World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

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Knowledge, awareness and prevalence of safety cultures workers of indigenous oil and gas firms operating in the Niger Delta Region, Nigeria

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World Journal of Advanced Research and Reviews, 2026, 29(02), 1273-1286

Publication history: Received on 13 January 2026; revised on 21 February 2026; accepted on 23 February 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.29.2.0421

Abstract

The study examined the knowledge, awareness and prevalence of safety cultures workers of indigenous oil and gas firms operating in the Niger Delta Region, Nigeria. Response of 482 oil and gas workers from the sampled oil and gas companies in Nigeria (Niger Delta) on safety culture was collected using a structured survey questionnaire consisting of safety culture's contributing constructs from four (4) domains in the cross-sectional descriptive research. However, descriptive statistics were employed for the study. Findings from the study show that there is a moderate domain's mean values from the constructs for knowledge, awareness and prevalence; communication strategy; management commitment; and adoptive strategy (3.153, 3.175, 3.177 and 3.402 respectively) indicating moderate impact on safety performances, participation including safety compliance. It can be concluded that proper knowledge, awareness and prevalence of the safety culture contributed the least components to safety climates and there was no discernible difference between the practices of safety cultures in the indigenous oil and gas companies in the Niger Delta Region. It is recommended that there is need for more concerted effort in developing safety cultures in the indigenous oil and gas companies and adequate sanctions should be given to any industry that fails to comply. Also, the routine safety assessment should be carried out by firms with a view to receiving recommendations from employees on how to improve the safety culture of the firms in all upstream, midstream and downstream sectors.

Keywords: Knowledge; Prevalence; Safety; Culture; Oil; Gas; Firms; Niger Delta

1. Introduction

Safety culture encompasses more than just individual attitudes and beliefs. It includes proactive risk management, preventive thinking, group responsibility, effective communication, ongoing training, and the inclusion of safe practices in diverse levels in organizations (Bautista-Bernal, Quintana-García, and Marchante-Lara, 2024). The oil and gas industry is one of the most hazardous sectors in the world, therefore ensuring safety is not just a regulatory requirement but a moral obligation. Consequently, building and maintaining a safety culture is crucial for protecting lives, assets, and the environment. It underscores the need for operators in the industry to be alive to the primordial responsibilities which add value to lives apart from their profit considerations, as it has been observed that health and safety have continued to be priority issues for the Nigeria oil and gas industry, as they are germane to the sector's overall success.

Universally, millions of men and women work in poor and hazardous occupational conditions. According to International Labour Organization, 1.2 million working peoples die of work-related accident and diseases every year while more than 160 million workers fall ill each year due to workplace hazards as United Nations estimates ten million (10,000,000) occupational disease cases occur each year globally, severity and frequency is greatest in developing

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countries. According to Ajayi et al. (2006), four hundred thousand (400,000) new cases of occupational diseases are diagnosed each year, while an estimated 100,000 people pass away as a result of these ailments due to their exposure to varied types and levels of workplace dangers, this has an impact on employees in a variety of occupations. When the environment within the workplace is healthy and secure, which means that the workplace has sufficient structures and systems that addresses the well-being of the worker, then the worker will be able to perform better and his or her productivity levels will be very high (Garcia-Herrero, 2012). The systemic approach to Occupational Safety and Health has been widely proven to be an effective strategy for achieving the sustainable safety and health management, leading to the development of a preventative occupational safety and health culture and continuous improvement of the work environment.

In recent decades, organizations have attempted to remove and reduce casualties through focusing on creating a safety culture. The term safety culture was initially used in 1987 in the notification of the International Atomic Energy Agency (IAEA) on the explosion of Chernobyl, since then it has been incrementally used in the context of various organizations (Cooper, 2002). Reason (2016), believes that an efficient safety culture is based on the three components of report culture, culture, and learning culture for the creation of which a safety database system is essential. He further stated that safety culture is an informative culture that everyone knows and does not exceed its limits, and that the system requires the involvement of the employees of that organization to make it influential, as he explained that the organization's workers are ready to report their own mistakes, as he noted that the organization has to have a single culture to differentiate desirable and undesirable activities from one another.

The phenomenon of safety culture is considered as one of the components of a person's professional development in the context of continuous education and professional self-improvement. That why it is necessary to focus on the safety culture of workers in this industry in the context of their impact on global economic and environmental processes. The oil and gas industry included the global processes of exploration, extraction, refining, transporting, and marketing of petroleum products. It is also one of the fastest growing industries in which huge investments and large number of manpower are employed in the business operations. According to studies, safety regulations and procedures have an impact on workers' safety habits.

