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Prevalence And Patterns Of Workplace Accidents In Selected Oil Servicing Companies In Port Harcourt, Nigeria

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Abstract: Workplace accidents remain a significant concern in high-risk industries, such as oil servicing, where employees face substantial safety risks due to complex operations and hazardous environments. This study examined the prevalence of workplace accidents, their causes, and how they occur in specific oil servicing firms in Nigeria. The issue is that safety management remains inadequate, despite existing regulations. This results in numerous accidents and health hazards at work. The study aims to identify the types of incidents and their frequency, investigate underlying causes, and suggest methods to enhance workplace safety. Grounded in Heinrich's Domino Theory of accident causation, the research adopts a descriptive survey design to explore accident trends and contributing behaviours. Data were collected using structured questionnaires distributed to 120 respondents across four oil servicing companies. Purposive sampling ensured that participants were operational staff directly exposed to safety-critical environments. Quantitative data were analysed using chi-square tests, percentages, and frequency distribution tables to examine the relationships between safety measures and the

prevalence of accidents. The findings reveal that the most common types of accidents include slips, falls, injuries from equipment, and exposure to hazardous substances. Contributing factors encompass improper use of personal protective equipment (PPE), inadequate safety training, and poor enforcement of safety regulations. There was a strong correlation between the effectiveness of safety measures and the number of accidents. The article concludes that regular training, strict enforcement of safety protocols, and investment in new safety equipment are all crucial. The study recommends strengthening regulatory oversight and cultivating a proactive safety culture to mitigate risks in the oil servicing sector.

Keywords: Workplace accidents, oil servicing companies, safety management, personal protective equipment, Heinrich's Domino Theory, occupational health, risk reduction.

Introduction: The oil servicing industry is vital to Nigeria's energy infrastructure and economic framework, especially in Port Harcourt, Rivers State, where significant upstream and midstream operations are concentrated (Poi & Okwandu, 2021; Scott, 2022). The high-risk nature of oilfield operations, characterised by flammable substances, heavy machinery, confined spaces, and hazardous chemicals, presents significant occupational safety challenges, particularly in developing economies with inadequate regulatory oversight (Razalia et al., 2025; Tagiyev & Ismayilova, 2024).

Fossil fuels currently dominate global energy supply chains, accounting for over 70% of energy consumption and playing an integral role in economic activities in developed and developing countries (Zhao et al., 2025; Rusanov et al., 2024). In resource-rich nations such as Nigeria, oil exports constitute a substantial share of GDP and employment, highlighting the necessity for stringent workplace safety standards within the industry (Addison & Roe, 2024). Occupational health burdens remain significant. The World Health Organisation (WHO, 2021) and Takala et al. (2022) estimate that work-related risk factors account for a considerable proportion of musculoskeletal disorders, chronic respiratory diseases, cancers, and workplace trauma.

International organisations like the ILO advocate for preventive safety strategies (ILO, 2023); however, research indicates ongoing deficiencies in implementation, especially concerning PPE utilisation, emergency response, and real-time hazard monitoring in oil and gas operations (Rzaeva et al., 2024; Andrew, 2025). The challenges are particularly pronounced in Port Harcourt, where local companies frequently lack adequate training, compliance, and reporting mechanisms (Promise et al., 2024; Nur, 2020).

Data from Nigeria indicate that falls from heights, slips, trips, repetitive motion disorders, and equipment-related injuries represent some of the most common and serious types of workplace accidents (Campo et al., 2020). Underreporting and insufficient documentation, exacerbated by long work hours and lack of supervision, hinder proactive safety interventions (Kryvenko et al., 2021; Jayady et al., 2024; Scandelai, 2025). In addition to the direct physical effects, workplace accidents negatively impact organisational performance, diminish employee morale, and increase operational costs associated with insurance, legal claims, and high turnover (Zhao et al., 2023; Suseno, 2025; Yeshitila et al., 2021).

Statement of the Problem

Despite implementing policies through the Petroleum Industry Bill and regulatory initiatives by the Nigerian Upstream Petroleum Regulatory Commission, enforcement continues to be inconsistent and inadequate (Nwankwo et al., 2022). The discrepancy between policy and practice contributes to avoidable workplace injuries, worsened by informal work arrangements, outdated training models, and inadequate safety leadership (Tubosun, 2015; Adebiyi et al., 2021).

Workplace accidents in Nigeria's oil servicing industry, particularly in Port Harcourt, remain shockingly prevalent and severe, despite legislative changes such as the Petroleum Industry Bill and safety initiatives by the Nigerian Upstream Petroleum Regulatory Commission (Nwankwo et al., 2022; Tubosun, 2015). Inconsistent enforcement and varying compliance rates among companies across industries reveal a significant gap between policy formulation and practical implementation (Adebiyi et al., 2021).

Insufficient Health, Safety, and Environment (HSE) training, inadequate hazard identification, and

insufficient real-time monitoring techniques exacerbate the risk landscape. Operational complexity increases worker susceptibility when combined with high-pressure settings, fast-paced work, and obsolete training methods (Smaz & Sahroni, 2021; Cabral et al., 2023).

Inadequate incident documentation also hinders root cause analysis; underreporting hides the full scope of occupational dangers (Kryvenko et al., 2021). These systematic constraints compromise the efficacy of current safety frameworks and impede data-driven safety planning. Fatigue, poor supervision, and longer working hours increase risk exposure, as well as human mistakes and operational mishaps (Scandelai, 2025). In Port Harcourt, local oil servicing companies, both international and indigenous, continue to report falls from height, equipment-related injuries, slips, trips, and repetitive motion disorders as usual occurrences (Campo et al., 2020). Apart from their obvious physical dangers, these occurrences cause long-term productivity decline, higher turnover, and greater financial strain connected to compensation, insurance premiums, and lawsuits (Zhao et al., 2023; Suseno, 2025). Port Harcourt's concentration of oil servicing firms, including multinationals such as Schlumberger and Halliburton, alongside local entities like Oando and Oil Data, provides a distinctive context for evaluating occupational hazards within this sub-sector (Poi & Okwandu, 2021; Scott, 2022). Localised empirical studies are limited, constraining the development of context-sensitive safety interventions. This study aims to identify the prevalent workplace accidents in Port Harcourt's oil servicing industry, examine their patterns and implications for safety management, and enhance occupational health results in Rivers State.

Scope of the Study

Geographically, this study emphasises Port Harcourt, Rivers State, a hub of Nigeria's oil and gas industry, as it focuses on upstream and downstream activities and ongoing safety concerns. The research investigates the prevalence, patterns, and causes of workplace accidents among employees of selected oil servicing companies in Port Harcourt, Nigeria, with over 55,000 employees (CAC, 2018). Although localised, the study references global safety norms and practices to contextualise its findings within the international discussion.

Methodology

This research employed a descriptive cross-sectional survey design to analyse the prevalence, patterns, and causes of workplace accidents among employees of selected oil servicing companies in Port Harcourt, Nigeria. Port Harcourt was chosen due to its significant oil and gas operations concentration and associated occupational hazards (Ezenwa, 2021). A multi-stage sampling technique was utilised to select six major firms: Shell, ExxonMobil, TotalEnergies, Chevron, ENI/Agip, and Texaco. This was followed by stratified random sampling of 450 employees from the technical, logistics, and HSE departments (Onyekachi, 2022). Data were collected through a structured questionnaire of closed-ended and Likert-scale items focusing on accident frequency, training, and safety compliance. Interviews with key informants, specifically HSE managers, were conducted to supplement the survey responses. Quantitative data were analysed using SPSS version 25, employing descriptive statistics and logistic regression, while qualitative data underwent thematic analysis (Okoye & Okolie, 2020). Ethical approval was obtained, ensuring informed consent and confidentiality. This methodological approach aligns with recommendations for assessing safety outcomes in high-risk sectors in developing economies (Ogundele, Musa, & Eke, 2022).

Conceptual Review

Workplace

The modern conceptualisation of the workplace in occupational health and safety (OHS) research has evolved from a static physical location to encompass a socio-technical, psychological, and legal environment shaped by complex interactions among human, organisational, and technological systems.

