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Mechanical and Psychological Hazards Associated with Oil and Gas Workers in Rivers State, Nigeria

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Abstract
Mechanical and Psychological hazards pose a great threat to the physical and mental health of oil and gas workers. There is little or no research on the type of hazard in the oil and gas sector in Nigeria. This study investigated mechanical and psychological hazards associated with oil and gas workers in Rivers State. The descriptive survey design was adopted for the study. The population of the study covered 4,223 workers in various departments in the oil and gas sector. A total number of 514 (12.2% of the population) respondents participated in the study. Out of 514 copies of questionnaire administered, 314 copies (61.1%) were properly completed and used for data analysis. A self-designed questionnaire titled: Mechanical and Psychological Hazard Questionnaire (MPHQ) was used for data collection. The Mean, Standard Deviation and Rank Order were used to answer the research questions while the null hypothesis was tested with z-test statistics at 0.05 level of significance. The results among others indicated that the mechanical hazards identified were; working in confined spaces, injury due to struck by object, injuries due to impact force collision and falls etc. The study also revealed the psychological hazards to include; work related stress such as work overload, violence in workplace, emotional abuse and verbal abuse. The hypothesis tested was rejected. It was recommended among others that management should provide adequate, appropriate, and modern personal protective equipment for their workers.

Keywords: *Mechanical hazards, psychological hazards, workers*

1. Introduction

The oil and gas industry in Nigerian have been active since the shell group discovered crude oil in 1956. However, the oil and gas industry in Nigeria was largely dominated by multinational corporations until the early 1990s when indigenous Nigerian companies began to make entry into the oil and gas industry. With the implementation of the Nigerian Content Directives issued by the Nigerian National Petroleum Corporation (NNPC) about a decade ago, and eventually, by the promulgation of the Nigerian Oil and Gas Industry Content Development (NOGIC) Act (The Act) in 2010 Local participation was boosted. (KPMG Advisory Services, 2014).According to KPMG Advisory Services (2014), the oil and gas industry in Nigeria is broadly divided into: Upstream sector, Downstream sector, and Services sector.

The upstream sector is characterized by exploration and production of crude oil and gas (petroleum operations). The income of companies engaged in these activities is subject to tax under the Petroleum Profits Tax Act, 2004 (PPTA), as amended. The upstream oil sector is the single most important sector in the economy; this is because it accounts for over 90% of the country's exports and about 80% of the Federal Government's revenue. Crude Oil is currently produced from three different basins: the onshore Anambra, the offshore Benin/Dahomey (deepwater and ultra-deepwater) and the Niger Delta (shallow and deep offshore basins). The Niger Delta and Benin basins are known to be the richest basins and hold the largest majority of reserves, and the source of a large portion of current crude oil production in Nigeria.

In the downstream sector, there are four key segments in the downstream oil and gas sector which involves workers in each of the sectors. The key segments are as shown below:

Transmission and Conveyance: This involves the transportation of oil and gas products to the refinery and gas stations. There is a pipeline network from the wellhead to the refinery or plant. In some cases, tankers and purpose-built vessels are also used for this transportation of these products. Refining: There are four refineries in Nigeria; located in Port

Harcourt, Warri and Kaduna. The refineries are all wholly owned or are subsidiaries of the Nigerian National Petroleum Corporation (NNPC). Distribution and Marketing: Distribution and Marketing of the refined petroleum products are complementary activities. This involves the transportation of refined petroleum products from the refineries through pipelines, coastal vessels, road trucks, rail wagon etc. to where they are stored/sale depots. Petroleum products are supplied in Nigeria principally through the Petroleum Product Marketing Company's (PPMC) pipeline system, which links the refineries to the about 21 regional storage/sale depots.

Liquefied Natural Gas (LNG): As at today, Nigeria holds the largest natural gas reserves in Africa but has limited infrastructure in place to develop the sector. Nigeria's first and most ambitious gas project, the Nigeria LNG (NLNG) facility on Bonny Island has six LNG trains currently operational with a total annual capacity of 31bcm. It has become an increasingly important supplier of liquefied natural gas (LNG) to European buyers. The LNG facility is currently supplied natural gas from dedicated gas fields. The oil services sector is classified as follows: Exploration support services Drilling services, Production support services, Downstream services and others.

