

## Rates and Patterns of Operating Room Hazards among Nigerian Perioperative Nurses

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### Abstract

**Introduction:** The perioperative nurse's job content becomes highly extensive in the 21st century. This makes them more frequently exposed to various degrees of hazards. However, little is known about rates and patterns of operating room hazards among Nigerian perioperative nurses.

**Aim:** To investigate the rates and patterns of operating room hazards among Nigerian perioperative nurses.

**Methods:** A cross-sectional descriptive survey of all Nigerian perioperative nurses who attended the 15th Annual Scientific Conference of National Association of Perioperative Nurses of Nigeria (NAPON) in Sokoto between Monday 12th and Friday 16th October, 2015 was undertaken. An adapted and modified questionnaire on impact of "operating" room occupational hazards on intraoperative nurses was used for this study. The questionnaire was modified in content to include questions on rates and patterns of room hazards among perioperative nurses. Statistical analysis was performed using the descriptive (frequency, percentages, mean and standard deviation) and inferential operating statistics (Spearman's correlation coefficient). The level of significance was set at  $p < 0.05$ .

**Results:** This study involved 92 Nigerian perioperative nurses among the conference attendees who gave consent to participate in this study. Males constituted 58 (63.0%) of the study population and 80.0% of the participants were between the age of 31 and 60 years, with a mean age of 44.7 ( $\pm 9.5$ ) years. The prevalence rate of operating room hazards among Nigerian perioperative nurses was 77% and a similar portion (72%) of the participants in this study indicated being occasionally exposed to daily hazards related to factors at workplace. Nearly two-third (64%) of the participants affirmed being occasionally exposed to accidental type of hazards. There were statistical significant relationship between sex ( $p = 0.030$ ), ( $p = 0.026$ ), age group ( $p = 0.002$ ), years of experience ( $p = 0.003$ ), rank ( $p = 0.033$ ), ( $p = 0.003$ ), workplace health facilities ( $p = 0.001$ ), ( $p = 0.047$ ) and workplace geopolitical zones ( $p = 0.040$ ) with participants' exposure to operating room hazards and the overall rating of their operating room working condition.

**Conclusion:** The rate of operating room hazards among Nigerian perioperative nurses is high. This demonstrates a need for more professional consciousness on the concepts of educational and practical interventions practices on ways of identifying and preventing different types of hazards not only among perioperative nurses but also among other similar professional groups can significantly reduce the risk of hazards exposures.

**Keywords:** Operating room; Hazards; Occupational safety; Perioperative nurses

### Introduction

Perioperative nurses (PON) were formally referred to as operating room nurses (ORN), a term that was historically referred to patient care provided in the intraoperative period and practice within the operating room itself. However, as the responsibilities of the operating room nurses expanded to care for surgical patients in the preoperative and postoperative periods, the term "perioperative" was recognized as more appropriate [1,2]. The perioperative nurse is a nurse who

specializes in perioperative practice and who provides nursing care to all surgical patients throughout the continuum of surgical care [3].

Perioperative nurses function in various roles, including those of manager, clinical practitioner (e.g., scrub nurse, circulating nurse, and clinical nurse specialist), educator and researcher. In these roles, PON responsibilities are further expanded to include perioperative patient assessment, patient and family teaching, patient and family support and reassurance, patient advocacy, control of the OR environment, efficient provision of resources, coordination of activities related to surgical patient care, communication, collaboration and consultation with other healthcare team members, maintenance of aseptic and sterile techniques, on-going monitoring of the patients physiological and psychological status, supervision of patients care assistant,

management of equipment, instruments, supplies and mediate between various hospitals, departments, the surgeons, and the management [4].

In recent years, OR occupational hazards and nurse's occupational safety have become a global occupational and public health issues. The health and well-being of working people and their families are greatly influenced by the quality of their work environments [5]. Occupational Safety and Health (OSH) programs have traditionally been concerned with reducing hazardous exposures at work that can lead to work-related injury, illness, and disability. The joint committee of International Labor Organization (ILO) and the World Health Organization (WHO) adoption of OSH in 1950, it has gained a lot of global importance on the health and safety at work matters that relate to the general health and well-being of working people [5] and that should be given consideration in policies at all level. Health and safety problems at work are, in principle, preventable and should be prevented by the use of all available tools, legislative, technical, research, training and education. The goal of all occupational health and safety programs is to foster a safe work environment [6].

