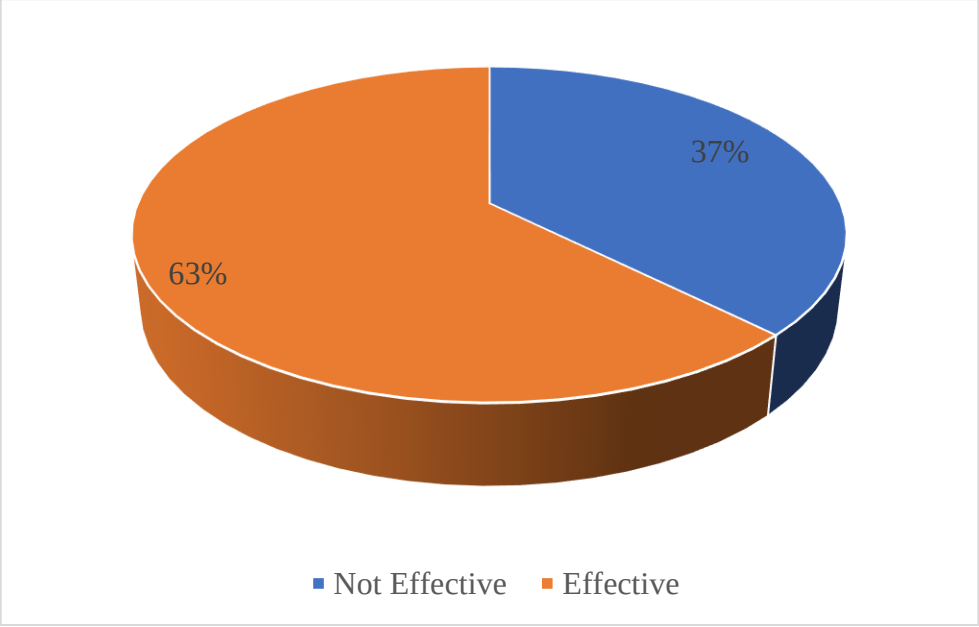

Fig 4.5 Overall Effectiveness of OHS protocols

Association Between Workplace Safety Measures and OHS Protocol Effectiveness

Table 4.17.1. The relationship between workplace safety, workplace safety measures and OHS protocol effectiveness in petroleum and mining industries.

For proper training, there was a significant association in both the petroleum, $\chi^2 = 36.59$, $p < .001$, and mining, $\chi^2 = 18.62$, $p < .001$, industries. In both industries, workers who did not believe that they were offered training were more likely to report OHS procedures as effective (89.6% in petroleum; 85.5% in mining). At the same time, workers who believed that they were offered training were less likely to believe OHS procedures as

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XII Issue XV October 2025 | Special Issue on Public Health

effective (40.0% in petroleum; 50.6% in mining). This shows a contradictory situation in which a usual train does not directly translate into perceived efficacy in OHS procedures.

The results were also important for OHS compliance in petroleum, $\chi^2 = 14.31$, $p < .001$, and mining, $\chi^2 = 8.94$, $p = .003$. In both, employees who disagreed that staff adhered to rules were significantly more likely to rate OHS procedures as effective (80.3% petroleum; 79.4% mining) than were employees who agreed that staff followed rules (49.3% petroleum; 55.3% mining). This indicates greater reported compliance did not equate with greater perceived protocol effectiveness.

In contrast, there was no noteworthy association in petroleum, $\chi^2 = 2.83$, $p = .09$, or mining, $\chi^2 = 3.54$, $p = .06$, in hazard awareness. Although levels of awareness were various, they didn't significantly predict if workers perceived OHS protocols as effective or ineffective and, therefore, by itself, hazard awareness possibly does not strongly establish protocol effectiveness as perceived by workers.

The relationship was strong and significant in both industries: petroleum, $\chi^2 = 14.16$, $p < .001$, and mining, $\chi^2 = 17.12$, $p < .001$. In petroleum, 93.3% who disagreed that machinery was guarded still rated OHS protocols as effective, and in mining 100% who disagreed stated efficacy. In agreeing groups, effectiveness decreased (56.1% in petroleum; 58.1% in mining), demonstrating that perceptions that machinery was guarded did not match perceived OHS protocol efficacy. Equipment inspection was significantly associated with protocol efficacy in both industries as well: petroleum, $\chi^2 = 17.59$, $p < .001$, and mining, $\chi^2 = 12.56$, $p < .001$. In petroleum, 96.7% who disagreed that inspections were carried out rated OHS protocols as effective compared with 55.1% who agreed. In mining, 91.2% who disagreed rated effectiveness compared with 58.1% who agreed.

The findings reveal a surprising association: in both petroleum and mining industries, lack of agreement with availability of workplace safety provisions (i.e., training, compliance, guarding, and inspections) tended to be linked with higher perceptions of effectiveness in OHS protocols. This suggests possible mismatches between implemented safety procedures and workers' day-to-day experiences that could influence perceptions of effectiveness.

Table 4.17.1: Association Between Workplace Safety Measures and OHS Protocol Effectiveness

	Petroleum		**χ^2(p-value)**	**Mining**		**χ^2(p-value)**
	OHS protocol effectiveness			**OHS protocol effectiveness**		
	Not Effective	**Effective**		**Not Effective**	**Effective**	
Proper training			**36.59(<0.001)**			**18.62(<0.001)**
Disagree	7(10.40	60(89.6)		9(14.5)	53(85.5)	
Agree	42960.0)	28(40.0)		38(59.4)	39(50.6)	
OHS compliance			**14.31(<0.001)**			**8.94(0.003)**
Disagree	13(19.7)	53(80.3)		13(20.6)	50(79.4)	
Agree	36(50.7)	35(49.3)		34(44.7)	42(55.3)	
Hazard Awareness			2.83(0.09)			3.535(0.06)
Disagree	11(25.6)	32(74.4)		10(22.7)	34(77.3)	
Agree	38(40.4)	56(59.6)		37(38.9)	58(61.1)	
Machinery Guarded			**14.16(<0.001)**			**17.12(<0.001)**
Disagree	2(6.7)	28(93.3)		0(0.0)	27(100.0	
Agree	47(43.9)	60(56.1)		47(42.0)	65(58.1)	
Equipment inspected			**17.59(<0.001)**			**12.56(<0.001)**
Disagree	1(3.3)	29(96.7)		3(8.8)	31(91.2)	
Agree	48(44.9)	59(55.1)		44(41.9)	61(58.1)	

Source: field Survey (2025)

Table 4.17.2. The relationship between workplace safety and OHS protocol success in petroleum and mining industries.

