

ASSESSMENT OF OCCUPATIONAL HAZARDS AMONG NURSING STAFF INSIDE INTENSIVE CARE UNITS IN A MILITARY MEDICAL COMPLEX

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Abstract

This study assessed occupational hazards among nursing staff in intensive care units in a Military Hospital. The study sample consisted of 70 nurses working in ICUs during the study time. A descriptive cross sectional research design was used in carrying out the study. The study conducted in the intensive care units at El Galaa Military Medical Complex. Data collection tool was questionnaire sheet of two parts, socio- demographic characteristics of nurses and risk assessment questionnaire. The results showed that exposure to stress and environmental risk were highest at oncology ICU, exposure to biological risks gave the highest percentage in internal medicine ICU and exposure to radiation was the highest in neurology ICU

Keywords: nursing staff/occupational hazards/ICU

Introduction

The risk is the exposure to a chance of loss, the combination of probability of an event occurring and the significance of the consequence of the event occurring (Gershon, 2010). Risk is also defined as the chance of something happening that will have an impact upon objectives (Kloma, 2013).

People worldwide face occupational health and safety hazards on a daily basis. Over years, many efforts were made to improve the health and safety of workers worldwide. Development of risk management program was a creative solution to meet this challenge (Tudor *et al*, 2016) who reported that in South Africa HIV was the major independent risk factor for tuberculosis among HCWs, which supported the need for HCWs to know their HIV status, and for HIV-infected HCWs to be offered antiretroviral therapy and isoniazid preventive therapy. Infection prevention and control should also be improved to prevent transmission of tuberculosis in health-care settings to protect both HCWs and patients.

Undoubtedly, the sharp injuries constitutes the serious occupational exposure in the hospital environment, and perhaps the newly graduated medical and dental students, known as House Officers as well as nurses in the first twelve months of their practice, are the most vulnerable of all health workers (Peters *et al*, 2013). The identification of the risk factors to which

ICUs doctors and nurses may be exposed to, will allow to orient preventive measures which can be useful to improve the health and quality of life of this professional group. Creating a culture of safety within a hospital is usually regarded as the specific responsibility of the risk management program (Knight, 2007).

Improving ICUs performance requires a shift of paradigm away from the discredited notion that most omissions, adverse events, errors, and other problems are the fault of individuals, and can be fixed by remediation that is aimed at individuals. Instead, meaningful and sustained improvement of ICU performance requires a system oriented approach via a relentless process of studying and changing the ICU structures and processes, which make it easy for people to make mistakes and hard for people to do their jobs well, in order to transform them into the opposite. Even the smallest ICU should have an appropriately constituted, multidisciplinary systems oriented risk management team that meets at least monthly (Anderson and Hart, 2011). Poor lighting and ventilation, crowded work area, poor storage, inadequate exits and poor housekeeping practices, unsafe environmental conditions such as slippery floors, Also, the inadequate guards, or protection, fire explosion hazard, substandard housekeeping, in adequate ventilation and inadequate emergency preparation (Reiling *et al*, 2004).

Baranski (2012) found that hazards of accidents and work injuries caused by lack attention and focusing, lack of training and experience, lack of or little supervision, failure to follow rules and safety instructions, personal reasons as sick or sensory defects, not using personal protective equipment, and improper potential hazards labeling.

Lack of proper instructions, job and safety rules not enforced, inadequate personal protective equipment (PPE), correct tools or equipment not provided, inadequate inspection of equipment or jobs, poor planning or improper job procedures, rushing the worker (Ballesteros *et al*, 2012). Kavalier and Spiegel (2013) added that inadequate communication and misunderstanding inciting agent that transforms a poor medical outcome into a legal action against a physician, even when quality care was delivered.

The risk manager's basic skills must include art of persuasion, the expertise to be a keen listener, and knowledge about team building importantly, risk managers must realize that the board of directors or governing body is part of the team, even though that directorate is not the immediate supervisor. Communicating effectively with board requires the use of these basic risk manage

ment skills.