In Nigeria, the oil and gas sector is mostly governed by the government and is not completely deregulated. The Petroleum Industry Bill (PIB), according to De montclos (2014), will enable full deregulation; sadly, some of its section is still not fully implemented even though the national assembly's legislative seems to have concluded its amendments and passage. The need to protect the worker from occupational health hazards and promote safety of all at the workplace has been emphasized in key documents of the World Health Organization like Declarations of Alma Ata Declaration (Global Strategy on Occupational Health for All, WHO General Programmes of Work), based on this vision, the network of World Health Organization Collaborating Centres in Occupational Health, comprising of 52 research and expert institutions from 35 countries, met to discuss the need for a new Global Strategy in Occupational Health. They proposed strategies aimed at setting standards for addressing the upcoming health and safety needs within the workplace.

In recent years, attention has increasingly shifted toward indigenous oil firms, particularly in developing economies. These firms play a growing role in national energy production, local content development, and employment generation. However, concerns persist regarding their capacity to effectively manage occupational safety risks due to limited resources, evolving regulatory compliance, and varying levels of workforce education and training (ILO, 2023). Understanding the knowledge, awareness, and prevalence of safety culture among workers in indigenous oil firms is therefore essential for improving safety performance and preventing occupational accidents and diseases. Safety culture refers to the collective values, attitudes, competencies, and patterns of behavior that determine an organization's commitment to safety management. The concept was popularized following major industrial disasters such as the Chernobyl nuclear accident, which highlighted the role of organizational and human factors in catastrophic events (Cooper, 2018). According to the International Atomic Energy Agency, safety culture reflects "the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, safety issues receive the attention warranted by their significance" (IAEA, 2019). In the oil and gas sector, safety culture encompasses leadership commitment, employee involvement, communication, training, incident reporting, and continuous learning. A strong safety culture is characterized by proactive hazard identification, open communication about safety concerns, adherence to procedures, and shared responsibility for safety outcomes. Conversely, a weak safety culture is often associated with rule violations, underreporting of incidents, and prioritization of productivity over safety (EU-OSHA, 2023). Indigenous oil firms are locally owned and operated companies engaged in upstream, midstream, or downstream oil and gas activities. While these firms contribute significantly to economic development and employment, they often face unique OSH challenges. One major challenge is limited technical and financial capacity, which can affect investment in safety infrastructure, training programs, and modern equipment (ILO, 2023).

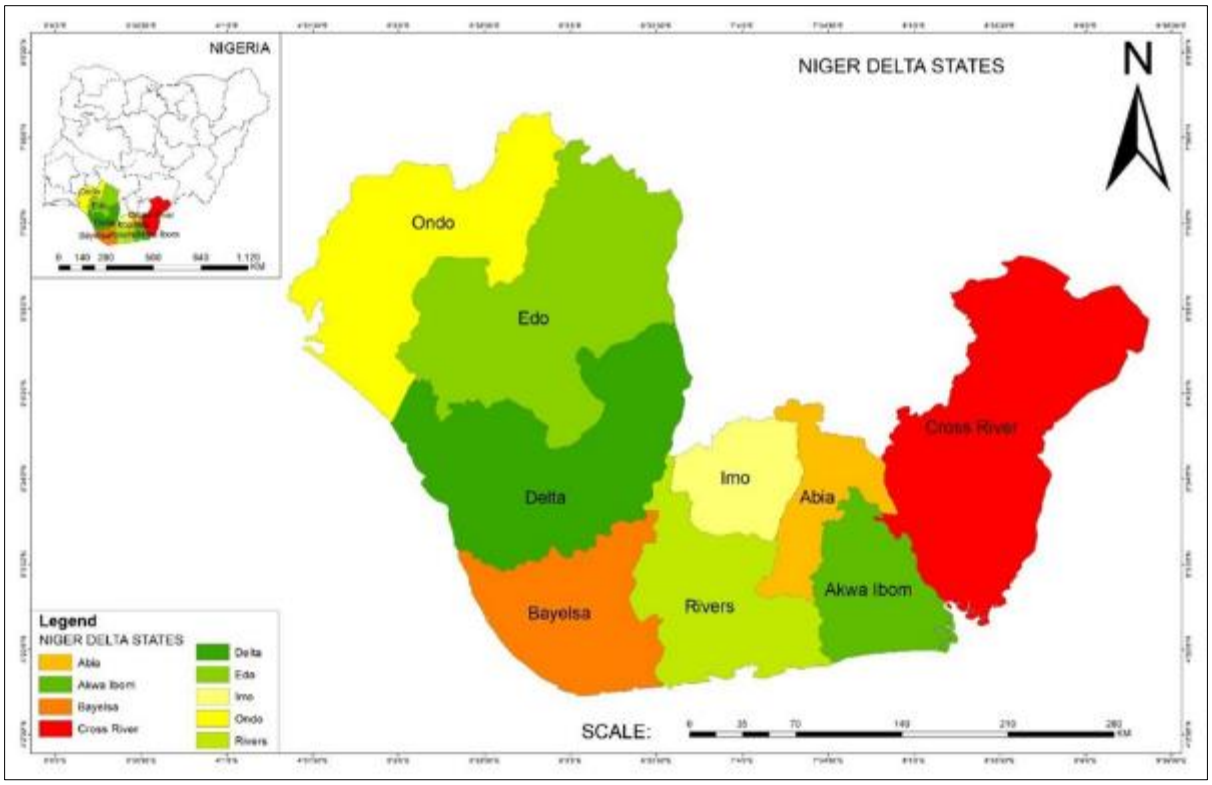
Additionally, indigenous firms may operate in remote or environmentally sensitive areas where regulatory oversight is weaker and emergency response systems are underdeveloped. Workforce diversity also presents challenges. Employees in indigenous oil firms often include workers with varying educational backgrounds, technical competencies, and cultural perceptions of risk. These factors influence workers' knowledge and awareness of safety practices, which in turn affect the prevalence and strength of safety culture (Adebayo et al., 2021).

