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Impact of Covid-19 Pandemic on the Health and Well-Being of Offshore Oil-Workers in Nigeria

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Abstract**—***This study aims to assess the causes and transmission dynamics of COVID-19 among offshore workers, considering factors such as interpersonal interactions, overcrowding, workplace conditions, emotional resilience, preventive measures, and training initiatives. It also explores the associations between demographic attributes and the impact of COVID-19. The research employed a comprehensive approach, utilizing data collection and analysis methods to uncover the effects and determinants of COVID-19 transmission among offshore oil workers in Nigeria. Chi-Square analysis was employed to reveal associations between demographic characteristics and the pandemic's impact on this workforce. The study revealed prominent contributors to COVID-19 transmission among offshore workers, including contact with infected colleagues (12.22%), overcrowding (11.41%), suboptimal working conditions (11.09%), and emotional distress factors like stress, anxiety, fear, and depression (11.09%). Other significant determinants encompassed the scarcity of COVID-19 prevention resources (10.61%), inadequate utilization of personal protective equipment (11.58%), unsuitable transportation practices (10.93%), the absence of COVID-19 awareness signage (8.63%), deficient training programs for offshore workers (8.63%), and miscellaneous undisclosed factors (3.81%). The research findings indicated the diverse educational backgrounds of offshore oil workers in Nigeria, highlighting the need for tailored health and well-being strategies considering varying roles and education levels. Based on the study's findings, it is recommended that offshore companies in Nigeria prioritize the development and implementation of targeted health and safety protocols. These should include improved infection control measures, strict adherence to social distancing, comprehensive health monitoring, and enhanced training programs to address the unique challenges faced by offshore workers and reduce the risk of COVID-19 transmission in this specific work environment*.

Keywords**—** *Offshore Workers, COVID-19 Impact, Occupational Health, Prevention Strategies, Demographic Associations*.

I. INTRODUCTION

The global landscape underwent a transformative shift following the declaration by the World Health Organization (WHO) in March 2020, categorizing the COVID-19 pandemic as a Public Health Emergency of International Concern (Pawar, 2020; Onyeaka et al., 2021). This declaration marked the onset of a crisis that engulfed 215 countries and territories, impacting major economies like the United States, Spain, Italy, Japan, France, and Germany with unprecedented infection rates (Watanabe, 2020; Wang et al., 2022; Odriozola-González et al., 2022; Barbieri et al., 2022; Or et al., 2022; Wurster et al., 2023). This global crisis precipitated a dual economic impact: a sharp decline in crude oil demand and a substantial drop in oil prices. As social distancing measures were implemented, crude oil prices plummeted from $70 to as low as $20 per barrel (Kim and Liu, 2022; Kimeka et al., 2022; Chen et al., 2023). The resulting economic turmoil had direct repercussions on the Nigerian oil industry, significantly affecting offshore oil workers' job security and overall well-being.

This economic turmoil had direct repercussions on the Nigerian oil industry, intensifying existing challenges and significantly affecting the job security and overall well-being of offshore oil workers. As COVID-19 cases emerged in Nigeria, the pandemic further intensified the challenges faced by the nation. The first confirmed case was reported on February 27, 2020, in Lagos State, triggered by a 44-year-old Italian citizen, leading to a chain of infections within the country (Obong et al., 2022). By May 15, 2020, Nigeria had reported 288 confirmed cases, with Lagos State recording the highest numbers. These local implications showed the urgent need to critically examine the impact of the pandemic on the health and well-being of offshore oil workers.

The COVID-19 pandemic disrupted global oil markets, creating a domino effect that reverberated through the oil industry. In Nigeria, the impact was profound, with a significant decline in crude oil production and plummeting oil prices. The oil industry, already grappling with challenges such as attacks on infrastructure by militants, faced an estimated 7.93% decline in production during the forecast period of 2018-2025 (Olujobi et al., 2022a; Obi and Akeyede, 2022). The pandemic-induced decline in demand, coupled with the initial drop in oil prices, caused a severe economic downturn, posing direct threats to the well-being of offshore oil workers (Olujobi et al., 2022b; Aghalino et al., 2023).

Amid the challenges posed by the pandemic, effective control and prevention measures became imperative, especially in industries like offshore oil production. Globally, strategies focused on disrupting the transmission of the virus, involving stringent measures within healthcare settings and large-scale community interventions (Newcomb et al., 2022; Stokes et al., 2022; Tang et al., 2022). In Nigeria, adherence to circulars and guidelines issued by government agencies, coupled with global health organizations' collaboration, played a pivotal role in controlling the spread (Eranga, 2020; Okaisabor, 2021; Ihekweazu, 2022). The unique challenges faced by the offshore oil industry prompted the implementation of tailored protocols to safeguard the health and well-being of workers.

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The aim of this research was to explore the impact of the COVID-19 pandemic on the health and well-being of offshore workers in the OML 119 field, Nigeria.