Contemporary understanding of occupational health and safety (OHS) has moved beyond the simplistic view of the workplace as merely a physical site. Instead, characterised by intricate interactions among human, organisational, and technological elements, it now includes a socio-technical system encompassing psychological variables and legal ramifications. In high-risk industries such as the oil and gas sector, where effective occupational safety hinges not solely on technical measures but also on the overarching organisational culture, legal standards, and workers'

behaviours, this holistic approach is especially pertinent (AKYILDIZ, 2023) (Ajmal et al., 2021; Liu et al., 2020).

Improving workplace safety in high-risk settings depends on integrating safety management techniques and a strong safety culture. OHS 4.0 stresses using new technologies to harmonise human and machine interactions, avoiding occupational accidents and health problems (AKYILDIZ, 2023). Recent research shows that a good organisational culture combined with efficient safety training can significantly reduce workplace accidents and injuries, therefore supporting the use of safety management systems fit for the particular circumstances of high-risk sectors (Ajmal et al., 2021; Liu et al., 2020). Furthermore, bureaucratic OHS procedures can undermine good safety leadership by emphasising the importance of simplifying administrative duties in favour of direct involvement with safety practices (Phelps et al., 2024).

The efficacy of health and safety policies depends on management-employee cooperation. Employing identifying and reducing possible hazards, health and safety committees can significantly lower the probability of workplace injuries (Awini et al., 2023). The modern OHS scene emphasises the need for thorough methods, including safety technology and legislation and the empowerment of workers by participating in safety debates and decision-making processes (O'Connor et al., 2020; Omofowa et al., 2021).

Advanced by the European Agency for Safety and Health at Work (EU-OSHA, 2023), European regulations generally define the workplace as any location under employer control, including offshore platforms and digital operations. Frick et al. (2020) utilise systems theory to characterise the workplace across micro (person), meso (organisational), and macro (policy) levels. Emphasising psychological aspects, Cox and Griffiths (2020) identify stress, workload, and interpersonal interactions as vital to safety outcomes. According to Hämäläinen et al. (2022) and Pousette et al. (2023), continuous learning within nested systems shaped by informal norms, environmental unpredictability, and task complexity contributes to safety.

Modern challenges like remote work and subcontracting make it increasingly difficult to manage safety. Antonsen (2021) and Zacharatos and Barling (2021) emphasize the importance of culture, leadership, and trust in shaping how safety is perceived and followed. However, Langaa Jensen et al. (2020) point out that temporary workers often find themselves without access to formal safety systems, leaving them vulnerable. Additionally, as shown by Vänän and Toivanen (2023) in their research on virtual workstations in the oil and gas industry, the rise of digitalization introduces new psychosocial hazards that we need to address together.

OSHA (2021) in the United States expands the definition of workplace to encompass mobile and home- based settings, thus supporting the socio-technical paradigm promoted by Goetsch (2021), in which safety depends on engineering design combined with behavioural measures. LaMontagne et al. (2022) associate physical safety with well-being through the Total Worker Health® paradigm. While Zohar and Luria (2020) emphasise the importance of safety climate in influencing outcomes, Burke et al. (2021) and Geller (2022) stress the significance of training and behavioural reinforcement. DeJoy (2020) and Quick & Tetrick (2021) conceptualise the workplace as a venue for psychological contracts and systematic intervention sites.

Huang et al. (2020). Al-Sagr and Jamal (2021), and Lee and Park (2022) strengthen the workplace as an integrated system of physical, cognitive, and cultural components throughout Asia and the Middle East. Their inputs show worries about automation, organisational fairness, and participatory safety in oil-rich countries. Fathi & Hashemi (2023) and Al-Hadhrami (2021) investigate how punitive policies and expatriate labour rules influence risk perception and reporting in Iran and the UAE.

African studies increasingly present the workplace within contextualised paradigms reflecting informality, labour segmentation, and regulatory inadequacy. Umeokafor et al. (2020) see it as a risk- laden social setting formed by policy holes and organisational culture. While Oke and Ogunsemi (2022) discuss a dualistic safety system divided between formal and informal workforces, Chikere and Nwosu (2021) emphasise resilience-building via communication and leadership response. Examined by Awoyemi (2023), legal definitions expose difficulties in enforcement under Nigerian law.

Cultural and psychosocial aspects are also rather important. While Ogbonna and Onoh (2022) point out safety culture as a factor influencing procedural

compliance, Edeh and Eze (2021) connect stress and bad communication to accident risks. Examining ergonomic hazards and gender exclusion, Akintunde and Yusuf (2020) and Adebayo and Salami (2022) demonstrate how inclusiveness influences access to safety.

Public health points of view (Nwachukwu & Adewunmi, 2023) and socio-political views (Akinwale, 2021) help to deepen this multidimensional awareness.

These conceptual models provide the workplace as an interactive, fluid system where physical infrastructure, regulatory systems, human behaviour, and institutional culture merge to influence safety results. Examining workplace accidents in Port Harcourt's oil servicing sector, where high-risk situations interact with socio-economic complexity and changing labour structures, offers a strong theoretical basis.

Workplace Accident

Due to its consequences for health, productivity, and organisational effectiveness, workplace accidents are complicated phenomena that have drawn significant academic interest (Chukwuma, 2025). Often, these occurrences are described as unplanned ones, causing damage to property, disease, or injury during work operations (Saragih & Fitriani, 2024; Priyanka & Basaria, 2023). The idea of workplace accidents has changed with time to reflect theoretical developments, technical change, and industrial growth (Anderson et al., 2023; Smaz & Sahroni, 2021).

Modern methods include safety management systems like Hazard Identification, Risk Assessment, and Risk Control (HIRARC), which enable companies to methodically find and reduce workplace dangers (Saragih & Fitriani, 2024; Priyanka & Basaria, 2023). This approach is necessary in high-risk industries like oil servicing, where proactive risk identification is essential.

Including the Resource-Based View (RBV), Chukwuma (2025) underlines the strategic relevance of organisational skills and safety culture in accident prevention. This point of view connects workplace accidents to more general organisational dynamics, including leadership, communication, and resource allocation. Sothivanan et al. (2025) equally stress the importance of proactive leadership and communication in building efficient safety cultures. Understanding workplace accidents still depends on human factors. Cognitive failures, caused by stress, weariness, or habitual exposure, are major accident causes, according to Anderson et al. (2023). These results change the emphasis of workplace safety from technical failures to behavioural and psychological elements.

Regional studies have provided more context for these results. For example, Putri et al. (2024) link inadequate supervision, knowledge deficits, and SOP deviation with higher accident rates in Southeast Asia. These revelations ring true in Nigeria's oil servicing environment, where comparable conditions exist. Sudiarno and Maharani (2024) also support a hierarchy of control theory, prioritising preventative safety measures. Accidents have significant socio-economic effects as well. Juhari et al. (2023) show that accidents affect organisational reputation, morale, and production in addition to physical damage. These results are especially noticeable in sectors vital to national economies, like oil and gas in Nigeria. Despite legal obstacles in Nigeria, global best practices provide helpful tools to improve worker safety in Port Harcourt's oil service firms. Though few, local research supports the idea that loose SOP compliance, inadequate supervision, and poor training increase accident risk (Chukwuma, 2025; Putri et al., 2024)

Classification Of Workplace Accidents

Particularly in high-risk industries like oil servicing, classification of workplace accidents is a basic instrument in occupational health and safety (OHS) research and practice. Accidents are often classified by severity, impact, and outcomes, ranging from deaths and serious injuries to minor injuries and property damage. This classification supports efficient risk management, action plans, regulatory reporting, and statistical analysis (EU-OSHA, 2021). International frameworks, notably those created by the European Agency for Safety and Health at Work (EU-OSHA), characterise workplace accidents as separate occurrences resulting in physical or psychological damage. Categories are damage-only occurrences, mild injuries not requiring leave, reportable injuries causing work absence, and fatal injuries. National safety policies and insurance procedures throughout the EU are based on this categorisation (EU-OSHA, 2021; HSE, 2022).

Researchers contend that these systems reflect more profound epistemic beliefs about risk and causality than just administrative ones. For instance, Lundberg et al. (2020) suggest a multi-causal model linking latent

organisational elements with minor and catastrophic occurrences. Carroll and Fahlbruch (2023) also advocate a continuum-based approach instead of a binary classification, stressing how low-severity events sometimes hide warning signs of significant risks. One common problem is misclassification. Emphasising the requirement of differentiating reportable from recordable injuries, Weber and Krahé (2022) argue that underreporting hinders proactive safety actions, particularly in subcontracted oil activities. Giraud and Montmayeul (2022) define "functional damage" as operational disturbances including equipment failure, which, while non-injurious, indicate systematic flaws.