The International Labour Organization's Convention 187 on Promotional Framework on Occupational Safety and Health provides the guidelines towards achieving these objectives. A National Occupational Safety and Health Profile, as the starting point, brings about the identification of the relevant elements of the national OSH system, their specific roles, capacities and achievements for effective synergy towards a sustainable national OSH prevention programme. The competent national authority responsible for occupational safety and health regulation in Nigeria is the Federal Ministry of Labour and Employment, as it has the responsibility for safeguarding and promoting the health, safety, and wellbeing of workers in their various workplaces, with a view of preventing the occurrence of work-related illnesses, injuries and/or death and reduce damage to property, work injury, treatment and rehabilitation of injured persons and compensation claims thereby improving productivity. Workers are at greater risk of occupational hazards for a variety of reasons such as low education and literacy rates; unfamiliarity with work processes and exposures, inadequate training, predisposition not to complain about working conditions or exposures because of jobs, whether or not they are hazardous, are relatively scarce. Therefore, understanding the specific risk which the oil industry faces is key to lessening these risks, prioritizing safety through rigorous training, strict regulations and proper equipment, and vessel maintenance can significantly reduce the likelihood of accidents and their far-reaching repercussions. moreover, an emphasis on safety culture instills confidence among workers, investors and the public, contributing to sustainable growth. Previous studies concentrated more on the oil and gas industries in the developed worlds and have not really dug to the roots of the knowledge, awareness and prevalence of safety culture especially in the indigenous oil and gas industries which in recent times are emerging across the developing countries. Thus, the present study is examining the knowledge, awareness and prevalence of safety cultures workers of indigenous oil and gas firms operating in the Niger Delta Region, Nigeria.

2. Materials and Methods

The study was carried out in the Niger Delta Region of Nigeria. The Niger Delta region is situated in the Gulf of Guinea between longitude 50E to 80E and latitudes 40°N to 60°N, as shown in Figure 1 (Opafunso, 2007). The Niger-Delta region of Nigeria was chosen as the study's location as it contains roughly 606 oilfields, 355 of which are onshore and 251 of which are offshore (Ekong and Ogunbawo, 2023). The Niger Delta region of Nigeria comprises nine states which Abia State, Akwa Ibom State, Bayelsa State, Cross Rivers State, Delta State, Edo State, Imo State, Ondo State and Rivers State intersecting the South-South, Southwest, and Southeast geopolitical zones. With a surface area of 112,000 square kilometres and a population of more than 31 million people, the region is home to roughly 3000 households (Grey, Ojo, William, Certoma, Greco, Ogbara and Ohwojeheri, 2013), as represented in Figure 1.

The Niger Delta region is in the belt of tropical rainforest climate or the equatorial monsoon, which falls within the Koppen climate classification, which is influenced by the monsoon running from the South Atlantic Ocean, conveying the maritime tropical air mass, a warm moist sea breeze to land seasonal wind (Ayoade, 2004). Geologically, the Niger Delta region is within the natural delta area of the Niger River which is a vast sedimentary basin. The region is characteristically divided into five zones in terms of its vegetation. They are; mangrove forest and coastal vegetation; fresh water swamp; tropical rainforest, savannah and montane vegetation (Eregha and Irughe, 2009). The Niger Delta region is greatly endowed with numerous natural resources especially high-quality crude oil and solid minerals, rich fertile agricultural land capable of growing diverse crops, and vast fishing waters.



Source: University of Port-Harcourt Cartography Lab.