To apply the appropriate safety appliance, a significant association was observed in both industries, but the strength was varied. In petroleum, $\chi^2 = 4.62$, $p = .03$, and in mining, $\chi^2 = 13.35$, $p < .001$. In petroleum, 83.3% among persons who disagreed with application, nevertheless, rated OHS procedures as effective as 60.2% among persons agreeing only. Furthermore, in mining, 100% among persons who disagreed rated as effective compared with 59.8% among persons agreeing.

For unnecessary exposure, there was also a strong association in petroleum, $\chi^2 = 7.39$, $p = .007$, and in mining, $\chi^2 = 18.27$, $p < .001$. Disagreeing workers were significantly more likely to respond that OHS procedures were effective compared with agreeing workers (72.9% in petroleum; 80.5% in mining, vs. 50.0% in petroleum; 45.6% in mining, respectively).

Correct use of the right PPE was significantly correlated with workers' perceptions in selected industries. In petroleum, there was no significant association, $\chi^2 = 0.00$, $p = .99$, as nearly equal percentages in effectiveness were observed among workers who disagreed (64.3%) and agreed (64.2%) on the correctness in OHS protocols. In mining, a significant association was exhibited, $\chi^2 = 8.02$, $p = .005$, in that 94.7% among workers who disagreed indicated OHS protocols as effective compared with 61.7% among workers who agreed.

For clean working area, there was a big relationship in both industries: petroleum, $\chi^2 = 18.71$, $p < .001$, and mining, $\chi^2 = 7.43$, $p = .006$. In petroleum, 92.3% who disagreed with a clean work area rated OHS procedures as effective compared with 53.1% who agreed. In mining, 81.3% who disagreed rated as effective compared with 58.2% who agreed.

Finally, emergency knowledge showed no significant association in petroleum, $\chi^2 = 2.12$, $p = .15$, where effectiveness was also mutual among the disagreeing and agreeing groups (75.0% and 61.0%, respectively). Mining, however, was significantly linked, $\chi^2 = 9.28$, $p = .002$, as increased effectiveness was noted among the disagreeing relative to agreeing groups (86.5% and 58.8%, respectively).

The findings follow a systematic trend in industries and variables: in petroleum and mining, and in all individual and variable sets, conflict with certain workplace protection procedures (i.e., proper appliances, undue exposure, clean workplace, and in certain sets, use of PPE or emergency preparedness), on a contradictory basis, was associated with increased perceptions of OHS protocol efficacy. This evidences a possible dissonance between intended safety arrangements and workers' experienced realities of OHS protocol implementation.

Table 4.17.2: Association Between Workplace Safety Measures and OHS Protocol Effectiveness

Variable	**Petroleum**		**χ^2(^{p}-value)**	**Mining**		**χ^2(^{p}-value)**
	OHS protocol			**OHS protocol**		
	Not Effective	**Effective**		**Not Effective**	**Effective**	
Correct safety Appliance			**4.62(0.03)**			**13.35(<0.001)**
Disagree	4(16.7)	20(83.3)		0(0.0)	22(100.)	
Agree	45(39.8)	68(60.2)		47(40.2)	70(59.8)	
Unnecessary exposure			7.39(0.007)			**18.27(<0.001)**
Disagree	23(27.1)	62(72.9)		16(19.5)	66(80.5)	
Agree	26(50.0)	26(50.0)		31(54.4)	26(45.6)	
Correct PPE use			0.00(0.99)			**8.02(0.005)**
Disagree	5(35.7)	9(64.3)		1(5.3)	18(94.7)	
Agree	44(35.8)	79(64.2)		46(38.3)	74(61.7)	
Clean Work Area			**18.71(<0.001)**			**7.43(0.006)**
Disagree	3(7.7)	36(92.3)		9(18.8)	39(81.3)	
Agree	46(46.9)	52(53.1)		38(41.8)	53(58.2)	
Know what to do in			2.12(0.15)			**9.28(0.002)**

emergency						
Disagree	8(25.0)	24(75.0)		5(13.5)	32(86.5)	
Agree	41(39.0)	64(61.0)		42(41.2)	60(58.8)	

Source: field Survey (2025)

Analysis of Variance (ANOVA)

Table 4.18: Analysis of Variance (ANOVA) on Overall OHS protocols implementation effectiveness

Petroleum/Mining	**SS**	**df**	**MS**	**F**	**Sig.**
Between Groups	1.033	1	1.033	4.596	.033
Within Groups	61.576	274	.225		
Total	**62.609**	**275**			

*SS= sum of squares *MS+ mean square *df= degree of freedom

H_0 : The OHS protocol implementation is ***not effective*** in both Petroleum and Mining industries in Ghana

H_1 : The OHS protocol implementation is ***effective*** in both Petroleum and Mining industries in Ghana

Decision Rule: Reject H_0 if p-value<0.05

The ANOVA test in Table 4.18 above shows that there is a statistically significant difference in overall effectiveness in OHS protocol implementation in the petroleum and the mining sectors in Ghana, F(1,274) =4.596, p=.033. Since the value of the p-value (.033) is less in comparison with the 0.05 threshold, the null hypothesis (H_0) that OHS protocol implementation in both industries is ineffective is rejected. This implies that the alternative hypothesis (H_1) is accepted, and it demonstrates that OHS protocol implementation is effective among the petroleum and mining industries in Ghana, with a partial discrepancy in levels of effectiveness in both industries.