Furthermore, job injuries connected to mental health are becoming acknowledged. Cox and Griffiths (2021) support including post-incident anxiety, stress disorders, and psychological trauma into official classification systems. Arguing that delayed-onset injuries, however underreported, make a significant share of occupational impairment, Rosness and Antonsen (2024) add temporal differences between acute and cumulative injuries to broaden classification.

However, Hollnagel (2021) attacks traditional classifications from a systems viewpoint as reactive and linear. He suggests using the Functional Resonance Analysis Method (FRAM) to show how tiny changes in routine operations could snowball into mishaps. Supporting this perspective, Grabowski and Roberts (2020) demonstrate that even property damage occurrences can trigger major events in energy and maritime industries, thereby requiring their inclusion in safety analytics. Emphasising the inclusion of near-miss and property-damage events into loss control plans, OSHA keeps rigorous rules for categorising events into fatal, recordable, and non-recordable injuries in the United States (Vineyard, 2009; Abdalla et al., 2018; Salminen, 2023). Farooq (2025) likewise demonstrates that near misses connected to equipment in oil servicing frequently precede significant incidents.

Accident classification in African and Asian settings has to consider informal labour networks and less rigorous regulation. Especially in industries with cumulative ergonomic risks, Yadav (2020) and Alnuaimi (2022) support adding near-misses and mild injuries to official records. Namumba, Mushabati (2018), and Dodoo and Al-Samarraie (2021) contend for region-specific models sensitive to economic impact and recurrence probability. Classifications in Nigeria's oil servicing sector largely follow worldwide standards but are modified for local reality, including regulatory constraints and informal labour practices. While non-fatal injuries include burns, respiratory problems, and psychological trauma (Ukpong-Udo, 2022), fatal incidents often follow pipeline explosions, gas flaring, and mechanical failures (Adim & Mezeh, 2020). Though common, minor injuries are mostly unreported as they are important early signs of systemic collapse (Eyayo, 2014; Agabe, 2023). Incidents of property damage, from environmental spills to equipment failure, are increasingly acknowledged as forerunners of significant accidents. Akalonu et al. (2017) and Benson (2021) contend that these occurrences should be treated with the same urgency as injury-related ones because of their systematic consequences.

New creative models keep appearing. Revealing trends like night-shift injuries and third-party equipment failures, Ekong and Ogunbanwo (2023) suggest categorisation according on time, severity, equipment type, and work shift. Digital solutions are also improving classification methods; Adakporia and

Ajiroghene (2020) piloted AI-driven reporting apps that automatically categorise events into severity levels, indicating a possible paradigm change in safety management in Nigeria. The trend across worldwide, regional, and sector-specific settings is towards integrated, context-aware classification systems covering psychological, functional, and systematic aspects. This development shows the intricacy of industrial risk environments, particularly in oil servicing, where even minor or non-injury occurrences could indicate more profound structural flaws.

Legal Frameworks in Nigeria

Occupational safety in Nigeria's oil servicing industry is governed by a multi-tiered legal framework designed to align domestic practices with international safety standards. Key regulatory instruments include the National Oil Spill Detection and Response Agency (NOSDRA) environmental compliance requirements, the Department of Petroleum Resources (DPR) safety policies, and the Factories Act (Cap F1, LFN 2004). These guidelines are crucial given the hazardous working conditions prevalent in oil servicing organisations. Nigeria's primary legislation on worker safety is the Factories Act. It outlines, among other responsibilities,

employer obligations such as conducting regular inspections, providing personal protective equipment (PPE), and maintaining safe working conditions (Edem et al., 2021). Enforcement remains inadequate despite a strong legislative intent; research indicates low compliance levels, primarily due to regulatory inefficiencies and employer neglect (Olaniran & Akinbile, 2023; Zailani et al., 2022). Furthermore, persistent accidents in the oil industry highlight the gaps between policy and actual implementation (Esan et al., 2020).

The DPR's safety system particularly targets the oil and gas sector. It enforces regular safety checks and requires basic training via the Minimum Industry Safety Training for Downstream Operations (MISTDO). Though many companies satisfy training criteria, incorporating acquired safety measures into everyday operations remains uneven (Genty et al., 2022).

By requiring oil spill contingency planning and spill damage mitigation, NOSDRA's regulatory supervision, focused on environmental safety, indirectly promotes occupational health (Zailani et al., 2022; Esan et al., 2020). However, enforcement gaps exist; some argue that lax regulatory action could increase worker exposure (Olaniran & Akinbile, 2023). Ongoing issues prevent the complete realisation of these legal frameworks. Barriers include insufficient worker training, inconsistent enforcement, and a weak culture of compliance (Bashar et al., 2024). Furthermore, under-reporting of accidents, driven by fear of punishment or reputational damage, distorts workplace safety assessments and hinders policy development (Genty et al., 2022). These systemic issues highlight a critical need for changes in organisational culture towards genuine safety involvement and proactive risk management in the oil servicing sector.

Port Harcourt, Rivers State

Port Harcourt, the capital of Rivers State, is a pivotal industrial city in Nigeria's Niger Delta, geographically positioned between Latitude 4.6667°N to 5.0000°N and Longitude 6.8833°E to 7.1667°E. Covering approximately 369 km², it is a central hub for oil and gas operations, shaping its socio-economic and urban development since its colonial founding in 1912 (Bisco et al., 2021; Echendu & Georgeou, 2021). Its significance is further emphasized by its strategic location and the presence of key oil servicing firms that drive both economic activity and occupational exposure to workplace hazards.

The city's coastal landscape is characterised by mangrove swamps, deltaic plains, and various soil types influenced by industrial activity. Variability in soil nutrients, particularly deficiencies in potassium and nitrogen, has been observed, with central commercial areas exhibiting relatively higher fertility due to intensive land use (Eyetan & Ozabor, 2021; Echendu & Georgeou, 2021). Industrialisation, urban sprawl, and inadequate planning contribute to environmental challenges, including flooding and land degradation (Momirski et al., 2021; Evoh et al., 2022; Alilonu et al., 2023).

Port Harcourt is geologically underlain by Benin, Agbada, and Akata Formations, sedimentary structures crucial for petroleum systems (Okeke et al., 2021; Alagoa et al., 2022). The region features three dominant soil types: (1) coastal marine sediments that support mangrove vegetation, (2) alluvial soils with high organic matter, yet they are prone to salinity and odour, and (3) nutrient-rich levee loams in inland areas, although often limited by acidity and stratification (Okonkwo & Ogah, 2023; Ezeaku & Ogundele, 2020; Ibe & Ugochukwu, 2024). Seasonal flooding and sedimentation from the Niger and Benue Rivers shape the ecological and agricultural dynamics of the delta (Nwachukwu & Egbunike, 2022; Ogunbiyi & Fajemirokun, 2021). These biophysical and industrial characteristics form the environmental backdrop for oil servicing companies. The interaction between environmental stressors and occupational settings significantly contributes to the region's pattern and prevalence of workplace accidents.

Map of Rivers State

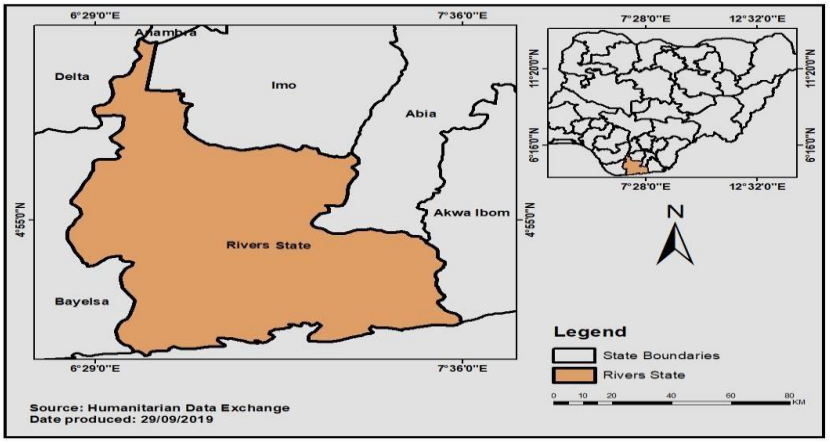

Figure 1: Showing Rivers State Map.

