Perceived Morbidity Patterns among Workers in the Oil Industry of Nigeria

ABSTRACT

Background: Globally, the oil industry is replete with several high-risk activities as seen in seismic exploration, construction, drilling, production, and maintenance. Generated hazards could impact exposed workers. Exposure to associated hazards and rigour of activities usually puts workers in oil and gas installations at risk of developing several occupational illnesses. Environmental problems have also been reportedly associated with these activities as well. This study was thus aimed at determining the perceived environmental effects and morbidity patterns among staff of an oil and gas installation in the Niger Delta Region of Nigeria.
Methods: A descriptive, cross-sectional study design was used in conducting this study in an onshore oil and gas hub in Nigeria. Study group comprised engineers and technicians of various oil and gas specialties. A random sampling method was used to select 256 personnel from the study population. A self-administered questionnaire was administered to the personnel of the facility. Data was analysed using the Statistical Package for Scientific Solutions (SPSS) version 17.0 (statistical software package) for analyses. Ethical considerations were adhered to during this study.
Results: Common complaints include transient tinnitus (97.3%), joint pain of varying degrees (83.6%), occasional prickling sensation in the skin (78.1%) and the lowest frequency of health effects was claims of stressful feeling (56.6%). Environmental problems including the destruction of aquatic biodiversity as well as water contamination were reported in this study.
Conclusion: This study found experience of several morbidities by the respondents. They also reported observation of certain environmental problems related with oil exploratory activities at the oil and gas installation. It is recommended that a regular review of measures be put in place to prevent these health and environmental problems from occurring in or around oil and gas installation located in Nigeria.

Keywords: Oil and gas; industry; environmental effects; occupational effects; health morbidities. (4-6 words, Alphabetical order)

1. INTRODUCTION

Oil and gas has been the artery of Nigeria's economy since the discovery of crude oil [1]. Crude oil in commercial quantity was first discovered in 1956 at Oloibiri in the Niger Delta by Shell-BP. Nigeria had an estimated 37.2 billion barrels of proven oil reserves as of January 2011 [2]. The total oil production in Nigeria has been estimated as slightly over 2.46 million bbl./d, making her the largest oil producer in Africa [2]. The exploration and exploitation of oil in Nigeria has gone on for years and has largely contributed to her economy and development at the expense of depletion of the environment and occurrence of health problems of the populace. Though petroleum resources sustain the Nigerian economy, industrial activities in the sector have been known to be hazardous and pose risks to workers' health. Also, closely related to this is the occurrence of substantial environmental degradation from oil exploration and exploitation activities, including gas flaring and so on. There has been growing concern over the health and environmental impacts of oil exploration and production in Nigeria [3].These are traceable to the occurrence of accidental oil spills during the oil exploration and transportation activities, gas flaring activities, fire outbreaks at exploration sites as well as illegal oil bunkering activities [4-6].Anecdotal evidence shows that high potential incidents and accidents with fatalities and varying health effects have been recorded [5,6].

Several health abnormalities and environmental problems have been associated with released volatile organic compounds. Report of accidental

fires, oil spillage, exposure to dangerous chemicals, noisy machinery amongst others; are commonplace with lethal health consequences [3,6-8]. Regarding the effects on the environment, reports have been made of worrying levels of contamination of the water, soil and air of areas where oil pollution occurs with resultant deterioration of the environment [6]. This has contributed to the occurrence of several water-borne diseases as well as shortage of drinking water in communities of operation. Ecosystems have also been adversely affected which has affected food available for consumption by the human population, loss of livelihoods among others [6]. The survival of different species of plants and animals has also been threatened by the environmental pollution caused by oil exploration activities and accidents. Radiological damage to the environment because of the impact of ionizing radiations from atmosphere as well as water bodies has also been reported with consequent contamination of aquatic life-forms which when ingested by humans inadvertently has the capacity to increase the risk of occurrence of several diseases [6,9]. Activities in oil installations entails manual handling tasks like lifting, reaching, carrying, holding, climbing, repetitive movements, pushing, lowering, use of visual display units in the control room among others. Often there is congestion due to large number of personnel working in a confined or limited workplace; thus, making man-machine interface a notable flash point for hazards as well as occupational injuries and illnesses in an offshore oil facility. This explains why musculoskeletal complaint is a constant recurrence among offshore oil workers [6-8]

1.1 Justification and Aim

Despite the common use of gas flares in the oil industry in Nigeria as well as the occurrence of other adverse consequences related with oil exploratory activities, little study of the associated health impact in humans living in the oil and gas production environment have been conducted in the Niger Delta region of Nigeria [10]. Considering that oil exploratory activities still go unabated in this region of Nigeria, it became necessary to carry out this study to determine the perceived environmental effects and morbidity patterns associated with the activities of an oil and gas installation in the Niger Delta region of Nigeria.

