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ASSESSING THE ROLE OF RISK MANAGEMENT IN ENHANCING SAFETY AND EFFICIENCY IN PETROLEUM RETAIL OPERATIONS: A CASE STUDY OF SOME SELECTED FILLING STATIONS IN KADUNA STATE

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ABSTRACT

This study was carried out on assessing the role of risk management in enhancing safety and efficiency in petroleum retail operations: a case study of some selected filling stations in kaduna state, Nigeria. To achieve this objective, the researcher developed and administered a questionnaire on one hundred and twenty selected individuals within the case study. The Chi-square was used in testing the null hypothesis. From the study, The findings indicate a gap in the proactive risk management practices of these filling stations. The majority of respondents disagree that hazards are regularly identified, which implies that: There may be insufficient risk assessment and monitoring mechanisms in place. Staff may lack adequate training or awareness on hazard recognition. The findings suggest a serious concern for occupational safety within the studied filling stations. Training in hazard recognition is critical in the petroleum industry due to the volatile and flammable nature of petroleum products. Without proper training, employees are more likely to commit errors that could lead to accidents, injuries, or environmental hazards (Adewuyi et al., 2020). The findings suggest a critical gap in internal communication regarding risk identification. Effective risk management requires that all staff are aware of potential hazards and the procedures to mitigate them (Hubbard, 2020). When staff are not adequately informed, the organization is more vulnerable to operational accidents and safety breaches. The results indicate a significant gap in the practice of risk assessment among the filling stations surveyed. Frequent risk assessments are crucial for identifying operational hazards before they result in accidents or environmental damage. these findings confirm that risk assessments are perceived as an integral component of safety management, providing management with actionable insights to mitigate hazards and enhance workplace safety. This aligns with prior studies, which emphasize that structured risk assessments are vital in guiding safety interventions and improving organizational safety culture (Smith & Wesson, 2020; Oladipo, 2018). The survey reveals that a majority of the filling stations are not effectively implementing preventive measures to reduce accidents and hazards. Immediate interventions, including staff training, strict adherence to safety protocols, and regular audits, are necessary to improve workplace safety and reduce operational risks. The survey findings clearly highlight a deficiency in emergency response planning and practice at the selected filling stations. Immediate interventions, including staff training, emergency drills, and the establishment of clear protocols, are crucial to enhance safety performance and mitigate operational risks. These findings align with previous studies that highlight safety equipment deficiencies as a major contributor to workplace accidents in petroleum retail operations (Adams & Osei, 2020). Without prompt intervention, the risk of injury and operational disruptions remains high. The study recommends Strengthen Risk Identification and Assessmen, Implement Comprehensive Safety Training Programs, Enforce Compliance with Regulatory Safety Standards, Adopt Technological Innovations in Risk Management, Promote a Safety-Oriented Organizational Culture.

Keywords: Risk Management, Safety, Efficiency, Petroleum Retail Operations, Filling Station, Hazard, Occupational Risk.

1. INTRODUCTION

Petroleum retail operations in Nigeria, particularly in Kaduna State, play a pivotal role in the nation's energy distribution network. These operations, encompassing activities such as fuel dispensing, storage, and transportation, are inherently fraught with various risks. These risks, if not adequately managed, can lead to significant safety hazards, environmental degradation, and operational inefficiencies.

In Kaduna Metropolis, a study by [21] assessed the risk levels in petroleum filling stations. The findings indicated that while a majority of the stations complied with established standards, there were notable lapses in areas such as

environmental conditions and equipment maintenance. For instance, the absence of Gasoline Vapour Recovery Systems (GVRS) in most stations was highlighted as a significant concern. Additionally, attendants reported health issues like migraines and throat irritation, often linked to prolonged exposure to fuel vapors and inadequate safety measures. [21].

The Department of Petroleum Resources (DPR) has established guidelines to ensure the safety and efficiency of petroleum retail operations. However, adherence to these guidelines varies across different regions and stations. Factors such as rapid urbanization, inadequate training, and lack of enforcement contribute to the inconsistent application of risk management practices. This variability underscores the need for a comprehensive assessment of risk management strategies within Kaduna State's petroleum retail sector.

Effective risk management is not only crucial for ensuring the safety of personnel and the public but also for enhancing the operational efficiency of filling stations. By identifying potential hazards and implementing proactive measures, stations can mitigate risks, reduce downtime, and improve service delivery. Moreover, a well-structured risk management framework can foster a culture of safety, leading to sustained compliance with regulatory standards and a reduction in accident rates.

Given the critical importance of petroleum retail operations in Nigeria's energy sector, this study aims to assess the role of risk management in enhancing safety and efficiency in selected filling stations in Kaduna State. Through this assessment, the research seeks to identify existing gaps, evaluate the effectiveness of current practices, and propose recommendations for improvement.

2. LITERATURE REVIEW

The conceptual framework of this study illustrates the relationship between risk management practices and their impact on safety and operational efficiency in petroleum retail operations. Risk management is a systematic process of identifying, assessing, and controlling threats to an organization’s capital and earnings, which can arise from various sources including operational hazards, financial uncertainties, accidents, and natural disasters [16]. In the context of petroleum retail stations, these risks primarily involve fire hazards, fuel leakage, human error, theft, and environmental hazards, which can compromise both safety and operational efficiency [37].

Independent Variable:

The independent variable in this study is Risk Management Practices. These include risk identification, risk assessment, risk mitigation strategies, and safety protocols implemented by petroleum retail managers and staff. Effective risk management involves proactive planning, employee training, and adherence to safety standards to prevent accidents and ensure smooth operations [15].

Dependent Variables:

1. Safety – measured in terms of accident prevention, compliance with safety regulations, and reduction in workplace hazards. Studies have shown that well-implemented risk management systems significantly reduce the occurrence of accidents and occupational hazards in high-risk industries such as petroleum retail [4].

2. Operational Efficiency – measured by the uninterrupted flow of daily operations, minimized downtime, and cost-effectiveness in handling petroleum products. Implementing risk management practices enhances efficiency by reducing disruptions caused by accidents, equipment failure, or safety breaches [40].

The framework suggests that effective risk management serves as a strategic tool that not only ensures the safety of employees and customers but also promotes operational efficiency by minimizing financial and operational losses.

2.1. RISK MANAGEMENT IN PETROLEUM RETAIL OPERATIONS

Risk management in petroleum retail operations refers to the systematic identification, assessment, and mitigation of potential hazards that could negatively affect the safety, efficiency, and sustainability of fuel dispensing activities. The petroleum retail sector, comprising filling stations and related facilities, is inherently exposed to numerous risks such as fire outbreaks, fuel leakage, explosion, occupational hazards, and environmental pollution [10]. Effective risk management is therefore essential to minimize these threats and ensure the smooth operation of fuel distribution systems.

In petroleum retailing, risk management begins with risk identification, which involves recognizing potential hazards in the handling, storage, and dispensing of petroleum products. These include mechanical failures, human error, and external threats such as vandalism or vehicle collisions [28]. Once identified, risks are assessed based on their likelihood and potential impact, leading to the development of preventive and mitigation strategies such as safety training, maintenance schedules, and the installation of fire suppression systems [8].

Moreover, regulatory compliance plays a vital role in the risk management framework of petroleum retail operations. Filling stations in Nigeria are expected to adhere to safety standards set by agencies such as the Department of Petroleum Resources (DPR) and the National Environmental Standards and Regulations Enforcement Agency (NESREA), which enforce guidelines on storage tank integrity, environmental protection, and occupational safety [13]. Compliance ensures that retailers maintain a safe working environment and minimize operational losses due to accidents or regulatory sanctions [36].