Theoretical Framework

The Human Factor Theory

Using human factors theory as a starting point, this paper investigates the causal factors and trends of workplace accidents within oil servicing organisations. The hypothesis, derived from Heinrich's groundbreaking 1931 work, emphasises human error as a primary source of accidents, suggesting that dangerous behaviours account for a significant proportion of industrial mishaps (Jiang et al., 2020). While previously criticised for overemphasising personal responsibility, the theory has evolved to encompass organisational, cognitive, and systemic factors that contribute to accident causation (Nwankwo et al., 2021). Modern interpretations of Human Factors Theory include concepts such as Reason's Swiss Cheese Model and the Human Factors Analysis and Classification System (HFACS). Particularly relevant in high- risk sectors like oil and gas, these systems-based approaches provide a comprehensive analysis of accidents across various organisational levels (Nwankwo et al., 2021). They identify both active failures, typically attributed to immediate human mistakes, and latent conditions, such as supervisory gaps and procedural flaws, that precede accidents (Lin et al., 2021).

Key assumptions supporting this theory include: (1) recognising human fallibility as an inherent quality requiring management rather than punitive action; (2) understanding that a synergistic interaction of organisational, environmental, and technical elements shapes workplace behaviours; and (3) acknowledging that cognitive-emotional stressors, such as weariness and decision-making pressures, greatly influence safety outcomes. This theory is particularly relevant in Port Harcourt's oil servicing operations, characterised by labour intensity and increased vulnerability to human errors resulting from long working hours and environmental stressors. The systematic nature of the theory enables methodical data collection on risky behaviours, cognitive stressors, and organisational shortcomings, thereby facilitating a thorough examination of accident frequency in this sector.

Empirical studies confirm the significance of this framework. For instance, Bello and Adeleke (2021) noted that avoidable human errors constitute a substantial portion of reported offshore incidents in Nigeria, often exacerbated by insufficient communication and ergonomic issues. Eze et al. (2023) also emphasised the link between accident frequency in Port Harcourt and inadequate safety training, thereby complementing the HFACS-OGI framework by identifying resource and supervisory shortcomings. Such findings resonate with the recommendations of contemporary safety researchers who advocate for resilience-oriented systematic interventions to enhance safety. Therefore, the Human Factors Theory serves as a robust foundation for developing data instruments, classifying occurrences, and creating intervention strategies for this study. It fosters a shift towards organisational learning and proactive safety systems and supports predictive modelling for the probability of accident incidence.

Critics of the theory remain, however. Earlier models have been criticised for overlooking the influence of broader structural and policy contexts while being

unduly reliant on behaviourist approaches. However, modern versions of the framework have rectified these flaws through integrated, system-oriented models, confirming the continued significance of Human Factors Theory in addressing complicated safety issues in industrial settings.

Empirical Review

Common Types of Workplace Accidents in the Oil Sector

Workplace accidents at oil and gas servicing companies remain a significant concern, especially in high- risk areas like Nigeria's Niger Delta. These incidents endanger employee safety and health, undermining operational efficiency and long-term viability. Research has frequently identified common types of accidents, each associated with different underlying processes and repercussions, including slips and falls, burns, electrocution, equipment failures, and chemical exposures.

- Falls and Slips

Slips and falls are among the most frequently reported workplace accidents in industrial settings. In the oil and gas industry, hazardous surfaces, inadequate lighting, and insufficient hazard anticipation often contribute to these incidents. Although healthcare environments report similar falls due to slippery surfaces and obstructed pathways, the construction and extraction sectors have experienced particularly fatal falls from heights (Adeyemo, 2024; Juhari et al., 2023). Notably, amongst contract-based employees operating in dynamically hazardous areas, behavioural lapses and poor housekeeping are contributing factors (Parasram et al., 2024; Puspa & Widanarko, 2024; Jayady et al., 2024).

Fatigue, poor lighting, inappropriate footwear, and pressure to meet production targets further increase accident likelihood. Studies show these factors diminish alertness and impair safety compliance, particularly in tasks requiring high mobility (Ramdan et al., 2021).

- Burns

Burns resulting from contact with hot surfaces, uncontrolled flames, or hydrocarbon explosions typically lead to injuries. Offshore installations lacking adequate emergency preparedness and containing combustible materials exacerbate these issues. Deficiencies in process safety and inadequate danger detection systems contribute to numerous burn-related incidents (Brkić & Praks, 2021; Tayab et al., 2023).

- Electrocution

In oil service activities, electrocution poses a constant danger, particularly in areas with high-voltage equipment and ageing infrastructure. Studies link these occurrences to inadequate grounding, insufficient electrical safety training, and corporate irresponsibility (Parasram et al., 2024; Wingate et al., 2023). Supervisory lapses and equipment mismanagement further heighten the risk (Puspa & Widanarko, 2024).

- Equipment Failures

Major accident causes have been found to include equipment failures such as valve ruptures, hoist breakdowns, and pipe bursts. These can sometimes result in amputations and crush injuries, among other painful consequences. All of these are enmeshed in larger supervisory and organisational failures, with root causes including deferred maintenance, design defects, and human error (Wingate et al., 2023; Alrbaihat, 2023; Puspa & Widanarko, 2024).

- Chemical Exposure

Due to inadequate containment measures or insufficient ventilation, refining and maintenance activities often expose workers to chemicals. Exposure to hazardous by-products can lead to skin and respiratory issues. Poor hazard communication and regulatory non-compliance also contribute to these exposures (Guida et al., 2020; Alrbaihat, 2023).

Orr (2022) presents a thematic and narrative examination of the offshore oil and gas safety landscape, particularly in the U.S. Gulf Coast. Although it lacks a systematic empirical approach, the research provides insightful analysis of physical and psychological hazards, emphasising solitude, mental fatigue, and delayed emergency response as primary risk amplifiers. The author advocates for comprehensive safety models, including mental health frameworks and integrated risk controls encompassing operations.

Puspa and Widanarko (2024) analyse the fundamental causes of recordable injuries by applying the Human Factors Analysis and Classification System for the Oil and Gas Industry (HFACS-OGI). The researchers conducted a retrospective study of incident records to categorise accidents into four layers of causation: Unsafe Acts, Preconditions for Unsafe Acts, Unsafe Supervision, and

Organisational Influences. The findings reflect a complex interplay of frontline errors, supervisory negligence, and systemic organisational deficiencies, paralleling Reason's Swiss Cheese Model. The HFACS-OGI model may exhibit comparable multidimensional risk patterns in the occupational landscape of Port Harcourt.

Effective safety management in high-risk industries such as oil servicing requires a holistic approach beyond behaviour-based interventions. Puspa and Widanarko (2022) emphasise that mitigating workplace accidents necessitates integrated safety strategies encompassing human, supervisory, and organisational dimensions. Real-time feedback, adaptive training, and institutional responsibility are three key factors that influence sustainable safety performance. However, their focus on a single case and reliance on secondary data limit generalisability. In unstable environments like Nigeria, excluding HFACS-OGI Level 5 (external influences) is particularly noteworthy.

This emphasis on organisation aligns with Hopkins (2009), who pointed to hidden organisational elements as forerunners of industrial catastrophes. Zacchaeus et al. (2023) identified poor regulatory compliance and deteriorating infrastructure as major risk concerns in Nigeria's oil industry. In contrast, Ezenwa (2021) attributed occupational accidents primarily to behavioural non-compliance, an assertion this current study interrogates by embedding behaviour within broader systemic failings. The structural lens employed also corresponds with the original HFACS model by Shappell and Wiegmann (2000), which was later adapted to oil and gas contexts.

In the context of the United States, Parasram, Socias-Morales, and Reichard (2022) conducted a large- scale longitudinal analysis of OSHA's Severe Injury Reports (2015–2022), highlighting disparities in injuries across oil and gas sub-industries using the NAICS classification. Contract workers in oil well servicing (NAICS 213112) were most affected, with upper extremity injuries accounting for 43% of the 2,101 severe cases. Their findings indicate the systemic exclusion of contract workers from formal safety systems. Although methodologically rigorous, the study lacked qualitative insights and excluded non- OSHA jurisdictions, limiting its contextual relevance.