2. METHODS

2.1 Study Area

The study was carried out in an oil and gas field logistic base which houses workers from several oil and gas facilities in the same hub. Geographically, the Field Logistic Base (FLB) lies between latitude 4° and 6° north of the equator and longitudes 5° and 9° East of the Greenwich Meridian [11]. This cohort of workers was chosen for the study because of the dense activities of oil exploration and production undertaken by the workers with significant potentials for hazard generation in and around the installation.

2.2 Study Design and Population

A descriptive, cross-sectional study design was utilized in conducting this study between August 2019 and January 2020. The study population comprised mechanical technicians and engineers, instrument technicians and engineers, operation technicians, electrical engineers and technicians; support staffs, which include the caterers, administrative staff, housekeepers, cleaners, gardeners and other office workers. Generally, the workers consist of two crews with a work cycle of 14 days in the field and 14 days on 'time off'(meaning that they were allowed to take a break which was necessary mainly to ensure a break in exposure to prevailing work hazards). While in the field they work actively on the flow station in the day but are on standby at night, retiring to a houseboat (accommodations suspended on water) about 30 meters from the facility. The personnel included in the study comprised workers who work a minimum of 8 hours daily in and around the facility on a bi-weekly basis and have been in employment for over 5 years. They included the technical and support staff in the facility. These benchmarks enabled a time weighted average exposure to hazards. Casual workers who come from the community on daily basis were excluded in the study because they work mainly in the early hours of the day for 1 hour in the accommodation area before retiring to the community and thus did not meet the selection criteria. Confidentiality and privacy of subjects were also respected. To this end, questionnaires were made anonymous, with the respondent at liberty to make objective views. Respondents were properly informed of the voluntary nature of participation in the study.

2.3 Sample Size and Sampling

A self-administered questionnaire was administered to personnel of the facility.

The minimum sample size for this study was calculated using the formula:

$$n = \frac{z^2 pq}{d^2}$$

Where n = the desired sample size, z = the standard deviation, set at 1.96 corresponding to 95% confidence level, p = the proportion of the variable of interest which was the prevalence of health impacts experienced from exposure to hazards in this oil and gas region which was 22.4% (0.22) as reported in a study conducted in Nigeria [12], d = degree of acceptable error set at 6% = 0.06. A total of 256 participants was the calculated minimum sample size after allowing for 10% level of non-response. The random sampling method was used to select the respondents.

2.4 Data Management

Completed questionnaires were entered on the Microsoft Excel spread sheets (2007 version) and then imported into the Statistical Package for Scientific Solutions (SPSS) version 21.0 (statistical software package) for analyses.

Frequency distribution tables and descriptive statistics (mean and standard deviation) were used to express study data.

3. RESULTS AND DISCUSSION

A total of 256 persons participated in the survey. Majority (70.3%) of the respondents were within 31-40 years age bracket and were also males (98.4%). Majority (97.6%) had received tertiary education. The largest proportion of respondents (48.8%) had worked in the facility between 0 and 10 years. The demographic data of respondents is shown in Table 1.

Morbidities were found to be experienced by all respondents with majority reporting temporary threshold shift (97.7%) and transient tinnitus (97.3%), joint pain of varying degrees (83.6%) and occasional prickling sensation in the skin (78.1%).The lowest frequency of health effects experienced by the respondents was claims of stressful feeling (56.6%). The self-reported morbidities of the respondents are shown in Table 2.

Table 1. Socio-demographic characteristics of respondents

Variable	Frequency (n=256)	Percentage (%)
Age (Years)		
• 21-30	40	15.6
• 31-40	180	70.3
• 41-50	20	7.8
• 51-60	16	6.3
Sex		
• Male	252	98.4
• Female	4	1.6
Marital status		
• Single	50	19.5
• Married	206	80.5
Level of Education		
• Primary	1	0.4
• Secondary	5	2.0
• Tertiary	250	97.6
Ethnic Group		
• Benin	60	23.4
• Esan	20	7.8
• Urhobo	100	39.1
• Yoruba	20	7.8
• Igbo	20	7.8
• Owan	10	3.9
• Others	26	10.2
Department		
• Electrical	20	7.8
• Mechanical	40	15.6
• Instrumentation	40	15.6
• Operations	28	10.9

• Support Staff	128	50.0
Duration of Employment (years)		
• 0-10	125	48.8
• 11-20	120	46.9
• >20	11	4.3

Table 2. Morbidities experienced by respondents

Variable	Frequency (n=256)	Percentage (%)
Morbidities		
• Temporary threshold shift	250	97.7
• Transient tinnitus	249	97.3
• Joint pain of varying degrees	214	83.6
• Low back pain	206	80.5
• Occasional prickling sensation on the skin	200	78.1
• Occasional burning sensation on the skin	176	68.8
• Occasional skin rashes	156	60.9
• Occasional crawling sensation on the skin	156	60.9
• Headache	155	60.5
• General body pain	148	57.8
• Feel stressed	145	56.6