Figure 1 Niger Delta States, (2024)

2.1. Population of the Study

The field production and process plant employees of indigenous (local and national only) oil and gas firms were taken into account for the study, with a focus on those who work in the dependent (process plant) areas of the whole indigenous Oil and Gas companies operating in the Niger Delta Region of Nigeria is the study population. These selected indigenous oil and gas firms for the study included the following the Indigenous Oil and Gas companies listed as: Nigerian Petroleum Development Corporation, NPDC. (A subsidiary of the Nigerian National Petroleum Company Limited); Oando Energy Resources, OER) (A subsidiary of Ocean and Oil Development Partners limited); Aieteo Exploration and Production Limited, (An energy subsidiary of Aiteo Group); Amni International Petroleum Development Company, (Operator of OML-52 and-112, Tubu and Ima fields respectively); Belemaoil Producing Limited, (Operator of OML-55, Kula field); Moni Pulo Petroleum Development Limited, (Operator of OML-114,Abana field); and Prime Exploration and Production Limited, (Operator of OML-11, Asaramatoru Marginal field) all of them operating in the study area. According to Hammond and McCullagh (1978) as cited in Oyegun (2003), a population is a complete set of counts or measurement derived from all objects possessing one or more common characteristics.

2.2. Sample Design and Sample Techniques

Information obtained from the Human Resource Department of Head Offices of the purposively selected indigenous oil and gas firms disclosed that there are five hundred and eighty-nine (589) supervisory/ management and operational unit staff of the six (6) Indigenous oil and gas firms. Convenient and quota sampling techniques were combined in the study's non probability sampling method. The goal of the study serves as the focal point of purposeful sampling (Ben-Shlomo et al., 2013). Consequently, the knowledge and traits that are appropriate for the study was used to determine how the population's elements were chosen. Workers in various departments of oil and gas plants, known as process operations workers, are a good fit for the study given that they process crude oil on a daily basis, demonstrating their familiarity with the workplace hazards associated with the job and their understanding of what can be achieved in terms of viewed process safety culture in the management of process safety procedures for their respective sections. Nonetheless, while using quota sampling, the sample is chosen based on an equal number and drawn from a population with similar characteristics (Warmbrob, 2001). Also, the indigenous oil and gas companies share the same requirements for the processes involved in the oil and gas exploration and production, the workers in their process operations are equally at risk. Nevertheless, therefore the selection of the participating firm was based on a 50–50% ratio as the research were to compare the safety cultures of the indigenous Oil Companies operating in Nigeria.

Table 1 List of Selected Indigenous Oil and Gas Firms Operating in the Niger Delta region and their sampled Staff Strength as at March, 2024

S/No	Names of Indigenous Oil and Gas Firms.	Sampled Staff Strength
1	Nigerian Petroleum Development Corporation, NPDC.	140
2	Oando Energy Resources, OER.	184
3	Aieteo Exploration and Production Limited,	105
4	Amni International Petroleum Development Company,	65
5	Belemaoil Producing Limited	50
6	Prime Exploration and Production Limited	45
	Total	589

To determine the sample size for this study, the Taro Yamane (1967) formula for sample size determination was used as shown below;

That $n = N/1+N(e)^2$

Where $n = \frac{589}{1+589\,(0.05)^2}$

Where n = 399.89

=400.

- N = Projected population
- E = level of precision (0.005 @95% conclusion level) error %
- 1 = Constant

The total number of 400 participants is gotten from the sampled population for the study, which is the numbers of survey instrument (questionnaires) distributed among the sampled oil depots/terminals using the ratio of their population proportion to the sample size as seen in the Table 2. The questionnaires were administered by the Researcher with assistance of trained research assistants (enumerators) to the respondents whom were randomly-route sampled in addition to using certain inclusion principles like being responsible for managerial or supervisory responsibilities in the selected depots/terminals in each of the sampled states.

Table 2 Distribution of Questionnaires among sampled Workers of the Selected Indigenous Oil and Gas Firms in the Niger Delta region

S/No	Names of Indigenous Oil and Gas Firms	Distributed questionnaire	Percentage of Distributed questionnaire	Retrieved questionnaire
1	Nigerian Petroleum Development Corporation, NPDC.	95	23.75	88
2	Oando Energy Resources, OER.	125	31.25	114
3	Aieteo Exploration and Production Limited,	85	21.25	79
4	Amni International Petroleum Development Company,	44	11	40
5	Belemaoil Producing Limited	34	8.5	32
6	Prime Exploration and Production Limited	31	7.75	29
7	Total	400	100	382

The study used a well-designed, self-administered questionnaire to gather information about the effective safety culture among workers of the indigenous oil and gas operating in the Nigeria. The study used the results from the field questionnaire (both hardcopy questionnaires and soft copy form) as the primary data. In order to provide answer to the study's research questions; descriptive statistics such as average mean and standard deviation was utilized. The choice of mean and standard deviation was for the reason that the research questions aimed at knowing and comparing the level of safety culture operationalization in the sampled indigenous oil and gas companies. A 5-point modified Likert scale which is a measure of an interval scale (Kamalu and Wokocha, 2011) was adopted in the present study, as scores were then multiplied by the number of responses and divided by the total number of respondents to determine the weighted score and percentages calculated because those who strongly agree and agree are saying the same thing. The average of the responses (5 + 4 + 3 + 2 + 1) 5 = 3.0

Therefore, a mean score below 3.0 was considered rejected and a mean score of 3.0 and above was considered accepted. The hypotheses were tested with simple linear regression analysis with Statistical Packages for Social Science (SPSS version 22.7).

