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Assessment of Occupational Health Hazards Among Oil Refinery Workers at Kaduna Refining and Petrochemical Company

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Abstract

Occupational health and safety are vital in the petroleum refining industry due to various hazards faced by workers. A study at Kaduna Refining and Petrochemical Company (KRPC) evaluated industrial accidents and preventive measures using a survey of 250 employees. A cross-sectional survey design was adopted, while primary data were utilized. Structured questionnaires were administered to 250 employees selected from a population of 1,696 workers using the Yamane sampling formula and simple random sampling technique, frequency and percentage was used for the demographic items while mean and standard deviation with remarks was used for the research questions. Findings indicated a relatively low perception of industrial hazards (mean score 2.21), although work-related deaths raised significant concern (mean score 3.06). Positive acknowledgment was given to safety measures like personal protective equipment and hazard management systems (mean score 3.96). Based on these survey results, the study concludes that KRPC staff perceive several safety measures in place but recommends further investigation using objective environmental monitoring and enforcement/audit records to verify exposure and compliance.

Keywords: *Occupational health, industrial accidents, refinery workers, workplace safety, KRPC.*

1.0 Introduction

The petroleum refining sector presents one of the most hazardous occupational environments globally. Research demonstrates that workplace safety remains a critical challenge in the oil and gas industry, particularly in developing regions. [1] The global Fatal Accident Rate (FAR) for the oil and gas industry stood at 0.75 deaths per 100 million work hours in 2021, illustrating the persistent danger inherent to petroleum operations worldwide. This global benchmark becomes even more concerning when examining regional data, as many developing nations experience substantially higher incident rates than this average.

Industrial safety focuses on protecting the physical, mental, and social well-being of workers within and outside the workplace. According to the International Labour Organization (ILO) and the World Health Organization (WHO), occupational health and safety (OHS) involves promoting and maintaining the highest degree of workers' well-being in all occupations. Globally, workplace accidents and occupational diseases remain major concerns, with the ILO reporting millions of work-related accidents and deaths annually, particularly in developing countries where weak reporting systems and rapid industrialization increase occupational risks [2], [3].

Indonesia, ranked 21st in global oil production, reported 634 workplace accidents in the upstream oil and gas sector from 2016 to 2021, highlighting prevalent injuries. To combat this, the government established the Occupational Health and Safety Management System (SMK3) via Government Regulation No. 50 of 2012. Research on the Contractor Safety Management System (CSMS) at an eastern oil refinery revealed that 10% of respondents experienced minor accidents, with lower safety compliance among field workers and contractors compared to management. [4][5].

In Nigeria and other developing nations, industrialization has been encouraged to reduce poverty and stimulate economic growth. However, the introduction of modern machinery and mass production systems has also increased workplace hazards such as respiratory illnesses, fractures, burns, amputations, electrocution, and other occupational injuries [6]. These hazards result in loss of lives, reduced productivity, and economic setbacks. Occupational Safety and Health (OSH) legislation in Nigeria dates back to the colonial era, beginning with the Workmen's Ordinance of 1941, Labour Code Ordinance of 1945, and the Factories Act of 1955, later revised as the Factories Act Cap 126 Laws of the Federation of Nigeria, 1990. These laws were designed to establish minimum safety standards and empower the Federal Ministry of Labour and Productivity to enforce workplace safety regulations [7].

In Nigeria, the literature highlights the urgent need for occupational safety in its oil industry. A safety management model was created to tackle the industry's hazards, using questionnaires to evaluate safety performance among firms. This initiative acknowledges the high injury and fatality risks faced by workers, especially in field operations. Broader Sub-Saharan Africa shows significant gaps in occupational health protection,

with a history of poor working conditions in mineral extraction exacerbated by colonial exploitation. Post-colonial records reveal ongoing challenges in workplace safety enforcement, particularly relevant to petroleum refining, which shares similar hazards [8][9].