Hazard according to Okeafor and Alamina (2018) is any situation, condition or thing that may be dangerous to the safety or health of workers at workplace. The Occupational Health and Safety Act (1993) opined that hazard is a source of exposure to danger, adding that danger means anything which may cause injury or damage to a person or property. Similarly, the New Webster's Dictionary of English Language (2000) defined hazard as the risk or chance associated with dangers. Achalu (2000) asserted that hazard is any condition that possess the potential of causing ill health or injury. Hazard may also be rated according to how severe the harm they cause. Nwafor and Ogulu (2018) opined that occupational hazards, could lead to injury, illness or death. The occupational hazards may include physical risk such as being exposed to heavy machines and falls, psychological hazards which could be stressors, other hazards that may exist are exposure to radiological agents, exposure to chemical agents and exposure to biological agents. In people who work in places or jobs were occupational safety hazards are recognized, special training is frequently provided for such people for them to be aware of the hazards present in their job.

Nwafor and Ogulu (2018) categorized industrial hazards into physical, chemical, biological, mechanical, and psychological hazards.WAHEB (1991) opined that occupational hazards are of six types which include chemical, biological, mechanical, ergonomics and psycho-social hazards. Eyayo (2014) categorized Occupational health hazards into six, such as: (a) Physical hazards (b) Chemical hazards (c) Biological hazards (d) Behavioural hazards (e) Mechanical/Ergonomics hazards (f) Psycho-Social hazards. According to Pratibha and Anupama (2008), hazards may be broadly grouped under the following: chemical hazards, mechanical hazards, biological hazards, environmental or potential hazards. Jain and Rao (2014) classified industrial hazards into mechanical hazards, environmental hazards and radiation hazards. Nwafor and Ogulu (2018) further added that chemical hazards are resultant pollutants which include, oxides of sulphur, fibrogenic, plastic, carbon monoxide, nitrogen, hydrocarbon, sulphur oxides and oxide of nitrogen which are emitted into the air and become incorporated with the cloud, mixed with vapour condensed and drop as sulphuric acid rain. Industrial hazard has played a tremendous negative role on the health of industrial workers. In our country today, due to insufficient accident statistics, Nigeria were until recently using only the experience of the developed countries to be able to highlight the effects of accidents.

Psychological hazards are hazards that affect the mental well-being or mental health of the worker and may have physical effects by overwhelming individual coping mechanisms and impacting the workers' ability to work in a healthy and safe manner (Okeafor & Alamina 2018).Of the various types of hazards, psychosocial hazards impact the most on the mental wellbeing of workers (WHO, 2006). Psychosocial hazards refer to those aspects of work design, work organization and management, including their social context, which have potential of inflicting psychological or physical harm (Cox & Griffiths, 1996). According to European Agency for Safety and Health at Work (2016) Work-related psychosocial hazards include interpersonal relationships at work, work overload, work stress, low job control, bullying, violence and poor organizational justice. Prolonged exposure to these psychosocial hazards is related to increased health problems, such as cardiovascular diseases8, and could also contribute to psychiatric disorders, including depression (Cottini & Lucifora, 2013). According to International Labour Organization (2016) posits that Psycho-social hazards are thus associated with the experience of work-related stress.

According to Atasoylu (2016) Mechanical hazards are those associated with power-driven machines, whether automated or manually operated. Concerns about such hazards date back to the Industrial Revolution and the earliest days of mechanization. Failure to provide proper machine guards and enforce their use can be costly for companies. Mechanical hazards that are not properly guarded are implicated in thousands of workplace injuries every year. Small gains in productivity obtained by willfully bypassing mechanical safeguards on machines can cost companies huge fines & medical bills. In industrial settings, people interact with machines designed to drill, cut, shear, punch, chip, staple, stitch, abrade, shape, stamp, and slit. If workers fail to follow safety precautions, these procedures can happen to humans, instead of workpieces.

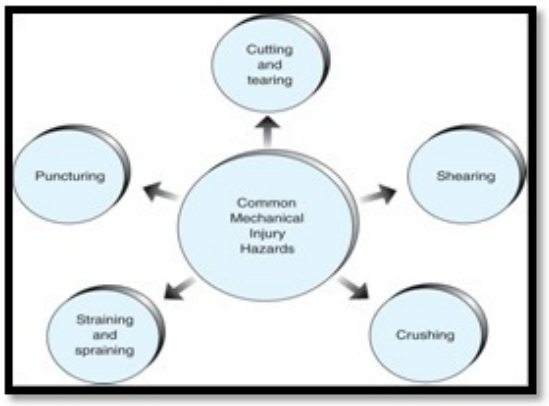

Figure 1: Common Mechanical Hazards
Source: Atasolylu (2016) IENG409 Occupational Safety and Health Management, Lecture Note

Strains/Sprains, Cuts, Shearing Injuries: A strain results when muscles are overstretched or torn, a sprain results from torn ligaments in a joint. Strains and sprains can cause swelling and intense pain. A cut occurs when a body part comes in contact with a sharp edge. Seriousness of cutting or tearing depends on damage done to skin, veins, arteries, muscles, and even bones. Power-driven shears for severing paper, metal, plastic, elastomers & composites are widely used. Such machines often amputated fingers & hands when operators reached under the shearing blade, and activated the blade before fully removing their hand.