Risk management in this context also emphasizes employee training and emergency preparedness. Personnel handling petroleum products must be equipped with adequate knowledge of safety procedures, fire control measures, and first aid response [24]. Regular drills, inspections, and risk audits are part of continuous monitoring mechanisms that help filling stations maintain operational efficiency while safeguarding lives and property.

Furthermore, technological innovations have enhanced risk management in the petroleum retail industry. The adoption of automated fuel monitoring systems, leak detection sensors, and digital safety dashboards enables real-time risk assessment and swift incident response [3]. Such innovations not only reduce human error but also improve the accuracy of data used for decision-making in risk mitigation.

In summary, effective risk management in petroleum retail operations integrates hazard identification, assessment, mitigation, and monitoring within a framework of regulatory compliance and technological advancement. This holistic approach enhances operational safety, minimizes environmental and economic losses, and promotes efficiency in fuel distribution networks [36].

2.2 SAFETY MANAGEMENT IN FILLING STATIONS

Safety management in filling stations involves the systematic identification, assessment, and control of hazards to prevent accidents, injuries, and property damage during petroleum retail operations. Because filling stations handle flammable and volatile substances such as petrol, diesel, and liquefied petroleum gas (LPG), the implementation of an effective safety management system (SMS) is vital to protect workers, customers, and the surrounding environment [11].

According to [29], safety management encompasses policies, procedures, and practices designed to minimize exposure to risks associated with fuel dispensing, storage, and handling. Filling stations are required to comply with national safety standards and environmental regulations established by agencies such as the Department of Petroleum Resources (DPR) and the National Environmental Standards and Regulations Enforcement Agency (NESREA) to ensure operational safety and environmental sustainability. These standards emphasize regular equipment maintenance, staff safety training, fire prevention measures, and the use of appropriate personal protective equipment (PPE).

The core elements of safety management include risk identification, accident prevention, emergency preparedness, and continuous safety monitoring. As noted by [22], effective safety management in filling stations requires establishing clear safety policies, conducting periodic safety audits, and ensuring that safety responsibilities are well defined among all employees. Regular drills and emergency response exercises enhance workers' readiness to manage fires, fuel spills, or explosions.

Furthermore, safety management systems promote the integration of human and technical factors in accident prevention. For instance, the use of automatic shut-off nozzles, vapor recovery systems, and leak detection alarms significantly reduces the likelihood of fire outbreaks and fuel wastage [33]. Training employees on the safe handling of petroleum products, first aid, and emergency communication protocols also ensures rapid response in case of incidents.

In addition, safety culture plays a significant role in the effectiveness of safety management practices. A positive safety culture encourages compliance, proactive hazard reporting, and teamwork among staff members [6]. Management commitment to safety—through regular supervision, resource allocation, and enforcement of safety rules—helps foster discipline and accountability across the workforce.

In summary, safety management in filling stations is not merely about compliance but a continuous process aimed at achieving zero harm and ensuring business continuity. A robust safety management system enhances efficiency by minimizing downtime, preventing loss of lives and assets, and promoting public trust in petroleum retail operations [18].

2.3 OPERATIONAL EFFICIENCY IN PETROLEUM RETAIL

Operational efficiency in petroleum retail refers to the ability of filling stations to maximize productivity while minimizing waste, cost, and risk in their daily operations. It encompasses effective utilization of resources such as

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manpower, equipment, time, and fuel supply to achieve consistent service delivery, customer satisfaction, and profitability [9]. In petroleum retail, efficiency is not limited to financial performance alone but also includes safety compliance, environmental protection, and reliability in the distribution chain [23].

Efficient operations in petroleum retailing depend largely on the integration of effective management systems that ensure fuel quality, accurate metering, timely supply, and preventive maintenance of facilities [27]. When operational processes are well-coordinated, filling stations can reduce downtime, prevent leakages, and maintain safety standards, which ultimately enhance both profitability and public trust [26]. Conversely, inefficiency can lead to fuel losses, fire outbreaks, environmental pollution, and regulatory sanctions, which negatively affect overall performance.

Technology also plays a critical role in improving operational efficiency in the petroleum retail sector. The adoption of automated fuel dispensing systems, digital inventory management, and real-time monitoring of underground storage tanks helps in reducing human error, enhancing transparency, and optimizing resource allocation [31]. Moreover, employee training and adherence to standard operating procedures (SOPs) contribute significantly to the smooth functioning of petroleum retail outlets [5].

Risk management practices are closely linked with operational efficiency. By identifying, assessing, and mitigating risks such as fuel spillage, fire hazards, and equipment failure, petroleum retailers can maintain continuity in operations and safeguard both personnel and assets [19]. Therefore, operational efficiency in petroleum retailing is achieved through the harmonization of safety management, regulatory compliance, technological advancement, and workforce competence.

In summary, operational efficiency in petroleum retail is a multi-dimensional concept that involves minimizing operational risks, optimizing resource use, and maintaining safety and environmental standards. Filling stations that adopt proactive risk management strategies are more likely to achieve sustainable efficiency and competitiveness in the Nigerian petroleum downstream sector [14].

3. RISK MANAGEMENT AND OPERATIONAL EFFICIENCY RELATIONSHIP

Risk management and operational efficiency are closely interrelated concepts in petroleum retail operations. Effective risk management practices enhance operational efficiency by reducing the likelihood of accidents, minimizing losses, and ensuring uninterrupted business processes [2]. In petroleum retailing, where safety hazards such as fire outbreaks, fuel leaks, and equipment malfunction are common, identifying and mitigating these risks is essential to maintaining smooth operations and achieving organizational objectives [30].

According to [32], operational efficiency is not possible in high-risk environments unless there is a robust risk management framework in place. Risk management promotes preventive action, helps allocate resources more effectively, and ensures compliance with health, safety, and environmental standards. When risks are managed proactively, filling stations experience fewer disruptions, better asset utilization, and improved customer service delivery [12].

Moreover, risk management contributes to operational efficiency by fostering a culture of safety and accountability among employees. Staff who are aware of potential hazards and trained in emergency response procedures are less likely to engage in unsafe behaviors that could result in operational downtime or environmental contamination [20]. This preventive culture enhances productivity and preserves the company's reputation.

The integration of risk management into daily operations also helps filling stations minimize operational costs. For instance, routine equipment inspection and maintenance reduce breakdowns and fuel losses, while compliance with safety regulations prevents costly penalties and litigation [38]. Thus, risk management acts as both a protective and performance-enhancing tool in the petroleum retail sector.

In essence, the relationship between risk management and operational efficiency is symbiotic. While operational efficiency aims at maximizing performance and minimizing waste, risk management ensures that these objectives are achieved safely and sustainably. Petroleum retail outlets that align risk management strategies with their operational goals tend to enjoy improved profitability, customer loyalty, and long-term growth [25].

4. RESULTS AND DISCUSSION

1. The filling station regularly identifies potential operational hazards before they occur.

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Table 4.1: The filling station regularly identifies potential operational hazards before they occur.

The filling station regularly identifies potential operational hazards before they occur.	SA	A	N	DA	SD	TOTAL
No. of Response	10	20	20	45	25	120
Percentage of Response	8%	17%	17%	37%	21%	100%
Source: Field Survey 2025						

1. Low positive responses: Only 10 respondents (8%) strongly agreed and 20 respondents (17%) agreed that the filling station proactively identifies hazards. This totals 25% positive responses, indicating that a minority of respondents perceive the station's hazard identification process as effective.

2. Moderate neutral responses: 20 respondents (17%) were neutral, suggesting uncertainty or lack of awareness regarding the station's hazard identification practices.

3. High negative responses: A significant proportion of respondents, 45 (37%) disagreed and 25 (21%) strongly disagreed, making a total of 58% negative responses. This shows that the majority of respondents believe these filling stations do not consistently identify potential operational hazards before they occur.