Subjects and Methods

Research design: A descriptive cross sectional research design was used in carrying out the study.

Setting: The study was done in the intensive care units at El Galaa Military Medical Complex, and consists of six hospitals with around 1000 beds included 291 ICU Beds, 37 surgical theatres. The six referral hospitals are: El-Galaa main Hospital, Trauma & Emergency Hospital, Pediatric & Gynecology Hospital, ENT Hospital, Oncology Hospital and Nephrology Center

Subjects: The sample consisted of all nursing staff who accepted to participate in the research and met the inclusion criteria

Exclusion criteria: Nurses participated in the pilot study, Nurses refused to participate in the study, and undergraduate nurses

The sample consisted of nurses working in different ICUs as renal dialysis, neurosurgical, internal medicine, Cardio-thoracic care, pediatric and neurology ICU in a Military hospital. The study sample was selected from the different ICU.

Sample technique: Convenience sample technique was used in conducting this study
Final sample:

Hospital	Department	Nurses no.
Nephrology hospital	Dialysis ICU	13
Trauma hospital	Neurosurgical ICU	13
Pediatric hospital	Pediatric ICU	13
Al Galaa	Internal medicine ICU	9
	Neurology ICU	9
Oncology Hospital	Oncology ICU	13
	Total	70

Tools of data collection: Questionnaire sheet consisted of two parts.

Part 1: Socio- demographic characteristics of the nurses such as age, qualifications, experience, sex, years of experience, years of experience in ICU and attendance of training program of occupational safety.

Part 2: Risk assessment questionnaire was taken from Occupational Health and Safety (2008) with some modification to suit this study setting. It divided into four categories: 1- Biological hazards (6items), 2- Psycho-

logical hazards (6items), 3- Environmental hazards (15items), 4- Physical hazards (3 items), and 5- Chemical hazards (3 items).

Pilot study was carried out on 10% of the study sample; the aim of the pilot study was to test the applicability of the tools, the feasibility of the study and the time needed for filling the forms. Thus, this pilot study questionnaire was assessed and some modification was done. The personnel of this pilot study were excluded from the study.

The field work started in February 2017 to

end of April 2017. Before distributing the questionnaire to the study subjects, the component of the tool was explained to the participants. Only code numbers were used to mark sheets and it is nameless. Questionnaire sheet was distributed to the respondents individually in their work setting by the researcher. Time needed to complete the sheet ranged from 10-15 minutes, and then checked each sheet after being completed.

Ethical consideration: Approval was obtained from the Hospital Authorities A verbal consent was obtained from each participant and was assured that confidentiality, privacy would consider and each participant had the right to withdraw from the study at any time.

Statistical analysis: Data were analyzed by computer software package SPSS15.0).

Results

The results were given in tables (1, 2, 3 & 4) and figure (1).

Table 1: Percentage distribution of study participants by groups:

Hospital	ICUs groups	No. of nurses	%
Al-Galaa hospital	Internal medicine ICU	9	14
	Neurology ICU	13	18
Nephrology hospital	Dialysis ICU	9	14
Trauma hospital	Neurosurgical ICU	13	18
Pediatric hospital	Pediatric ICU	13	18
Oncology Hospital	Oncology ICU	13	18
Total		70	100