Objective IV: Challenges and barriers to implementation of OHS protocols

Challenges and barriers to implementation of OHS protocols

Table 4.19 gives the challenges and barriers in OHS protocol implementation in petroleum and mining industries. Both industries faced many challenges, with some differences noted. In petroleum, lack of managerial support was most mentioned at 29.9%, followed by inadequate training by 24.1%, and time limitation by 23.4%. In mining workplace, inadequate training by 28.1% and lack of managerial support by 26.6% were most mentioned, followed by time limitation by 24.5%. The lack of adequate equipment was less mentioned in both industries by 22.8% in petroleum and 20.9% in mining. In communication during OHS protocols, a significant percentage in petroleum industries mentioned communication as either very well communicated by 31.4% or well communicated by 29.2%. In mining, communication was less well by 25.2% than 29.5% citing poor communication, showing a challenge in having good OHS communication in that field. In frequency, both industries most often faced challenges either all the time by 28.5% petroleum and 28.1% mining, or often by 27.0% petroleum and 26.1% mining, thus showing recurrent and frequent OHS implementation challenges. In training, more than half in mining by 58.3% desired more in comparison with 51.8% in petroleum. Equipment access was moderately higher in mining by 65.5% compared with petroleum by 62.0%, yet a significant percentage in both industries still mentioned inaccessibility. Time management was a more favorite tool in mining by 57.6% compared with petroleum by 43.8%. Finally, managerial support was practically divided in both industries evenly, with a bit more in mining by 54.7% mentioning adequate support compared with petroleum by 52.6%. These results point out both industries share similar barriers, but workers in mining mentioned inadequate training and poor communication, while workers in petroleum mentioned lack of managerial support. The results point out systemic gaps that require commitment in a different form by organizations in the areas of commitment in communication, equipment access, training, and managerial support in OHS protocol implementation.

Table 4.19: Challenges and barriers to implementation of OHS protocols

Challenges	**Industry**	
	Petroleum	**Mining**
Challenges faced		
lack of proper equipment	31(22.8)	29(20.9)
Insufficient training	33(24.1)	39(28.1)
Time constraints	32(23.4)	34(24.5)
Lack of management support	41(29.9)	37(26.6)
Communication of OHS		
Very communicated	43(31.4)	35(25.2)
Adequately communicated	40(29.2)	35(25.2)
Poorly communicated	26(19.2)	41(29.5)
Not communicated at all	28(20.4)	28(20.1)
Frequency of difficulties		
Always	39(28.5)	39(28.1)
Often	37(27.0)	37(26.1)
Sometimes	31(22.6)	27(19.4)
Raely	30(21.9)	36(25.9)
Never	0(0.0)	0(0.0)
Additional training		
Yes	71(51.8)	81(58.3)
No	66(48.2)	58(41.7)
Accessible equipment		
Yes	85(62,0)	91(65.5)
No	52(38.0)	48(34.5)
Time management strategies		
Yes	60(43.8)	80(57.6)
No	77(56.2)	59(42.4)
Managerial support		
Yes	72(52,6)	76(54.7)
No	65(47.4)	63(45.3)

Barriers to OHS implementation

Theme 1: Inadequate Resources and Equipment

Participants observed poor availability of PPE, outdated equipment, and poor medical facilities.

"Sometimes we cannot find basic protection gear, and we are told to work with what we've got." (Participant 3)

"They rely on outdated safety equipment, and the management does not readily replace them." (Interviewee 7)

Theme 2: Weak Training and Awareness

Workers considered training as inconsistent, predominantly theoretical, and never reinforced in practice.

"Once a year we receive OHS training, but accidents happen every day." (Participant 1)

"Most new staff are not oriented on safety practices properly." (Participant 9)

Theme 3: Organizational and Management Barriers

Limited commitment by management through cost reduction, production pressure, and no enforcement.

"*Management prioritizes production over safety, so protocols are sometimes overlooked." (Participant 4)*

"Supervisors never insist on following rules during tight deadline situations." (Respondent 5)

Theme 4: Cultural and Behavioral Factors

Cultural perceptions regarding risk-taking and worker complacency were mutual barriers.

"Certain colleagues think accidents are merely 'God's will' and dismiss safety procedures." (Participant 8)

"Workers cut corners as they feel that experience is more important than following procedures." (Participant 6)

Common Issues Across Both Industries:

lack of PPE, inadequate training, emphasis on production by management, culture of complacency, and inadequate enforcement. The petroleum workers cited aging emergency response centers, and mine workers mentioned inadequate ventilation and inadequate PPE.

The inquiry found that OHS matters in both sectors were multifaceted, with numerous causes, including a lack of resources, a lack of effective management commitment, beliefs within a culture, and systemic regulatory failings. These overlapping problems suggest sector-specific reforms, emphasizing adequate resourcing, cyclical education, culture change programs, and effective enforcement systems.

DISCUSSION OF FINDINGS

Level of awareness and understanding of OHS protocols among workers

A major proportion of petroleum workers (79.7%) and mining workers (88.1%) were informed about Occupational Health and Safety (OHS) policies. Fewer, however, showed evidence of a written OHS policy, with 53.1% in petroleum and 57.3% in mining affirming. This disconnect between knowledge and written evidence reflects a larger dilemma observed in the oil and gas sector, whereby OHS management practices are readily known but application varies (Nkrumah, Liu, Doe Fiergbor, & Akoto, 2021). Also in small mines, provisions are generally well known in principle, but workers in mines are without access to well-documented principles or consistent application (Samuel Kwesi et al., 2022).