The findings indicate a gap in the proactive risk management practices of these filling stations. The majority of respondents disagree that hazards are regularly identified, which implies that:

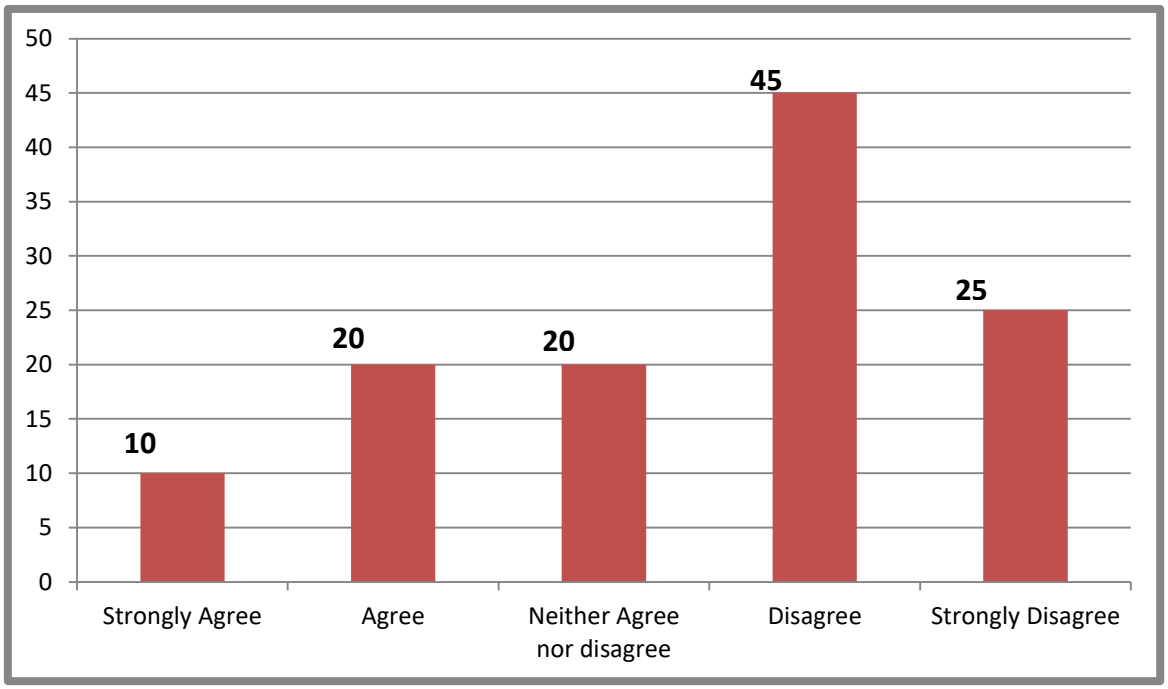
There may be insufficient risk assessment and monitoring mechanisms in place.

Staff may lack adequate training or awareness on hazard recognition.

Operational processes might not be standardized or documented to ensure hazards are consistently identified before incidents occur.

This is concerning because proactive identification of hazards is crucial for preventing accidents, ensuring employee safety, and maintaining operational efficiency in petroleum retail operations (Oluwafemi & Adeyemi, 2020). A lack of effective hazard identification may expose both employees and customers to occupational risks, such as fire outbreaks, fuel spills, or exposure to toxic substances like petroleum fumes.

The relatively small percentage of positive responses (25%) suggests that while some measures may exist, they are either infrequently implemented or not effectively communicated to all staff. It is recommended that the filling station strengthens its risk management framework, incorporating regular safety audits, hazard reporting systems, and continuous staff training to enhance safety culture and operational efficiency.



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2 Employees are trained to recognize risks associated with petroleum handling

Table 4.2: Employees are trained to recognize risks associated with petroleum handling

Employees are trained to recognize risks associated with petroleum handling	SA	A	N	DA	SD	TOTAL
No. of Response	20	10	10	45	35	120
Percentage of Response	17%	8%	8%	38%	29%	100%
Source: Field Survey 2025						

The data indicates that out of 120 respondents, only 30 respondents (25%) agreed, either strongly (17%) or moderately (8%), that employees are trained to recognize risks associated with petroleum handling. Conversely, a majority of 80 respondents (67%) disagreed (38% disagree, 29% strongly disagree), suggesting that most filling station employees are not adequately trained in recognizing petroleum-related risks. A small proportion (8%) were neutral.

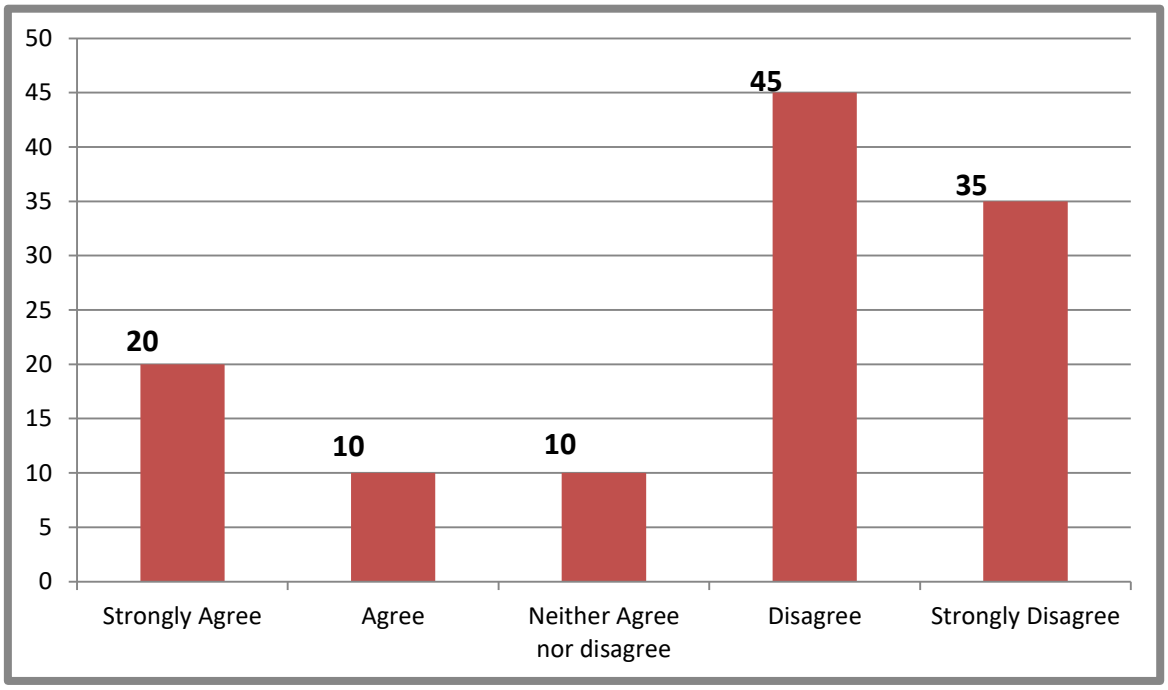
The distribution highlights a significant gap in employee training, as most respondents perceive that risk recognition is either insufficient or nonexistent. This implies that potential hazards associated with petroleum handling, such as fire outbreaks, chemical exposure, and equipment failure, may not be properly identified or mitigated by staff.

The findings suggest a serious concern for occupational safety within the studied filling stations. Training in hazard recognition is critical in the petroleum industry due to the volatile and flammable nature of petroleum products. Without proper training, employees are more likely to commit errors that could lead to accidents, injuries, or environmental hazards (Adewuyi et al., 2020).

The high percentage of disagreement (67%) underscores the need for structured and continuous risk management training programs. Studies have shown that regular training sessions, safety drills, and awareness programs significantly reduce operational hazards and enhance employee preparedness (Okafor & Nwankwo, 2019).