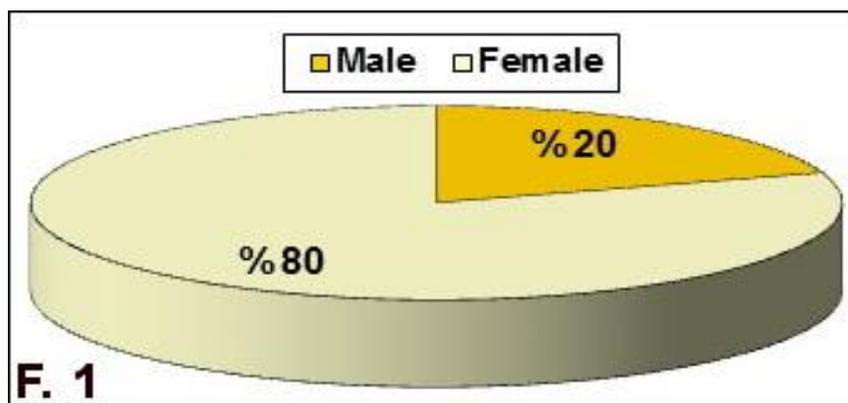


Fig. 1: Percentage of study participants by sex

Table 2: Percentage distribution of study participants by education

Educational level	No.	%
Nursing school diploma	41	58.6
Technical nurses	9	12.9

Table 3: Exposure of nursing staff to psychological hazards in ICUs

Psychological risk	Pediatric		Neurosurgery		Oncology		Internal medicine		Renal dialysis		Neurology		Total
	No. (11)		No. (10)		No. (12)		No. (12)		No. (13)		No. (12)		
	No	%	No	%	No	(%)	No	(%)	No	(%)	No	(%)	
Stress	9	81.8	9	90	12	100	11	91.6	13	100	10	83.3	64
High work load	6	54.5	7	70	11	91.6	11	91.6	12	92.3	7	58.3	54
Violence	2	18.1	4	40	2	16.6	2	16.6	1	7.6	2	16.6	13
Conflict with peer	7	63.6	6	60	6	50	8	66.6	6	46.1	7	58.3	40
Job dissatisfaction	5	45.4	5	50	7	58.3	3	25	3	23	3	25	26
Lack cooperation	3	27.2	4	40	8	66.6	6	50	5	38.4	6	50	32

Table 4: Exposure of nursing staff to environmental hazards in ICUs:

Environmental risk & ergonomic problem	Pediatric		Neurosurgery		Oncology		Int. medicine		R. dialysis		Neurology		Total
	No	%	No	%	No	%	No	%	No	%	No	%	
Fatigue	10	90.9	9	90	12	100	11	91.6	12	92	10	83.3	64
(lifting /moving patient)	5	45.4	9	90	11	91.6	8	66.6	7	54	8	66.6	48
Prolonged standing (back pain, varicose)	10	90.9	9	90	12	100	12	100	10	77	10	83.3	63
Chemical/radiological/ pathological wastes	2	18.1	1	10	4	33.3	5	41.6	2	23	1	8.3	13
Hazardous waste(dressing)	4	36.3	3	30	2	16.6	6	50	9	75	4	33.3	28
Needle pricks, sharps injuries	8	72.7	5	50	11	91.6	10	83.3	13	100	7	58.3	51
Mercury	5	45.4	2	20	6	50	6	50	2	15	5	41.6	26
Allergy from latex gloves	6	54.5	6	60	8	66.6	9	75	7	54	8	66.6	44
Allergy from poor ventilation	5	45.4	5	50	9	75	8	66.6	6	46	7	58.3	40
Eye strain from poor lighting	4	36.3	4	40	8	66.6	5	41.6	1	8	5	41.6	27
Overcrowding /traffic problem	2	18.1	2	20	3	25	6	50	1	8	2	16.6	16
Insufficient emergency exits	2	18.1	2	20	4	33.3	4	33.3	1	8	4	33.3	17
Falling/slipping accidents	2	18.1	4	40	6	50	7	58.3	1	8	6	50	26
Lack, job organization	1	9	4	40	2	16.6	5	41.6	5	39	4	33.3	21
Injuries from fire (burn /suffocation)	1	9	1	10	3	25	1	8.3	2	15	3	25	11

Table 5: Exposure of nursing staff to biological hazards in (ICUs)