Crushing Injuries: Crushing injuries occur when a part of the body is caught between hard surfaces that progressively move together crushing anything between them.

The consequences of industrial accidents and occupational health hazards exert adverse effect not just on the company alone but also extends various effects to individual workers who are the victims to their families, and social support system unto the society as a whole (Nwafor & Ogulu 2018). According to Achalu (2000), accidents have a significant impact on society both emotionally and financially. Occupational accidents are the causes of economic and personal loss to workers and their families, employers, and the nation at large. He further posited that for the workers, some of the cost includes sufferings and pain of the injuries they sustain, possibility of losing their jobs, spending on health care services and loss of income. This which could be probably because majority of Nigerian employees in the oil industry are placed on temporary employment which may result in workers in factories fall victim of some occupational health hazards that can or could be prevented. Probably, if workers had been trained and retrained through health education programme, the skills to be able to manage risk at work-place and taking measures to preventing hazards would have been derived. (Nwafor & Ogulu 2018).

According toOSHA(2014). Hazard controls should incorporate the accepted hierarchy of effective controls. The most effective control is elimination of the hazard, which should be considered first before using other controls. The next control strategy is the use of engineering or design controls. Anupama and Pratibha (2008), recognized the following as various ways on how employee's exposure to occupational hazards can be reduced. (1) Hazard control through Engineering (2) Hazard control through Work practice (3) Administrative control of hazard (4) Hazard control through Personal protective equipment.

2. Statement of the Problem

Workers in the oil and gas industries are exposed to many unfavourable conditions that result in accidents and occupational diseases. Working in an oil and gas industry is associated with various mechanical and psychological health hazards. These health hazards can lead to illnesses or diseases associated to these health hazards. In spite of increasing research on these hazards on oil and gas workers in developed countries, there is little or no research on mechanical and psychological hazards existing in Africa and specifically, Nigeria. Hence, it is important to explore the mechanical and psychological hazards among oil and gas workers in developing countries such as Nigeria. Furthermore, this could serve as a basis for instituting occupational health and safety policies and programs tailored to oil and gas industry workers. It is on this basis that the researcher tends to find out the various mechanical and psychological hazards experienced by oil and gas industry workers in Rivers State.

3. Aim and Objectives of the Study

The aim of the study is to investigate the occupational hazards among oil servicing company workers in Rivers State. The objectives of this study were to:

- Examine the mechanical hazards among oil servicing company workers in Rivers State.
- Determine the psychological hazards among oil servicing company workers in Rivers State.

4. Research Questions

The following research questions guided the study:

- What are the mechanical hazards associated with oil industry workers in Rivers State?
- What are the psychological hazards associated with oil industry workers in Rivers State?

5. Hypothesis

There is no significant difference between gender on psychological hazards associated with oil industry workers in Rivers State.

6. Research Methodology

The descriptive survey research design was adapted for the study. A sample size of three hundred and fourteen (314) respondents was selected through stratified random sampling technique. A structured questionnaire titled Mechanical and Psychological Hazard Questionnaire (MPHQ) was developed and used for data collection. Modified Likert-type four-point rating scale of Strongly Agree (SA) = 4 points; Agree (A) = 3 points; Disagree (D) = 2 points and Strongly Disagree (SD) = 1 point was used to establish the criterion mean of 2.50. It is important to note that any mean score(s) from 2.50 and above were regarded as agreed while mean scores below 2.50 were regarded as disagreed. The mean scores and standard deviation were used to answer the research questions while rank order was used to identify questionnaire item(s) with highest mean scores. The null hypotheses were tested using z-test statistics at 0.05 level of significance.

- Research Question One**:** What are the mechanical hazards associated with oil industry workers in Rivers State.

