Frontiers in Health Informatics
ISSN-Online: 2676-7104
www.healthinformaticsjournal.com
2019; Vol 8
Open Access

OCCUPATIONAL HAZARDS OF OPERATIONAL ROOM PERSONNEL IN AL MUTHANNA GOVERNORATE

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Abstract:
Background: Surgeons experience many hazards when working in an operating room. Surgeons might have a higher chance of being exposed to infectious disease; radiation; surgical smoke; hazardous materials, and loud noises from other staff; and developing musculoskeletal disorders as well as other emotional and psychological stresses.
Objective: to Identify significant occupational hazards that may affect workers in the operation room and its association with stress.
Methods: Cross sectional study involved 200 candidates of operation room personnel (surgeons, nurses and anesthetic assistant in Al-Muthanna health directorate during 2018.
Results: The study recruited 200 of surgical staff. 20 - 59 years old. 45 % of the studied staff effected by traumatic hazards like pinprick injuries with needle, 15.5 % affected by anesthetic drugs , stress have significant association with operation room personnel specially in consuming caffeine and smoking , while surgical nurse show high level of anxiety with statistical significance (p less than 0.005)
Conclusion: The pinpricks traumatic injury by needle and anxiety are the most common affected hazard on the surgical staff in the operation room.

Key words: Occupational exposures, Operating room, Needle stick injuries, Surgeons, Irritant substances.

Introduction:

Surgeons and surgical room staff are regularly come into contact with a variety of workplace risks, all of which are known to be dangerous to their health and safety[1]. There are many hazards present in an operating room therefore an estimated 5,600,000 health care associates are exposed to both bloodborne pathogens and biological byproducts created from surgical smoke [2]. In addition, the level of radiation exposure (mrem) for different surgical specialities averages between 5-50 per case, 10-350 per month and 2000-3000 annually [2]. Because surgery is a team-based profession, some physicians will identify risk factors that exist for them outside of their specialty area as well. The role of the operating room (OR) in hospitals and other healthcare facilities as a location where patients get surgical therapy is crucial. Because of the nature of procedures, operating room assistants and nurse roles tend to be dynamic, busy, and fast-paced. The scope of the work performed by operating room staff, specifically intraoperative nurses, has increased significantly because to the quick growth of medical knowledge, technology, and models. Their duties extend beyond providing basic medical care; they also perform other tasks like scrubbing and circulation, using anesthetic techniques, and having technical and engineering knowledge[3,4].

Professionals from the variety of their specialty, such as vascular surgeons, ortho, and plastic surgeons often work together on complex surgical cases and could potentially use intraoperative equipment that emits radiation or generates percussive (vibratory) noise of a higher intensity (amplitude) than their specialty typically employs [5]. The operating room is also filled with many different types of occupations risks (accidental, physical, chemical, biological, psychosocial, and organizational) which can have different impacts on the physical and psychological health of the staff. Injuries and diseases caused by these types of hazards

can be quite serious and can result in things like, physical injury, work-related illness or suffering and, ultimately, even death [6].

The operating room poses many hazards for both patients and those working in surgery as a result of failures and deficits in safety procedures. The numerous hazards that could exist can be successfully mitigated and converted into safe environments through understanding and awareness of the hazard(s), followed by being vigilant about the existed potential hazards. While there are regulations and training for lesser-known hazards (i.e., Use of chemical and biological agents produced by lasers; surgical smoke; anesthetic gases; ergonomic hazards; etc.), most efforts to improve operating room (OR) safety continue to depend on the established regulation of mandatory Occupational Safety Training. Implementation of Occupational Health and Safety (OHS) standards relies on both institutional protocols and on individual actions. Studies have repeatedly demonstrated that both cancer risks and reduced reproduction and increased mortality are adversely affected by long-term, repeated, and routine exposures of staff to routinely occurring hazards in the OR [7,8].