Perception of adequacy was inconsistent, 60.8% of petroleum and 66.4% of mining stating that existing policies were satisfactory, yet over a third were doubtful. This reflects earlier research in which, in spite of companies' having rules in place regarding safety, gaps in coverage and enforcement limit their potential for protection (Agyemang-Duah, Bansah, Dumakor-Dupey, Assan, & Bekui, 2024). Corresponding research in mining has suggested that effective OHS management within companies enhances commitment, and therefore discontent could be a product of inadequate or fragmented policy regimes (Amponsah-Tawiah & Mensah, 2016).

The availability of OHS implementation committees was confirmed by 50.3% of employees in the petroleum and 62.2% in mining industries, thereby leaving a significant percentage without corresponding mechanisms in place. The absence of committees diminishes systematic follow-through, an issue observed in small mines, wherein only 36% of companies routinely followed through on adhering (Samuel Kwesi et al., 2022). Effective safety committees are the foundation in ensuring safety culture and reducing risk, and their partial non-existence reflects a lack in institutional commitment.

Fewer than half the workers were provided with a copy of their business's OHS policy during recruitment (49.9% petroleum; 57.3% mining). Limiting policy document distribution constrains understanding of rights and responsibilities. Earlier evidence suggested that workers who are not provided with continuing access to guidelines demonstrate lower compliance and safety performance, irrespective of overall knowledge (Nkrumah et al., 2021).

Training was predominantly periodic, and the most common was once a year (37.8% petroleum; 49.7% mining), followed by quarterly, and monthly and weekly were rarely practised. Lack of adequate provision of opportunities for training was confirmed as a perennial weakness in all high-hazard sectors. In mines, inadequate induction and ineffective refresher courses were blamed for recurrent accidents and low adherence in the implementation of safety practice (Samuel Kwesi et al., 2022). Accordingly, ineffectiveness in oil and gas training has been blamed on the knowledge-safety practice discrepancy (Nkrumah et al., 2021).

Different avenues were employed as a method to deliver OHS education. In petroleum, notice boards (56.6%) and seminars (54.5%) were more in evidence, and in mining, one-on-ones (54.5%) were comparatively more popular. Literature shows communication channel effectiveness depends on the participation by workers; personalized approaches such as a one-on-one training are likely to more substantially enhance compliance and motivation compared with blanket coverage methods such as posters or seminars (Nkrumah et al., 2021).

The overall, two out of every three participants (66%) displayed greater knowledge on OHS procedures, and a third (34%) displayed lower knowledge. This distribution indicates that while knowledge on OHS is widespread, there is a large minority of workers who are less knowledgeable. Similar patterns were indicated in previous studies, whereby most workers are educated on OHS principles yet gaps in diffusion and training make the rest less knowledgeable, leading to frequent accidents and occupational disease (Agyemang-Duah et al., 2024). Overcoming low knowledge through frequent training, well-prepared committees, and communication channels remains essential in enforcing safety culture and compliance.

OHS protocols currently operational in companies

Provisioning of Personal Protective Equipment (PPE) shows highest availability, with 39.2% in petroleum and 32.9% in mining showing access. First aid centers fall behind (18.2% petroleum; 14.0% mining), and fire extinguishers (14.0% compared with 18.9%) and accident alarms (12.2% compared with 19.6%) are more abundantly provided in mining. Emergency gathering points are also underprovided (17.5% petroleum; 14.7% mining). Whilst most provisioned is the PPE, essential ones such as first aid, fire extinguishers, alarms, and gathering points are poorly provided. This imbalance is repeated in port-related settings, in which safety measures provided for are PPE, emergency gathering points, first aid, alarm systems, and safety communication—but are implemented with wide variability and incomplete coverage (Abila Abugre, 2024)

The uneven availability of security infrastructure points to scanty overall preparations in hazardous industries.

Perception of working in hazardous conditions reflects that about half the workers report adequate amenities (51.7% petroleum; 52.4% mining). Exposure to heat stress is considerably higher in petroleum (55.2%) than in mining (44.8%). Mining experiences higher exposure to chemicals (58.7%) and objects falling from above (56.6%) compared with petroleum (50.3% and 50.3%, respectively). Exposure to explosions is roughly comparable (44.1% vs. 46.9%). Long hours standing are more common in petroleum (49.0%) than in mining (39.2%), and long hours sitting are higher in petroleum (55.2%) than in mining (50.3%). The disparity in profiles of hazards reflects the different working environments. Previous reviews confirm that multifaceted or complex hazards—which involve physical, chemical, mechanical, and psychosocial risks—are important in both industries (Agyemang-Duah et al., 2024)

Over half report involvement in an accident (53.1% petroleum; 50.3% mining). Fatigue is noted by around 54% in both industries as a cause. Laziness (49.7% petroleum; 42.0% mining) and poor supervision (49.7%; 50.3%) are also invariably mentioned. Negligence is considered more seriously in petroleum (61.5%) than in mining (39.2%), and poor infrastructure (49.9%; 47.6%) and faulty equipment (47.6%; 40.6%) are also invariably mentioned. Lack of awareness (51.7%; 51.0%) and lack of training (49.7%; 43.4%) are also invariably mentioned. These perceptions indicate general patterns observed in high-hazard industries, in which worker fatigue, poor supervision, inadequate infrastructure, and inadequate training are recognized accident contributors (Agyemang-Duah et al., 2024)

Understanding what to do after an accident is also high: 82% in petroleum report knowledge of correct actions, with a corresponding large share in mining. Nevertheless, close to a fifth in petroleum and a minority in

mining do not have such knowledge. Effective safety orientation continues as important, particularly in situations with a high frequency of hazards (Martek et al., 2024)

Reported use of PPE is 67.1% in petroleum and 70.6% in mining. Use varies by specific product: earplugs (52.1% petroleum; 40.8% mining), coats (48.9%; 48.5%), gloves (55.3%; 49.5%), goggles (55.3%; 52.4%), helmets (46.8%; 53.4%), and boots (53.2%; 46.6%). Even though overall use of PPE is moderately high, the differential in use of particular items suggests differential supply and enforcement patterns. Among artisanal miners, compliance with use of PPE depends significantly on access, price, and perception of danger—variables that affect levels of compliance (Aram et al., 2021)