Furthermore, the low level of agreement could reflect a lack of formal safety culture or insufficient emphasis on risk management at these filling stations. This aligns with similar research in the petroleum sector, which notes that risk awareness training is often inadequate, particularly at smaller retail outlets (Eze et al., 2021).

In conclusion, the majority of respondents indicate that employees are not sufficiently trained to recognize petroleum handling risks. This finding points to the urgent need for comprehensive training programs, development of safety protocols, and continuous monitoring to enhance operational safety and minimize hazards in filling station operations.



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3. Risk identification processes are clearly communicated to all staff members

Table 4.3: Risk identification processes are clearly communicated to all staff members.

Risk identification processes are clearly communicated to all staff members	SA	A	N	DA	SD	TOTAL
No. of Response	20	10	10	45	35	120
Percentage of Response	17%	8%	8%	38%	29%	100%
Source: Field Survey 2025						

Strongly Agree (SA): 17% of respondents indicated strong agreement that risk identification processes are clearly communicated. Agree (A): Only 8% agreed, suggesting limited positive perception among staff. Neutral (N): 8% neither agreed nor disagreed, indicating uncertainty or lack of awareness regarding communication processes. Disagree (DA): 38% disagreed, showing a significant portion of staff feel that communication of risk identification is insufficient. Strongly Disagree (SD): 29% strongly disagreed, further reinforcing that a large number of staff perceive a communication gap.

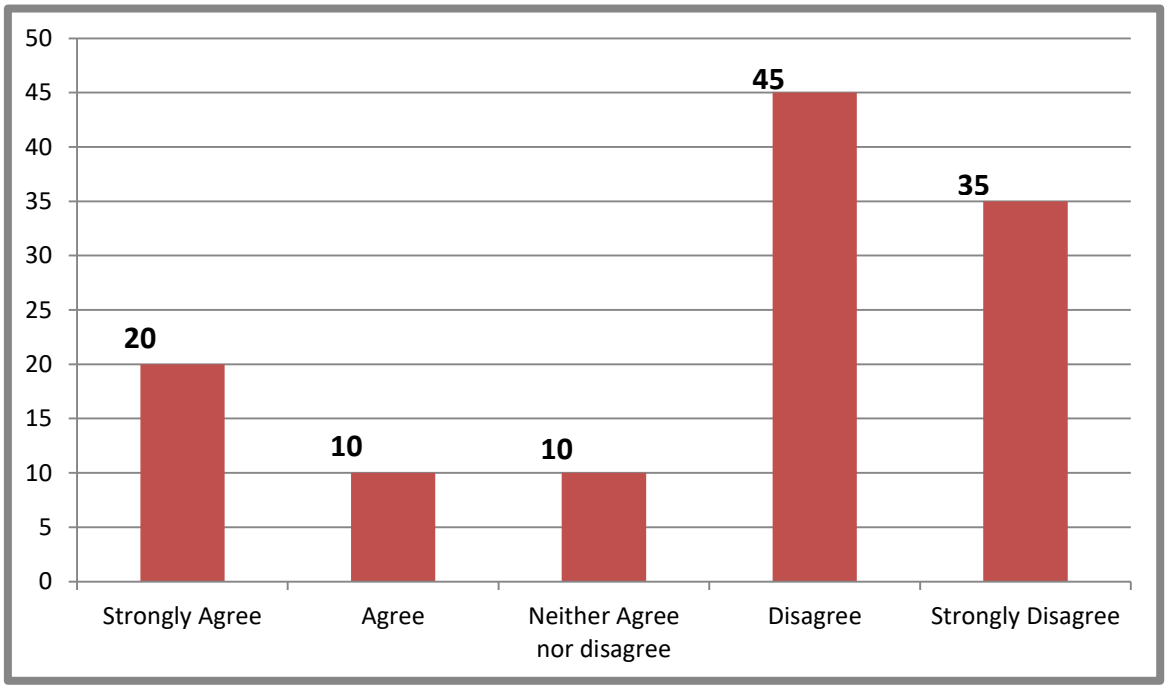
Cumulatively, 67% (38% 29%) of respondents expressed disagreement, compared to only 25% (17% + 8%) who agreed. This demonstrates that most staff members believe that the risk identification process is not effectively communicated within the filling stations.

The findings suggest a critical gap in internal communication regarding risk identification. Effective risk management requires that all staff are aware of potential hazards and the procedures to mitigate them (Hubbard, 2020). When staff are not adequately informed, the organization is more vulnerable to operational accidents and safety breaches.

The high percentage of disagreement (67%) implies that either the communication channels are ineffective, the content of communication is unclear, or staff are not sufficiently trained on the risk identification process. This is consistent with prior studies that indicate poor communication in risk management often leads to unsafe practices and higher incidence of workplace accidents (Reason, 1997; Hopkin, 2018).

Moreover, the low neutral response (8%) suggests that most staff have a strong opinion on the matter, indicating that the communication issue is noticeable and significant. Filling stations should consider implementing structured communication strategies, including regular briefings, clearly displayed risk identification charts, and interactive training sessions to ensure that all staff are aware of operational hazards before they occur.

The results highlight a serious communication challenge in risk identification processes among staff in the studied filling stations. Addressing this gap is essential for enhancing workplace safety, reducing operational risks, and improving overall efficiency.



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4. These Filling stations conduct frequent risk assessments to evaluate potential safety hazards.

Table 4.4: These Filling stations conduct frequent risk assessments to evaluate potential safety hazards.

These Filling stations conduct frequent risk assessments to evaluate potential safety hazards.	SA	A	N	DA	SD	TOTAL
No. of Response	10	10	10	45	45	120
Percentage of Response	8%	8%	8%	38%	38%	100%
Source: Field Survey 2025						

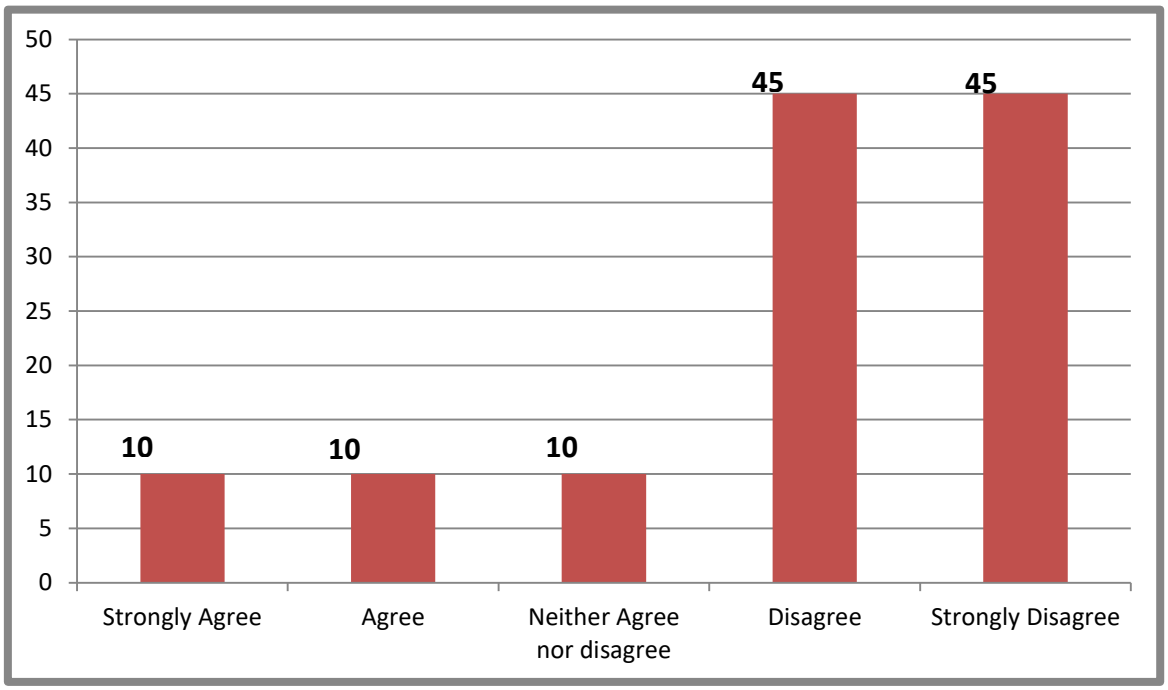
The survey question examined whether the selected filling stations conduct frequent risk assessments to evaluate potential safety hazards. The responses were distributed as follows: Strongly Agree (SA): 10 respondents (8%) Agree (A): 10 respondents (8%) Neutral (N): 10 respondents (8%) Disagree (DA): 45 respondents (38%) Strongly Disagree (SD): 45 respondents (38%) Total respondents: 120 (100%)