3. Results

3.1. Socio Demographic Characteristics of Respondents

Table 3 depicts the social-demographic characteristics of the respondents in the study area which indicated that from a total of 400 copies of questionnaire which were administered, as 382 copies of the questionnaire were returned completely filled, indicating a 95.5% response rate. The table shows 313 (82%) of the respondents were male and 69 (18%) were female. Table 3 also shows that we have more graduates with Secondary/Technical/Diploma certification in the employment of the Oil and Gas firms making up to 223 (over 58%) of the respondents, with 100 (26%) of them having Higher Diploma/Bachelor's degrees, as 46 (12%) of the respondents were with Masters degrees and 13 (4%) of the respondents have Doctors of Philosophy. Table 4.1 showed that 96 (25%) of the respondents have worked in the Oil and Gas companies for between one (1) to five (5) years, whereas 130 (34%) of them have worked in the Oil and Gas companies for five (5) to ten (10) years, while 76 (20%) of them has worked in the Oil and Gas companies between ten (10) to fifteen (15) years, meanwhile 80 (21%) of the respondents has worked in the Oil and Gas companies for between fifteen (15) and above years. The table further reveals that 212 (56%) of the respondents are within the age bracket of 18 - 35 years, whereas 147 (38%) of the respondents were within 36 - 50 years of age, while 23 (6%) of the respondents were within the ages of 51 – Above years. Furthermore, table 4.1 shows that, 199 respondents (52%) were Engineering/Technical Staff, 56 responses (15%) were Management Staff, 46 responses (12%) were Health, Safety and Envi Staff, whereas 81 respondents (21%) are General Services Staff.

Table 3 Socio-Demographic Characteristics of Respondents

Independent Variable	Frequency	Percentage
Age of Respondents		
18 -35 years	212	55.50
36 – 50 years	147	38.61
51 and Above years	23	5.89
Sex of Respondents		
Male	313	82. 06
Female	69	17. 94
Level of Education		
Secondary / Technical / Diploma Certificates	223	58.42
Higher Diploma/ Bachelor Degree	100	26.09
Master's Degree	46	11.96
Doctor of Philosophy	13	3.53
Job Category/ Role		
Engs. and Technical Staff	199	52.01
Management Staff	56	14.75
Health, Safety and Envi. Staff	46	12.06
General Services Staff	81	21.18
Number of Years in Employment		
Less than 1yr – 5 years	96	25.13
6 – 10 years	130	34.29
11 – 15 years	76	20.10
More than 15 years	80	21.25

The Knowledge, Awareness and Prevalence (KAP) of Safety Culture among Workers of Oil and Gas Firms within the Niger Delta region, Nigeria

3.2. There is Routine Inspection of Equipment/ Tools before the start of Work on Site Daily

The answers of the respondents to the daily inspection of equipment/tools before the start of work on site in their respective indigenous oil and gas companies operating in the study area was collated and displayed in Table 4; with the total numbers of 117 respondents asserting Strongly Agree to observing daily inspection of equipment/tools before the start of work on site in their respective indigenous oil and gas companies; as 141 respondents retorted Agree to the daily inspection of equipment/tools before the start of work on site in their respective indigenous oil and gas companies. Whereas, 80 of the respondents reacted Disagree to daily inspection of equipment/tools before the start of work on site in their respective indigenous oil and gas companies, As 43 respondents responded Strongly disagree to daily inspection of equipment/tools before the start of work on site in their respective indigenous oil and gas companies, while, none of the responses riposte Undecided to the daily inspection of equipment/tools before the start of work on site in their respective indigenous oil and gas companies. Thus, giving the calculated mean score of 3.86 as against the criterion mean of 3.0 on the 5-point Likert's scale.

Table 4 Daily Routine Inspection of Equipment/Tools before the start of Work on Sites of the respective Indigenous Oil and Gas firms in the Study Area

S/no	There is daily inspection of equipment/tools before the start of work on site. (B1)	SA (5)	A (4)	D (3)	SD (2)	U (1)	Mean	Rank
1	Nigerian Petroleum Develop. Corporation, NPDC.	26	24	18	20	0	3.64	6th
2	Oando Energy Resources, OER.	39	45	20	10	0	3.99	2nd
3	Aieteo Exploration and Production Limited,	20	35	20	04	0	3.90	4th
4	Amni International Petroleum Development Company,	10	15	10	05	0	3.75	5th
5	Belemaoil Producing Limited	12	10	08	02	0	4.00	1st
6	Prime Exploration and Production Limited	10	12	04	02	0	3.93	3rd
	Total	117	141	80	43	0	**3.86**	

Where, AS = Strongly Agree, A = Agree, D = Disagree, SD = Strongly disagree, U = Undecided.