Workforce safety behaviors indicate most find PPE quite important (38.5% petroleum; 44.1% mining) or important (48.3%; 42.0%) and only small minorities think it's less or not important. Roughly half indicate defects are reported promptly (53.1% petroleum; 52.4% mining). Accident reporting in petroleum points in the direction of complaints by management (43.4%) or immediate supervisors (36.4%), with some by protesting (18.9%) and few by not reporting at all (1.4%). Accident reporting in mining favors immediate supervisors by a wide margin followed by complaints by management and protesting (21.7%). These results indicate contrasts in work culture and trust issues, themes explored in reports on the value of reporting mechanisms in safety cultures (Agyemang-Duah et al., 2024)

Age, sex, education, and experience do not significantly correlate with OHS awareness, though there are small differences. Awareness is kept at a generally high level within groups. This goes along with overall findings that OHS activity and awareness are more inclined on workplace policy and culture than on individual characteristics (Martek et al., 2024).

Statistical relationships find that OHS policy knowledge significantly increases awareness in petroleum, but not in mining. Written policy strongly correlates with awareness in both mining and petroleum. Perceived policy adequacy, implementation committees, and job commencement receipt are significantly correlated with awareness, too. Work-based frequency does not significantly contribute to awareness. Communication media--seminars, individual briefings, union meetings, and, in mining, notice boards--register strongly positive relationship with increased awareness, thus emphasizing individual and dynamic communication. Facility availability is associated with awareness in mining, mainly specific personal protective equipment and points of assembly, but none in petroleum. These patterns reflect evidence that access, institutional arrangements, and participation mechanisms are more useful in raising awareness than are passive or infrequent work-based training (Martek et al., 2024; Agyemang-Duah et al., 2024)

Hazard awareness and exposure have inconsistent relations. Protracted standing hours are linked with reduced awareness in both sectors, chemical exposure with higher awareness only in mining, explosion exposure with significance in petroleum, and other types of hazards have low impact. These nuanced relations indicate that certain exposures are capable of stimulating workers' concern over safety more than are certain others. Similar complexity in relations among exposure and awareness is noted in literature on exposure assessment (Exposure Assessment, 2015)

These relations are typically nonsignificant, with the exception that in petroleum, defective equipment shows a significant relation. The overall no significance means that ascertaining cause does not directly reflect or influence overall knowledge of safety. The use of PPE is significantly linked with awareness in mines, yet petroleum mines are an exception. Certain individual pieces of PPE show weak or no significant association. The value placed on PPE, defect reporting, and accident reporting are all mechanisms that are no significantly linked with awareness. This suggests that, although safety behaviors and PPE are reinforced, they will not universally reflect greater awareness, particularly if supply or culture reinforcement differentiates by industry.

Effectiveness of OHS Protocols in Reducing Work-Related Incidents

A vast majority of workers verified the presence of OHS procedures in both mining and petroleum sectors, with somewhat higher recognition in mining (97.2%) compared to petroleum (95.8%). This indicates that well-established OHS systems are firmly embedded in both sectors. Allocation of supervisory role was also

moderately balanced, yet supervisors were more prominently referred to in mining and managers somewhat more in petroleum. In both situations, supervisors were the primary actors in maintaining work safety practices. Similar findings are noted in industries considered hazardous in which supervisors are the frontline enforcers of safety bridging organizational policy with workers' behaviors (Okoye & Okolie, 2021; Fargnoli et al., 2022).

High levels of perceived efficacy were observed in technical details in OHS implementation. The use of the correct PPE received the highest rating (M = 4.51), followed by the use of the right appliances (M = 4.36), machinery protection (M = 4.17), and routine checking on equipment (M = 4.12). These indicate strong compliance with procedures that are more tangible, easier to monitor, and more directly connected to legal requirements. Similar trends have been observed in oil, gas, and building industries in which technical protection is generally highlighted and maintained adequately (Chen et al., 2020; Goh et al., 2021).

Moderately high levels of effectiveness were seen in accident awareness, clean workspaces maintenance, and emergency preparedness, with mean 3.8-4.1. While they reflect a generally positive safety culture, they reflect potential improvement areas in maintaining awareness and preparedness. Previous research shows that hazard awareness and emergency preparedness vary with frequency of drills, communication, and Management perceived commitment (Martek et al., 2024; Agyemang-Duah et al., 2024).

Lower means were also registered in staff training (M = 3.34), rules adherence (M = 3.44), and unwarranted exposure reduction (M = 3.00). The gaps reflect points of weakness in behavioral OHS application. Where procedures are established, repetitive training and hardline enforcement of compliance are less effective. Comparable concerns are observed in mining and energy literature in which weak training diminishes thelong-term effectiveness of safety efforts despite availability of technological controls (Boadi & Akuamoah-Boateng, 2020; Aram et al., 2021).

Total rating of effectiveness shows that 63% of workers rated OHS protocols as very effective and 37% rated lowly. This points towards widespread yet patchy application of OHS practices. The fact that there is a sizable minority with low effectiveness reporting is a need for increased sensitization and targeted interventions. Experience in other hazardous industries shows that, irrespective of well-formulated protocols, workers' participation and faith in the safety systems are decisive in their perceived as well as practical effectiveness (Shafique et al., 2019).