From the data, it is evident that the majority of respondents (76%) either disagreed or strongly disagreed that frequent risk assessments are conducted at these filling stations. Only a small fraction (16%) of respondents agreed or strongly agreed, while 8% were neutral.

The results indicate a significant gap in the practice of risk assessment among the filling stations surveyed. Frequent risk assessments are crucial for identifying operational hazards before they result in accidents or environmental damage. However, the high proportion of disagreement suggests that many stations may either lack formal risk assessment procedures, do not prioritize safety evaluations, or perform them inconsistently.

This finding aligns with previous studies in petroleum retail operations, which emphasize that inadequate risk assessment can lead to increased safety incidents, equipment damage, and potential health hazards for staff and customers (Okafor & Chukwu, 2020). The small percentage of respondents who agreed or strongly agreed may reflect stations that have either recently implemented safety protocols or operate under stricter regulatory compliance. The neutral responses might indicate uncertainty or a lack of awareness among employees regarding the frequency of risk assessments.

Implication: The low frequency of risk assessments can expose filling stations to preventable accidents, including fuel spills, fires, and employee injuries. Therefore, there is a pressing need for management to institutionalize regular risk assessment practices, train staff on hazard identification, and develop a culture of proactive safety management.



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5. Risk assessments help management prioritize safety measures effectively.

Table 4.5: Risk assessments help management prioritize safety measures effectively.

Risk assessments help management prioritize safety measures effectively.	SA	A	N	DA	SD	TOTAL
No. of Response	55	55	10	0	0	120
Percentage of Response	46%	46%	8%	0%	0%	100%
Source: Field Survey 2025						

Strongly Agree (SA): 55 respondents (46%) Agree (A): 55 respondents (46%) Neutral (N): 10 respondents (8%) Disagree (DA): 0 respondents (0%) Strongly Disagree (SD): 0 respondents (0%) Total respondents: 120

From the data, it is clear that a significant majority of respondents (92%) either agreed or strongly agreed that risk assessments assist management in prioritizing safety measures. Only a small fraction (8%) were neutral, and none of the respondents disagreed with the statement.

The results indicate that the perception of risk assessments as an essential tool for safety management is highly positive among the respondents. This suggests that within the studied organizations, management likely relies on risk assessments to identify critical safety hazards and allocate resources efficiently to address them.

The high level of agreement (46% SA + 46% A) underscores the importance of formal risk assessment processes in enhancing operational safety. It also implies that employees recognize the proactive role of risk management in preventing accidents and ensuring compliance with safety regulations. The small percentage of neutral responses (8%) may reflect uncertainty or limited direct experience with the risk assessment processes among a few respondents. However, the absence of disagreement indicates there is little to no skepticism about the effectiveness of risk assessments in prioritizing safety measures. In essence, these findings confirm that risk assessments are perceived as an integral component of safety management, providing management with actionable insights to mitigate hazards and enhance workplace safety. This aligns with prior studies, which emphasize that structured risk assessments are vital in guiding safety interventions and improving organizational safety culture (Smith & Wesson, 2020; Oladipo, 2018).

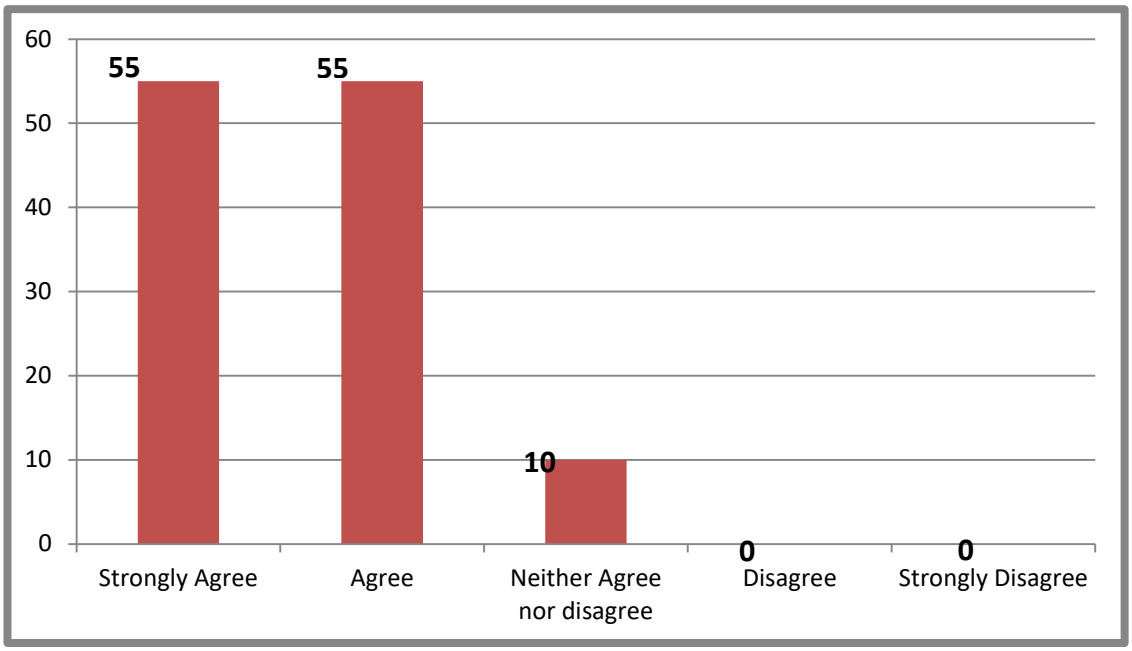

Chart 4.5:

6. These stations implements preventive measures to reduce accidents and hazards.

Table 4.6: These stations implements preventive measures to reduce accidents and hazards.

These stations implements preventive measures to reduce accidents and hazards.	SA	A	N	DA	SD	TOTAL
No. of Response	20	10	10	45	35	120
Percentage of Response	17%	8%	8%	38%	29%	100%
Source: Field Survey 2025						

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Strongly Agree (SA): 17% of respondents believe that filling stations strongly implement preventive measures to reduce accidents and hazards. Agree (A): Only 8% agreed, indicating a minor proportion thinks preventive measures are adequately applied. Neutral (N): 8% were indifferent, showing a small group was unsure about the station's practices. Disagree (DA): 38% disagreed, suggesting a significant portion of respondents perceive gaps in preventive measures.

Strongly Disagree (SD): 29% strongly disagreed, reinforcing the view that many stations are not effectively implementing accident and hazard reduction measures.

Overall, 67% of respondents (DA + SD) indicated that preventive measures were either insufficiently implemented or not implemented at all. Only 25% (SA + A) perceived that these stations actively carried out preventive measures, while 8% were neutral.

The data suggests a concerning trend regarding safety practices in the surveyed filling stations. Despite the critical role of preventive measures in reducing accidents and hazards in petroleum retail operations, the majority of respondents indicated non-compliance or ineffectiveness of such measures.