Despite these legal frameworks, enforcement of OSH regulations in Nigeria remains weak. Researchers argue that poor enforcement contributes significantly to non-compliance with safety standards [10]. Although developed countries such as the United Kingdom, United States, and Germany have demonstrated that strict enforcement and strong organizational safety culture can reduce workplace accidents, Nigeria still records frequent industrial accidents, especially in the manufacturing and construction sectors [11]. The Employee Compensation Act (ECA) of 2011 was enacted to provide compensation for workers affected by occupational injuries, diseases, or death, and to promote safer working conditions. Nevertheless, workplace accidents continue to occur due to poor compliance and inadequate enforcement mechanisms [12]. Kaduna Refining and Petrochemical Company (KRPC) is a key site for examining occupational health challenges due to its status as one of Nigeria's largest and oldest refineries, established in the 1970s. Its operations expose workers to various hazards, including chemical exposure, noise, heat, and ergonomic risks. Aging infrastructure and inconsistent enforcement of health and safety standards further increase these risks. Oil refineries are among the most hazardous industrial environments because they involve the processing of crude oil into products such as gasoline, diesel, kerosene, liquefied petroleum gas, and petrochemical feedstocks. Refining operations are conducted under high temperatures and pressures and involve exposure to toxic chemicals, fire outbreaks, explosions, air pollution, wastewater contamination, and industrial noise [13], [14]. Although technological advancements and automation have reduced some risks, refinery workers remain exposed to significant occupational hazards depending on the nature of their tasks and refinery processes [15]. Petroleum products are essential to industries such as transportation, manufacturing, aviation, and power generation [16]. However, the hazardous nature of oil refining operations poses serious health risks to workers. This study therefore seeks to examine the Occupational Health Hazards among Oil Refinery Workers at Kaduna Refining and Petrochemical Company.

1.2 Statement of the Research Problem

Rapid technological advancement and industrialization have increased the rate of workplace accidents and occupational hazards across industries such as manufacturing, mining, construction, engineering, transport, and warehousing. Employees in these sectors are exposed to unsafe working conditions, hazardous substances, excessive noise, poor ventilation, extreme temperatures, and inadequate safety measures, leading to injuries such as fractures, burns, electrocution, amputations, head injuries, and even death. According to [17], about 6,000 workers die daily worldwide from work-related accidents and illnesses, demonstrating the seriousness of occupational safety challenges.

Industrial accidents not only affect employees and their families but also negatively impact organizational productivity, profitability, and reputation. For example, BHP Billiton experienced production shutdowns and financial setbacks following multiple workplace fatalities during the 2009 financial year. Organizations that fail to implement effective safety measures often face legal liabilities, operational disruptions, and declining performance [18].

Unsafe and unhealthy work environments are commonly caused by human error, negligence, and deliberate violations of safety procedures [19]. In many developing countries, especially Nigeria, the problem is worsened by unemployment, corruption, outdated labour laws, weak enforcement mechanisms, and poor workplace design. These shortcomings result in unsuitable workstations, inadequate lighting, lack of personal protective equipment, poor emergency preparedness, and insufficient ventilation. Consequently, employees become vulnerable to occupational diseases and reduced productivity [20], [21].

Poor occupational health and safety performance imposes significant human and financial costs on organizations. This highlights the need for effective Occupational Health and Safety Management Systems (OHS-MS) to reduce workplace accidents, ensure legal compliance, improve employee well-being, and enhance organizational performance [22]. Despite the recognized importance of workplace safety, many industries continue to experience high accident rates due to inadequate implementation of occupational health and safety measures.

Kaduna Refining and Petrochemical Company (KRPC) present a critical case for examining occupational health and safety challenges in Nigeria's petroleum sector. Workers face documented risks including chemical exposure, noise and heat emissions, musculoskeletal disorders, and frequent injuries. Despite awareness of hazards, preventive measures have not fully eliminated risks, underscoring the need to evaluate both hazard perceptions and the effectiveness of safety management practices at KRPC. Therefore, this study seeks to examine the occupational Health Hazards among Oil Refinery Workers at Kaduna Refining and Petrochemical Company.