II. Research Methodology

2.1 Study area

The study area for this research encompasses the Okono-Okpoho field (OML 119), a significant offshore oil production site situated in Nigerian waters within the Gulf of Guinea. The Okono-Okpoho field is positioned in the marine expanse, characterized by water depths ranging from 70 to 200 meters. This offshore field is historically significant within Nigeria's oil and gas industry. It comprises a total of nineteen wells, with eleven wells located in the Okono segment and eight wells situated in the Okpoho segment. The commencement of oil production in the Okono-Okpoho field dates to December 31st, 2001, marking a significant milestone in Nigeria's energy sector. As of the most recent data available, which is as of December 28, 2022, the net daily production from this field stands at approximately 15,160 barrels of oil per day (BOPD) (Wood Mackenzie, 2022). The reserves in the Okono-Okpoho field play a vital role in Nigeria's hydrocarbon reserves portfolio. The booked reserves in this offshore area are estimated to be substantial, with approximately 74.69 million barrels (MMB) of oil and 68.22 billion standard cubic feet (Bscf) of gas (GlobalData, 2023).

2.2 Research Design

To gather data for analysis, we employed a descriptive survey approach with the aid of a questionnaire. This survey design aligns with the methods described Essilfie (2021) which involves conducting interviews, either orally or in writing, to collect information and data.

2.3 Sampling Design

To ensure a representative sample, we employed a combination of sampling techniques. Firstly, we used stratified sampling, which involved categorizing the sample population based on their roles, following the approach outlined by Kekeya (2021). This helped ensure that each stratum was adequately represented.

Additionally, we implemented probability random sampling to provide every individual in the population an equal chance of being selected. This random sampling procedure enhances the reliability and representativeness of the research findings, allowing for broader generalizations, as recommended by Levitt (2021).

To determine the sample size from the overall population, we applied Taro Yamane's formula:

$$n = \frac{N}{(1+Ne^2)}$$ Equation 1.

Where: N represents the population of the study (200), n is the sample size (to be determined), e signifies the level of significance at 9% (0.09), 1 denotes a constant. Using this formula, we calculated the sample size and determined it to be 76.

2.4 Validity of Instruments

The raw data collected from the survey underwent a rigorous validation and reliability process, which involved sorting, and editing. This process aimed to eliminate or minimize errors, omissions, and any other discrepancies that could potentially compromise the integrity of the findings.

2.5 Data Collection

Data collection was carried out using the questionnaires, with the researcher personally overseeing all operations. Respondents were provided with ample time to complete the questionnaires. After two weeks of distributing the questionnaires, the researcher conducted follow-up reminders, reminding respondents of the remaining days for questionnaire retrieval and replacing any lost questionnaires. In December 2022, all 76 questionnaires were successfully retrieved for processing and analysis.

2.6 Data Analysis

Data was analyzed using Microsoft Excel and Chi-Square tests was conducted using IBM SPSS software on the data generated to examine the associations and relationships between various variables within the study.

III. Results and Discussion

3.1 Socio-demography of Respondents

The socio-demographic characteristics of offshore workers in the OML 119 field, off Nigeria's coast are represented in table 1 below.

TABLE 1: Socio-demographic distribution

Variables	Respondents	Percentage (%)
Gender		
Male	44	59.76
Female	32	40.24
Total	**76**	**100**
Educational Background		
SSCE	22	28.94
OND	21	27.63
HND/BSC	21	27.63
MSC >	12	15.79
Total	**76**	**100**
Age		
20-30	21	29.27
31-40	31	37.8
41-50	18	18.29
51-60	4	9.76
61-70	2	4.88
Total	**76**	**100**
Occupation Status		
Client (NNPC)	9	11.84
O & M Contractor staff	5	6.58
Management	7	9.21
Production	4	5.26
MTCE	7	9.21
HSE	9	11.84
Medics	6	7.89
Cargo	3	3.94
Marine	5	6.57
Security	2	2.63
Catering	7	9.21
Third Party Contractor	5	6.58
Total	**76**	**100**
Work Shift Characteristics		
Day only	20	26.32

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Day and flexible night	23	30.26
Night Only	19	25
Rotating between day & night	14	18.42
Total	**76**	**100**

The gender distribution among offshore oil workers in offshore facilities in Nigeria, as revealed by respondent data, displays a significant imbalance. Notably, 59.76% are male, while 40.24% are female, mirroring the traditional male dominance in offshore facilities. Recruitment practices, possibly influenced by stereotypes about physical fitness, may contribute to this gender disparity. Perceptions of roles suitable for women and the demanding work schedule, often requiring extended periods away from home, might dissuade female participation. These findings is consistent to the argument by Perks and Schilz's (2020) that physical job demands contribute to the male prevalence in oil and gas offshore facilities.