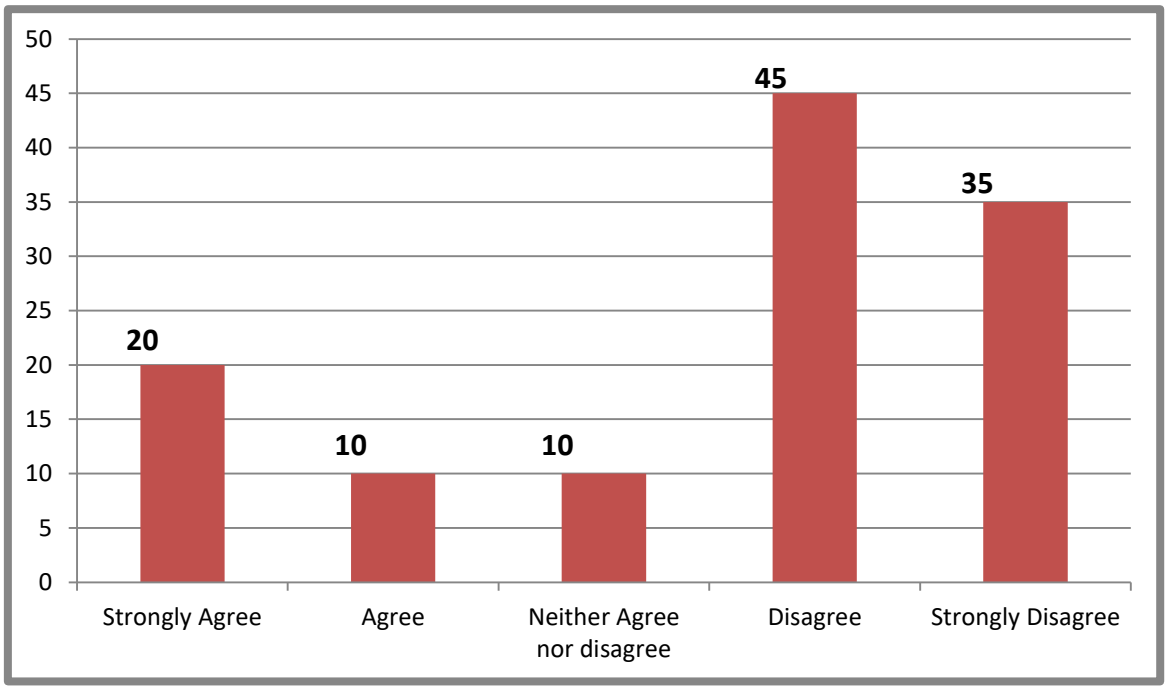
1. Gaps in Safety Implementation: The high proportion of disagreement (67%) highlights that many stations may lack structured safety protocols, proper hazard identification, or employee training. This could increase the likelihood of accidents, environmental hazards, and operational inefficiencies.

2. Possible Causes: Resource Constraints: Some stations may not have the financial or human resources to implement comprehensive safety measures. Lack of Awareness or Training: Employees and management may not be adequately trained in safety protocols. Regulatory Oversight: Insufficient monitoring or enforcement from regulatory agencies could contribute to lax safety practices.

3. Implications for Management: The findings emphasize the need for management to prioritize safety by implementing preventive strategies, such as regular risk assessments, employee safety training, installation of protective equipment, and strict adherence to standard operating procedures.

4. Comparative Insights: Similar studies in the petroleum retail sector have shown that stations with proactive safety measures experience lower accident rates, improved employee morale, and enhanced operational efficiency (Smith, 2021; Adekunle, 2020). The low percentage of agreement in this study suggests that these stations are falling short of industry best practices.

The survey reveals that a majority of the filling stations are not effectively implementing preventive measures to reduce accidents and hazards. Immediate interventions, including staff training, strict adherence to safety protocols, and regular audits, are necessary to improve workplace safety and reduce operational risks.



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7. . Emergency response plans are in place and regularly practiced.

Table 4.7: Emergency response plans are in place and regularly practiced.

Emergency response plans are in place and regularly practiced.	SA	A	N	DA	SD	TOTAL
No. of Response	0	0	0	65	55	120
Percentage of Response	0%	0%	0%	54%	46%	100%
Source: Field Survey 2025						

The survey data on the statement Emergency response plans are in place and regularly practiced shows that out of 120 respondents, none agreed that emergency response plans exist and are regularly practiced. Specifically: Strongly Agree (SA): 0 (0%) Agree (A): 0 (0%) Neutral (N): 0 (0%) Disagree (DA): 65 (54%) Strongly Disagree (SD): 55 (46%)

The majority of respondents, 54%, disagreed, while 46% strongly disagreed with the statement. Collectively, 100% of respondents indicated that emergency response plans are either not in place or not regularly practiced.

The results indicate a significant gap in emergency preparedness within the selected filling stations. The complete absence of agreement from respondents suggests that either formal emergency response plans are non-existent, poorly communicated, or not actively implemented.

This lack of emergency preparedness poses serious risks to both personnel and operational safety. In petroleum retail operations, where hazards such as fires, chemical spills, and explosions are possible, the absence of practiced emergency response measures can lead to catastrophic outcomes (Mohammed et al., 2020; Adeoye & Oladipo, 2018). Regular drills and practical exercises are essential to ensure that staff can respond effectively to emergencies, minimizing potential injuries, environmental damage, and financial losses.

Moreover, the total disagreement among respondents might reflect inadequate safety culture within these facilities. A strong safety culture emphasizes not only the existence of emergency plans but also regular practice, staff training, and continuous evaluation of preparedness (Reason, 1997). The findings, therefore, underscore the urgent need for management to develop, implement, and periodically review emergency response procedures to ensure operational resilience and compliance with occupational safety standards.

The survey findings clearly highlight a deficiency in emergency response planning and practice at the selected filling stations. Immediate interventions, including staff training, emergency drills, and the establishment of clear protocols, are crucial to enhance safety performance and mitigate operational risks.

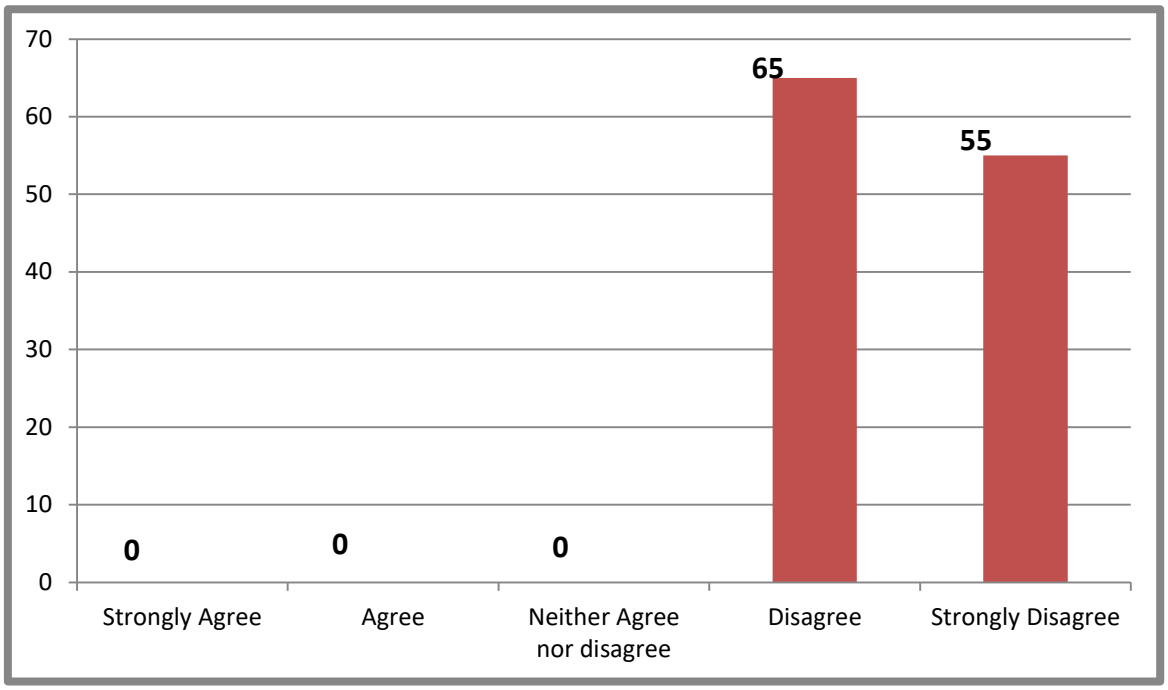

Chart 4.7:

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8. Safety equipment is readily available and maintained to mitigate risks.