Operating room (OR) environment, functions as a site of performing surgical treatment to patients, is of great importance in the hospital among other healthcare settings. The nature of surgeries makes characters of nurse's work in the OR to be fast-paced, high-loaded, and changeful. With the rapid development of medical science, technology and model, ORN job content becomes highly extensive in the 21st century and their responsibilities involve not only basic medical caring, scrubbing and circulating, and anesthetic skills, but as well as engineering and technical skills [7].

Right from inception, OR environment is basically a closed, isolated, restricted, yet flexible environment charged with multiple inherent risks for both surgical team and the patient brought for surgical treatment. OR environment requires coordinated and well-directed team effort [8-10]. The complexity of surgical working environment is determined by various occupational hazards and risks ranging from accidental, physical, chemical, biological, ergonomic, psychosocial and organizational hazards (Table 1), and all of these, could potentially affect and threaten perioperative nurses physical and psychological health and well-being in varying degrees [11-13].

Categories of Hazards	Examples of Operating Room Hazard
<b>Accident hazards</b>	Harms caused by falling objects, e.g., medical instruments.
	Slips, trips, and falls on wet floors, especially during emergency situations.
	Harms caused by sharp objects, especially needle pricks and cuts by blades.
	Burns and scalds from hot sterilizing equipment.
	Electrical shock from faulty or improperly grounded equipment, or equipment with faulty insulation.
	Acute muscle pain resulting from awkward body position or overexertion when handling and transferring patients.
<b>Physical hazards</b>	Exposure to radiation from x-ray and radioisotope sources.
<b>Chemical hazards</b>	Exposure to various anesthetic drugs and gases.

	Skin problems because of frequent use of soaps, detergents, disinfectants, etc.
	Irritation of the eyes, nose, and throat because of exposure to airborne aerosols or contact with droplets of washing and cleaning liquids.
	Chronic poisoning because of long-term exposure to medications, sterilizing fluids (e.g., glutaraldehyde), anesthetic gases.
	Latex allergy caused by exposure to natural latex gloves and other latex-containing medical devices.
<b>Biological hazards</b>	Exposure to blood, body fluids or tissue specimens possibly leading to blood-borne diseases such as HIV, Hepatitis B and Hepatitis C.
	Risk of contracting a nosocomial disease as a result of a prick from a syringe needle.
	Possibility of contracting palm and finger herpes.
	Increased hazard of spontaneous miscarriages.
<b>Ergonomic psychosocial hazards</b>	Fatigue and chronic muscular-skeletal pain due to the handling of heavy patients and to longer periods of work in a standing posture.
	Psychological stress caused by a feeling of heavy responsibility towards patients.
	Stress, strained family relations, and burnout due to shift and night work, overtime work, and contact with sick patients, especially when patients don't recover from the operation.
	Problems of interpersonal relations with surgeons and other members of the operating team.
<b>Organizational hazards</b>	Exposure to severely traumatized patients, multiple victims of a disaster or catastrophic event or exposure to severely violent patients, long working hours without break / off duty, working with bad equipments and lack of surgical supplies.

**Table 1:** Categories and examples of operating room hazards, Source: Jingle G [23].

Hazard is a generic term for any situation or state of events which poses a threat or harm [14] and work-related hazards are the risk to the health of a person usually caused by unsafe working environment [15,16]. Johnson's [14] equally defines risk as the combination of severity, consequences and likelihood of occurrence of undesirable outcomes.

Internationally, it is estimated that about 2.9 billion workers are exposed to hazardous risks at their respective workplaces [17], likewise the international labor organization statistics revealed that, every day, 6,300 people die as a result of occupational accidents or work-related diseases, which are more than 2.3 million deaths per year. Over 337 million accidents occur at work annually; many of these resulting in extended absences from work. The human cost of this daily adversity is huge and the economic burden of poor occupational safety and health practices is estimated at 4 per cent of global Gross Domestic Product each year [18]. There is ample evidence that occupational hazards account for 4% of all cancer deaths. The National Safety Council (NSC) has stated that hospital employees are 41% more likely to lose time from work because of injury or illness than employees in other fields. Hospital employees who work in or around laboratories or operating

rooms are more likely to be injured by exposure to medical gases than workers in other areas [19]. Furthermore, in Nigeria, a study by [16] reported annual mortality rate of 1,249 per 100,000 workers.