S/N.	Mechanical Hazards	Age of Workers						
		21-40 years		41 years and above		Mean Set	Rank Order	Remarks
		N=287 ($\bar{x}_1$)	SD	N=131 ($\bar{x}_2$)	SD	$\frac{\bar{x}_1 + \bar{x}_2}{2}$		
1.	Workers work in confined spaces in my workplace.	3.01	1.11	2.67	1.22	2.84	1st	Agreed
2.	Workers sustain injuries due to struck by object in my workplace.	2.89	1.09	2.59	1.15	2.74	3rd	Agreed
3.	Workers sustain injuries due to malfunctioning of equipments.	2.11	0.52	2.45	1.19	2.28	5th	Disagreed
4.	Workers sustain injuries due to impact force collision and falls.	2.91	1.00	2.58	1.19	2.75	2nd	Agreed
5.	Workers in my workplace work in areas of compressed air and high pressure.	2.82	1.04	2.20	1.33	2.51	4th	Agreed
	Aggregate Mean	2.75		2.50		2.62		Agreed

Table 1: Mean ($\bar{x}$) Scores, Standard Deviation and Rank Order of Workers' Responses on the Mechanical Hazards Associated with Oil Industry Workers in Rivers State

From Table 1, item 1 has the highest mean score of 2.84, it also ranked 1st among others. It was followed by items 4, 2, 5 and 3 which ranked 2nd, 3rd, 4th and 5th, with mean scores of 2.75, 2.74, 2.51 and 2.28 respectively, the result indicates that items, 1, 2, 4 and 5 were accepted by the respondents as mechanical hazards in oil servicing companies. This is because the mean scores of these items were above the criterion mean of 2.50. On the other hand, only one item was rejected. This is item number 3 with mean score of 2.28 and ranked 5th in the rank order. It is rejected because the mean score was below the criterion mean. It is an evident that the workers do not sustain injury due to malfunctioning of equipments and the item was not among mechanical hazards seen among oil servicing company workers as was shown by the respondents. The table also showed an aggregate mean score of 2.62 which was greater than the criterion mean score of 2.50. This implies that the respondents agreed that there was presence of mechanical hazards among oil servicing company workers in Rivers State.

- Research Question Two: What are the psychological hazards associated with oil industry workers in Rivers State?

S/N.	Psychological Hazards	Gender						
		Male		Female		Mean Set	Rank order	Remarks
		N=269 ($\bar{x}_1$)	SD	N=149 ($\bar{x}_2$)	SD	$\frac{\bar{x}_1 + \bar{x}_2}{2}$		
1.	Workers in my workplace are exposed to work related stress such as over load.	3.39	1.34	2.98	1.11	2.69	2nd	Agreed
2.	There is problem of violence in my workplace.	2.56	1.40	2.84	0.95	2.72	1st	Agreed
3.	Workers in my workplace are bullied (emotional and verbal abuse).	2.47	1.34	2.88	1.08	2.68	3rd	Agreed
4.	Workers in my workplace are sexually harassed.	1.83	1.34	2.38	1.21	2.10	4th	Disagreed
	Aggregate Mean	2.31		2.78		2.55		Agreed

Table 2: Mean ($\bar{x}$) Scores, Standard Deviation and Rank Order of Workers' Responses on the Psychological Hazards Associated with Oil Industry Workers in Rivers State

Table 2 indicates that item number 2 had the highest mean scores of 2.72 followed by item 1 with 2.69, item 3 with 2.68 and item 4 with the lowest mean score of 2.10. Since only items 2, 1 and 3 had the mean scores above the criterion mean of 2.50 it simply implies that the respondents agreed that items 2, 1, and 3 are the psychological hazards in the oil servicing companies. Item number 4 had a mean score which was less than the criterion means of 2.50 which also implies that the respondents disagreed that Workers in the workplace were sexually harassed and was not seen as a psychological hazard of workers in the oil servicing companies. Drawing inference from the above scores, the result indicated that exposure to work related stress such as over load, problem of violence at workplace, and workers being bullied (emotional or verbal abuse) were the psychological hazards faced by workers at their workplace while workplace sexual harassment was not seen to be a psychological hazard among oil servicing company. The above table also revealed that the aggregate mean score was 2.55 and is greater than the criterion mean score of 2.50. This implies that the respondents all agreed that there was presence of psychological hazards among oil servicing company workers in Rivers State.

- Ho_1: There is no significant difference between gender on psychological hazards associated with oil industry workers in Rivers State.