The association tests exhibited an inconsistent pattern: employees who disagreed there were provisions on safety in the form of training, adherence to procedures, machinery guarding, or equipment inspections tended to perceive greater levels of OHS effectiveness. As illustrations, in petroleum, 93.3% among workers who disagreed there was machinery guarding in spite of it still perceived OHS protocols as effective compared with 56.1% among those agreeing. In mining, 100% among workers who disagreed there was machinery guarding perceived OHS protocols as effective compared with 58.1% among those agreeing. The inconsistent tendency reflects the possible disassociation between lived realities in a workplace and prescribed provisions in a workplace. Workers may be giving more priority to informal routines, individual judgment, or instructions from supervisors as compared with observed compliance. Similar inconsistencies have been noted in the literature on safety culture, whereby having a lot of observed safety rules does not automatically contribute to higher levels of perception on effectiveness (Shalini, 2020; Cooper, 2022).

ANOVA results confirmed OHS protocol effectiveness differs significantly between petroleum and mining industries, $F(1,274) = 4.596$, $p = .033$. This implies that, despite the overall effectiveness in both industries, there are differences in implementation and impact in a given context. Mining, having higher exposures and greater regulatory cover, potentially stimulates higher perceptions of OHS relevance compared to petroleum. This aligns with inter-industry evidence showing industry context influences both compliance and perceptions in safety provisions (Khdair et al., 2019; Fargnoli et al., 2022). The results are generally that OHS procedures in the petroleum and mining industries are good, particularly in equipment and technical aspects, yet less efficient in behavioral aspects, such as in training, compliance, and minimization of exposure. The unexpected relationships point towards a larger area for investigation into workers' perceptions and knowledge on safety provisions, highlighting incompatibilities between provisions on paper and lived experiences. Refinement in

continuous education, alignment of written procedures and workers lived experiences, and enhancement in participation-based safety culture are needed in mitigating work-related accidents and entrenching OHS efficacy.

Challenges and barriers to implementation of OHS protocols

The research revealed that both the petroleum and mining sectors face significant challenges in undertaking occupational health and safety (OHS) procedures, but the nature and emphasis of challenges vary moderately in the two sectors. In the petroleum sector, lack of managerial support was most prominently cited among the challenges (29.9%), followed by inadequate training (24.1%) and time limitation (23.4%). In the mining industry, inadequate training (28.1%) and lack of managerial support (26.6%) were the overwhelming challenges, and time limitation (24.5%) was also a significant force. The focus identifies systemic shortcomings in organizational commitment, resource allocation, and readiness of the workforce as challenges that hamper effective OHS procedures implementation.

The fact that issues with training are sustained in both industries points to a structural defect in the building of worker capability. More than half of the miners (58.3%) and over half the petroleum workers (51.8%) expressed a desire for more education. Qualitative accounts by participants confirmed this, in citing irregular and predominantly theoretical trainings, and a lack of orientation on work by new workers. This is in alignment with Tawiah and Baah (2019), whose commentary was that inconsistent and irregular training watered down compliance with OHS behaviors and results in frequent accidents. Boateng and Amedofu (2017), in a similar vein, noted that within the extractive industries, a lack of sustained safety education vitiated OHS knowledge translation into workday activity, and thereby watered down safety culture.

Management support was also a determining factor in OHS implementation. The workers verified that production time was prioritised by most supervisors at the expense of security, and enforcement of the rules was inconsistent. This is in line with Mensah and Frempong (2021), who found that weak managerial commitment in petroleum companies was significantly associated with higher levels of non-adherence to protocol. Furthermore, Audu et al. (2018) established that if managerial support was low, OHS implementation was considered a formality and not a operating necessity, and therefore its influence was confined.

Communication of OHS procedures and policies were variable. In petroleum, communication was rated by most workers as adequate or well implemented, but in mining, inadequate communication (29.5%) was barely greater than positive responses. The disparity reflects intersectoral variations in practices, with petroleum companies having more formal communication systems in general. Nonetheless, ineffective communication of OHS information in mining is a setback repeated in previous work on Africa. In response, for example, Akpan and Patrick (2020) observed that ineffective communication channels in Nigeria's petroleum industry created knowledge gaps in workers, reducing compliance with minimum safety procedures.

The problem of limited resources and equipment was also evidenced in participants' testimonies, wherein improper provision of personal protective equipment (PPE), overdependence on outdated tools, and lags in procuring equipment were observed. Similar evidence was gathered in previous studies. Boateng and Amedofu (2017) observed that outdated infrastructure and uneven supply of PPE significantly affect safety performance in mines. Akpan and Patrick (2020) also noted that improper emergency response infrastructure among petroleum companies left workers more exposed during accidents. Such a limitation on resources directly violates world standards on safety and points to systematic lack of investment in occupational safety.

Behavioral and cultural barriers also affected workers' attitudes in OHS implementation. Some attributed accidents to fate or "God's will," and others attributed accidents to complacency, cutting corners, or overreliance on individual experience rather than monitoring safety procedures. These attitudes are similar to Tawiah and Baah's (2019), who observed that in African mines, cultural perceptions on risk usually outweigh strict adherence in safety procedures. This example shows that OHS challenges are socio-cultural as well as structural and require certain behavioural corrective actions.

Finally, systemic issues such as weak regulatory enforcement and inconsistent application were universal problems. The workers mentioned that inspections were a rarity and, if conducted, were inclined to focus on

paperwork and less on the conditions on the ground. These findings are congruent with Mensah and Frempong (2021), who commented that the effectiveness of OHS procedures is compromised by corruption, lack of effective regulatory capability, and ineffective mechanisms for enforcing OHS in Africa's extractive industries. Without effective monitoring and sanctions regimes, otherwise well-thought procedures are also likely to fail in implementation. Ultimately, the problems observed in both petroleum and mining sectors are multifaceted, including resource deficiencies, weak managerial support, inadequate training, social attitudes, and systemic enforcement failings. Although lack of managerial support and ageing equipment were concerns raised by the petroleum industry, inadequate training, subpar PPE, and communication were concerns expressed by the mining sector. These concerns all indicate OHS implementation enhancement needing a multi-dimensional response, including organisational commitment, continuing training, adequate resourcing, social culture shift initiatives, and strengthened regulatory enforcement.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

The study compared how Occupational Health and Safety procedures were applied in petroleum and mining industries. Four drivers guided the study: (i) OHS protocol knowledge and awareness among workers, (ii) OHS procedures in operations in both industries, (iii) level of implementation and compliance, and (iv) challenges and barriers in effective implementation.