In recent years, OR nurse's job content becomes highly extensive in the 21st century which makes ORN more frequently exposed to various degrees of hazards [10,13,20]. OR hazards have direct and indirect spillover effects on the surgical patient which may further compound the client's health problems with unpleasant consequences; these undesirable effects of the hazards are usually irreversible [9]. The effects of a hazardous working condition range from injuries to occupational diseases [21].

## Aims of the Study

To describe frequency and patterns of operating room hazards reported by Nigerian perioperative nurses.

## Methods

### Setting

The study was carried out at the 15th Annual Scientific Conference of National Association of Perioperative Nurses of Nigeria (NAPON) held at Sultan Macchido Institute of Quranic and General Studies Sokoto, Sokoto State between Monday 12th and Friday 16th October, 2015.

NAPON Annual Scientific Conference is an annual event tailored to congregate all perioperative nurses all over the federation to brainstorm on ways of improving the standards of perioperative nursing practice all over Nigeria and to increase patients' satisfaction through quality surgical nursing care [22].

### Study design

A cross-sectional descriptive survey of Nigerian perioperative nurses.

### Sample

The sample was a convenience sample. All attendees of the NAPON conference (15th October, 2015) were invited to participate. Inclusion criteria included perioperative nurses working in government and non-government health care facilities in Nigeria. Exclusion criteria were all non-perioperative nurses who attended the conference.

### Data collection tools

The instrument used for this study was a questionnaire adopted from Jingke [23] study. The questionnaire was modified by the researchers to identify the participants' rates and patterns of operating room hazards. Hazards were categorized into five major hazard groups and the participants were asked to rate the frequency and the severity of each categorical hazards they were exposed to using 4 and 5-level Likert scales. The rating scale ranged from '1'–never, '2'–occasionally, '3'–often, '4'–very often for frequency rating and 1'–minor, '2'–moderate, '3'–major, '4'–catastrophic for severity rating [24,25]. The questionnaire was earlier distributed among 15 perioperative nurses who were at different ranks at Ahmadu Bello University Teaching Hospital Zaria in September 2015 for content validity. The suggested corrections were made and the revised questionnaires were administered to the participant at the conference. The researchers

sought for permission and introduction from the authorities of the association to carry out the study and a written informed consent of each participant was also obtained.

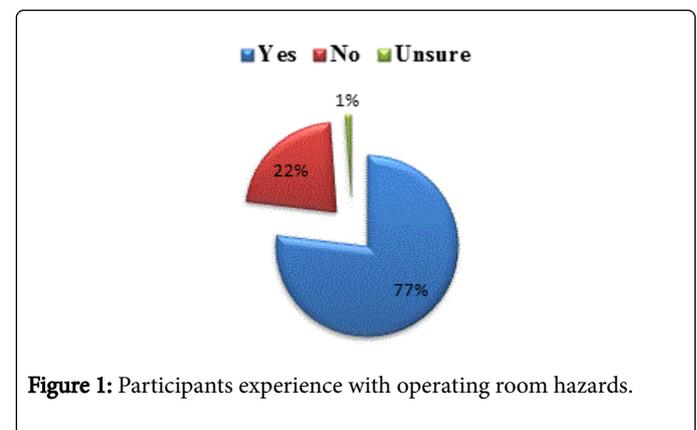
## Data analysis and management

Data were screened, then coded and computed into SPSS version 16.0 for windows for analysis. Statistical analysis was performed using the descriptive (frequency, percentages, mean and standard deviation) and inferential statistics (Spearman's correlation coefficient). The level of significance was set at  $p < 0.05$ .

