



## EFFECTIVENESS OF AN EDUCATIONAL PROGRAM ABOUT BIOLOGICAL HAZARD SAFETY MEASURES KNOWLEDGE AMONG CRITICAL CARE NURSES

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### ABSTRACT

**Background:** communicable and contagious diseases and exposure to blood-borne pathogens make critical care nurses expose to biological work place hazard. The aim of the study was to assess the effectiveness of an educational program on critical care nurses' knowledge about safety measures of biological hazard.

**Methodology:** It was a pre/post interventional, hospital-based study, study subjects were 200 intensive care nurses (34 males 17% and 166 females 83%) working for one year or more in critical care settings (8 units) in five public hospitals, Khartoum state, Sudan. A structured face to face questionnaire was used pre and posttest. A program done by lectures about biological hazard, causes, and safety measures, sitting group's discussion and direct individual educational sessions, interview was carried with each hospital's matron.

**Results:** Knowledge about biological hazard as work place hazards was 100% in both pre and post results. Regarding preventive measures of biological hazard, participants showed different values in answer like uses of personal protective equipment (PPE) mentioned by 99% in preprogram test while hand washing was mentioned by 49.5% in pretest evaluation, Personal protective equipment was poorly provided.

**Conclusion:** The educational program for critical care nurses had efficient results, as the noticeable improvement of results of critical care nurses' knowledge about universal precautions.

**KEYWORDS :** Biological hazard, critical care nurses, safety measures

### INTRODUCTION:

Critical Care Settings are the units offering potentially life-saving intervention during physiological crises, called intensive care units, critical care nurse or intensive-care nurse: a professional registered nurse who works in an intensive-care unit. Receives the patient into the ward, gives him/her the necessary personal treatment, connects him, according to need, to the appropriate medical system (e.g. respiratory instruments, artificial-feeding set-up, blood and plasma transfusion system, measuring and monitoring systems, etc.)

Critical care nurses expose to biological hazards in the work, giving care for patients presents nurses with a real risk for infectious diseases, from blood or body fluids, droplets in the air, or direct contact. Blood-borne pathogens of major concern include human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus. Infections transmitted by air-borne particles include cytomegalovirus (CMV), tuberculosis (TB), and meningococcal disease. Direct contact with secretions infected with herpes simplex virus produces herpetic whitlow. Severe acute respiratory syndrome (SARS), TB, and methicillin resistant staphylococcus infection are other infectious diseases that can afflict nurses. [1, 4, 12, 13]

Methods of minimizing exposure to blood and body fluids are known as universal precautions or body substance isolation (BSI), since the infection status of patients is usually unknown, all patients should be considered potential carriers of HIV, HBV, and other blood-borne pathogens. [1, 11, 14, 15, 16]

Nurses must observe rigid, standardized guidelines to guard against diseases and other dangers posed by work hazards. Cost to prevent, control, and treat occupationally acquired illness is considerable, in terms of both moneys spent and lives affected.

### Methodology

This study was pre - post-intervention, one group, hospital-based study carried out during 2017, (8 Intensive care units in Khartoum state, 5 governmental hospitals) Sudan, conducted to evaluate effectiveness of educational program about biological hazard safety measures on nurses who work in critical care units.

Study population was all nurses working in critical care units, for one year or more, all were three hundred and twenty (320) nurses. two hundred (200) nurses agreed to participate, the

rest of the population dropped because of an individual or institutional causes.

An interviewing structured closed ended questionnaire was used as study tool, to identify nurses' knowledge about biological hazard as one of work place risks, causes, and methods of prevention.

After the first questionnaire administered, an educational program was conducted by lectures in each hospital conference hall consisting purposes of occupational health, occupational hazards types, causes, preventive methods of infectious work place hazard, provision of personal protective equipment (PPE), and training session on universal standard precautions. same contents taught in the prescribed units as sitting group's discussion, and direct individual educational session.