Every day during the operation, surgeons are subject to injury. An estimated 400,000 needlestick/sharp object injuries occur in the U.S. each year and an estimated 1/4 of the needlestick or sharp object injuries involve a member of the surgical staff. Given the extensive use of sharp instruments during surgery, it is not surprising that surgeons are rated as the highest risk professional group among the OR staff [9]. A 2020 study of surgeons in Asia and the Pacific Region at hospitals and clinics specifically in surgical departments revealed that surgical smoke-related occupational injuries require urgent action in the surgical community. This study also found evidence of significant under-reporting of these injuries to the occupational health services [10].

The operating room is the second most common site of sharps injuries. Surgical staff and post-operative services workers have much higher risk of injury due to sharps injuries than are those of their counterparts in other specialties [11]. Surgical team members have the highest incidence of injury, followed by surgical assistants and other surgical staff, including those in training. Research has indicated that of all physicians and dentists, those who practice in specialties that are exposed to a large amount of blood or needles (e.g. surgery, obstetrics and gynecology, anesthesiology) have a much higher prevalence of injury than their counterparts who practice in specialties that are better referred to as low-exposure specialties (e.g. psychiatry or family medicine) [12].

Risks to health surgical staff are ignored because for them, the patient comes first. In 2010, the health of around 30,000 healthcare workers in England was seriously affected by their work. Psychiatric, musculoskeletal (28%) and dermatological disorders were the most common in percentage of (59%).[13]

When considering the increased likelihood of experiencing psychological harm after exposure to physical hazards in your profession, the medical profession's traumatic impact is likely the highest. Anesthesiologists, surgeons and surgical nurses face some of the most intense stress in any profession and have been identified for many years as careers that have had a significant deterrent effect for many trainees who are pursuing careers in these areas [14]. A variety of factors that lead to higher stress levels among operating room professionals include long hours of work, lack of sleep, fatigue (both physical and mental), the need for good communication with others, the complexity of tasks completed, the need to remain vigilant, the unpredictability of workflow and outcome, the presence of adverse events and complications, concerns regarding the potential for tort suits and workplace violence, and productivity demands [14].

The impact of the COVID-19 pandemic has compounded not only the demand for work but also the psychological distress associated with working in the operating room. In a recent study published by Meng et al., they found that nurse anesthetists were experiencing marked levels of occupational stress and burnout and recommended that management staff address this issue. To provide optimal patient care and effective infection control, clinicians working in the operating room should take action to reduce the amount of stress they experience [15].

Study objectives: to identify significant occupational hazards that may affect workers in the operation room and its association with stress

Methods:

Study design and duration : This is a descriptive cross-sectional study done in Al Muthanna health directorate including the hospitals : Al_Hussain teaching hospital, Maternity and children teaching hospital, Rumaitha General hospital and El khidir General hospital during 2018.

Study participants and sample size : a convenient sample of 200 candidates who works in the surgical room were chosen , surgeons, nurses and anesthetic assistant were included in the study

Data collection : the data was collected by direct interview using a questionnaire contains sections of surgical hazards and risks . The questionnaire contain the following

First part contain sociodemographic data of the participants like age , gender, years of work and job.

Second part: surgical hazards like traumatic , chemical, physical , irritants . Participants can answer more than one item in this part for those who exposed to multiple types of hazards.

Third part: type of stress affecting the participants during their work in the OR

Inclusion criteria : candidates who works more than one year in the surgical room.

Exclusion criteria

Staff who worked less than one year or declined to participate were excluded from being in the study.

Definitions of Variables

Physical Risks: The risk from exposure to accidents and injuries, and radiation from X-ray and radioisotope sources within the operating room [5].

Chemical Risks: All of the anesthetic agents that could be exposed to the staff include, but are not limited to nitrous oxide (N_2O), halothane, ethyl bromide, ethyl chloride, ether, and methoxyflurane [7].

Biological Risks: Staff had a potential risk of contracting an infection from exposure to blood, body fluids, or tissue specimens that could cause an illness through contaminated blood. For example, the staff were at risk of contracting HIV, Hepatitis B and Hepatitis C [15].

Ergonomic Risks: The staff may experience fatigue and low back pain as a result of handling heavy patients; prolonged standing during work can lead to problems with blood sugar levels, and difficulties seeing [4].