## Results

### Socio-demographic characteristics

A total of one hundred and six questionnaires were distributed and ninety two were duly completed and valid for analysis, giving a return-rate of 87%. Males constituted 58 (63.0%) of the study population and 80.0% of the participants were between the age of 31 and 60 years, with a mean age of  $44.7 \pm 9.5$  years. All participants have dual nursing professional qualifications and (20.7%) had Bachelor of nursing science degree certificates. Participants work experience showed that 74 (82.6%) of them had spent between 1-20 years in practice as registered perioperative nurses in the operating theatre. Fifty one (53.2%) of the participants were on the rank of Chief Nursing Officers and Assistant Chief Nursing Officers. More than half (64.1%) of the participants worked with federal / tertiary health facilities and a third (34.8%) were from the north-west zone where the conference was held. Majority ( $n = 70, 77.0\%$ ) of the participants reported that they had experienced different types of hazards in the operating room while 20 (22.0 %) indicated that they had never experienced any form of operating room hazards before (Figure 1).



**Figure 1:** Participants experience with operating room hazards.

Figure 2 below depicts that 66 (71.7%) of the participants reported been occasionally exposed to daily hazards related factors at workplace.

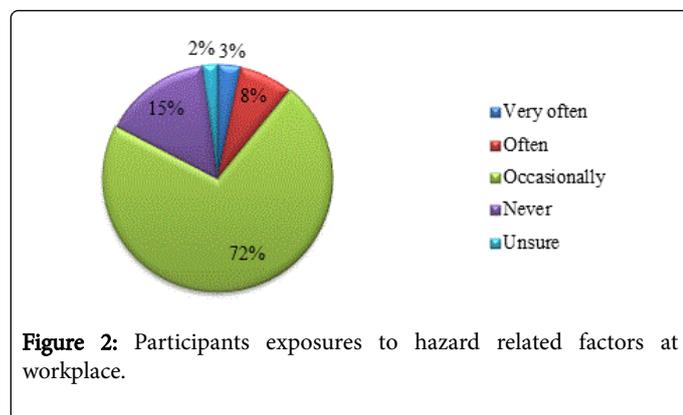


Figure 2: Participants exposures to hazard related factors at workplace.

Table 2 below reveals that nearly two-third 59 (64.1%) of the participants affirmed been occasionally exposed to accidental hazards while, it is significant to note that nearly two in every five 42 (45.7%) of the participants attested that they have never encountered any form of chemical hazards before.

Types of hazards	Very often (%)	Often (%)	Occasionall y (%)	Never (%)	Unsure (%)
Accidental	2 (2.2)	3 (3.3)	59 (64.1)	23 (25.0)	5 (5.4)
Physical	0 (0)	10 (10.9)	53 (57.6)	23 (25.0)	6 (6.5)
Chemical	3 (3.3)	10 (10.9)	30 (32.6)	42 (45.7)	7 (7.6)
Biological	3 (3.3)	8 (8.7)	34 (37.0)	38 (41.3)	9 (9.8)
Psychologica l	3 (3.3)	11 (12.0)	45 (48.9)	30 (32.6)	3 (3.3)
Organization al	5 (5.4)	18 (19.6)	39 (42.4)	24 (26.1)	6 (6.5)

Table 2: Frequency of exposures to hazards in the operating room.

Table 3 below shows that more than half 51 (55.4%) and three in every five 57 (62.0%) of the participants were majorly exposed to minor level of accidental and physical hazards in the operating rooms.

Categorical hazards	Catastrophic (%)	Major (%)	Moderate (%)	Minor (%)	Unsure (%)
Accidental	0 (0)	5 (5.4)	20 (21.7)	51 (55.4)	16 (17.4)
Physical	0 (0)	4 (4.3)	17 (18.5)	57 (62.0)	14 (15.2)
Chemical	1 (1.1)	1 (1.1)	26 (28.3)	41 (44.6)	23 (25.0)
Biological	1 (1.1)	6 (6.5)	19 (20.7)	41 (44.6)	25 (27.2)
Psychologica l	0 (0)	5 (5.4)	28 (30.4)	37 (40.2)	22 (23.9)
Organization al	1 (1.1)	9 (9.8)	34 (37.0)	29 (31.5)	19 (20.7)

Table 3: Severity of hazards reported by perioperative nurses.