Zacchaeus et al. (2023) further contribute by applying a semi-quantitative, ISO 45001-informed, risk- based modelling framework to assess hazards in Nigeria's oil and gas sector. They identified critical risks such as infrastructure decay, technical failures, and insecurity through expert surveys and structured hazard checklists. Their study supports the growing utilisation of expert-driven modelling approaches in high-risk settings (Ajayi & Oyedele, 2020; Ogbonna & Ugochukwu, 2019). However, drawbacks include dependence on personal interpretation, a lack of subgroup analysis, and inadequate longitudinal validation. Despite these limitations, Zacchaeus et al.'s work supports the current research by emphasising the need for systematic diagnosis and organised interventions in accident prevention. However, this research aims to extend the framework by incorporating behavioural and cognitive dimensions into accident causality analysis, adding nuance through Human Factors Theory (Reason, 1990; Nwankwo et al., 2021).

Results

The study adopted the Taro Yamane (1967) formula for determining the sample size, presented as follows. n =

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

Where:

e= Level of precision (0.05 @ 95% confidence level)

N= Projected Population n= Sample size

1= Constant

$$n = \frac{36,618}{1+36,618\,(0.05)^2}$$

n= 400

The formula gave a total of 400 persons as the study sample. Therefore, the study's sample size is 400 respondents in the selected communities.

Table 1: Companies population and Sample Size.

S/N	Sampled Companies	Population	Sample Size
1	Dutch Shell	12, 071	152.42
2	Exxon Mobil	10, 200	128.80
3	ENI/Agip	9, 407	118.78
	Total	**31,678**	**400**

Source: Researchers Computation (2025)

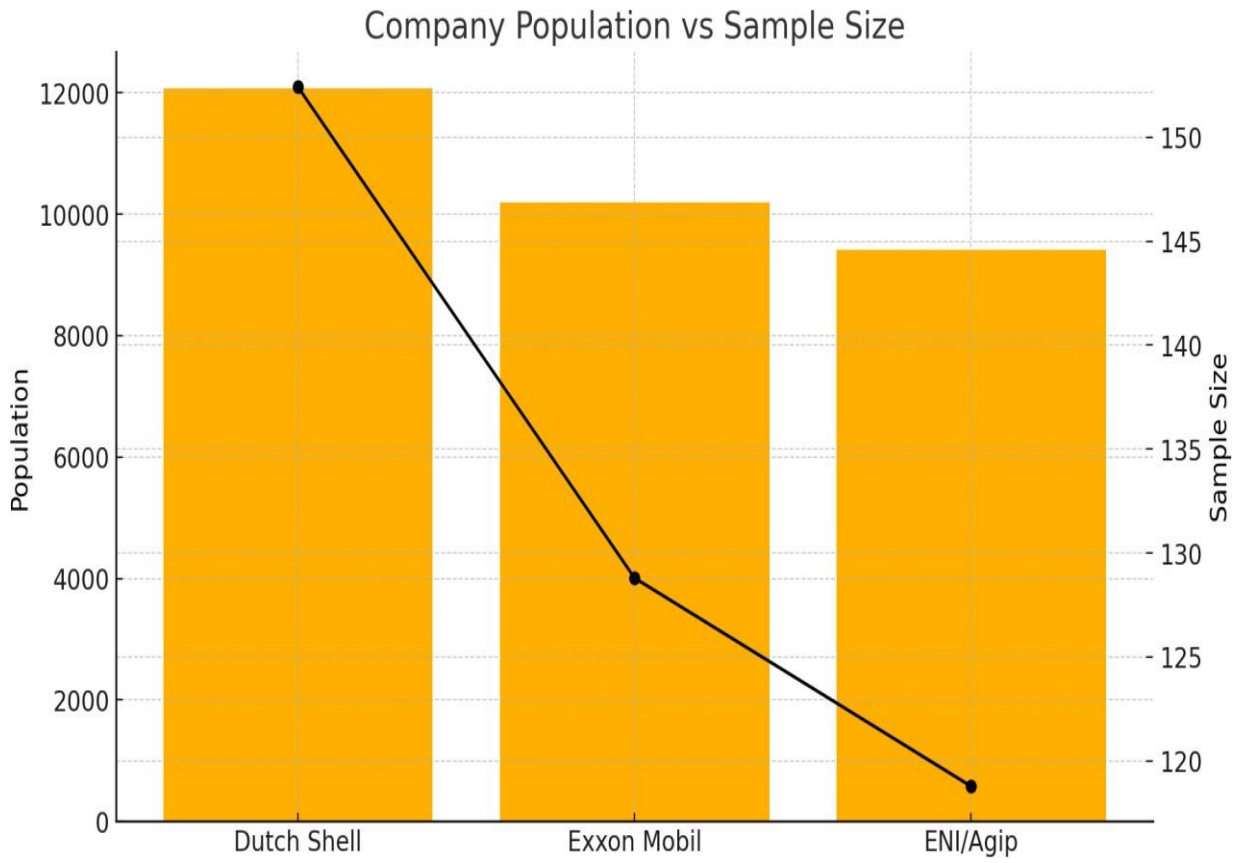

Figure 1. Companies' population and Sample Size.

Table 2: Questionnaire Distribution and Retrieval.

S/N	Sampled Companies	No. of Questionnaires Distributed	No. Returned
1	Dutch Shell	134	133

2	Exxon Mobil	133	133
3	ENI/Agip	133	129
	Total	**400**	**395**

Source: Researchers Computation (2025)

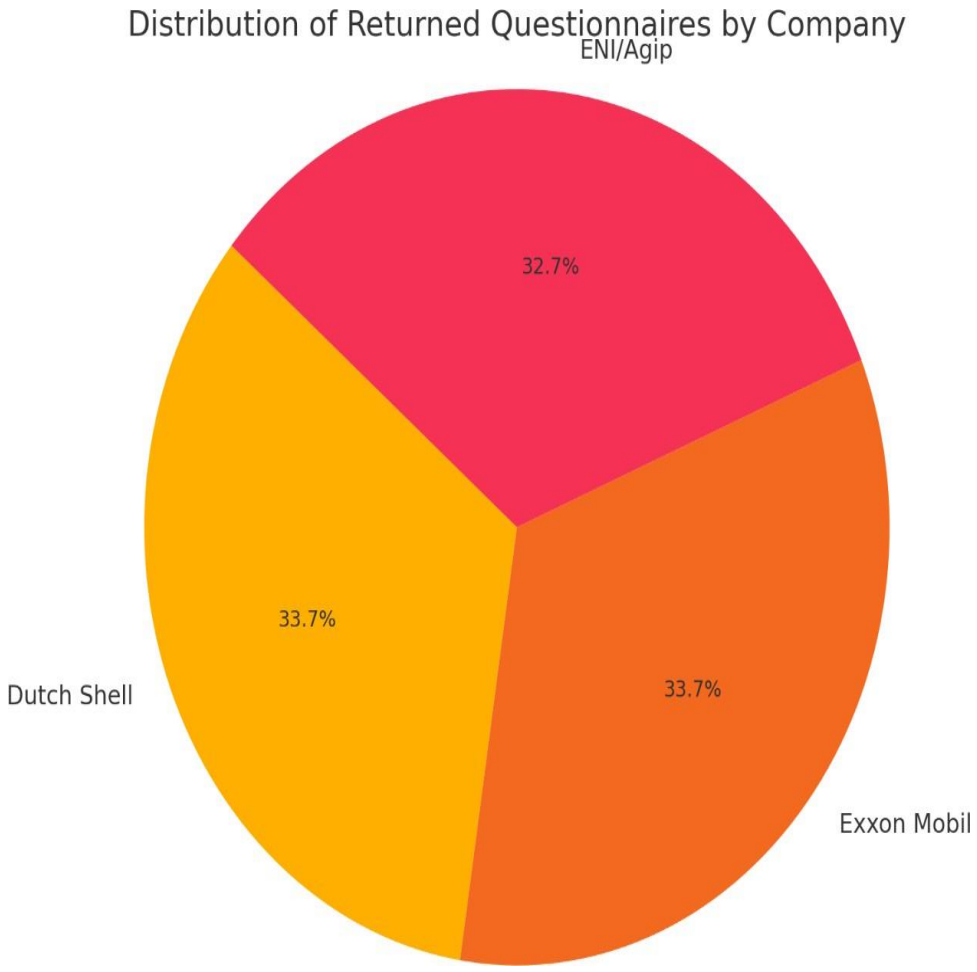

Figure 2. Questionnaire Distribution and Retrieval.