Regarding the educational background of participants, 28.94% hold Senior School Certificate (SSCE), 27.63% completed Ordinary National Diploma (OND), another 27.63% possess Higher National Diploma (HND) or Bachelor's degrees, while 15.79% attained Master's degrees or higher. Remarkably, 56.57% hold qualifications below HND, and 43.42% have HND or higher-level certificates. This diversity necessitates tailored health strategies, aligning with offshore demands. Entry-level roles often require SSCE, technical roles demand OND and BSC, while specialized functions involve postgraduate degrees. These results is similar to the research by Avwiri et al.' (2019) findings on offshore oil workers' occupational health, emphasizing the importance of recognizing educational differences for targeted interventions.

Examining the age distribution, 29.27% of respondents are aged 20 to 30, 37.80% are 31 to 40, 18.29% are 41-50, 9.76% are 51-60, and 4.88% are 61-70. Selected for physical prowess, offshore oil workers span diverse age ranges. COVID-19 impact analysis emphasizes the need for tailored health strategies. Older workers, with distinct vulnerabilities, necessitate specialized attention in preventive screenings and mental health support. Customized programs, addressing unique age-related needs, are pivotal for overall well-being amid pandemic challenges in this workforce. These results are similar to van der Heijden et al.,'s (2017) findings on age diversity in offshore wind electrical generation platforms, noting a concentration of 31-40-year-olds in supervisory roles and younger workers in main roles.

In the occupational analysis of OML 119 offshore workers, diverse roles emerge, with 11.84% as Clients (NNPC core staff), 6.58% as Contract Staff, and 9.21% in Management positions. Additionally, 5.26% engage in Production, 9.21% in Maintenance (MTCE), and 11.84% in Health, Safety, and Environment (HSE) teams, with 7.84% serving as Medics. This variety reflects the adaptability crucial for facility operations. Comparatively, van der Heijden et al.'s (2017) study on offshore wind employees aligns with our findings, emphasizing technical roles in both industries, with distinct proportions in management and support roles.

The survey reveals that 26.32% of respondents work exclusively day shifts, while 30.36% engage in a mix of day and flexible night shifts. Additionally, 25.00% exclusively work nights, and 18.42% follow a rotating day-night schedule. These patterns, highlight the continuous nature of offshore oil operations, requiring a diverse workforce for uninterrupted functions. However, the varied work shift patterns, including rotation, can disrupt sleep and circadian rhythms, potentially leading to fatigue, sleep disturbances, and increased stress. Such diverse patterns may impact susceptibility to infectious diseases like COVID-19, facilitated by irregular schedules and close quarters on platforms. Recognizing these implications is crucial for addressing the health and well-being of offshore workers during the pandemic, necessitating tailored health protocols, mental health support, and scheduling adjustments. This study aligns with the study by Park et al., (2021) identifying increased COVID-19 risk among shift workers due to factors like disrupted sleep and increased exposure in crowded workplaces.

3.2 Analysis of COVID-19 Impact on Offshore Oil Workers

3.2.1 Causes of COVID-19 transmission

In this study, the causes of COVID 19 transmission are shown in Figure 1, elucidating the causative factors behind COVID-19 transmission among offshore workers, providing information on the profound repercussions of the pandemic on the health and well-being of individuals laboring in Nigeria's offshore oil facilities. The results show that 12.22% of transmissions result from contact with infected colleagues, highlighting the intricate challenge of upholding physical distancing within the tightly-knit offshore milieu. The issue is further compounded by overcrowding in accommodations and transportation (11.41%), wherein shared living spaces and confined travel pose impediments to adherence to distancing measures. Additionally, 11.09% report stress, anxiety, fear, and depression as contributing factors, indicative of the psychological toll exacted by offshore work and its potential immunosuppressive effects.

Proximity, overcrowding, and psychological strain coalesce to establish an environment conducive to viral dissemination. Mitigating these challenges mandates tailored strategies, encompassing augmented infrastructure, exhaustive training, consistent access to preventive resources, and comprehensive mental health support. Recognizing the unique vulnerabilities of offshore workers becomes imperative for the implementation of proactive measures aimed at safeguarding their health and well-being during pandemics and ensuing periods. A comparative analysis with Sunandar and Ramdhan's (2021) research in a Turkish offshore facility showed contextual variations, informing of the necessity for region-specific responses and bespoke health protocols.

3.2.2 Mode of transmission of COVID-19

The COVID-19 transmission modes among offshore oil workers as shown in Figure 2 indicates droplets and aerosols (19.94%), airborne transmission (20.22%), surface transmission (19.94%), faecal-oral transmission (19.66%), and community spread (20.22%). The findings shows the challenges of close living quarters, emphasizing the need for

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preventive measures like vaccination, regular testing, enhanced ventilation, and hygiene practices.