Ethics Approvals

Prior to the start of data collection, all participants provided verbal consent. All data collected

will be anonymous and will only be used for research purposes. Administrative permission was obtained from the Directorate of Al Muthanna, as well as from administrative staff from each of the hospitals that participated.

Statistical Analyses
Data were entered into and analyzed using the Statistical Package for the Social Sciences (SPSS, version 26). Continuous variables were reported by means and standard deviations and ranges, categorical variables were reported as frequency and percentages. The chi-square test of independence was utilized to evaluate the relationship between each of the study groups and the independent variable of interest. If appropriate, the Fisher's Exact test was employed instead of the Chi Square test of independence. For the analysis of the data, a p-value of <0.05 was considered statistically significant.

Results:
All study participants had to have been employed in operating rooms during the entire study time frame. A cohort of 200 surgical personnel was included in the total study population, which consisted of 86 nurses who were included in the entire cohort, 34 nurse anesthetic assistants, and 80 surgeons from operational sites. In the entire sample, the age of the subjects ranged between 20 and 59 years. Males made up approximately 60.5% of the sample, while approximately 40.0% of the cohort contained individuals with five to ten years of professional experience (Table 1).

Table 1: sociodemographic features of the studied sample :

Variables		No	%
Workforce of the operation room	Surgeons/anesthetists	80	40
	Surgical nurses	86	43
	Anesthetic assistants	34	17
Age of participants	20-35	42	21
	35-50	107	53.5
	50 and more	51	25.5
Mean age in years ±Sd (range)	39.57 ±39.9 (20-59.5)		
Gender	Male	121	60.5
	Female	79	39.5
Years of experience	Less than 5 years	44	22
	5-10 years	80	40
	More than 10 years	76	38

According to the participants , 45 % of the studied staff effected by traumatic hazards like pinprick injuries with needle, 15.5 % affected by anesthetic drugs , 16.5 of the complaining from musculo-skeletal pain and
7% were exposed to both blood and verbal abuse. table 2

table 2: Occupational hazards affecting operation room personnel in the studied sample :

Types of hazards		No	%
Physical Hazards	Traumatic/accidental injuries	90	45
	Electrical injuries	4	2

	Exposure to radiation	9	4.5
Chemical hazards	exposure to irritant substances	12	6
	Exposure to anesthetic drugs	31	15.5
	Latex injury	7	3.5
Occupational/Ergonomic hazards	Musclo-skeletal pain	33	16.5
	Varicose vein	5	2.5
	Hypoglycemia	20	10
Biological hazards	Exposure to blood	14	7
	Infections (HIV, TB, hepatitis	8	4
Violence	Verbal abuse	14	7
	threats	4	2
	physical assaults	2	1

The surgical staff that effected by stress due to the previous hazards, divided as follow: Anxiety : 42 % Sleeping problems : 54 % Depression : 30.5% Excessive consumption of caffeine and smoking . table 3

Table 3: types of stress affecting operation room personnel in the studied sample:

Type of stress	NO	%
Anxiety	85	42.5
Sleeping problems	54	27
Excessive consumption of caffeine and smoking	61	30.5

Regarding stress , the current results found that stress have significant association with operation room personnel specially in consuming caffeine and smoking , while surgical nurse show high level of anxiety with statistical significance (p less than 0.005), male gender had also associated with consumption of caffeine and smoking , on the other hand anxiety was significantly lower than other types with increase years of experience (p less than 0.005). table 4

Table 4: association of types of stress with criteria of operation room personnel:

		Anxiety		Sleeping problems		Consumption of coffee and smoking		P VALUE
		No	%	NO	%	NO	%	
Operation room personnel	Surgeons/anesthetists(80)	28	35	10	12.8	42	52.5	0.0001*
	Surgical nurse(86)	42	48.8	34	39.5	10	11.6	

	Anesthetic assistants (34)	5	14.6	20	58.8	9	26.4	
Gender	Male (121)	45	37	30	24.7	46	38	0.063
	Female (79)	30	40	34	42	15	18	
Years of experience	Less than 5 years(44)	15	34	20	45.4	9	20.4	0.001
	5-10 years(80)	20	25	30	37.5	30	37.5	
	More than 10 years (76)	19	25	25	33	32	42.2	

*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.