Biological Risk	Pediatric		Neurosurgery		Oncology		Int. medicine		R. dialysis		Neurology		Total
	No.	%	No	%	No	%	No	%	No	%	No	%	
Air borne	6	54.5	4	40	10	83.3	11	91.6	7	53.8	9	75	47
HCV	6	54.5	6	70	8	66.6	12	100	8	61.5	7	58.3	47
HBV	4	36.3	5	50	6	50	11	91.6	8	61.5	7	58.3	41
HIV	2	18.1	2	20	6	50	6	50	3	23	3	25	22
Food borne infection	5	45.4	3	30	4	33.3	5	41.6	2	15.3	5	41.6	24
Contact infection	6	54.5	3	30	5	41.6	8	66.6	3	23	7	58.3	32

Table 6: Exposure of nursing staff to physical hazards in ICUs

Physical Risk	Pediatric		Neurosurgery		Cardiothoracic		Int. medicine		R. dialysis		Neurology		Total
	No.(11)		No. (10)		No. (12)		No. (12)		No. (13)		No. (12)		
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
Radiation & laser	5	45.4	5	50	6	50	6	50	2	15.3	7	58	64
Noise	4	36.3	6	60	7	58.3	8	66.6	3	23	6	50	48

Table 7: Exposure of nursing staff to chemical hazards in ICUs

Chemical Risk	Pediatric		Neurosurgery		Oncology		Int. medicine		R. dialysis		Neurology		Total
	No. (11)		No. (10)		No.(12)		No.(12)		No.(13)		No. (12)		
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
Pesticides, disinfectants	7	63.6	4	40	4	33.3	6	50	4	30.7	7	58.3	32
Anesthetic gases	3	27.2	4	40	4	33.3	4	33.3	1	7.6	4	33.3	20
GIT problems by water treated substances	2	18.1	4	40	5	41.6	6	50	1	7.6	7	58.3	25

Discussion

The present study was showed that exposure to stress was the highest exposure at oncology and renal ICU (100%). This could be due to shortage, heavy work load and dealing with difficult or seriously ill patients. Increase number of working nurses could minimize stress and work load. Murphy (2013) mentioned that nurses have found the following factors to be linked with stress: work overload, time pressure lack of social support at work especially from supervisors, head nurses, and higher management exposure to infectious diseases needle stick injuries exposure to work-related violence or threats sleep deprivation. Aiken *et al.* (2013) added several studies in the Unit-

ed States have confirmed the relationship between nurse staffing load, and patient outcomes.

The present results showed that exposure to violent events (40%) in neurosurgical ICU this finding may due to presence of acute and critical cases that in agreement with Mayhew and Chappell (2013) violent events included verbal abuse, threats, assaults, bullying and others. Nurses 37% reported being assaulted. This agreed with the Franx (2005) who in Netherlands surveyed 200,000 physicians and nurses from 130 general hospitals; 21 showed that 90% suffered mental and physical violence and (50%) of staff were threatened with weapons.

This present result showed that there were

statistically significant difference between nurses' opinion related to environmental risk as regard ergonomic problem (lifting/moving patients) with statistical significant ($P=0.01$). Hajaghadzadeh *et al.* (2019) in Iran reported that construction workers were at greater risk of musculoskeletal disorders due to their exposure to physical ergonomic risk factors and studied quantify ergonomic hazards for workers in the construction of residential buildings. They concluded that in the construction of residential buildings with the concrete structure, workers perform their task with non-neutral postures of trunk and leg and handling heavy loads. Consequently, the hospital health care workers (especially nursing assistants, who do a majority of the lifting in many facilities) may develop musculoskeletal injuries such as muscle and ligament strain and tears, joint and tendon inflammation, pinched nerves, herniated discs and others from patient/residents handling.