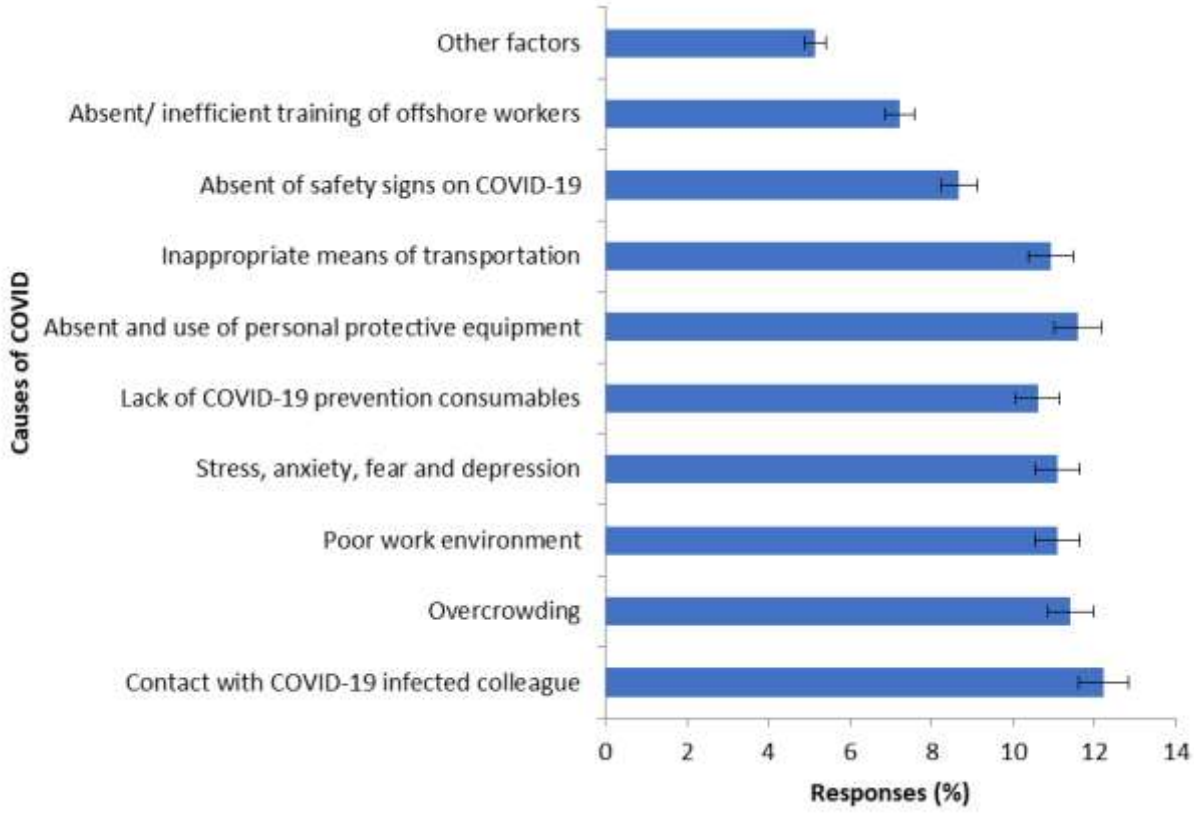

Figure 1: Causes of COVID-19 transmission in OML 119

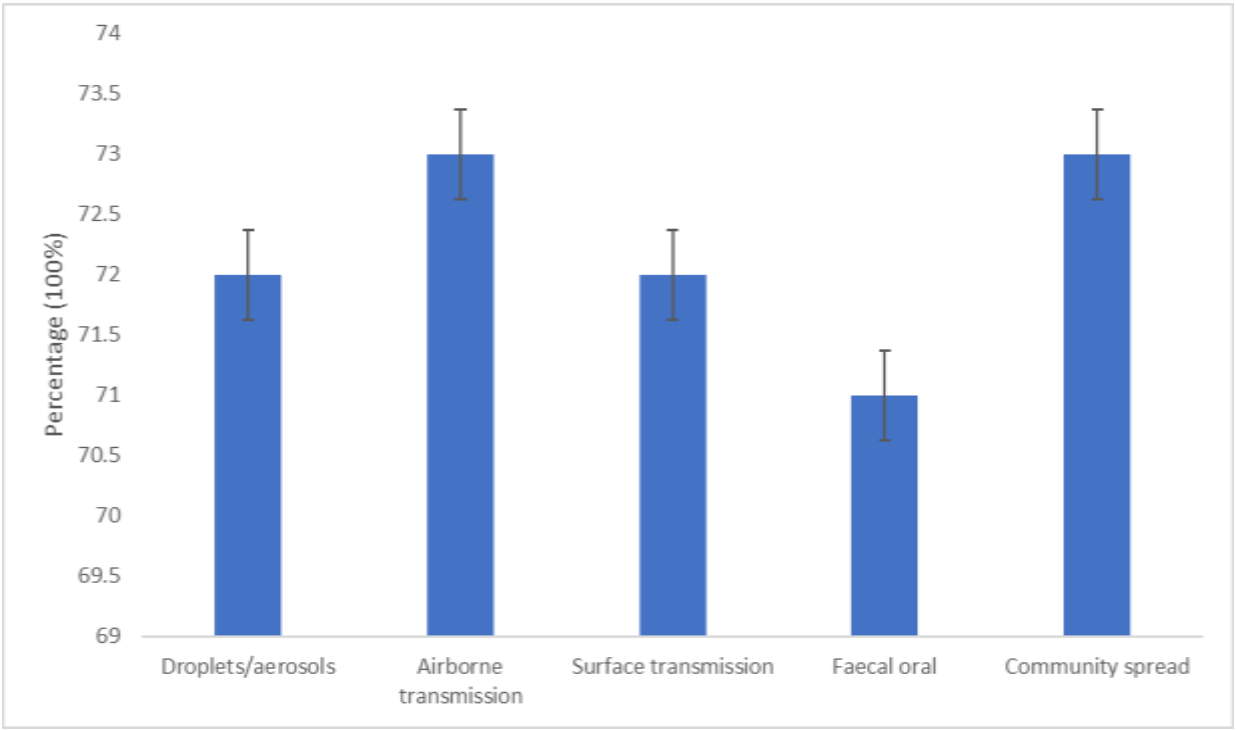

Figure 2: Mode of transmission of COVID-19 among offshore workers

These results significantly contribute to understanding offshore workers' vulnerability to COVID-19, particularly in shared spaces. The study by Ingram et al., (2021) highlighted respiratory droplets and aerosols as primary transmission

modes which is similar to what was observed in this study. The universal relevance of the importance of consistent preventive measures across occupational settings especially in offshore facilities, offering valuable information for crafting effective strategies in mitigating COVID-19 transmission in diverse workplace environments.

3.2.3 Effects of COVID-19 on offshore workers

The effects of COVID-19 on offshore workers as shown in Figure 3 encompass various aspects, with mental health problems being the most prevalent, reported by 12.91% of workers. This is followed by a decline in worker morale (12.56%), an increase in accidents (12.39%), longer work hours (12.74%), decreased job satisfaction (12.39%), health concerns like fever and headaches (12.74%), and heightened tardiness or absenteeism (12.22%). Job loss or retrenchment was the least reported effect, at 12.05%. The inherently isolating and demanding nature of offshore work, involving extended shifts and physical separation from support systems, contributes to the notable percentage (12.91%) reporting mental health issues, exacerbated by the pandemic's uncertainty and fear of infection. The reported increase in accidents (12.39%) accentuates safety concerns, indicating the need for enhanced safety measures during crises. The fear of job loss (12.04%) highlights economic uncertainties, emphasizing the importance of job security and a supportive work environment.