1.3 Research Question

The following are the research questions of this study:

i. What are the types of industrial accident in KRPC Kaduna?

ii. What are the accident preventive measures in KRPC Kaduna?

2.0 Literature Review

Occupational health hazards remain one of the most critical challenges confronting workers in the petroleum refining industry globally. Oil refining processes involve exposure to physical, chemical, biological, ergonomic, and psychosocial hazards capable of affecting workers' health, productivity, and operational efficiency. Refinery workers are routinely exposed to toxic substances such as benzene, hydrogen sulfide, sulfur dioxide, hydrocarbons, heavy metals, and particulate matter generated during crude oil processing and petrochemical operations [23]. Prolonged exposure to these hazardous substances significantly increases the risks of respiratory diseases, skin disorders, neurological complications, kidney dysfunction, and occupational cancers among refinery workers [24]. Petroleum vapors also have toxicological effects on liver and kidney functions, particularly among workers in petroleum refining environments where exposure levels are inadequately controlled [25].

The oil refining process itself presents multiple occupational safety risks because of the complexity of operations, high-pressure systems, flammable substances, and continuous mechanical activities. Workers in refineries are frequently exposed to fire outbreaks, explosions, gas leaks, excessive heat, noise pollution, and machinery-related accidents [26]. The petroleum industry remains one of the most hazardous industrial sectors due to the volatile nature of crude oil refining operations and the high probability of catastrophic industrial accidents [27]. In developing countries such as Nigeria, these risks are intensified by aging infrastructure, poor maintenance culture, inadequate enforcement of occupational safety standards, and insufficient provision of personal protective equipment (PPE) [28].

Studies conducted within Nigerian refineries have consistently shown that occupational hazards negatively influence workers' health and organizational performance. Inadequate occupational safety measures contribute to reduced employee productivity, increased absenteeism, and higher accident rates [29]. Workers who lack access to adequate safety training and protective equipment are more vulnerable to workplace injuries and occupational illnesses [30]. Although many petroleum workers demonstrate awareness of occupational hazards, compliance with PPE usage remains low due to discomfort, poor supervision, and inadequate organizational safety culture [31].

Chemical exposure constitutes one of the major occupational hazards in oil refineries. During refining operations, workers are exposed to volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and toxic gases capable of causing long-term health complications [32]. Exposure to benzene, in particular, has been associated with leukemia, anemia, and immune suppression among refinery workers [33]. Continuous exposure to refinery emissions and air pollutants significantly contributes to chronic kidney diseases and other systemic illnesses in oil-producing communities and industrial workers [34].

Physical hazards are equally prevalent within refinery environments. Workers are exposed to excessive heat generated during refining processes, high noise levels from industrial machinery, and vibrations from heavy equipment. Prolonged exposure to these conditions can lead to hearing impairment, fatigue, heat stress, and musculoskeletal disorders [35]. Poor occupational safety practices in oil and gas industries increase workers' susceptibility to injuries and long-term health complications [36]. Effective hazard control measures, including environmental monitoring, engineering controls, and continuous safety training, are essential for improving workers' safety outcomes [37].

The implementation of Occupational Health and Safety Management Systems (OHSMS) has been widely recognized as an effective strategy for reducing workplace hazards in industrial settings. Organizations with strong occupational health and safety systems record lower accident rates and improved operational performance [38]. Adoption of ISO 45001 occupational safety standards significantly improves hazard identification, risk management, and employee safety compliance in industrial organizations [39]. Effective occupational health management promotes productivity, reduces operational downtime, and minimizes accident-related financial losses [40].

Despite these advancements, occupational health and safety challenges persist in many Nigerian refineries, including Kaduna Refining and Petrochemical Company (KRPC). Inadequate safety infrastructure, irregular maintenance of refinery facilities, poor enforcement of safety regulations, and insufficient employee training continue to expose workers to occupational risks [41]. Weak Health, Safety, and Environment (HSE) supervision in Nigeria's petroleum sector contributes significantly to operational hazards and workplace accidents. The deteriorating condition of some refinery facilities increases the likelihood of gas leakages, fire incidents, and environmental pollution [42].