Table 3: Number of Years in Service of Respondents

Number of Years of Service	**Frequency**	**Percentage (%)**
Below 2Yrs	34	8.5
2-5yrs	48	12

6-8yrs	44	11
8-10yrs	202	50.5
Above 10yrs	72	18
Total	**400**	**100.0**

Source: Researcher Fieldwork (2025).

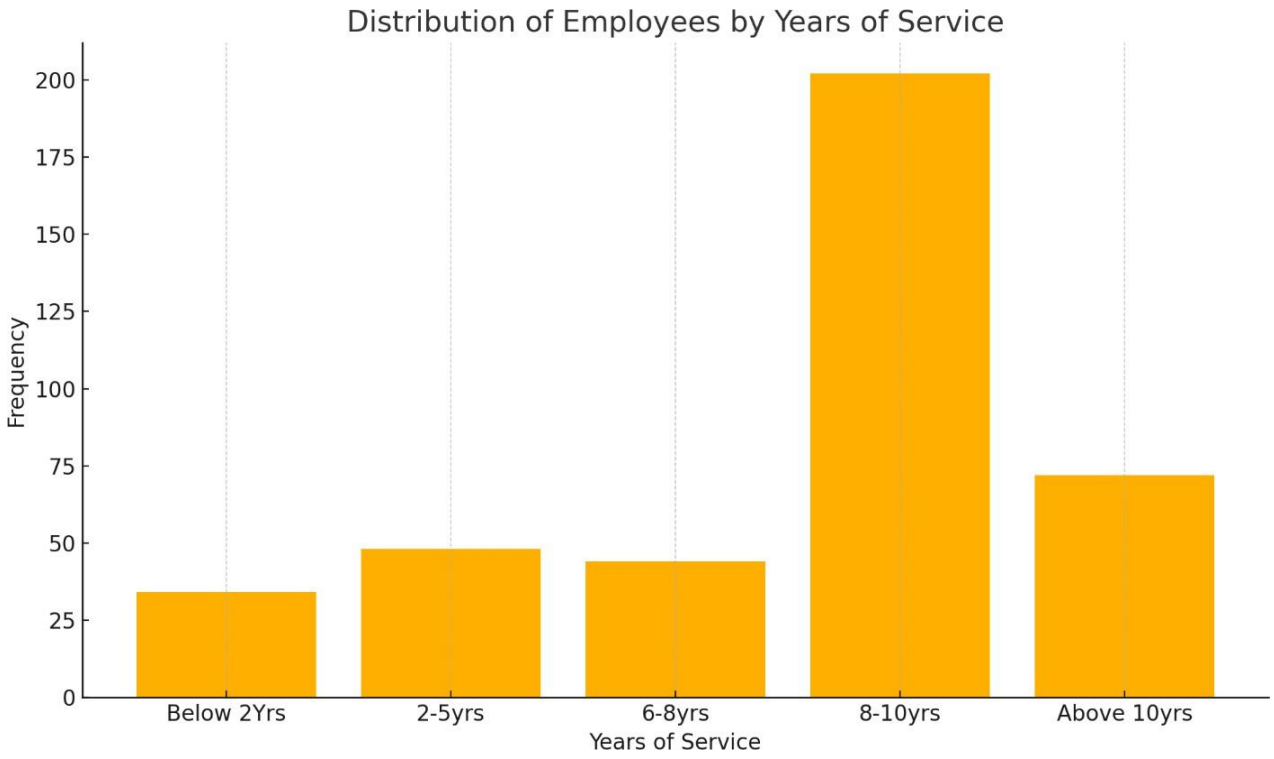

Figure 3. Number of Years in Service of Respondents

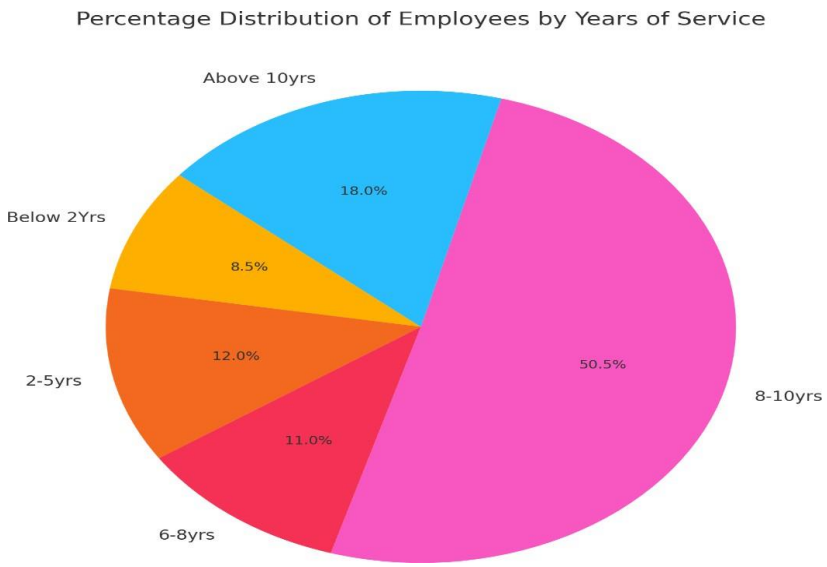

Figure 4. Percentage Distribution of Employees by Years of Service

Table 4: Types of workplace accidents in oil companies in the Study Area

Accident Type	**Frequency**	**Percentage (%)**
Vehicle Collisions	53	13.25
Struck-By/ Caught-In/ Caught-Between	50	12.5
Explosions and Fires	48	12
Confined Spaces	58	14.5
Ergonomic Hazards	33	8,.25
High Pressure Lines	30	7.5
Equipment failures	60	15
Electrical	38	9.5
Hazardous Energy.	30	7.5
Total	**400**	**100**

Source: Researcher Fieldwork (2025).

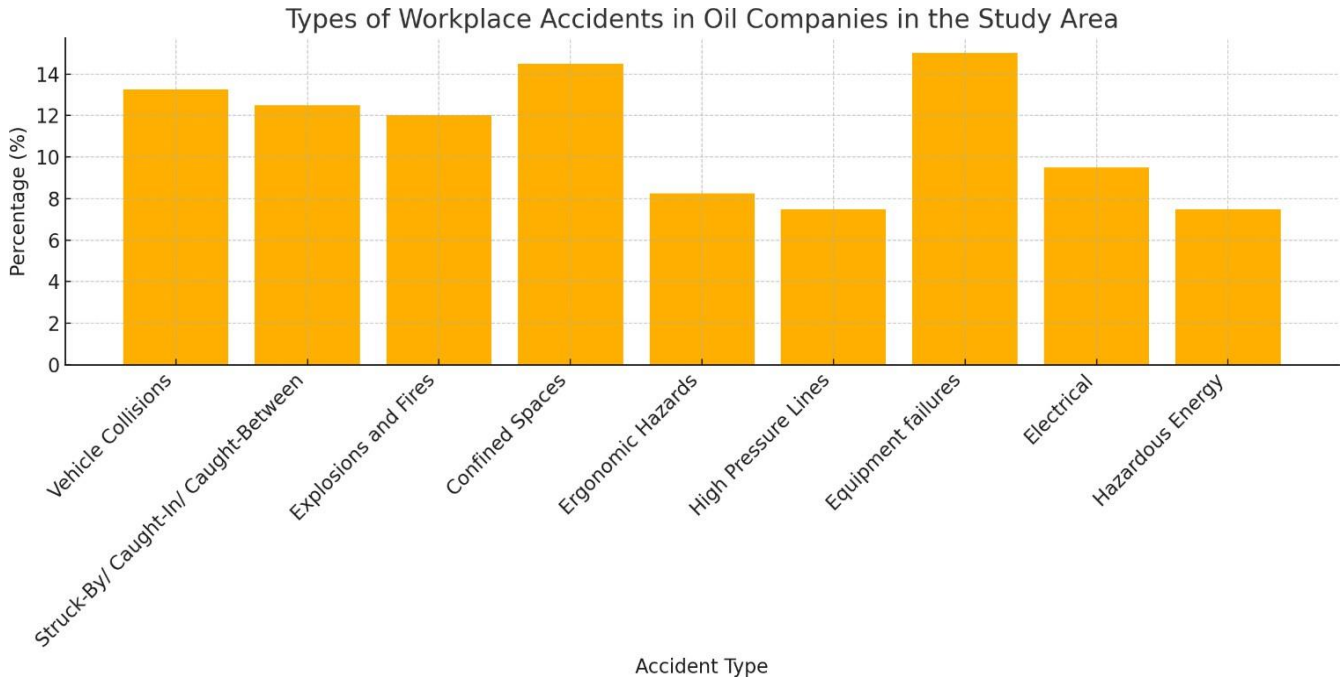

Figure 4. Types of Workplace Accidents in Oil Companies

Table 5: Causes of workplace accidents

Answer Alternatives	**Frequency**	**Percentage (%)**
Slips	33	8.25
Trips and Falls	34	8.5
Overexertion	38	9.5
Exposure to hazards	23	5.75
Inadequate training	26	6.5
Safety protocols	16	4
Stress	16	6.75
Burnout and fatigue	28	7
Lack of Preparation	32	8
Distractions	29	7.25