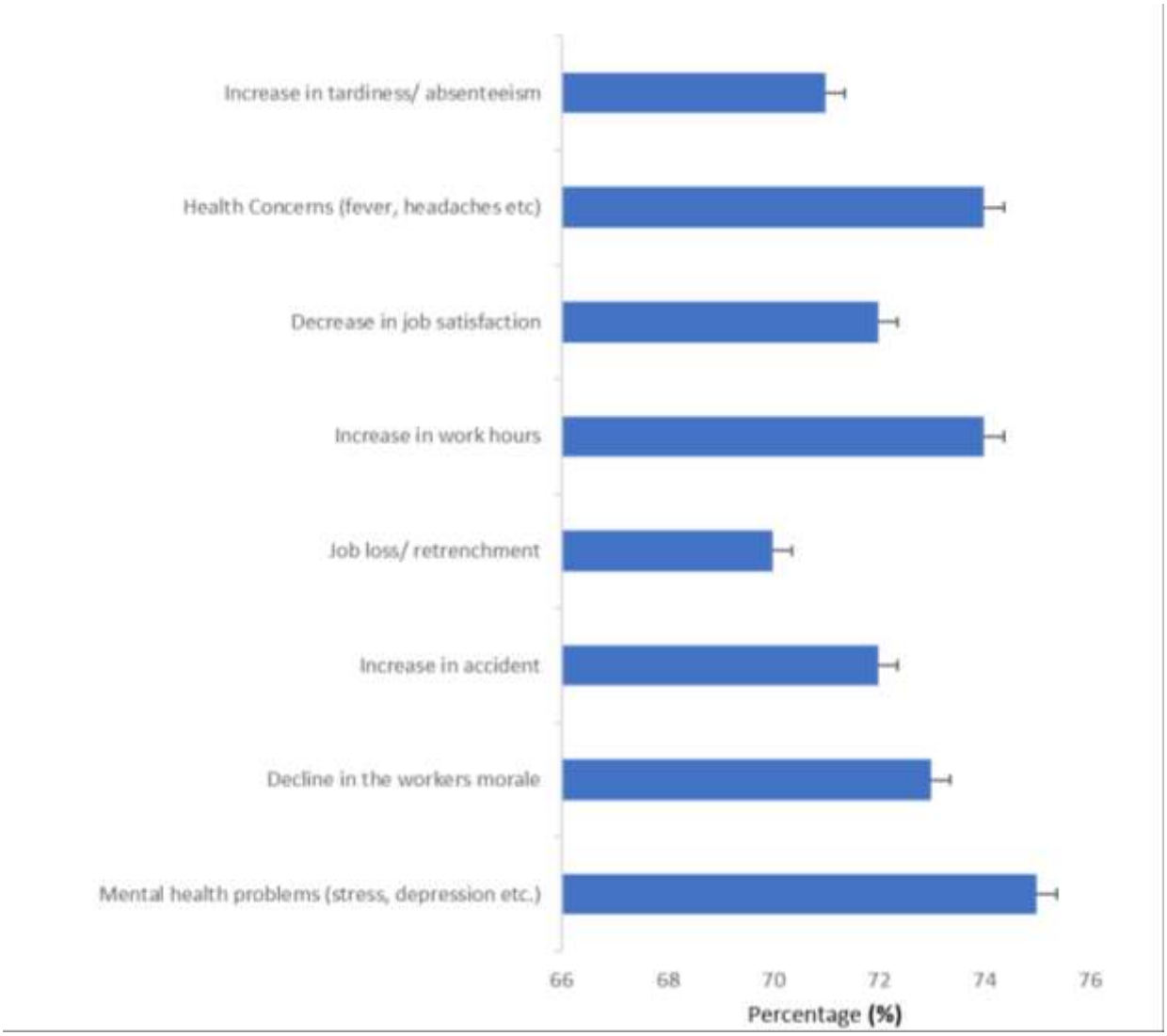

Figure 3: Effects of COVID-19 on offshore workers

These findings hold significant implications for crafting tailored support measures in offshore facilities during crises. The observed mental health challenges, safety issues, and economic concerns emphasize the need for proactive health and safety measures within offshore facilities. The study by Kulip et al., (2022) also discovered and confirmed that offshore workers are more likely to experience adverse health and well-being outcomes from COVID-19. This is likely due to a combination of factors, including the increased risk of transmission, the physically and mentally demanding nature of offshore work, and the limited access to healthcare.

3.2.4 Clinical Manifestation of COVID-19

The clinical manifestations of COVID-19 among offshore workers are diverse, with joint and body pain and mental health issues such as stress, depression, and anxiety being the most observed at 9.19%. In contrast, rhinorrhea is the least reported manifestation at 3.68%. Common respiratory symptoms include fever (7.19%), cough (9.19%), sore throat (7.53%), and sputum production (7.53%), aligning with general COVID-19 symptoms. The study emphasizes the prevalence of mental health problems (9.19%), reflecting the challenges exacerbated by the isolation and confinement inherent in offshore settings. Muscular disorders (6.86%), body weakness and pains (6.69%), myalgia (3.84%), and tiredness (8.19%) are also notable, linked to the physically demanding nature of offshore work and exacerbated by COVID-19.