Discussion:

The present study was designed to evaluate occupational hazards of surgical staff in hospitals Al Muthanna Governorate during 2018.

Traumatised staff in surgery are a leading threat to surgical team member, affecting about 56% of the research samples. Most injured team member had experienced an accidental needlestick/pinprick incident. If sharp instruments create wounds while being used during surgery, there is a risk of infection from those wounds. Some of the instruments that surgeons use during surgery expose team member to the risk of HIV by contacting blood or other body fluids or tissues from patients. In addition, surgeons who utilize CO_2 lasers could also contract human papillomavirus (HPV) [16]. The review by Bevan et al. released in 2017, indicates a 41.5% needlestick injury incident rates [13]. During surgical procedures, surgical staff regularly handle advanced technology and utilize numerous sharp instruments to complete surgical procedures, and therefore, have multiple opportunities for them to nick another person's finger, hand, arm, or wrist inadvertently with those sharp instruments. The risk of an injury occurring while lifting a heavy load, or lifting and moving something can lead team members to incur back, shoulder, arm, leg, etc. [17]. Surgical staff also work directly with patients who may have an infectious disease or disorder. The risk of exposure to ionizing radiation is very well known; however, workers who perform surgical procedures could also be exposed to ionizing and non-ionizing radiation from the use of lasers and could be exposed to non-ionizing radiation caused by the use of intra-operative x-ray, fluoroscopic, or other surgical procedures.Skin defatting, irritation, and skin diseases [18; 19] are caused by frequent use of soaps, detergents, disinfectants, and other cleaning materials in the operating room. Guidelines on environmentally friendly adjustments to the working environment to decrease different hazards related to musculoskeletal injuries associated with this high risk profession number over 40 per cent of absenteeism in the National Health Service (NHS) compared with 27 per cent of all other diseases and conditions resulting in missed workdays at a national level. Most frequent the neck region is affected by approximately 44 per cent of all work-related musculoskeletal health conditions in the UK [20]. Results from a survey completed by 77 consultant surgeons across all disciplines (general, orthopaedic, neurosurgical and plastic surgical) indicating that surgeon discomfort during surgical procedures occurred most frequently during these operations (82%) demonstrates the need for further attention to be given to providing surgeons with work settings that have less potential for comfort and ergonomic (postural) issues.

The purpose of this research was to determine the level of operational stress associated with all staff members in an operating room. Psychological stress, excessive caffeine and smoking

consumption, as well as super extended work hours due to work and night shifts, have been linked to worker performance problems and impaired family relationships, along with direct accountability for patient mortality or morbidity from their direct patient care, along with patients being seriously injured and their families [22].One recent study that surveyed 192 operating room nurses found moderate levels of anxiety in nurses since the beginning of the pandemic, as well as the highest prevalence of smoking and alcohol use in the medical field among women, individuals younger than 40 years old, and surgeons [23]. A surgeon may also have to interact with family members who may be angry if surgery does not go as planned in a critical/emergency situation. The above results were similar to a study done by Tavga et al., who evaluated healthcare operative hazards. They found a number of different kinds of occupational hazards effecting healthcare workers during their jobs. Of healthcare workers who were exposed to work-related stress, doctors were the most severely impacted (13.8%) and medical assistants were the most severely impacted by radiation (3.1%). Other types of workplace hazards, like falls (5%), unsafe staffing (13.8%), chemical spills (8.8%), and noise (5.4%) affected all the other members of the workforce [24]. While British surgeons exhibit a high prevalence of stress and burnout without regard for specialty, qualifications, and number of hours worked in a week, surgeons' mood profiles are major predictors of burnout according to a study done by Upton et al. [25].

In conclusion, the operating room is filled with many occupational hazards that lead to increased levels of stress and anxiety for surgical professionals. Sharps injuries, bloodborne pathogens, and musculoskeletal disorders are some examples of occupational hazards present in the operating room. Future studies need to investigate how surgeons' attitudes about risks correspond to preventable adverse outcomes. The information generated from this study provides valuable foundational knowledge on an important subject.

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