Shortcuts	36	9
Overconfidence	26	6.5
Poor Housekeeping	28	7
Lifting	14	3.3
Poor Lighting	10	2.5
Violence	11	2.75
Total	**400**	**100**

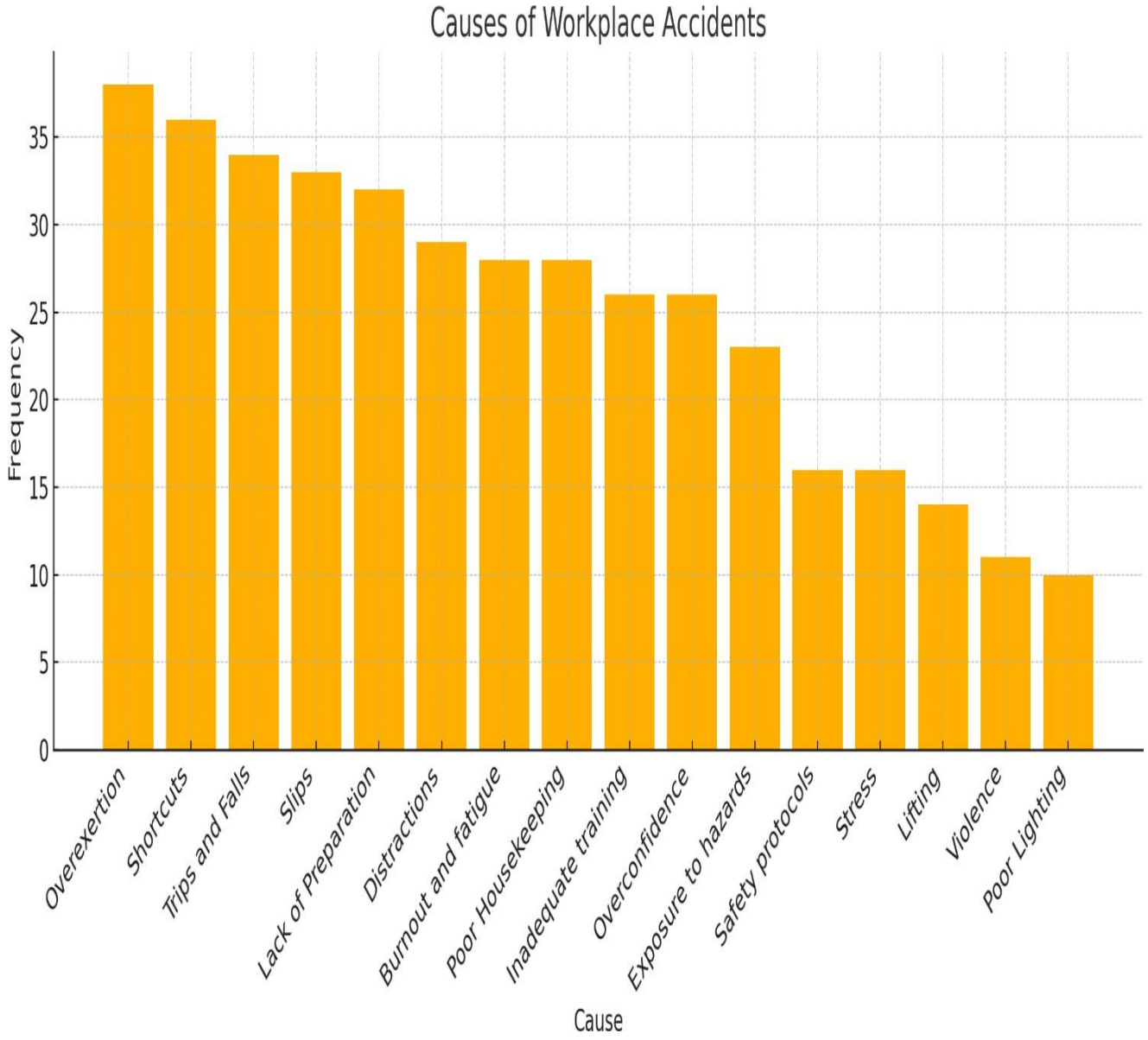

Figure 5. Causes of Workplace Accidents

Table 6: Effect of workplace accidents on the health of the workers.

Description	Frequency	Percentage (%)
Burns	33	8.25
Fractures	38	9.5
Strains	40	10
Respiratory issues	26	6.5
Irregular heartbeat and nervous system impairment from Hydrogen sulfide poisoning before collapsing and dying	25	6.25
Electrocution	28	7
Amputation	30	7.5
Back injury	43	10.75
Spinal cord injury	48	12
Head trauma	29	7.25
Hearing loss	32	8
Eyes injury	28	7
Total	400	100

Source: Researcher Fieldwork (2025).

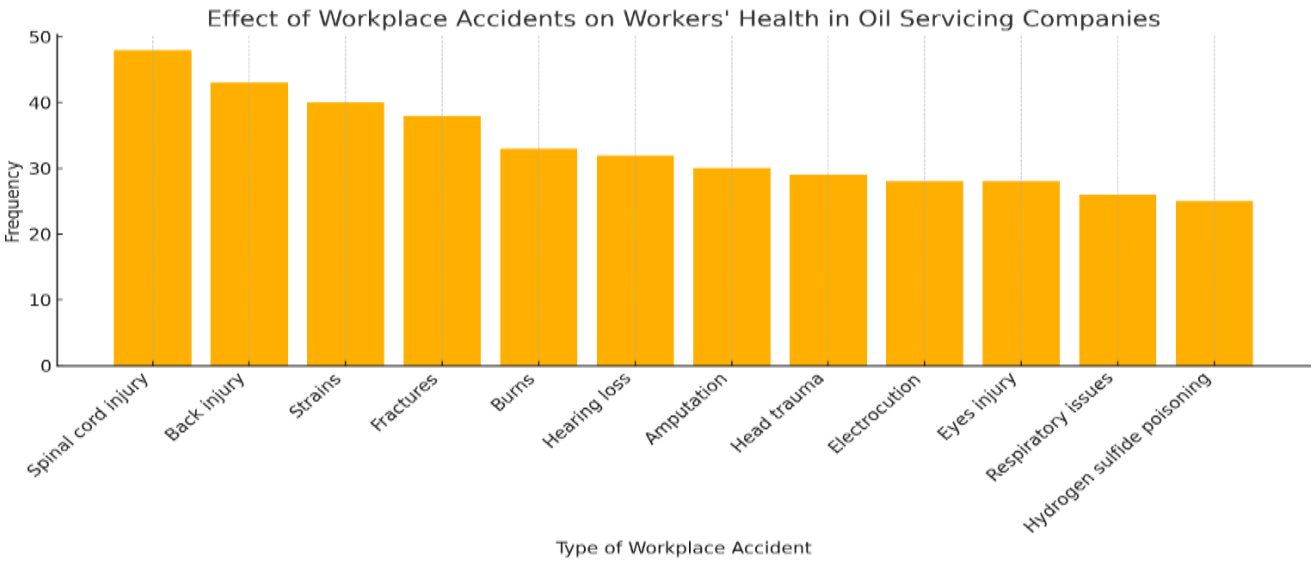

Figure 6. Effect of workplace accidents on the health of the workers

Discussion

This study investigated the prevalence, trends, causes, and health consequences of occupational accidents among workers in selected oil servicing companies in Port Harcourt, Nigeria. The results provide important empirical data for regional and international discussions on worker safety in high-risk industries, including oil and gas. The findings confirm important hypotheses in the Human Factors Theory (Reason, 1990) and support the modification of multidimensional safety models like the Human Factors Analysis and Classification System for the Oil and Gas Industry (HFACS-OGI) (Shappell & Wiegmann, 2000).