Theoretical perspectives on occupational hazards emphasize the relationship between workplace environment and employee well-being. The Heinrich Domino Theory posits that workplace accidents result from unsafe acts and unsafe conditions, implying that effective hazard prevention mechanisms can significantly reduce industrial accidents. Similarly, the Systems Theory of occupational safety argues that accidents occur when there is a breakdown in organizational safety systems, communication, and operational controls. These theories are relevant

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to refinery operations where human error, equipment failure, and inadequate safety management frequently interact to create hazardous working conditions. The questionnaire design and variable selection were guided by Heinrich's Domino Theory and Systems Theory. Heinrich's theory, which links accidents to unsafe acts and conditions, led to items measuring workers' perceptions of hazards (e.g., respiratory infections, falls) and preventive measures (e.g., PPE availability). This aimed to identify potential "dominoes" for safety interventions. Systems Theory focused on organizational safety breakdowns, influencing items on safety management practices, hazard monitoring, and organizational commitment. Together, these theories created a framework connecting individual experiences with organizational safety structures, addressing both worker and system-level determinants of occupational health at KRPC.

Empirical evidence therefore indicates that occupational hazards have substantial effects on refinery workers' physical health, psychological well-being, and job performance. However, there remains limited empirical research focusing specifically on the effect of occupational health hazards on oil refining processes among workers in Kaduna Refining and Petrochemical Company Ltd. Most previous studies concentrated on environmental pollution, community health implications, or generalized oil and gas safety practices without adequately addressing the operational and worker-specific implications within KRPC. Occupational health hazards in petroleum refining have been widely documented, but the nature and severity of risks differ across contexts. For example, studies in developed countries consistently report lower accident rates due to strict enforcement of safety standards and adoption of ISO 45001 frameworks, whereas Nigerian refineries continue to record frequent incidents, largely attributed to weak enforcement and aging infrastructure. This contrast highlights the role of regulatory strength in shaping safety outcomes.

Chemical exposure is a recurring theme. International studies show benzene and hydrogen sulfide levels exceeding occupational limits, directly linked to cancers and respiratory illnesses. Nigerian studies acknowledge similar risks but often rely on self-reported perceptions rather than environmental monitoring, which limits the reliability of conclusions. This methodological gap suggests that Nigerian workers may be underestimating actual exposure levels compared to measured data elsewhere. Physical hazards such as noise, heat, and vibration are reported globally, but their impact varies with infrastructure quality. In Canada and Europe, engineering controls mitigate these risks, while Nigerian refineries, including Kaduna, face challenges due to outdated equipment and poor maintenance culture. This divergence underscores the importance of infrastructure investment in reducing hazard severity. Compliance with personal protective equipment (PPE) also shows mixed findings. Some Nigerian studies report awareness of hazards but low compliance due to discomfort and poor supervision, while international studies emphasize high compliance rates driven by strict organizational safety culture. This suggests that organizational culture and enforcement mechanisms are critical determinants of safety behaviour. Overall, while global evidence confirms that occupational hazards significantly affect worker health and productivity, Nigerian studies reveal unique contextual challenges weak enforcement, poor infrastructure, and reliance on perception-based data. These differences justify the present study at Kaduna Refining and Petrochemical Company, which aims to bridge the gap by examining both hazard perceptions and preventive measures within a high-risk, under-researched environment.

3.0 Materials and Methods

This study adopted a cross-sectional survey design to examine occupational health and safety practices among workers of Kaduna Refining and Petrochemical Company (KRPC), Kaduna State, Nigeria. A preliminary reconnaissance survey and pre-testing of research instruments were conducted to familiarize the researcher with the study area and refine the data collection tools. Primary data sources was utilized. Primary data were obtained through structured questionnaires administered to refinery workers across eleven departments, including Administration and Human Resources, Maintenance, Power Plant and Utilities, Lube Plant, Finance and Accounts, and Project Departments, while secondary data comprising occupational health and safety records, accident reports, and safety audit documents covering the period 1998–2003 were obtained from relevant KRPC departments.