The present study showed that medical & surgical (ICUs) exposure to falling / slipping accidents for medical and surgical ICUs were statistically significant difference, this finding due to the type of care in medical ICUs each of these activities involves multiple interactions with handling or transferring of patients and could result in employee injuries. This consistent study was done by in intensive care units many patients are totally dependent on staff members to provide activities of daily living, such as dressing, bathing, feeding, and toileting (CDC, 2012). Each of these activities involves multiple interactions with handling or transferring of patients and could result in employee injuries. Employee exposure to ergonomic stressors in healthcare workplaces occurs not only during patient handling tasks, but also patient lifting in particular is a major cause of injury to healthcare workers. One must realize that infections in ICUs are different from traditional infections. The population of infected people, the ICU environment, and the biological characteristics of the microorganisms all suggested that treatment of

ICU infection lies in a series of measures centered on the prevention and control of nosocomial infections, rather than the excessive use of antibiotics. The focus on environmental and air cleanliness, preventing colonization from turning to pathogenesis, and reducing pathogenic pathways enhanced pathogen clearance. Su *et al.* (2019) in China stated that they hoped to protect every critically ill patient from the infection or infestation of new pathogens or the exacerbation of existing infections. This was the real essence of ICU infection therapy, and was the only way to solve future risky infections and drug resistance (CDC, 2013).

Grist *et al.* (2003) in USA found employee exposure to wet floors or spills and clutter that led to slips/trips/falls and other possible injuries which is in agreement with the present study finding which revealed the highest exposure was internal medicine (58.3%).

The present study found that exposure to needle stick injuries hazards was highest (100%) in dialysis ICU this may be due to frequent deal with arterio-venous fistulas in hemodialysis patients. Needle stick injuries are a common event in the healthcare environment. When drawing blood, administering an intramuscular or intravenous drug, or performing other procedures involving sharps, needle can slip and injure the healthcare worker. This allowed for transmission of pathogens. Injuries also occurred during needle recapping or failure to place used needles in the sharps containers. Also, lack of access to or failure to use appropriate personal protective equipment can cause needle stick injuries. Night shifts also put practitioners at risk for needle stick injuries (Abdel-Motagaly *et al.*, 2017).

The present study results revealed that nursing staff those working in internal medicine ICU were the highest percentage of exposure to HCV (100%). Pria (2015) added that exposure to biological hazards, such as HIV, Hepatitis B and C, was estimated to have a serious impact on medical staff. A study of health care workers in three Indian

hospitals reported that 60% of the 100 respondents (35 of whom were nurses) confirmed that contact with blood and without the benefit of personal protective equipment. Westermann *et al.* (2015) found that healthcare personnel are at risk for occupational exposure to blood borne pathogens, through needle sticks or cuts from other sharp instruments contaminated with an infected patient's blood or through contact of the eye, nose, mouth, or skin with a patient's blood. Clark *et al.* (2012) found that healthcare workers were at serious risk of contracting nosocomial infectious diseases due to air-borne and contamination factors as poor ventilation and fungal contamination of the ventilation system that have been linked to the spread of nosocomial infections among patients may also impact staff.

The present results revealed that nursing staff working in internal medicine ICU were the highest percentage of exposure to HCV (100%). Pria (2005) found that exposure to biological hazards, such as HIV, Hepatitis B and C, is estimated to have a serious impact on medical staff. A study of health care workers in three Indian hospitals reported that 60% of 100 respondents (35 were nurses) confirmed that contact with blood and without personal protective equipment.

Moreover, Bianco *et al.* (2019) evaluated the risk of HCW needle-stick injuries in a tertiary university hospital in southern Italy in relation to some HCW characteristics (age, sex, professional profile, and work department) and the source of infection. All HCWs of the University Hospital "Federico II" in Naples, Italy, attending the Infectious Diseases Unit after potential accidental contact to blood-borne viruses through needle-stick injuries were enrolled during a 22-year period. They concluded that some profiles, namely physicians, nurses and healthcare assistants, are still at risk of needle-stick injuries, especially in surgical areas, including obstetric wards. Apart from blood-borne viruses, four blood protozoa could be transmitted by needle-stick injuries are malaria,

babesiosis visceral leishmaniasis and toxoplasmosis (Saleh *et al.*, 2017) which are all encountered in Egypt (El-Bahnasawy *et al.*, 2014) and *Trypanosoma cruzi* or American trypanosomiasis (Herwaldt, 2001). Further primary and secondary prevention strategies are needed to decrease the incidence of new cases of needle-stick injuries.