- Prevalence and Patterns of Workplace Accidents

Equipment failure (15%), confined space incidents (14.5%), vehicle collisions (13.25%), and struck-by/caught-between injuries (12.5%) were among the most frequently reported occupational accidents. These results reflect global trends in oil servicing activities, where mechanical failure and safety in restricted spaces are major concerns (Waqar et al., 2023; Wingate et al., 2023). The significant occurrence of confined space accidents emphasises deficiencies in atmospheric monitoring and emergency response procedures, as Fernández-Muñiz et al. (2021) noted. The reappearance of equipment-related failures confirms the findings of Parasram et al. (2022), whose longitudinal OSHA-based investigation highlighted machinery-related trauma as an ongoing risk in well-servicing sub-sectors.

- Causal Factors and Organizational Dynamics

Overexertion (9.5%), shortcuts (9%), trips and falls (8.5%), slips (8.25%), and distractions (7.25%) were identified by the study as significant causes of workplace accidents. Systemic shortcomings, such as inadequate training (6.5%), poor housekeeping (7%), and stress or fatigue (6.75%), exacerbate these issues. These findings support the assertions of Hopkins (2009) and Puspa and Widanarko (2024) that accident causation tends to stem from the complex interactions among human, supervisory, and organisational factors, rather than isolated behavioural failures. The alignment with Reason's (1990) Swiss Cheese Model is evident, particularly where latent organisational factors permit active failures.

Importantly, the findings differ from Ezenwa (2021), who attributes behavioural non-compliance to the frequency of accidents in Nigeria. Instead, the present results identify behavioural lapses within broader systematic and institutional flaws, supporting a more integrative theoretical perspective. This reinforces recent calls to reconsider causality in accident analysis, shifting from punitive, individual-focused models to comprehensive, systems-based approaches (Jiang et al., 2020; Lin et al., 2021).

- Health Effects of Workplace Accidents

Spinal cord injuries (12%), back injuries (10.75%), strains (10%), and fractures (9.5%) were among the most frequently reported health effects. These injuries are often caused by falls, heavy lifting, and equipment failure, reflecting the physical demands of oil servicing work conditions. Emphasising the need for improved hazardous gas monitoring and electrical safety protocols, hydrogen sulphide poisoning (6.25%) and electrocution (7%) also posed significant hazards to worker safety. These results echo Alrbaihat (2023) and Parasram et al. (2022), who linked inadequate danger communication systems to serious health consequences. Moreover, the frequency of upper body and spinal injuries corresponds with findings from OSHA investigations, which indicated unreasonably high rates of musculoskeletal and upper extremity trauma arising from well-servicing activities (Parasram et al., 2022). Such accidents diminish output and give rise to long-term medical issues, supporting previous findings on the economic and health impact of occupational hazards in the sector (Suseno, 2025; Zhao et al., 2023).

The empirical findings of this study closely align with risk-based frameworks, including those proposed by Zacchaeus et al. (2023), who utilised ISO 45001-guided modelling to identify significant hazards in Nigerian oil operations. Their emphasis on infrastructure deterioration, equipment wear, and insufficient oversight corroborates the results of the current study. Conversely, this study incorporates cognitive, behavioural, and emotional factors in accident causation, further enhancing the HFACS framework's relevance in Nigeria. The study also affirms Nwankwo and Adegoke's (2018) concerns regarding the systematic exclusion of contract workers from formal safety systems—an oversight recognised in U.S.- based research (Parasram et al., 2022). This exclusion

highlights the necessity for inclusive, tiered training strategies, comprehensive contractor integration into safety standards, and the efficacy of organisational safety culture. When implemented in this context, the human factors theory serves as a robust analytical tool for understanding the interplay of cognitive, emotional, and organisational elements. It facilitates the transition from reactive to proactive safety systems and provides a basis for predictive modelling in accident prevention.

This study establishes that workplace accidents in Port Harcourt's oil servicing sector are prevalent and multifaceted. These incidents stem from human actions, organisational shortcomings, equipment failures, and regulatory deficiencies. The results enhance the existing literature on workplace safety by providing localised, evidence-based insights and corroborating global frameworks like HFACS and the Human Factors Theory. Grounded in a systems-oriented understanding of safety, targeted measures are essential for risk mitigation and health protection in Nigeria's oil servicing sector.

Conclusion

This paper examined the prevalence, trends, reasons, and health effects of workplace accidents within selected oil servicing companies in Port Harcourt, Nigeria, using a strong empirical basis and the theoretical underpinnings of the Human Factors Theory and the HFACS-OGI framework. The results reveal a notable frequency of structurally complex accidents in this high-risk sector, primarily driven by behavioural and organisational factors. Reflecting a dangerous operational environment exacerbated by lapses in safety monitoring, inadequate training policies, and a systematic underemphasis on preventative measures, these accidents include equipment failures, confined space incidents, and vehicle collisions. The inconsistent application of occupational safety regulations has a human cost, evident from the incidence of spinal injuries, musculoskeletal disorders, and chemical exposures among workers.

This study helps to close the recognised gap between legal frameworks and their actual application in the Nigerian oil servicing sector. The research, which highlights the continuous gap between policy expectations and organisational reality, supports comprehensive safety solutions addressing significant behavioural aspects, including emotional stress, cognitive decision-making limits, the need for worker empowerment, and structural deficiencies. Improving workplace safety in this industry ultimately requires a paradigm shift from reactive incident management to proactive, systems-oriented preventative techniques. By advocating for inclusive, adaptive safety systems based on the socio-technical complexity of the Port Harcourt industrial ecosystem, this paper makes a fundamental contribution to academic research and organisational change. Future studies should incorporate longitudinal analyses, qualitative ethnographic studies, and broader stakeholder involvement to further contextualise and build on these findings.

Recommendations

The following five focused suggestions aim to reduce accident frequency, enhance compliance, and cultivate a sustainable safety culture. They are based on the findings of this study and are relevant to occupational safety in Port Harcourt's oil servicing sector.

- Establish a Unified Safety Management System in line with ISO 45001

Oil servicing firms should develop a comprehensive Safety Management System (SMS) that includes risk assessment, hazard identification, incident mitigation, and continuous improvement. To ensure regulatory compliance and early warning capabilities, the SMS must incorporate digital technologies for real-time monitoring, structured near-miss reporting, and documentation of actual occurrences.

- Mandate Inclusive and Behaviour-Based Safety Training

All staff members, including contractors and subcontractors, must undergo the necessary safety training that addresses both technical and behavioural aspects. The training should encompass decision-making under pressure, situational awareness, emotional resilience, exhaustion, and stress management. This approach integrates cognitive-behavioural theories that are vital in high-risk environments, such as oilfields.

- Extend HSE Protocols to Subcontract and Contract Workers

Businesses must develop inclusive Health, Safety, and Environment (HSE) systems that cater to all types of employees. Subcontracted labour, often disproportionately affected by accidents, should receive equal access to personal protective equipment (PPE), daily safety briefings, emergency exercises, and incident reporting systems.

- Use Advanced Monitoring and Hazard Detection Technologies

Invest in and utilise innovative technologies, including confined space monitors, vibration sensors, mobile hazard-reporting apps, and atmospheric gas detectors. These tools are essential for managing risks associated with hydrogen sulphide exposure, equipment failures, and electrical hazards, particularly in environments with ageing infrastructure.

- Enhance Regulatory Compliance, Reporting Culture, and Supervision

A qualified HSE officer should monitor each operating shift; routine internal and external safety audits should be institutionalised. Encouraging prompt incident and near-miss reporting relies on a non-punitive reporting culture. Oil companies should also collaborate with regulatory bodies such as DPR and NOSDRA to update outdated safety laws and adapt foreign models like HFACS to the local Port Harcourt context for culturally and operationally relevant execution.

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