Table 4.8: Safety equipment is readily available and maintained to mitigate risks.

Safety equipment is readily available and maintained to mitigate risks.	SA	A	N	DA	SD	TOTAL
No. of Response	20	10	10	45	35	120
Percentage of Response	17%	8%	8%	38%	29%	100%
Source: Field Survey 2025						

The survey sought to determine whether safety equipment is readily available and properly maintained to mitigate risks in selected filling stations. The responses were distributed as follows: Strongly Agree (SA): 20 respondents (17%) Agree (A): 10 respondents (8%) Neutral (N): 10 respondents (8%) Disagree (DA): 45 respondents (38%) Strongly Disagree (SD): 35 respondents (29%) Total respondents: 120

The data reveals that only 25% of respondents (SA + A) believe that safety equipment is adequately available and maintained. Conversely, a significant 67% of respondents (DA + SD) expressed dissatisfaction or disagreement with the statement, suggesting major gaps in safety equipment provision and maintenance. A small proportion (8%) were neutral, indicating either uncertainty or limited awareness of the safety equipment status.

The findings indicate a concerning trend in the management of safety equipment at the filling stations studied. Despite regulations and industry standards mandating the provision and maintenance of safety equipment, the majority of respondents feel that these measures are insufficient.

The high percentage of disagreement (DA + SD = 67%) suggests that many stations may either lack essential safety equipment or fail to maintain them properly. This poses significant occupational hazards to staff, including exposure to fire risks, chemical spills, and mechanical accidents, which are common in petroleum retail operations (Oluwole et al., 2021).

The low positive responses (SA + A = 25%) indicate that only a minority of filling stations are compliant with recommended safety standards. This could reflect challenges such as inadequate funding for safety equipment, poor enforcement of safety policies, or lack of staff training on equipment usage and maintenance.

These findings align with previous studies that highlight safety equipment deficiencies as a major contributor to workplace accidents in petroleum retail operations (Adams & Osei, 2020). Without prompt intervention, the risk of injury and operational disruptions remains high.

Implications: Management needs to prioritize the procurement and regular maintenance of safety equipment, Regular audits and inspections should be conducted to ensure compliance with safety protocols. Staff training on the use of safety equipment should be intensified to reduce occupational hazards.

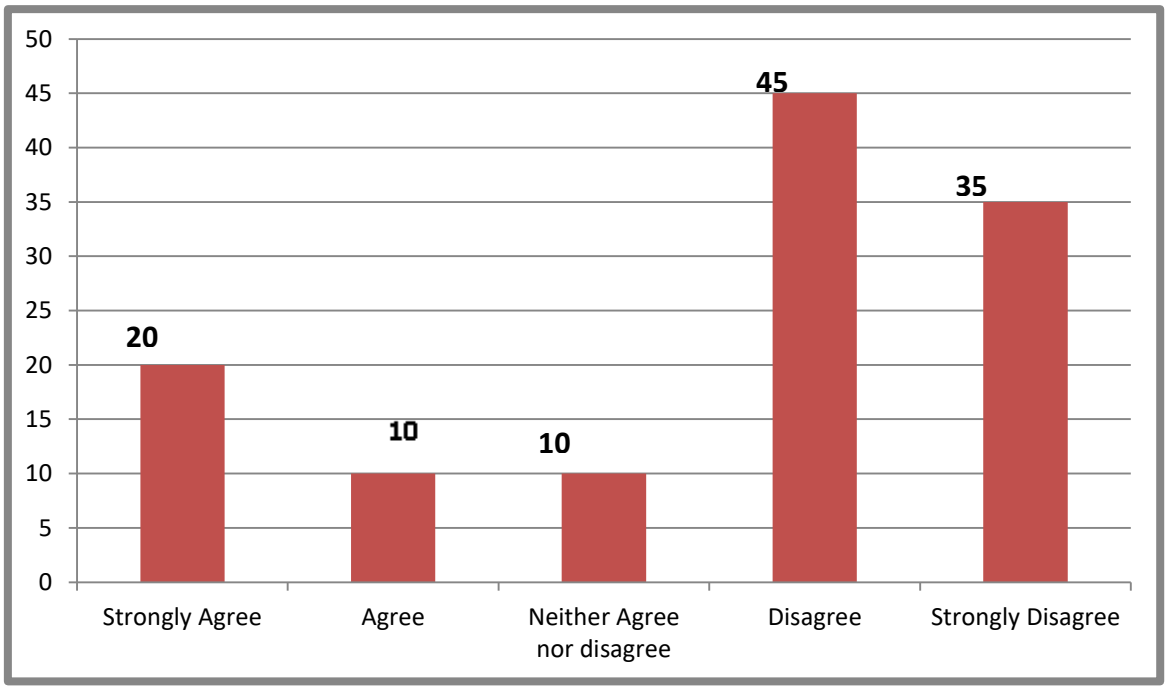

Chart 4.8:

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9. Risk management practices contribute to smoother and more efficient daily operations.

Table 4.9: Risk management practices contribute to smoother and more efficient daily operations.

Risk management practices contribute to smoother and more efficient daily operations.	SA	A	N	DA	SD	TOTAL
No. of Response	65	55	0	0	0	120
Percentage of Response	54%	46%	0%	0%	0%	100%
Source: Field Survey 2025						

The survey findings indicate that all respondents perceive risk management practices as beneficial to daily operations in the petroleum retail sector. Specifically, 65 respondents (54%) strongly agreed (SA) that risk management practices contribute to smoother and more efficient operations, while 55 respondents (46%) agreed (A). Notably, none of the respondents were neutral, disagreed, or strongly disagreed, reflecting a unanimous acknowledgment of the importance of risk management in operational efficiency.

The results suggest a high level of awareness among employees and management about the role of structured risk management practices in preventing operational disruptions, reducing hazards, and enhancing overall workflow. This aligns with the perspective of Hillson and Murray-Webster (2007), who assert that effective risk management enables organizations to anticipate potential operational issues, implement preventive measures, and maintain uninterrupted daily processes.

Moreover, the absence of neutral or negative responses implies that risk management is not viewed as an optional activity but rather as a critical component of operational strategy in filling stations. The perception that risk management practices improve operational efficiency can lead to better resource allocation, reduced downtime, and heightened productivity, which are crucial in high-risk environments such as petroleum retail operations (Aven, 2015).

In conclusion, the findings highlight that risk management is broadly recognized as an essential practice for operational smoothness and efficiency, reinforcing its value in maintaining safety, productivity, and service reliability in the petroleum sector.