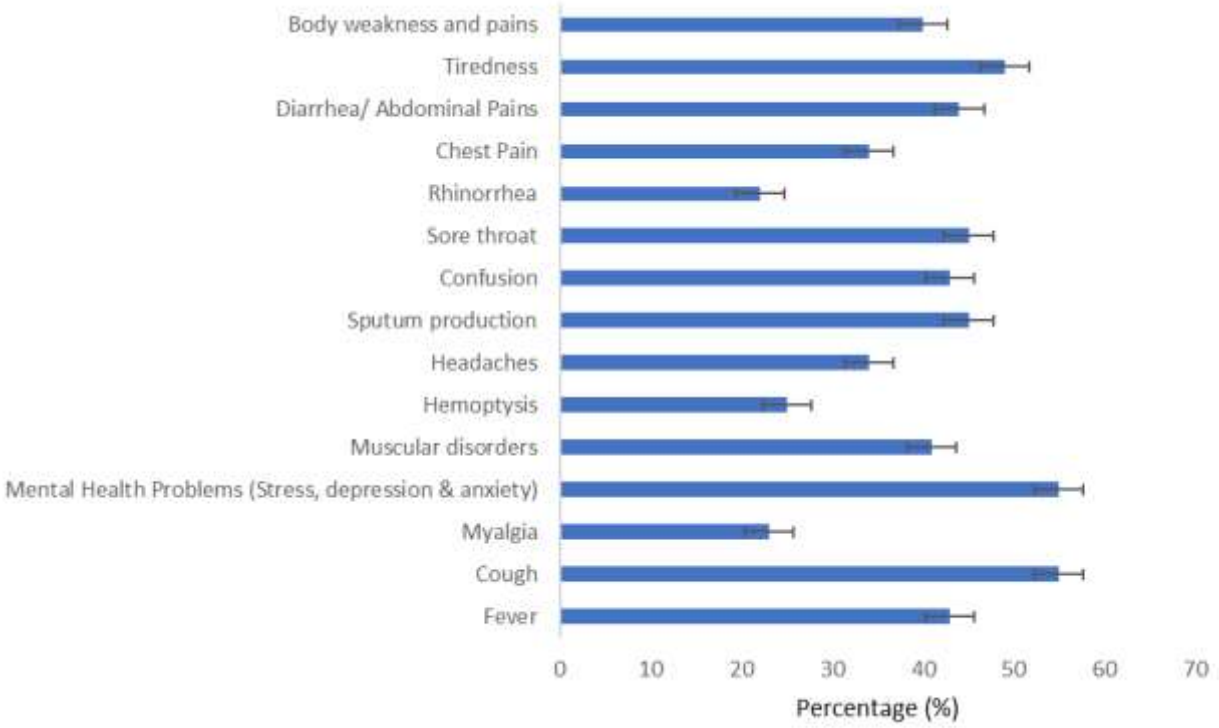

Figure 4: Clinical Manifestation of COVID-19 on offshore workers

These findings emphasises offshore workers' vulnerability to health challenges, emphasizing the need for tailored health interventions and comprehensive monitoring. Comparing these results to the studies by Shan (2022), it can be found that offshore workers are at increased risk of COVID-19 transmission and infection due to the unique characteristics of their work environment. Offshore workers often live and work in close quarters, and they may have limited access to adequate ventilation and hygiene facilities. These insights contribute to a broader understanding of offshore workers' health risks, supporting the development of targeted health measures for this population during pandemics and similar crises.

3.2.5 Strategies Employed in the Control and Prevention of COVID-19

The strategies in place at OML 119 as opined by respondents is shown in Figure 5. The results show that 7.47% exhibiting high adherence to COVID-19 protocols, approximately 7.37% ensuring the utilization of personal protective equipment (PPE) and adhering to social distancing measures, and another 7.47% implementing pre-facility-access quarantines for offshore workers, indicative of a proactive stance against virus transmission. However, certain categories, such as Emergency Plan and Availability of Emergency Response Team (ERT) and Conspicuous Display of COVID-19 Protocol, exhibit lower percentages, suggesting areas necessitating improvement in emergency preparedness and communication strategies tailored to the distinct challenges inherent in offshore facilities.

These findings hold particular import within the offshore context, emphasizing commendable adherence to established protocols. The results of efficient strategies for mitigating the spread of COVID-19 among offshore workers in this study were compared and found to be similar to results in the study Nugraha et al., (2022) who found that the most common COVID-19 prevention and control measures implemented by offshore oil and gas companies included adherence to COVID-19 protocols, quarantine and testing, and enhanced cleaning and disinfection.

3.4 Chi-Square Analysis

Table 2 presents the results of the Chi-Square (χ^2) tests, which examine the relationship between various demographic

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factors and the impact of COVID-19 on offshore workers within the study area.