Interview with key persons (I.K.P), with hospital matron for discussion of causes of gaps in supply of personal protective equipment, pre-employment education about safety measures.

Data were assessed, and analyzed by (SPSS), Significance differences of results tested by Pearson's chi square, the p value was accepted below 0.05.

### Ethical Considerations

Many formalities were done before starting data collection, ethical approvals to carry out the study was obtained, formal letter was sent to hospitals general director, and directed to hospital's research manager.

### RESULTS

The study sample consisted of 200 nurses working in critical care areas 17% were male, 43.5% more than the half (67%) held bachelor degree.



Figure 1. Shows participants' experience length in years

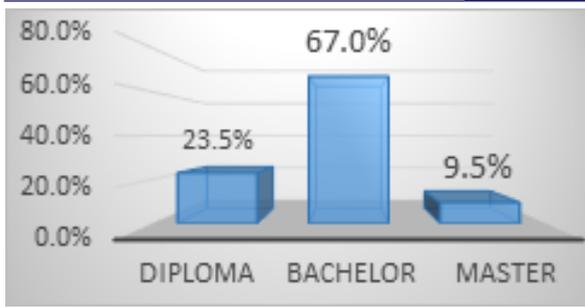


Figure2. Respondents' graduation level of participants

Table 1. Knowledge of critical care nurses about biological hazard as a type of occupational hazards and its main causes

Assessing nurses about the presence of biological hazard and its causes	Pretest %		Posttest %		P
	right answer	wrong answer	right answer	Wrong answer	
Do you face (infectious) hazard in work?	199 99.5%	1 0.5%	200 100 %	0 .0%	1.0
What are the main causes of biological hazard?	200 100 %	0 .0%	200 100 %	0 .0%	-

Respondents' knowledge about biological hazard and its causes was high in pretest result.

Table 2. Knowledge of critical care nurses about preventive measures of biological hazard in work

Knowledge about prevention methods of biological hazard	Pretest %		Posttest %		P
	Right answer	Wrong answer	Right answer	Wrong answer	
By uses of PPE	198 99%	2 1%	200 100.0%	0 .0%	0.499
by hand washing	99 49.5%	101 50.5%	199 99.5%	1 0.5%	.000
by uses of effective germicide	13 6.5%	187 93.5%	183 91.5%	17 8.5%	.000
proper handling, disposal of sharp objects	32 16%	168 84%	196 98%	4 2%	.000

In pretest, about half of participants mentioned prevention by hand washing while vast majority mentioned it in posttest. Less than quarter of respondents mentioned the right answer in pretest while most of them mentioned the right answer in posttest.

Tables 3. Knowledge of nurses about the component of universal precautions that prevent infectious

What are the components of universal precautions that prevent infectious hazards	Pretest %		Posttest %		P
	Right answer	Wrong answer	Right answer	Wrong answer	
1-Hand washing	69 34.5%	131 65.5%	200 100.0%	0 .0%	.000
2-PPE	86 43%	114 57%	200 100.0%	0 .0%	.000
3-Preventing and managing sharp injuries	16 8%	184 92%	198 99%	2 1.0%	.000

4-Aseptic technique	6 (3%)	194 (97%)	196 (98.0%)	4 (4%)	.000
5-Isolation	11 5.5%	189 94.5%	195 97.5%	5 2.5%	.000
6-Staff health	3 1.5%	197 98.5%	190 95.0%	10 5.0%	.000
7-Linen handling	2 1%	198 99%	191 95.5%	9 4.5%	.000
8-Waste disposal	6 3%	194 97%	188 94%	12 6%	.000
9-Spillage of body fluid care	2 1%	198 99%	182 91%	18 9%	.000
10-Environmental cleaning	15 7.5%	185 92.5%	186 (93%	14 7.0%	.000
11-Risk management and assessment	2 1%	198 99%	174 87%	26 13%	.000

Pretest value was very low and posttest value was improved.