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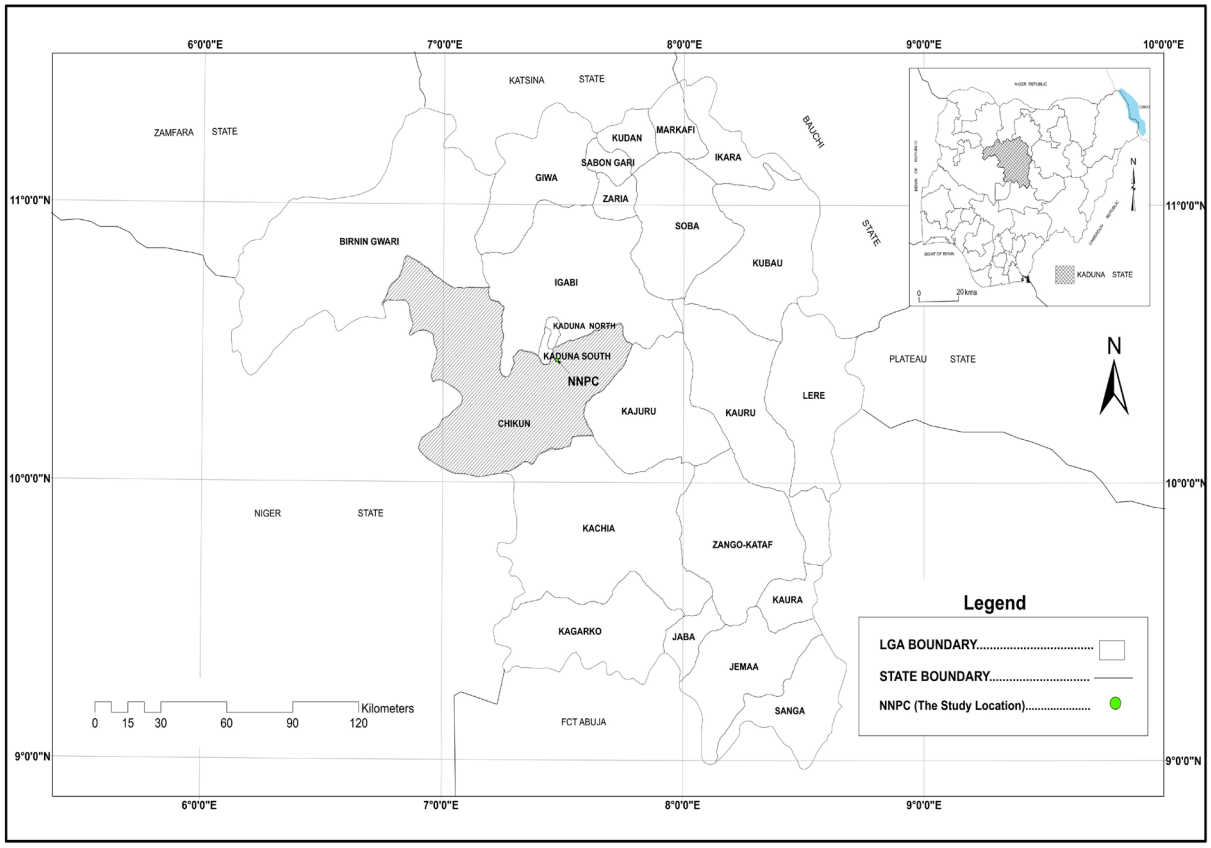

Figure 1: Kaduna State showing NNPC (Marked)

The study population consisted of 1,696 employees of KRPC, from which a sample size of 250 respondents was determined using the Yamane sampling formula at a 5% margin of error and selected through simple random sampling to ensure equal representation of both shift and non-shift workers. Data collected included demographic, socio-economic, occupational, health, and safety-related variables such as exposure to workplace hazards, safety training, use of personal protective equipment, accident occurrence, and adherence to safety protocols. Questionnaire items were structured on a five-point Likert scale ranging from strongly agree (5) to strongly disagree (1). The questionnaire was developed from established occupational health instruments and refined by experts. A pilot test with 20 workers assessed clarity and consistency, with Cronbach's alpha values above 0.70 indicating reliability, ensuring the instrument's validity for measuring hazard perceptions and preventive measures.