3.3. There is Regular Health/Medical Check Up Exercise among Workers of the Respective Indigenous Oil and Gas Firm before and during the start of Work Assignation.

The answers of the respondents to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies operating in the study area was collated and displayed in Table 5; with the total numbers of 76 respondents asserting 'Strongly Agree' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies; as 122 respondents retorted 'Agree' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies. Whereas, 116 of the respondents responded 'Disagree' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies, As 61 respondents replied 'Strongly disagree' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies, while, 13 of the responses retort 'Undecided' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies. Thus, giving the calculated mean score of 3.47 as against the criterion mean of 3.0 on the 5-point Likert's scale.

3.4. There is Regular Health/Medical Check Up Exercise among Workers of the Respective Indigenous Oil and Gas Firm before and during the start of Work Assignation

The answers of the respondents to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies operating in the study area was collated and displayed in Table 3; with the total numbers of 76 respondents asserting 'Strongly Agree' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies; as 122 respondents retorted 'Agree' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies. Whereas, 116 of the respondents responded 'Disagree' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies, As 61 respondents replied 'Strongly disagree' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies, while, 13 of the responses retort 'Undecided' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies. Thus, giving the calculated mean score of 3.47 as against the criterion mean of 3.0 on the 5-point Likert's scale.

Table 5 Regular Health/Medical Check Up Exercise among Workers of the Respective Indigenous Oil and Gas Firm before/during the start of Work Assignation in the Study Area

S/no	There is regular health/medical checkup exercise before and during work assignation. (B 2)	SA (5)	A (4)	D (3)	SD (2)	U (1)	Mean	Rank
1	Nigerian Petroleum Develop. Corporation, NPDC.	15	28	29	14	02	3.45	3rd
2	Oando Energy Resources, OER.	30	45	20	15	04	3.72	1st
3	Aieteo Exploration and Production Limited,	10	25	35	06	03	3.45	3rd
4	Amni International Petroleum Development Company,	06	10	12	10	02	3.20	6th
5	Belemaoil Producing Limited	07	08	10	12	01	3.44	5th
6	Prime Exploration and Production Limited	08	06	10	04	01	3.55	2nd
	Total	76	122	116	61	13	3.47	

Where, AS = Strongly Agree, A = Agree, D = Disagree, SD = Strongly disagree, U = Undecided.

3.5. Observant Appropriate Breaktimes and Work Day off among Workers of the Respective Indigenous Oil and Gas Firm during Working Periods

The answers of the respondents to observing appropriate breaktimes and work day off during working seasons in the respective indigenous oil and gas companies operating in the study area was collated and displayed in Table 6; with the total numbers of 40 respondents asserting 'Very Often' to observing appropriate breaktimes and work day off during working seasons in their respective indigenous oil and gas companies; as 79 respondents retorted 'Often' to observing appropriate breaktimes and work day off during working seasons in their respective indigenous oil and gas companies. Whereas, 140 of the respondents responded 'Moderately Often' to having regular health/medical checkup exercise before and during work assignation in the respective indigenous oil and gas companies, As 95 respondents replied 'Less Often' to observing appropriate breaktimes and work day off during working seasons in their respective indigenous oil and gas companies, while, 28 of the responses retort 'Never' to observing appropriate breaktimes and work day off during working seasons in their respective indigenous oil and gas companies. Thus, giving the calculated mean score of 3.02 as against the criterion mean of 3.0 on the 5-point Likert's scale.

Table 6 Observant of Designated Breaktimes and Work Day off among Workers of the Respective Indigenous Oil and Gas Firm during Working Periods

S/no	There is observing of designated breaktimes and work day off during working seasons. (B3)	VO (5)	O (4)	MO (3)	LO (2)	N (1)	Mean	Rank
1	Nigerian Petroleum Develop. Corporation, NPDC.	10	25	29	18	06	3.17	2nd
2	Oando Energy Resources, OER.	10	25	40	30	09	2.97	4th
3	Aieteo Exploration and Production Limited,	07	10	35	21	06	2.87	5th
4	Amni International Petroleum Development Company,	05	08	13	10	04	3.00	3rd
5	Belemaoil Producing Limited	05	07	13	06	01	3.28	1st
6	Prime Exploration and Production Limited	03	04	10	10	02	2.86	6th
	Total	40	79	140	95	28	3.02	

Where, VO = Very Often, O = Often, MO = Moderately Often, LO = Less Often, N = Never.