Table 4. Personal protective equipment availability in critical care areas in Khartoum state, 5 public hospitals

Personal protective equipment availability in study areas	Pretest %		Posttest %		P
	Available	Not available	Available	Not available	
1-Face mask availability	169 84.5%	31 15.5%	171 85.5%	29 14.5%	.889
2-Disposable gloves	200 100.0%	0 .0%	200 100.0%	0 .0%	
3-Plastic gown	14 7%	186 93.0%	13 6.5%	187 93.5%	1.000
4-Safety glasses	0 .0%	200 100.0%	0 .0%	200 100.0%	
5-Shoes covering	8 4%	192 96%	7 3.5%)	193 96.5%	1.000
6-Face shield	0 .0%	200 100.0%	0 .0%	200 100.0%	
7-Plastic caps	16 8%	184 92%	14 7%	186 93%	.850

availability of facemasks showed small changes in the second assessment results. Plastic gowns available in one unit from the study areas. Shoes covers was available in one unit from study areas. No study area had face shield available before.

**Interview with hospital's matron results**

There was similarity in all matrons' talks, especially in PPE provision, they said disposable gloves available in all hospital wards. Face masks, plastic apron and head covers not regularly provided, the rest of PPE not provided. The shortage of PPE due to low income and credit in ministry of health, the set of PPE is very expensive. new nurses not have planned pre-employment safety program, they should have orientation talk about hospital and sometimes, occupational

health mentioned in term of safety practice. No hospital recruited occupational health nurse.

## DISCUSSION

200 critical care nurses were evaluated for the effect of educational program about presence of biological hazard in work place, the possible causes, and the universal preventive measures suitable for this kind of hazards, the majority of them (67%) held bachelor degree, and 83% were female a similar ratio of university graduate nurses was reported by Sikuru Land Hanifa S, published 2010.

Participant knowledge about facing biological hazard in work place was high (99.5%) in pretest (table 1), that support finding in a study published in 2015 assessed the occupational health hazards faced by healthcare workers by Rawlance Ndejjo et al. Makerere University, Kampala, Uganda, found more than 40% of respondents faced work biological hazard, also another study in Sudan by Anwar Abbas Ahmed studied occupational hazards affecting dental manpower in Khartoum state, 2004. the results revealed high knowledge of the respondents about biological hazards (95.9%).

The study highlights the clear effectiveness of study interventions evidenced by the improved results of CCNs knowledge about preventive measures in post program evaluation (table 2), for hand washing as one preventive methods, participants showed 49.5% in pretest while posttest elevated to 99.5%, Participants showed high knowledge about ways to prevent biological effect by use of personal protective equipment (100%). This is similar to the results found in other studies, (the results from Philippine revealed that the high knowledge of the respondents about biological hazards 95.9%), Nigeria, Uganda. [18, 24]

Participants' knowledge about universal standard precautions was improved as value appears in (table 3).

Use and compliance with utilization of PPE has been recognized as important infection control measure in the healthcare industry, despite these recommendations, PPE provision contracting with that mention above in (table 4) is not proper in our study areas, gaps appear in plastic aprons and face masks supplies, face shield, and shoes covers never been provided to that areas. Prevention of biological hazards by adherence to PPE, took place in many previous studies, no study mentioned gaps in PPE provision except this study and other two studies carried out in Uganda and Namibia, which represented similar situations in African developing countries.

Based on the descriptions of American Board for Occupational Health Nurses (ABOHN), [24] The Roles and Responsibilities of Occupational Health Nurses are clinical activities, administrator, educator/advisory roles. These great roles of occupational health nurses are absent in our study areas because there is no assigned nurse for this job, similar to what is found in Amosu, A. M study published in 2011 about prevention of occupational hazards in Nigeria. [17]

## CONCLUSION

Those in the nursing profession are susceptible to occupational hazards, nurses need to follow universal safety practice measures, unavailability of personal protective measures, overload of work, and the inefficient role of the occupation health department, are the main points reported by participants.

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