On the other hand, air-borne diseases were found to be the lowest percentage among surgical ICU which deal with post-operative care rather than chronic disease this may due to lack of protective equipment and lack awareness of universal precautions. Similarly, Clarke *et al.* (2002) reported that healthcare employees were at serious risk of contracting infectious diseases from patients due to air-borne and surface contamination factors such as poor ventilation and fungal contamination of the ventilation system that were linked to the spread of nosocomial infections among patients may also impact staff. Kasina *et al.* (2016) in Sweden stated that lowering air-borne bacteria counts in the operating room was essential in prevention of surgical site infections. They concluded that single-use polypropylene clothing systems replaced mobile laminar airflow unit-assisted reusable mixed material-clothing systems. Measurements in standardized laboratory settings only serve as guidelines as environments in real operation settings present a much more difficult challenge.

This study result showed that the exposure to radiation hazards it was highest in neurology ICU (58%) due to bed ridden patients with difficult to transfer to x-ray department, lack of protective equipment and ineffective rules of regulation in hospital. This agreed with Simon and Linet (2014) in USA. They stated that a person exposed to natural or manmade ionizing radiation originated from environment and in medical and/or occupational settings. They added that adverse health effects associated with radiation exposure was known for decades, and ionizing radiation exposure attributed to a wide

range of different types of cancer and benign neoplasms as well as birth defects, reproductive effects, and diseases of the circulatory, hematologic, and neurologic systems.

The current study showed that exposure to radiation hazards was highest in neurology unit (58%) due to bed ridden patients with difficult to transfer to the x-ray department, lack of protective equipment and ineffective rules of regulation in hospital. Wang *et al.* (2018) in China stated that long-term low doses of ionizing radiation could affect the radiation worker's health, especially those engaged in the nuclear medicine and radiotherapy. They must pay attention to the occupational health care and management to ensure radiation worker's health. The present study result showed significant difference between nurses' opinion related to chemical risk as regard GIT problems due to water treated substances exposure (87.5%), due to lack of hospital notification system about water treatment unit and lack of awareness about the ways of exposure to these hazards.

El-Bahnasawy *et al.* (2015) in Egypt reported that the insecticide is an agent used against insects, ticks, mites and other animals affecting human welfare. They added that exposure to Insecticides is one of the most important occupational risks among staff worker in Military camp, veterinary medicine, industry, household, schools and hospitals. The present study, revealed that lack of awareness about (insecticides and chemical disinfectant) was highest exposure at cardiothoracic unit (83.3%) while the lowest was pediatrics unit (9%) with statistical significance difference were detected between different ICUs.

Conclusion

Nursing staff in the intensive care units were exposed to so many occupational hazards. There were no hospital regulation for the identification of occupational hazard and the risk related to job of nursing staff in intensive care units. There was no design for occupational hazard control plans inside all intensive care units.

Recommendations

- 1- Hospital should encourage training program about risk management among nursing staff for identifying the type of hazard and risk related to the job and controlling risks.
- 2- Hospital should design rules and regulations to define different occupational hazards and risks in a clear and simple way.
- 3- Hospital control plan should be implemented in different departments of hospitals and considered different in intensive care units regarding risk exposure during set of standards.
- 4- Safer work environment may be achieved by implementing adequate educational programs tailored specifically to house officers, and policies encouraging exposure reporting should be developed.
- 5- Continues training programs about infectious diseases acquired by needle stick injury must be developed on regular basis,

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