The findings were that OHS protocol knowledge was generally high, with most participants reporting OHS policy knowledge. Some areas were, however, noted in policy communication, adequacy, and repeated training, with mining having relatively stronger systems in place compared to petroleum. Mechanisms in communication were also varied in the industries, with petroleum workers reporting enhanced policy communication, and mining workers reporting inadequate communication practices.

Despite general knowledge, there were sustained issues in OHS protocol implementation. Inadequate training, managerial support, equipment, and systemic enforcement frailties were main inhibitors. Attitudes of risk-taking, complacency, and inadequate regulatory monitoring also impaired compliance. The qualitative evidence reinforced the gaps, citing limited resources, variable training, production pressures, and external systemic barriers as recurrent issues. Both industries, overall, were ready to adopt OHS, but there were sustained structural, organisational, and cultural obstacles that deterred overall uptake.

Limitations

The study was conducted in petroleum and mining industries only and therefore did not allow generalizability of findings in all industries with comparable levels of risks as noted above, for example, manufacturing or construction industries. The data were solely self-reported and were therefore likely affected by social desirability bias, especially in response to questions concerning following safety procedures. Time and resources were only available to include cross-sectional, but not longitudinal, measurement, and therefore could have distinguished patterns over time. Furthermore, while regulatory perspectives were considered through the literature, the study did not directly include perspectives of policymakers or inspectors, and could therefore have enriched findings.

Conclusion

In spite of a reasonable level of knowledge and recognition of OHS policies among workers in the petroleum and mining industries, recognition in itself does not translate into effective implementation. Key gaps remain in the regularity of training, communication, and support by managers, and lower the effectiveness of OHS provisions. Low levels of resources, inadequate regulatory control, and cultural attitudes contribute to these challenges, and cement systemic issues in advancing workplace safety. Oil companies showed relative strength in policy communication, and mining companies showed stronger infrastructure support for committee development and training emphasis. Nevertheless, both sectors are affected by perennial problems that are symptoms of more general systemic shortcomings in OHS governance, which require a holistic

approach, including organisational dedication, worker participation, culture transformation, and effective regulatory requirements enforcement.

Recommendations

Based on the findings, the following are the suggested recommendations:

i. The industries need to implement more frequent, useful, and interactive training schemes, so that fresh entrants are well oriented and in-service staff are kept up-to-date.

ii. Management must prioritize safety alongside productivity by investing in OHS infrastructure, supporting committees, and enforcing safety rules consistently.

iii. Sufficient and modern personal protective equipment (PPE) and emergency response equipment ought to be availed in order to lessen worker exposure.

iv. The OHS policies shall be Communicated and made Available by way of notice boards, electronic medium, and workers' unions, respectively, in order that all workers are informed.

v. Safety culture transformation programs must be implemented in order to combat complacency and fatalistic attitudes, and emphasize that accidents are preventable by following procedures.

vi. Regulators should conduct regular, unannounced inspections focusing on workplace conditions rather than paperwork. Penalties for non-compliance must be enforced consistently to drive accountability.

vii. Safety committees and periodic feedback mechanisms ought to involve workers in OHS decisions, and therefore, mutual ownership in safety practice is encouraged.

Contributions to Knowledge

The paper contains several innovative additions to knowledge:

i. It provides comparative information on petroleum and mining industries, uncovering OHS implementation strengths and weaknesses particular to industries.

ii. It combined quantitative data and testimonies of participants in presenting a holistic picture of OHS challenges, and it yielded greater depth than quantitative research alone.

iii. It understands the contribution of attitudes linked with culture, such as complacency and fatalism, in undermining safety compliance, a theme often neglected in OHS work.

iv. The study verifies empirically that manager support is a determining factor in OHS protocol effectiveness and thereby lends support to leaders' responsibility.

v. The findings provide practical directions both for organizations and regulatory officials, thereby contributing to policy-making and practical occupational health and safety governance reforms.

Suggestions for Further Study

i. Future work could be extended from petroleum and mining industries to more dangerous industries such as transport, manufacturing, and construction in general in order to make comparative inferences.

ii. Longitudinal research would be helpful in observing OHS impact in the long run and ascertaining sustainability.

iii. Beyond work on the role of cultural beliefs and behavioral attitudes in ascertaining compliance, more work would also be fruitful, in particular through ethnographic approaches.

iv. In addition, incorporation of perceptions by supervisors, policymakers, and regulators would increase depth in systemic enforcement challenges analysis.

v. Lastly, future research could examine the cost–benefit analysis of OHS expenditures in order to make a stronger case for managerial and government support.

ACKNOWLEDGEMENTS

I express gratitude to the Almighty God for granting me the knowledge, strength, and health to complete this thesis. I sincerely acknowledge the invaluable contributions of my supervisors, Prof. Ogbonna Friday Joel, and Prof. Kwasi Opoku Boadu, for their patience, guidance, corrections, and encouragement throughout this research. Special appreciation goes to my parents, Mr. and Mrs. Parmaak, and my wife, Catherine Nabila Musah, and the children, for their unwavering support and encouragement, both physically and spiritually. The researcher would also like to appreciate the support of the World Bank Africa Centre of Excellence in Oil Field Chemicals Research (Ace-Cefor) for the full scholarship support for the program

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Declaration

I, **JUSTICE, BADAM PARMAAK,** with registration number ***G2022/PhD/ACE-CEFOR/FT/002,*** declare that the work in this thesis, **EVALUATION OF OCCUPATIONAL HEALTH AND SAFETY IMPLEMENTATION PROTOCOLS OF THE MINING AND PETROLEUM INDUSTRIES IN GHANA** was carried out by me: that is my original work, and it has not been submitted wholly or in part for the award of a degree in this or any other institution.