3.6. There is Proper Feeding and Fitness Drills before Working Time among Workers of the Respective Indigenous Oil and Gas Firm

The answers of the respondents to proper feeding and fitness drills before working time among workers in the respective indigenous oil and gas companies operating in the study area was collated and displayed in Table 7; with the total numbers of 35 respondents asserting 'Very Often' to proper feeding and fitness drills before working time among workers in their respective indigenous oil and gas companies; as 76 respondents retorted 'Often' to proper feeding and fitness drills before working time among workers in their respective indigenous oil and gas companies. Whereas, 122 of the respondents responded 'Moderately Often' to proper feeding and fitness drills before working time among

workers in the respective indigenous oil and gas companies, As 105 respondents replied 'Less Often' to proper feeding and fitness drills before working time among workers in their respective indigenous oil and gas companies, while, 44 of the responses retort 'Never' proper feeding and fitness drills before working time among workers in their respective indigenous oil and gas companies. Thus, giving the calculated mean score of 2.88 as against the criterion mean of 3.0 on the 5-point Likert's scale.

Table 7 Proper Feeding and Fitness Drills among Workers of the Respective Indigenous Oil and Gas Firm before Working Time

S/no	There is proper feeding and fitness drills before working time among workers. (B 4)	VO (5)	O (4)	MO (3)	LO (2)	N (1)	Mean	Rank
1	Nigerian Petroleum Develop. Corporation, NPDC.	08	20	25	24	11	2.89	3rd
2	Oando Energy Resources, OER.	10	30	35	25	14	2.97	1st
3	Aieteo Exploration and Production Limited,	06	12	30	25	06	2.84	5th
4	Amni International Petroleum Development Company,	04	06	15	11	04	2.87	4th
5	Belemaoil Producing Limited	04	05	10	10	03	2.91	2nd
6	Prime Exploration and Production Limited	03	03	07	10	06	2.55	6th
	Total	35	76	122	105	44	2.88	

Where, VO = Very Often, O = Often, MO = Moderately Often, LO = Less Often, N = Never.

3.7. There is Timely and Self Reportage of Risk/Unsafe Events during Working Time among Workers of the Respective Indigenous Oil and Gas Firm.

The answers of the respondents to timely and self-reportage of risk/unsafe incidents during working time among workers in the respective indigenous oil and gas companies operating in the study area was collated and displayed in Table 8; with the total numbers of 26 respondents asserting 'Very Often' to timely and self-reportage of risk/unsafe incidents during working time among workers in their respective indigenous oil and gas companies; as 54 respondents retorted 'Often' to timely and self-reportage of risk/unsafe incidents during working time among workers in their respective indigenous oil and gas companies. Whereas, 120 of the respondents responded 'Moderately Often' to timely and self-reportage of risk/unsafe incidents during working time among workers in the respective indigenous oil and gas companies, As 127 respondents replied 'Less Often' to timely and self-reportage of risk/unsafe incidents during working time among workers in their respective indigenous oil and gas companies, while, 55 of the responses retort 'Never' to timely and self-reportage of risk/unsafe incidents during working time among workers in their respective indigenous oil and gas companies. Thus, giving the calculated mean score of 2.58 as against the criterion mean of 3.0 on the 5-point Likert's scale.

Table 8 Timely and Self Reportage of Risk/Unsafe Events during Working Time among Workers of the Respective Indigenous Oil and Gas Firm

S/no	There is timely and self-reportage of risk/unsafe incidents during working time among workers. (B5)	VO (5)	O (4)	MO (3)	LO (2)	N (1)	Mean	Rank
1	Nigerian Petroleum Develop. Corporation, NPDC.	08	15	25	20	20	2.67	3rd
2	Oando Energy Resources, OER.	06	20	40	40	08	2.79	1st
3	Aieteo Exploration and Production Limited,	05	10	30	25	09	2.71	2nd
4	Amni International Petroleum Development Company,	03	04	10	15	08	2.48	5th
5	Belemaoil Producing Limited	02	03	10	12	05	2.53	4th
6	Prime Exploration and Production Limited	02	02	05	15	05	2.35	6th
	Total	26	54	120	127	55	2.58	

Where, VO = Very Often, O = Often, MO = Moderately Often, LO = Less Often, N = Never.

3.8. Ranking of the Knowledge, Awareness and Prevalence (KAP) of Safety Culture among Workers of Oil and Gas Firms within the Niger Delta Region, Nigeria

The study finding indicated that the workers of the sampled oil and gas companies operating within the Niger Delta region of Nigeria do have diverse knowledge, awareness and observed prevalence of Safety culture traditions as these were summarise from Table 4 (B1) to 8 (B5) and ranked in Table 9; with each firms ranked comparatively as follow: Oando Energy Resources, OER with 3.27 ranking 1st position, followed by Belemaoil Producing Limited calculated mean of 3.23 ranking 2nd position; Nigerian Petroleum Develop. Corporation, NPDC with calculated mean of 3.16 is ranked 3rd position; Aieteo Exploration and Production Limited, with calculated mean of 3.15 is ranked 4th position; while, Amni International Petroleum Development Company, with calculated mean of 3.06 is ranked 5th positioned, as Prime Exploration and Production Limited with calculated mean of 2.61 ranked 6th. The grand mean for knowledge, awareness and observed prevalence of safety culture in their respective oil and gas companies is 3.15.

