

Evaluating the Effect of an Educational Intervention on Nurses Knowledge & Compliance Using Personal Protective Equipment in ICU

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Abstract:

Background: Personal protective equipment is special equipment you wear to create a barrier between health care. This barrier reduces the chance of touching, being exposed to, and spreading germs. **Aim of the study:** Evaluating the Effect of an Educational Intervention on Nurses Knowledge & Compliance Using Personal Protective Equipment in ICU. **Subjects and Methods:** **Research design:**, Quasi experimental design was utilized at the study. **Setting:** The study was conducted at ICU Department in Benha University Hospital. **Subjects:** All male and female nurses (56 working at ICU department were recruited for the study. **Tools of data collection:** structured interviewing questionnaire was designed to assess nurse's knowledge, Compliance Scale was used to evaluate the nurses' compliance, An educational intervention was implemented. **Results:** There were statistically significant differences between nurses' knowledge pre/post about personal protective equipment pre / post program& and nurses' compliance to personal protective equipment pre / post program.. **Conclusion:** The study concluded that the educational intervention was effective and its results had great improvements on nurses' knowledge and compliance after the using of the personal protective equipment than ever before. **Recommendations:** Further studies are needed for developing standard of safe environment, and manual for safety measures in the ICU, A studying the relation between the application of safety personal protective equipment and the incidence of complications.

Keywords: Educationa, Nurses knowledge, Compliance, personal protective equipment, ICU, Intervention.

Introduction:

Workers often need to wear protective equipment to be protected from injury, illness and death caused by exposure to workplace hazards. Occupational safety and health administration ⁽¹⁾.believe that workers are more likely to cooperate in achieving full compliance with existing standards if workers are aware of the potential health hazards in the workplace.

In addition, the Occupational Safety and Health Act of 1970 mentioned that workers have the right to know the health hazards they are exposed to in the workplace ⁽²⁾.Health care professionals and particularly nurses are often exposed to microorganisms, many of which can cause serious or even lethal infections ⁽³⁻⁵⁾. In 1996, the Centers for Disease Control and Prevention (CDC) issued the Standard Precautions, a set of guidelines to prevent exposure⁽⁶⁾, but unfortunately, despite

the simplicity and clarity of these guidelines, compliance among nurses is reported low ⁽⁷⁻¹⁰⁾. Although high incidence of occupational exposure to microorganisms is observed among all health care professionals ⁽¹¹⁻¹³⁾, Compliance has been defined in many ways ^(17,19). The law of safety and health in work of the republic of Cyprus and others Offered widely accepted definition of compliance within health care settings ⁽²⁰⁾. nurses are among those who are more highly exposed. ⁽¹⁴⁾

Occupational exposure can occur in different modes. These modes include contact (direct and indirect) transmission, droplet transmission, airborne transmission, percutaneous exposure and mucus membrane exposure. Many pathogens may share more than one and Personal protective equipment (PPE) helps prevent the spread of germs in the hospital. This

can protect people and health care workers from infections. All hospital staff, patients, and visitors should use PPE whenever contact with blood or other bodily fluids may occur. (According to this definition, compliance is the extent to which certain behaviour (for example, following physician's orders or implementing healthier lifestyle) is in accordance with the physicians' instructions or health care advice. Compliance can be influenced or controlled by a variety of factors like culture, economic and social factors, self-efficacy, and lack of knowledge or means. Guidelines that guide an individual's behaviour exist in a variety of settings (including health care settings), but people do not always comply with them.

Studies have shown that compliance with precautions among nurses in order to avoid exposure to microorganisms is low. More specifically, compliance was found inadequate concerning hand hygiene guidelines^(20,24), use of gloves when exposure to body fluids was anticipated^(10,23-25), eye protection^(6,7,26,27), mouth and nose protection (mask use)^[6,7,10,26], wearing a gown when required^(7,10,27), avoid recapping the needle after it was used for a patient⁽¹⁰⁾ and provision of care considering all patients as potentially infectious.^(28,29)

Therefore, compliance with personal protective equipment is very important to prevent infectious pathogens transmitted from patient to nurse and vice versa is true. Furthermore, correctly select and use of personal protective equipment is very effective to prevent transmission of infection, in addition to reduce the risks of exposure for infectious agents.

Significance of the study:

Hazards exist in every workplace in many different forms: sharp edges, falling objects, flying sparks, chemicals, noise and a myriad of other potentially dangerous

situations. The Occupational Safety and Health Administration (OSHA) requires that protecting their employees from workplace hazards that can cause injury by Controlling a hazard is the best way to protect employees. Depending on the hazard or workplace conditions, Occupational Safety and Health Administration recommends the use of health or work practice controls to manage or eliminate hazards to the greatest extent possible. Personal protective equipment reduces the risk of injury or harm to users caused by hazards present in the work place. These measures that make the workplace safe include the provision of instructions, procedures, training and supervision to encourage nurses to work safely and responsibly.

Aim of the study:

The aim of the current study was to evaluating the effect of an educational intervention on nurse's knowledge & compliance using personal protective equipment in ICU

Study Hypothesis:

There will be significant difference between nurses' knowledge and compliance with using the PPE before and after the implementation of the educational intervention.