JUSTICE BADAM PARMAAK
Signature/Date…….

Confirmation by Supervisors

Prof. Ogbonna Friday Joel

Signature/Date……..

Prof. Kwasi Opoku Boadu

Signature/Date……..

Certification

University Of Port Harcourt

School Of Graduate Studies

Evaluation Of Occupational Health And Safety Implementation Protocols Of The Mining And Petroleum Industries In Ghana By

JUSTICE, Badam Parmaak

(*G2022/PhD/ACE-CEFOR/FT/002*)

The board of Examiners certifies that the work in this Thesis is accepted in partial Fulfilment of the requirements for the award of the degree of Doctor of Philosophy (Ph.D.) in Occupational Health and Safety.

Designation Name Signature Date

Supervisor 1:

Supervisor 2:

Director of Centre:

Dean Faculty of OHSM:

Chairman Departmental Graduate Studies Board

External Examiner:

Dean, School of Graduate Studies/Chairman Board of Examiners

Dedication

I solemnly dedicate this work to Almighty God, the most gracious and the most merciful, and my cherished family for their affection and encouragement. I also want to dedicate this work to my beautiful wife, Catherine Nabila Musah, and my adorable children: Henriatta, Jean, and Joelle

APPENDIX: SUERVEY QUESTIONNAIRE

Section A: Bio data of Respondents

1. Age of Respondents ……

2. Gender Male ( ) Female( )

3. Level of Education Basic( ) SSCE. /WASSCE( ) First Degree( ) Postgraduate()

4. Organization of work Oil& Gas( ) Mining( )

6. How long have worked in this industry…….

Section B: Awareness of OHS protocols

S/N	Questions	Yes	No
7	Have you heard of OHS policy as pertains to the industry you worked in?		
8	Does your company have an OHS policy?		
8a	If yes, mention at least three thing you know about your company OHS policy		
9	In your view, is the policy adequate for the protection and safety of employees?		
10	Is there an OHS policy implementation committee to enforce safety standards		
11	During the time of your employment, were you given on the companies health and safety policy standard?		

12. How often does your company organize training on health and safety precautions for staff

Weekly( ) Monthly (Quarterly( ) Annually ( ) Not at all( )

13. How is health and safety education carry out in the company?

OHS education	Yes	No
Seminar		
Post on the notice board		
One-on-one sessions		
Union meeting		
Other(Specify)		

14. What OHS facilities do you have in your unit? PPEs ( ) First aid( ) Fire extinguisher( ) Accident alarms( ) Emergency assembly point( ) Others Specify( )

15. Are the facilities adequate? Yes ( ) No( )

16. What are some of the hazards you are expose to in the field of work

Hazards	Yes	No
Heat		
Chemicals		
Falling Objects		
Explosions		
Prolong Standing		
Prolong sitting		

17. Have you ever being involve in an accident in your work place before? Yes ( ) No( )

18. Do you think the following can cause accident?

Factor	Yes	No
Fatigue		
Laziness		
Negligence		
Poor supervision		
Poor facilities		
Faulty equipment		
Lack of awareness		
Lack of training		

19. Do you know what do in event of accident ? Yes ( ) No ( )

20. if yes to Q13, Outline the procedures followed to report accident when they occur

……
……
……

21. Do you use PPE in your line of work? Yes( ) No ( )

22. If yes to Q15, what kind of PPEs have your ben using?

PPE	Yes	No
Earplug		
Overall coat		
Hand gloves		
Goggles		
Helmet		
Boots		
Others (Specify)……		

23. How important do you think it is for staff to always be in PPEs during work?

Very Important( ) Important( ) Less important( ) Not important( )

24. Do workers report defects or hazards of risk promptly? Yes( ) No( )

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XII Issue XV October 2025 | Special Issue on Public Health

25. By what means do you report accidents? Telling immediate supervisor( ) laying a complain to management( ) Protesting( ) I don't report at all ( )

26. What role do you play to ensure that, the companies health and safety policies is maintained? ……..

Section C: Effectiveness of implementation of OHS protocols

27. Whose primary responsibility is it to ensure that, people are properly supervised for safety at all times? Operator ( ) Supervisor( ) Manager( )

28. Whose primary responsibility is it to ensure that, people work and behave safely at all times? Operator ( ) Supervisor( ) Manager( )

29. To what extent do you agree or disagree on the effectiveness of OHS protocols in your company using a Likert scale where 1= strongly Disagree, 2 Disagree, 3= neutral 4= Agree and 5= Strongly Disagree

Statement	**1**	**2**	**3**	**4**	**5**
All staff are properly trained on the company's OHS protocols					
Staff are complying with OHS rules in their line of work					
Staff are aware of nature of safety hazards related to their work					
Machinery is properly guarded when used					
All equipment/machinery are constantly inspected to ensure they are safe for use					
Staff are using correct safety appliances properly					
Staff are not unnecessarily expose to hazardous substances					
Staff are using the correct PPEs					
The working area is always clean, clear and tidy					
All staff know what to do in events of emergency					

Section D: Challenges to OHS protocols

30. what Challenges do you face in following OHS protocols at your work place?

Lack of proper equipment( ) Insufficient training( ) Time Constraints( )

Lack of Management support( ) Others(Specify) ……..

31. How well do you feel OHS protocols are communicated to employees at your work place

Very Communicated( ) Adequately Communicated( ) Poorly Communicated( ) Not communicated at all( )

32. How often do you encounter difficulties in adherence to OHS protocols?

Always( ) Often( ) Sometimes( ) Rarely( ) Never( )

33. What type of support will help you to adhere to OHS protocols more effectively

Type of support	**Yes**	**No**
Additional training		
More accessible equipment		
Better time management strategies		
Increase managerial support		
Others (Specify).,,,,,,,,,,,		

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34: What are the barriers affecting the effective implementation of OHS protocols

……
……
……

Thank you for your response