Data analysis was conducted using the Statistical Package for Social Sciences (SPSS), employing descriptive statistics such as frequencies, percentages, mean scores, and standard deviations, while results were presented using tables, charts, and graphs. A mean score of 3.0 and above was considered acceptable for interpretation of responses. Ethical clearance was obtained from the Nigerian Defence Academy Research Ethics Committee before data collection. Participation was voluntary, with informed consent from respondents. Confidentiality was ensured by anonymizing responses and limiting access to raw data. Historical accident records from 1998–2003 were analyzed to identify persistent hazard patterns within KRPC. Despite a 20-year gap, these records help assess whether historical accident types, such as respiratory infections and electrocution, are still perceived by workers. The study compares past and current perceptions to evaluate the effectiveness of safety interventions amid Nigeria's infrastructure challenges.

4.0 Results

Socio-Demographic Characteristics of Respondents

The socio-demographic profile of the respondents revealed that male respondents constituted the majority, accounting for 148 (61%) of the sample, while female respondents represented 97 (39%). In terms of age distribution, respondents within the age bracket of 31–40 years constituted the largest proportion with 71 (29%), closely followed by those aged 41–50 years with 69 (28%). Respondents aged 21–30 years accounted for 63 (26%), whereas those within the 51–60 years category represented the least proportion with 42 (17%). Findings on marital status showed that more than half of the respondents were married, representing 128 (52%), while 87 (36%) were single and 30 (12%) were divorced. Concerning educational attainment, the majority of respondents possessed

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B.Sc./HND qualifications, accounting for 134 (55%). This was followed by respondents with primary education qualifications, 56 (23%), and SSCE holders, 52 (21%). Only 3 (1%) respondents indicated possession of ND/OND certificates. The distribution of respondents according to years of service indicated that employees with 0–5 years of work experience formed the highest category with 74 (30%). Respondents with 6–10 years of service accounted for 54 (22%), while those with 11–15 years and 16–20 years represented 43 (18%) and 42 (17%) respectively. Employees with 21–25 years and 26–30 years of service constituted 18 (7%) and 14 (6%) respectively. Regarding employment status, contract employees constituted the majority with 135 (55%), whereas full-time staff accounted for 110 (45%). Furthermore, 62 (25%) respondents reported being in charge of shifts, while 183 (75%) indicated otherwise. Analysis of work duration per shift showed that 107 respondents worked less than 12 hours per shift, 59 worked exactly 12 hours, and 79 worked beyond 12 hours per shift. Overall, the findings suggest that the workforce was predominantly male, middle-aged, married, and highly educated, with a considerable proportion engaged under contract employment arrangements.

Research Question One: Types of industrial accident in KRPC

Table 1: The natures of industrial hazard and disaster.

S/No	Items	M	SD	Remark
1	Respiratory/ lungs infection	1.73	1.20	Low
2	Amputation	2.25	1.20	Low
3	Eye strain	2.55	1.66	Low
4	Skin disease	1.6	1.21	Low
5	Electrical Shock	2.59	1.33	Low
6	Falling and tripping of object	1.69	0.53	Low
7	Death (active service)	3.06	1.71	High
	Grand Mean	**2.21**	**1.26**	**Low**

Source: Field Work, (2023)

Table 1, present the findings of the data analysis, which indicates that the grand mean of 2.21 (SD=1.26) is below the cut-off mean point of 3.00. This highlights the nature of industrial hazards and disasters. The item-by-item analysis reveals that all of the questions had a mean score that was below the standard mean score of 3.00, indicating that respondents were in agreement with the questions themselves, with the exception of question number 7, which had a mean score of 3.06. In conclusion, this indicates that the staff at Kaduna Refinery and Petrochemical Company (KRPC) generally rate most aspects of industrial accidents low as Respondents perceived most hazards as relatively low, though this finding represents subjective perceptions pf the respondents rather than objective accident data. However, the item related to death has a comparatively higher mean score, suggesting it is perceived as a more significant concern, Workers may downplay everyday hazards but are acutely aware of catastrophic risks, reflecting cultural attitudes toward death, underreporting of non-fatal incidents, or memories of past fatalities.