Variable (Gender)	N	Mean ($\bar{x}$)	SD	df	z-cal	z-crit	Level of significance	Decision
Male	269	2.31	1.34	416	-3.91	±1.96	0.05	Ho_1 is Rejected
Female	149	2.78	1.09					

Table 3: z-test Analysis of the Difference between the Opinions of Male and Female Workers on Exposure to Psychological Hazards

The result from Table 3 shows that at 0.05 level of significance and at 416 degrees of freedom, the z-calculated value of -3.91 is greater than the z-critical value of ± 1.96. Therefore, the null hypothesis is rejected. Based on this result, it was concluded that there is a significant difference in the opinions of both male and female workers on exposure to psychological hazards. Therefore, the result shows that there is a significant difference between psychological hazards and gender among oil servicing company workers in Rivers State.

7. Summary, Conclusion and Recommendations

Working in the oil and gas industry is one of the most hazardous jobs in the world. This is because the workers are exposed to various occupational health hazards which in mechanical and psychological hazards. Oil and gas workers have a prolonged exposure to health hazards in their workplace risking their health to different type of diseases, infections and ailments. The study assessed the mechanical and psychological hazards among oil and gas workers in Rivers State. The workers identified different mechanical and psychological hazards associated with the workers. This descriptive study identified the various mechanical and psychological hazards associated to oil and gas workers in Rivers State using a structured questionnaire. The result of this study showed that the mechanical hazards identified were workers' working in

confined spaces, injury due to struck by object, injuries due to impact force collision and falls etc. While the identified psychological hazards include; work related stress such as overload, violence in workplace, emotional abuse and verbal abuse. Based on the review, recommendations that will help reduce the hazards associated with workers in the oil and gas industry were made. They include:

- Workers should as a matter of urgency report all hazards, near misses and accidents to the management of their company.
- The management of oil servicing companies should introduce health protection methods such as elimination, substitution, modification, containment and ventilation in protecting the health of its employees.
- Management should provide occupational health and safety education, and re-training for their employees.
- Management should provide appropriate, adequate and modern Personal Protective Equipments (PPEs) for workers in the oil servicing companies to improve the health and well-being of their workers.
- The employers should provide health examination monitoring/medical surveillance which will involve periodic medical examination; there should also be pre-employment medical examination, reporting of occupational diseases and illnesses and ethical issues.

8. References

i. Achalu, E.I. (2000). *Occupational health and safety.* Lagos: Splendid Publishers.
ii. Atasoylu E. (2016). IENG 409. *Occupational safety and health management.* Lecture Note.
iii. Cox T,Griffiths A. J. (1996). The assessment of psychosocial hazards at work In Schabracq MJ,
iv. J.A.M. Winnubst JAM, Cooper CL. (Eds.).*Handbook of Work and Health Psychology*.
v. Chichester: Wiley & Sons.
vi. European Agency for Safety and Health at Work. *Risk assessment in health care*. 2016;1–8.
vii. Retrievedfrom: http://www.osha.mddsz.gov.si/resources.
viii. Eyayo, F. (2014). Evaluation of occupational health hazards among oil industry workers: A case study of refinery workers. *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT),* 8(12), 22-53. Retrieved from http: www.iosr journals.org.
ix. International Labour Organization (2016). *Psychosocial risks and work-related stress*. Work Health Promotion well-being. Retrieved from: http://www.ilo.org/safework/areasofwork
x. Jain A, Leka S. (2010).*Health impact of psychosocial hazards at work: an overview.* World HealthOrganization.Retrivedfromhttp://apps.who.int/iris/bitstream/10665/44428/1/
xi. Jain, R.K. & Rao, S.S. (2011). *Industrial safety, health and environment management systems.* Delhi: Khana Publishers.
xii. KPMG Advisory Services (2014). *Nigerian oil and gas industry brief*. Retrieved from www.blog.kpmgafrica,com
xiii. Nwafor, A.U & Ogulu, C.B (2018). *Occupational hazards among oil and gas workers in Nigeria*. Mauritius: Lap LAMBERT Academic Publishing.
xiv. Pratibha, G. & Anupama, P. (2008). *Industrial safety and environment.* New Delhi: S.K. Kataria & Sons.
xv. The New Webster's Dictionary of English Language (2000). New York: Lexicon Publications
xvi. West African Health Examination Board (1991). *Waste disposal and environmental hazard control.* Lagos: WAHEB.
xvii. World Health Organization (2006).Health workforce. World Health Report; Geneva. Retrieved from: www.who.int/hrh/whr06/en/index.html.