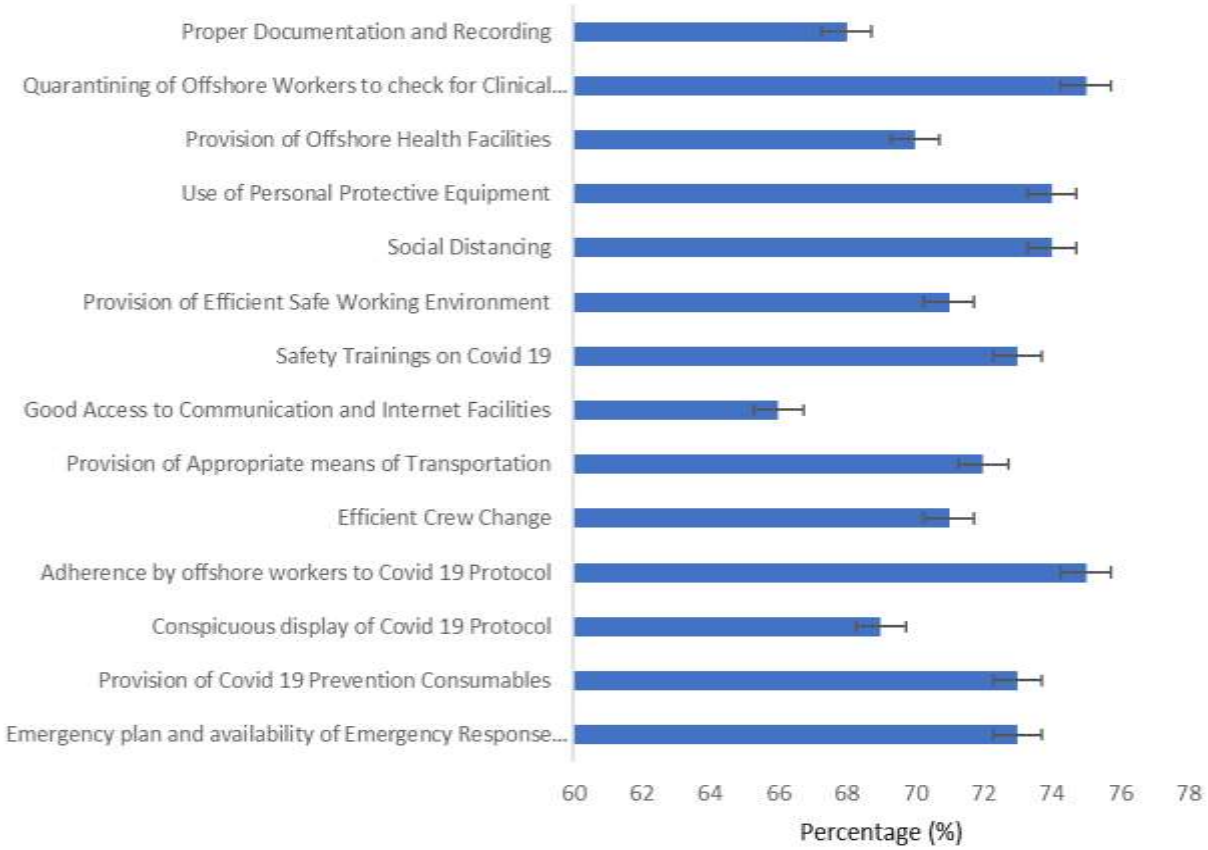

Figure 5: Control and Prevention of COVID-19 among offshore workers

TABLE 2: Chi-Square (χ^2) Test Results

Variable	χ^2	df	P-value	Significance
Educational Background of Respondents	8.452	3	0.037*	* (10%)
Sex of Respondents	3.621	1	0.057	
Age of Respondents	6.784	4	0.149	
Role of Respondents	11.987	6	0.061	
Work Shift Characteristics	9.317	3	0.025*	* (10%)
Causes of COVID-19 Transmission	22.185	8	0.007**	** (5%)
Mode of Transmission of COVID-19	16.429	3	0.001***	*** (1%)
Effects of COVID-19 on Offshore Workers	14.598	6	0.023*	* (10%)
Clinical manifestations of COVID-19 on Offshore Workers	20.935	8	0.006**	** (5%)
Strategies for Control and Prevention	12.126	5	0.034*	* (10%)

Note: *significant at 10% *, significant at 5% **, significant at 1%****

A statistically significant association was observed between respondents' educational backgrounds and the impact of COVID-19 ($P<0.05$). Emphasizing the imperative for tailored education and training initiatives, customized according to the educational levels of offshore workers, to effectively address the pandemic's challenges. While the gender distribution's association with the impact of COVID-19 is borderline ($P=0.057$) and does not reach statistical significance at the 0.05 level, it prompts further scrutiny into potential gender-specific vulnerabilities associated with COVID-19.

Conversely, the age of respondents and their occupational roles exhibit no statistically significant association with the impact of COVID-19 ($P>0.05$). However, an illuminating finding surfaces in the significant association observed in work shift characteristics ($P<0.05$), highlighting the necessity of considering specific work shift schedules when implementing preventive measures. Expanding the scope to encompass the causes and modes of COVID-19 transmission reveals highly significant associations ($P<0.01$), emphasizing the complex nature of transmission patterns and the indispensability of comprehensive prevention strategies. Furthermore, the effects and clinical manifestations of COVID-19 among offshore workers also demonstrate significant associations ($P<0.05$), elucidating the diverse impacts and symptoms experienced within this demographic.

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Lastly, the strategies employed for the control and prevention of COVID-19 among offshore workers exhibit a significant association ($P<0.05$), accentuating the importance of tailored preventive measures and stringent monitoring protocols.

IV. Conclusion

The COVID-19 pandemic has cast a long shadow over Nigerian offshore oil workers, impacting their health, well-being, and the very fabric of their unique work environment. Tailored safety measures must acknowledge the diverse demographics of this workforce, addressing variations in age, gender, roles, and work patterns. This study pinpoints the vulnerability of offshore platforms to interpersonal contact, cramped quarters, and emotional strain, necessitating a well-developed approach to mitigating any occurrence of future pandemic. Rigorous infection control, vigilant social distancing, and robust mental health support are crucial, alongside targeted training programs. Airborne transmission and community spread highlight the need for enhanced communication access, allowing vital information to flow freely and empower effective mitigation strategies. The effects of the virus, including mental health burdens, increased work hours, and job dissatisfaction, demand urgent action. Recognizing these concerns, the research proposes various interventions: implementing tailored health and safety measures, enforcing social distancing, prioritizing emotional well-being, strengthening infection control protocols, providing access to communication channels, and fostering a strong safety culture within the industry. This approach is not just about weathering the current storm, but building resilience for future public health crises. Protecting the health and well-being of Nigeria's offshore oil workers is not only a moral imperative, but a strategic investment in the nation's vital oil sector. Only by prioritizing their well-being can we forge a safer, healthier future for this critical workforce.

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