Research question Two: Accident preventive measures and mitigative processes

Table 2: Accident preventive measures and mitigative processes

S/No	Items	M	SD	Remark
1	Availability of Personal protective equipment (PPE)	3.09	1.471	Agreed
2	Level of exposure to hazard	4.52	1.054	Agreed
3	Modality for treatment of staff (gift, money, drugs)	4.22	1.016	Agreed
4	Compensations to victims	3.89	0.862	Agreed
5	Building/ structure and facilities	4.23	0.995	Agreed
6	Provision of free medical checkup for workers	4.2	0.985	Agreed
8	Health and well-being of workers.	3.61	1.109	Agreed
	Grand Mean	**3.96**	**1.070**	**Agreed**

Source: Field Work, (2023)

Table 2 present the results of the empirical data analysis, which indicates that the grand mean of 3.96 (SD = 1.07) is higher than the cut-off mean point of 3.00. This indicates that the items have been accepted by the respondent as the Accident preventive measures and mitigative processes in Kaduna Refinery and Petrochemical Company (KRPC). An item-by-item analysis reveals that all of the items each have a mean score that was higher

than the accepted mean score of 3.00, which indicates agreement between the two parties. In conclusion, this demonstrates that the staff at Kaduna Refinery and Petrochemical Company (KRPC) agreed to these items as accident preventive measures and mitigative processes in the company. Workers acknowledged PPE, medical checkups, and compensation positively (grand mean = 3.96), yet expressed concern about deaths. Preventive measures are visible and appreciated, but enforcement may be inconsistent. Workers may value compensation and medical support but still doubt prevention of severe accidents. Preventive measures exist, but aging equipment and systemic risks undermine their effectiveness.

5.0 Discussion of Findings

Types of industrial accident in KRPC

The data at Kaduna Refinery and Petrochemical Company (KRPC) reveals that the staff generally perceive industrial hazards and disasters incidence. The overall grand mean of 2.21 falls below the cut-off mean point of 3.00, indicating a broad consensus about the relatively low severity or frequency of these hazards. However, the item-by-item analysis suggests a different view, with a mean score of 3.06 for question number 7, highlighting a specific area of concern that may require further investigation. This discrepancy highlights the need for further exploration and improvement in safety perceptions and practices within the KRPC.

Supporting this study, this aligns with [43], who highlighted the increasing risk of industrial accidents resulting from natural hazards (Natech accidents), requiring integrated risk management approaches. Similarly,[44] emphasized sustainability strategies in oil and gas companies, showing how safety and environmental practices contribute to broader UN Sustainable Development Goals. The findings from Kaduna Refining and Petrochemical Company (KRPC) reveal that workers generally perceive the incidence of most industrial hazards as low (grand mean = 2.21). However, this interpretation must be made cautiously, as the data reflect self-reported perceptions rather than documented accident records. Perceptions may underestimate actual risks, particularly in contexts where underreporting of incidents or normalization of hazardous conditions is common. A notable exception is the relatively high mean score for work-related deaths (M = 3.06), which contrasts with the overall low perception of hazards. This discrepancy suggests that while everyday hazards such as respiratory infections or falls may be minimized in workers' accounts, fatal accidents remain salient and memorable, shaping risk perception differently. Possible explanations include heightened cultural awareness of death, collective memory of past fatal incidents, or the visibility of catastrophic accidents compared to less severe injuries.