** Multiple responses*

Table 3. Population of respondents that have witnessed environmental Impact around the work area

Environmental Impacts	Frequency (n=256)	Percentage (%)
• Destruction of economic plantations	230	89.8
• Dead aquatic creatures	156	60.9
• Contaminated riverine water	209	81.6
• Dark colour rain water	145	56.6

** Multiple responses*

Generally, it should be noted that individuals working at oil and gas installations are constantly exposed to a number of hazards at their peculiar workplace which places them at constant risk of physical, chemical or even radiological injury and in some extreme cases, death. In this study, a number of morbidities were found to be experienced among the workers of the oil and gas installation where the study was conducted. Significant morbidities experienced included transient noisy or ringing ears otherwise known as tinnitus, an occasional prickling and burning sensations of the skin, lower back pain as well as joint pains. These morbidities have also been reported in other studies in which it was said that residing near petroleum production sites had the capacity of producing adverse cases of morbidities among humans [6,13]. Complaints of tinnitus among study respondents could be because of work being done most of the time around noisy equipment. This can be prevented by provision and proper use of ear muffs while at work in such working conditions [14]. The experience of occasional crawling sensation, burning sensation, prickling sensation and rashes on the skin of respondents in this study is suggestive of the negative impact of exposure to certain chemical components of the oil exploration and exploitation process that have been released into the atmosphere. These include alkanes, sulphides, benzene, amongst other chemicals [13]. Some of the respondents also claimed to have experienced general body pain, low back pain and varying degree of joint pain. These complaints are suggestive of musculoskeletal disorders which could be connected with not having enough workers to allow for healthy shift-duty rotations as well as the performance of tasks that require forceful or strenuous body movements [15]. To prevent the occurrence of these morbidities, it is recommended that better health and safety protocols including the installation of functional air purifying apparatus, air quality monitors amongst others be done at oil and gas installations located in Nigeria. Strict adherence to safety protocols should also be ensured as well as continual education of the workers of the need to use safety apparatus.

In this study, several environmental challenges associated with petroleum exploration and production activities were reported to be observed by the study respondents. Some of these problems included the destruction of economic plantations, contamination of the river water as well as death of aquatic creatures. These environmental problems have also been reported by similar studies in which a myriad of other environmental problems have been reported [8,9,13]. Apart from these adverse effects on the ecosystem, populations residing in these environments are also affected as a result of the loss of their sources of livelihood including fishing, farming; and an inadvertent scarcity of drinking water due to contamination of both surface and ground water. In addition to these, problems related with the flaring of gas during which large amounts of greenhouse gases are released into the atmosphere have been reported. This is known to significantly contribute to the global warming phenomenon that manifests in several ways including extreme global temperatures as well as flooding [13,16].

It is common knowledge that these problems plaguing certain oil-bearing areas around the world are bound to occur if the proper mitigation protocols are not strictly adhered to [17,18]. There should be zero tolerance for avenues that allow for wrong oil exploratory practices including the flagrant flaring of gases, inadequate response to oil spills and related accidents. The government of nations where oil exploration and exploitation activities abound as well as all other relevant stakeholders in this industry must maximally ensure the protection of human life as well as ensure environmental sustainability. Though remediation modalities are in place and this industry largely funds economies around the world, the prevention of these oil and gas mining-related problems should take priority. We must all ask ourselves and answer this pertinent question: what kind of earth are we leaving behind for generations to come? The availability of crude oil as a resource for wealth generation must not be used as a weapon of mass destruction! Let's do what is right at the right time: Now.

4. CONCLUSION

The workers in this study reported that they experienced a number of morbidities. They also reported an observation of certain environmental problems related with oil exploratory activities at the oil and gas installation. It is recommended that strict adherence to health and safety practices such as compulsory use of personal protective apparatus is instituted. Also, measures put in place to prevent these health problems from occurring should be reviewed from time to time to ensure their effectiveness and maintenance of the health and wellbeing of the workers. It is also recommended that personnel in high noise level work area should undergo annual medical surveillance using audiometry to assess the impact of the noise hazard on their hearing ability and make redeployment decisions if any impairment is noticed. Training and retraining of the workers on the need for adherence to health and safety precautions to prevent the occurrence of morbidities associated with their work should also be regularly done. (Revise conclusion)

CONSENT AND ETHICAL APPROVAL

Ethical clearance to conduct this research was sought and obtained from the management of the field logistic base (FLB). (Reference Number of letter) Written informed consent was incorporated in each of the questionnaires which were signed by respondents after detailed explanation of purpose for the study by researcher.

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