Long working hours was identified by 68 (73.9%) among the participants (Figure 3), 67 (72.8%) spotted low back pain and 62 (67.4%) indicated fatigue were the major types of hazards encountered in their respective operating room theatres.

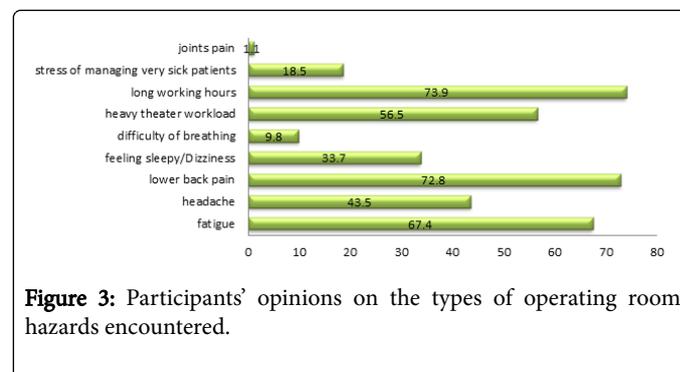


Figure 3: Participants' opinions on the types of operating room hazards encountered.

Figure 4 shows that 35 (38%) of the participants rated their operating room working condition as good this is followed by 29 (31%) who rated fair.

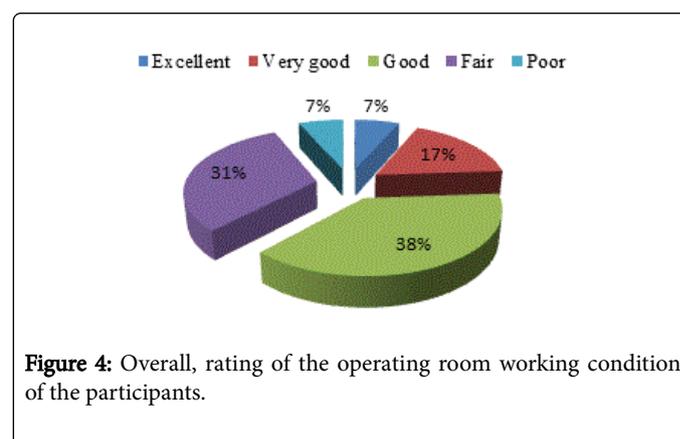


Figure 4: Overall, rating of the operating room working condition of the participants.

The results of the spearman's correlation coefficient analysis shows that sex ( $p = 0.030$ ), ( $p = 0.026$ ), age group ( $p = 0.002$ ), years of experience ( $p = 0.003$ ), rank ( $p = 0.033$ ), ( $p=0.003$ ), workplace health facilities ( $p = 0.001$ ), ( $p = 0.047$ ) and workplace geopolitical zones ( $p=0.040$ ) had association with some variables on participants' exposure to operating room hazards and the overall rating of their operating room working condition (Table 4).

Variables	Chi square ( $\chi^2$ )	df	p-value
<b>Sex</b>			
How frequent were you exposed to chemical hazards?	10.696	4	0.03
Severity rating of accidental hazard encountered in the operating room before?	9.285	3	0.026
<b>Age group</b>			
Have you ever encounter any form of hazard in the operating room before?	30.357	12	0.002
<b>Years of experience</b>			

Have you ever been exposed to any form of radiation/ laser before?	32.866	14	0.003
<b>Rank</b>			
Have you ever been exposed to any form of radiation/ laser before?	30.454	18	0.033
Have you been exposed to any of these substances (anesthetic gases, toxic fumes from the use of diathermy, gases and liquid, cytotoxic drugs, disinfectants and cleaning agents) before?	38.919	18	0.003
<b>Workplace health facilities</b>			
Have you had any of these accidentals hazards at work before? (Slips, trips, cuts, burns, pricks, electrical shocks, burns and falls)	13.229	2	0.001
Overall, how would you rate your operating room working condition?	9.658	4	0.047
<b>Workplace geopolitical zones</b>			
Overall, how would you rate your operating room working condition?	32.341	20	0.04

**Table 4:** Association between selected variables and participants' exposure to operating room hazards, df = Degree of freedom.