Accident preventive measures in KRPC

Accident preventive measures at KRPC were positively acknowledged, with a grand mean of 3.96, above the cut-off mean of 3.00. Employees agreed on the availability of PPE, compensation schemes, medical checkups, and improved facilities. This finding is consistent with [45], who applied Failure Mode and Effects Analysis (FMEA) in refinery risk management, demonstrating the importance of proactive hazard identification. [46] also noted that oil and gas employees face both physical and chemical risks, requiring strict safety policies. [47] found that occupational exposure limits for benzene and hydrogen were exceeded in Canadian oil and gas industries, underscoring the need for stricter controls. [48] reported that Ghana's oil and gas industry lacked a national OHS policy, leaving companies to create their own safety regulations. [49] further compared Nigerian pipeline safety practices to international standards, concluding that poor management and enforcement contributed to frequent accidents.

The Nigerian oil industry's image has been tarnished by pipeline explosions, which have resulted in loss of life and property. Pipeline explosions in Nigeria highlight a failure by industry players, including the government and oil and gas companies, to learn from past mistakes. The oil and gas industry currently lacks effective operational safety management practices. Oil and gas industries worldwide follow internal health and safety standards, such as API, to safeguard employees, investments, and property.

Interestingly, employees expressed strong agreement with accident preventive measures (grand mean = 3.96), acknowledging the availability of PPE, medical checkups, compensation schemes, and improved facilities. This positive perception of preventive measures, despite concern about fatalities, may reflect several dynamics. First, preventive measures are visible and tangible, making them easier for workers to recognize and appreciate. Second, compensation and medical support may be valued as reactive safety provisions, even if workers doubt their effectiveness in preventing severe accidents. Third, systemic issues such as aging infrastructure and inconsistent enforcement may undermine the effectiveness of preventive measures, explaining why workers remain concerned about deaths despite acknowledging safety provisions.

When compared with previous studies, the findings show both alignment and divergence. Local studies similarly report awareness of hazards but low compliance with PPE usage, consistent with the current results. However, international studies using environmental monitoring have documented exposure levels to benzene and hydrogen sulfide that exceed occupational limits, contrasting with the relatively low hazard perception reported by KRPC workers. This highlights a gap between perceived and measured risks, underscoring the need for

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objective monitoring in Nigerian refineries. Moreover, while studies in developed countries emphasize the role of strict enforcement and strong safety culture in reducing accidents, the KRPC findings reflect a context where enforcement is weaker, and workers' confidence in preventive measures coexists with concern about catastrophic outcomes.

6.0 Conclusion

This study examined occupational health hazards and accident preventive measures among workers of Kaduna Refining and Petrochemical Company (KRPC). The findings revealed that while most industrial hazards were perceived as relatively low (grand mean = 2.21), concern about work-related deaths was notably higher (M = 3.06). Employees positively acknowledged preventive measures such as PPE provision, medical checkups, compensation schemes, and improved facilities (grand mean = 3.96). These results suggest that workers recognize organizational efforts to improve safety, yet remain concerned about severe outcomes. Because the study relied on self-reported perceptions and did not directly investigate infrastructure conditions or regulatory enforcement, conclusions about aging facilities or weak enforcement should be treated as broader contextual considerations rather than empirical findings. The study therefore emphasizes the importance of continuous safety training, stricter adherence to existing regulations, and improved monitoring of workplace hazards to strengthen occupational health and safety practices in the petroleum refining sector.

7.0 Recommendation

i. management should implement regular environmental monitoring and accident reporting systems to validate and complement worker perceptions.
ii. Targeted interventions such as stricter enforcement of safety rules, improved emergency response systems, and periodic safety drills should be prioritized to reduce fatal incidents.
iii. To sustain and strengthen this positive perception, management should ensure consistent PPE availability, regular medical surveillance, and transparent compensation processes, while also addressing gaps in enforcement and infrastructure reliability.
iv. Management should foster a stronger safety culture through continuous training, visible leadership commitment, and accountability mechanisms.
v. KRPC should integrate objective hazard data (environmental sampling, medical records, enforcement audits) with perception surveys to provide a comprehensive picture of occupational risks.

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