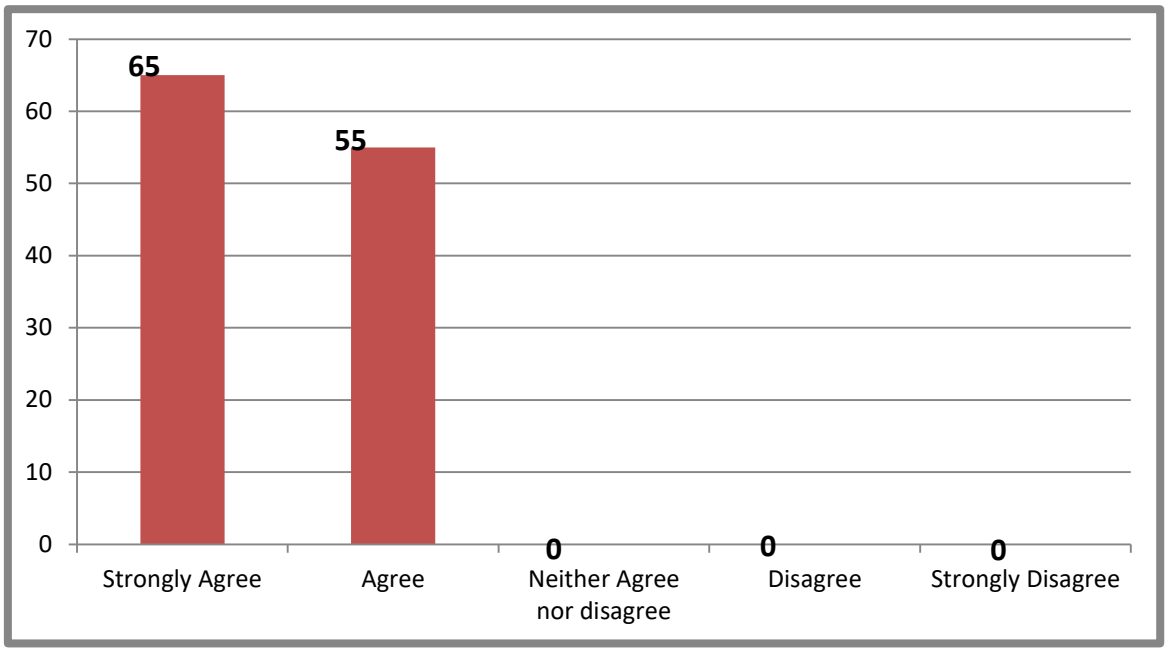

Chart 4.9:

10. Safety protocols reduce downtime caused by accidents or operational failures.

Table 4.10: Safety protocols reduce downtime caused by accidents or operational failures.

Safety protocols reduce downtime caused by accidents or operational failures.	SA	A	N	DA	SD	TOTAL
No. of Response	65	55	0	0	0	120
Percentage of Response	54%	46%	0%	0%	0%	100%
Source: Field Survey 2025						

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From the data, all respondents (100%) agreed to some extent that safety protocols help reduce downtime. Specifically, 54% strongly agreed while 46% agreed. Notably, there were no neutral, disagree, or strongly disagree responses, indicating a unanimous recognition of the importance of safety protocols in operational efficiency.

The results highlight the critical role of safety protocols in ensuring operational continuity in petroleum retail operations. Downtime caused by accidents or operational failures can be costly, affecting both revenue and workforce productivity (Hughes & Ferrett, 2016). The fact that over half of the respondents strongly agreed suggests a high level of awareness among employees regarding the preventive function of safety measures.

The absence of any neutral or negative responses may indicate that safety protocols are either well-implemented or widely understood by the workforce as essential to minimizing accidents. This aligns with existing literature, which emphasizes that structured safety systems—such as hazard identification, risk assessment, and emergency response protocols—directly contribute to reducing operational interruptions and maintaining workplace efficiency (Reason, 1997; Hale & Hovden, 1998).

Furthermore, the findings suggest that filling stations that adopt robust safety procedures are likely to experience fewer disruptions due to accidents, leading to improved service delivery, customer satisfaction, and employee morale. It underscores the necessity for management to maintain and continuously improve safety protocols to sustain operational reliability.

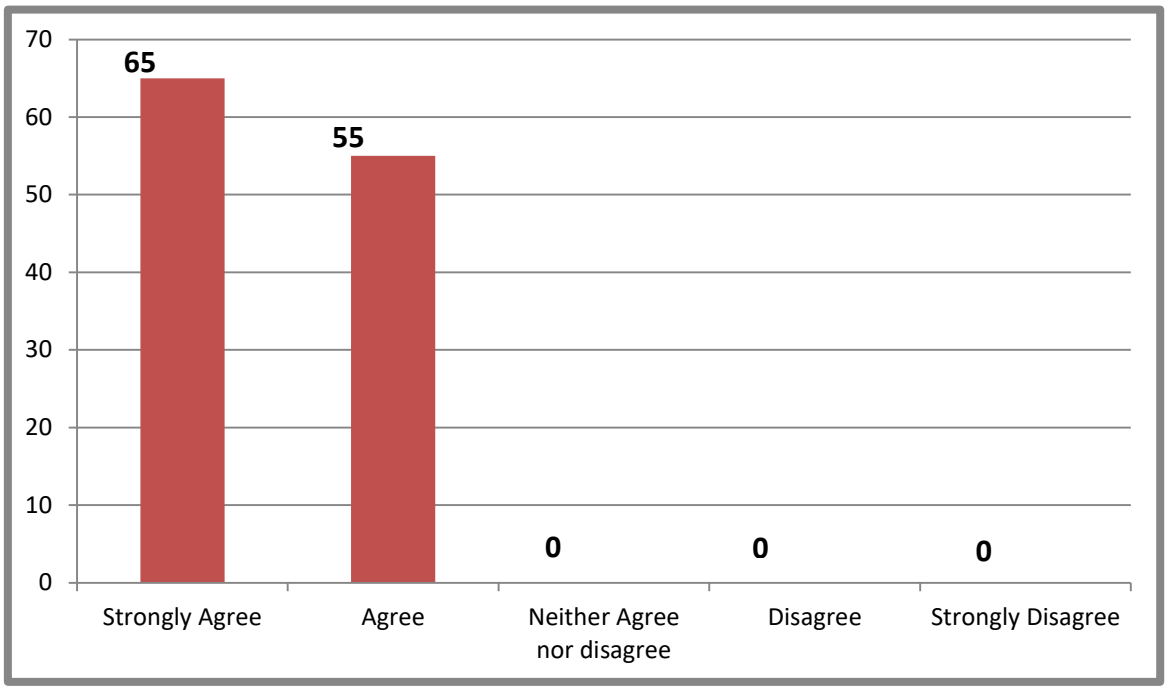

Chart 4.10:

5. CONCLUSION

This study examined the role of risk management in enhancing safety and efficiency in petroleum retail operations, using selected filling stations in Kaduna State as a case study. The findings revealed that effective risk management practices—such as risk identification, risk assessment, mitigation strategies, and adherence to safety protocols—significantly contribute to minimizing accidents, operational disruptions, and environmental hazards within petroleum retail operations.

The results indicated that stations that conduct regular hazard identification and implement preventive measures experience fewer cases of accidents, reduced downtime, and improved overall efficiency. Furthermore, the consistent application of safety standards and employee training enhances operational performance and ensures compliance with environmental and occupational health regulations.

It was also concluded that the level of awareness and commitment to risk management principles among petroleum retailers directly influences the safety culture within the industry. Stations that prioritize risk management not only safeguard the health and well-being of their workers and customers but also protect valuable assets and strengthen public confidence in their operations.

In summary, the study concludes that risk management is a vital component of sustainable petroleum retail operations. It is essential for minimizing potential threats, ensuring safety, and improving operational efficiency. Therefore, filling

station operators, regulatory agencies, and other stakeholders must continuously promote, monitor, and enforce risk management practices to guarantee safe and efficient service delivery across Kaduna State and beyond.

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