## Discussion

Findings of this study revealed a high prevalence rate 77% of operating room hazards among the participants and 72% of them were occasionally exposed to daily hazards and hazards-related factors at workplace. This findings is agreement with similar studies carried out among industrial and non-industrial workers that recorded high prevalence rates of 80% and 97.7%) across the occupational groups [26-28]. Likewise, studies [29-31] reported that on daily bases at workplace, workers are confronted with health and safety issues which are attributed to hazardous and stressful working environments.

Work schedule and the design of the workplace can lead to errors and accidents [32,33]. OR hazards can be ascribed to many factors such as the complexity nature of surgical working environment charged with multiple inherent of both potential and actual hazards [11,12]. Unrealistic workloads, unfinished tasks and high nursing attrition rates, long work duration, overtime and number of hours worked per week and so on, were reported to have significant effects on perioperative nurses as they carried out their daily duties and responsibilities combined with prolong standing posture in which those activities are being carried out [34].

Due to the complex nature of the OR, perioperative nurses do encounter series of hazards that are categorized into biological hazards, chemical hazards, physical hazards, and psychosocial hazards [11]. Significantly, the finding of this study shows that more than half (55.4%) and three in every five (62.0%) of the participants were majorly exposed to minor level of accidental and physical hazards in the operating rooms. This finding is in line with a study of [23] who reported that most of the perioperative nurses were more frequently affected by accidental, physical, chemical and organizational hazards at work than the nurse anesthetist.

The frequency of operating hazards experienced by the perioperative nurses varied from never to very often for patterns and

the severity of the hazards exposures were rated from minor to catastrophic. These reports could be attributed to different nature of the health facilities and the working conditions of the operating rooms of the participant's workplace. In this study, it was observed that 64% and 58% of the participants affirmed that they were frequently and occasionally exposed to accidental and physical hazards. Another evidence from this study is that 55% and 62% of the study participants rated minor for both accidental and physical hazards as the most severely encountered at their respective place of work.

Participants opinions on the frequency of exposures to hazards in the operating room illustrates that long working hours 74%, low back pain 73% and fatigue 67% were the three major types of hazards encountered among the participants in this study. This finding corroborates findings of previous studies [1,35] who reported prevalence of low back pain of 71% and 77% among nurses. This study established significant association between gender ( $p = 0.030$ ), ( $p = 0.026$ ), age group ( $p = 0.002$ ), years of experience ( $p = 0.003$ ), rank ( $p = 0.0033$ ), ( $p = 0.003$ ), workplace health facilities ( $p = 0.001$ ), ( $p = 0.047$ ) and workplace geopolitical zones ( $p = 0.040$ ) with operating room hazards, frequency and severity rating of the various hazards encountered and the overall rating of their operating room working condition as shown in Table 3. This is consistent with studies by [36-41] that found correlations with participant's exposure to occupational risk, hazards, sex, age, workplace and professional rank of the participants.

## Study limitations

Most Nigerian perioperative nurses could not attend the conference due to the security challenges (Boko Haram Terrorism) in the country. As such, the study is limited in its generalizability as it involved only few perioperative nurses in Nigeria. A wider coverage study may improve the external validity of the findings.

## Conclusion

The working environment of the PON in developed and developing countries might not be comparable. Perioperative nurses in the developed nations may be working under improved working conditions, which is most likely not the case under which PON in most African countries practice. Therefore, PON in Africa, particularly in Nigeria might be at higher risk to operating room hazards compared to those in industrialized countries. It is worthy to note that, this study established high rate of operating room hazards among Nigerian perioperative nurses cutting across all the geopolitical zones of the country. The overall rating of the participants working condition suggests that most of the participants were working in a poor working condition. Hazards and poor working environments have been associated with adverse consequences on the health and performance of staff and on patient safety and most of these hazards in the operating rooms are avoidable. Several educational intervention measures on identifying and preventing different types of hazards not only among perioperative nurses but also for other similar professional groups can significantly reduce the risk of hazards exposures. Furthermore, relevant protective measures should be put in place by the hospital to ensure an optimal working environment for PON so that the employees are able to work under least occupational hazards and work related illnesses. However, additional research is needed to identify and design further measures in reducing the risk of hazards exposures in the OR.

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## Competing Interest

The authors declare that no competing interests exist.

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