Table 9 Ranking of the Knowledge, Awareness and Prevalence (KAP) of Safety Culture among Workers of Oil and Gas Firms

S/no	Sampled Companies	B1	B2	B3	B4	B5	KAP Mean	Rank
1	Nigerian Petroleum Develop. Corporation, NPDC.	3.64	3.45	3.17	2.89	2.67	3.16	3rd
2	Oando Energy Resources, OER.	3.99	3.72	2.97	2.97	2.79	3.27	1st
3	Aieteo Exploration and Production Limited,	3.90	3.45	2.87	2.84	2.71	3.15	4th
4	Amni International Petroleum Development Company,	3.75	3.20	3.00	2.87	2.48	3.06	5th
5	Belemaoil Producing Limited	4.00	3.44	3.28	2.91	2.53	3.23	2nd
6	Prime Exploration and Production Limited	3.93	3.55	2.86	2.55	2.35	3.05	6th
	Grand Mean of KAP	3.87	3.47	3.03	2.84	2.59	3.15	

4. Discussion of Findings

The results from the knowledge, awareness and prevalence domain of safety culture reveal several priority perspectives of safety culture on which the sampled oil and gas companies were assessed and compared. From the findings, the daily safety checks and inspections to identify potential sources/issues before they cause harm indicated that these companies; Belemaoil, Oando, Prime oil, and Aeiteo has a good safety culture by having descriptive average score that were above the calculated mean score of 3.86, while NPDC and Amni has relatively poor safety cultures. This finding is supported by the position of Zacheus et al (2024), which stated that interventions should focus on implementing predictive maintenance strategies, incorporating condition monitoring techniques to identify worn-out seals in advance. Regular seal replacements based on predetermined intervals or condition-based assessments are essential. According to Ehiaguina and Moda (2020), Nigerian's oil and gas sector, lack of safety performance is a leading cause of death and huge financial losses, Therefore, planning and implementing preventive actions through risk assessment and modeling pathways is a very necessary safety culture constituent. Findings showed that comparatively, that only Oando ER and Prime EandP had better safety culture with descriptive scores above the mean descriptive score of 3.47, as regards the safety culture perspective of routine health and medical checkups of the workers for proactive hazard management, while the remaining four companies scored below, demonstrating sequences of poor safety cultures. Findings showed that Belemaoil, NPDC, and Amni Int. signifying good safety culture with descriptive scores above the calculated mean score of 3.02, for the perspective of observing designated break periods and day offs on site during working seasons. As other sampled companies (NPDC, Aieteo ltd, and Prime EandP) scored below this descriptive average (3.02) revealing weak safety culture in this perception. Furthermore, findings showed that Oando ER, Prime EandP, and NPDC has a good safety culture with scores above the descriptive score of 2.68 concerning the perception of proper feeding /fitness drills for the workers of the sampled oil and gas companies, as others (Amni Int, Belemaoil, and Prime EandP) scored below this calculated mean score, expressing weak safety culture. Finally, findings showed that almost all the participating oil and gas companies in the study indicated poor safety culture in the perspective of timely self-reporting of risk incidences/near misses which are relevant for long term growth of safety traditions, whereas Belemaoil, Amni Int, and Prime EandP compared better among the studied indigenous oil and gas companies. From the contributory constituents in the knowledge, awareness and prevalence domain, the routine daily inspections of tools/equipment before the start of any assignment scored the most value (3.87), as the best performed safety culture

in this domain. These findings are supported by the previous research studies. Example, the result is supported by the work of Hoffmann and O'Shaughnessy (2000) that states that routine risk assessments are used to identify and reduce risks in daily operations, ensuring that hazards are properly handled before beginning work. Hale and Hovden (1998) emphasize the need of regular checks, which the PTW system enforces by validating safety measures such as fire detection systems or lockout/tagout processes before work begins. This finding aligns with research by Kletz (2009), who asserts that effective risk assessments are critical to identifying and mitigating potential hazards in oil and gas operations. He went further to assert that Risk assessment entails identifying risks, analyzing them, and using the insights gained to evaluate risk by drawing conclusions about their relative significance in relation to the organization's objectives and performance thresholds. This process helps to inform decisions about whether treatment is required, treatment priorities, and risk-reduction actions (Asante-Duah, 2017).

5. Conclusion and Recommendations

It can be concluded that proper knowledge, awareness and prevalence of the safety culture contributed the least components to safety climates and there was no discernible difference between the practices of safety cultures in the indigenous oil and gas companies in the Niger Delta Region. It is recommended that there is need for more concerted effort in developing safety cultures in the indigenous oil and gas companies and adequate sanctions should be given to any industry that fails to comply. Also, the routine safety assessment should be carried out by firms with a view to receiving recommendations from employees on how to improve the safety culture of the firms in all upstream, midstream and downstream sectors.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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