Subjects and Methods:

Research design:

A quasi experimental design was utilized in the study. Subjects were given a pre-test, received the educational intervention and then were given a post-test. Subjects act as their own controls and intervention data were analyzed for difference.

Study setting:

The study was conducted at the ICU Department in Benha University Hospital.

Study subjects:

A Convenience sample was used (All male and female nurses, 56 nurses) working at the ICU

Department and their ages ranged from (21-40) or more were recruited for the study.

Tools of data collection:

Two tools were used for data collection:

1-A structured Interviewing

Questionnaire: was used designed by researcher's to assess nurse's knowledge before and after the educational intervention it comprises personal data, nurse's complains, nurse's knowledge regarding personal protective equipment and hospital health hazards.

2-Compliance Scale: designed was used to evaluate the nurse' compliance with using of personal protective equipment before and after the educational intervention.-The previously mentioned tools were used for assessing nurses' score knowledge and each sub-item was given one point; and nurses' compliance was classified into always, usually, sometimes, rarely.

-Educational Intervention:

An extensive review of literature was carried out about: Definition, importance and types of personal protective equipment, importance and method of hand washing methods of wearing and removing personal protective equipment the educational intervention also included objective, content, teaching activities. methods of evaluation for both knowledge and compliance.

Content Validity and reliability:

Face and content validity were done for the tools by five expertises in the working of medical and critical departments and necessary modifications were done, accordingly the reliability of the tools was tested using the internal consistency method. It proved to be high with Cronbach's alpha reliability coefficients 0.902.

Field work:

-An official permission was taken by the researchers from Benha University Hospital to carry out the study.

-The tools of the study were translating to Arabic language and reviewed by a jury of five expertise professors from medical & critical departments before the researcher distributed it for nurses.

-All nurses who were included in this study have been informed about the purpose and the nature of the study.

-To test the nurse's knowledge and compliance pre-test sheets/questions were distributed by the researcher and filled in by the nurses.

-The educational intervention was developed based on the results of the pre-test data. It was carried out through five sessions and the allowed time was (30- 40) minutes for each session.

-These sessions include information about definition, importance and types of personal protective equipment, importance and method of hand washing, methods of wearing and removing personal protective equipment.

-Four weeks after the last session the researchers gave the post-test to detect the improvement of nurses' knowledge through the structured questionnaire while compliance with the use of the personal protective equipment was tested through compliance scale. This phase of the procedure included 5 sessions (20 - 25minutes) for each session.

Pilot study:

The pilot study was carried out on six nurses (about 10% of the total sample) to test the clarity and applicability of the study tools, as well as to estimate time needed to fill in the questionnaire. Required modifications were done. Nurses involved in the pilot study were excluded from the main study sample.

Administrative &Ethical considerations:

Oral consent was taken from each participant. They were informed that the data collected will be used for the research only, and confidentiality is assured.

Statistical analysis:

Obtained data were presented as mean \pm SD, ranges, numbers and ratios. Results were analyzed using paired t-test for inter-group comparisons, Wilcoxon ranked test for unrelated data (Z-test) for comparison versus control group and Chi-square test (X^2 test) for comparisons of percentages and numbers. Statistical analysis was conducted using the (SPSS) Statistical Package for Social Services (Version 15, 2006) for Windows statistical package. P value <0.05 was considered statistically significant.

Results:

Table (1) Shows, the distribution of nurses' socio-demographic data, as regards to sex (96.4%) of nurses were female. Regarding to age less than three quarter of their age ranged from (71.4%) had age 21-30. Concerning marital status more than half of nurses (57.1%) were married.

Table (2) Displays, the distribution of hazards that the nurses are exposed to inside hospital. As regards to biological hazards, the highest percentage was 67.9% for blood. Considering awareness to potential harm the majority of nurses (85.7%) were aware of harm. The same table shows, methods of disposing of sharp objects, the majority of nurses with equal percentage was (89.3%) were disposing them in specialized container and they were aware of potential harm of when exposed to chemicals. As regards to types of accidents that the nurses confront at hospital more than half of nurses (57.1%) were exposed to needle stick and (71.4%) of them received vaccination for infectious disease at hospital.

Table (3) shows statistically significant difference between nurses knowledge about personal protective equipment pre/post program implementation in items of definition and purpose ($t=2.02, 2.35$, at $p<0.05$) respectively. However this table shows that there were highly statistically significant differences between nurses knowledge about personal protective equipment pre /post program implementation in items of importance, types, potential risk and different health hazards ($t= 7.96, 10.24, 6.71$ & 5.39 , at $p<0.001$) respectively.

Table (4) shows that, there were statistically significant differences between nurses' knowledge about usage of personal protective equipment pre / post program implementation in item Hand washing with soap and water or alcohol rub, and PPE eliminates need for hygiene ($p<0.05$).As well were there a highly statistically significant differences; in items; PPE interferes with patient treatment and nursing care, wash hands with alcohol when soiled and PPE is available in ICU ($p<0.001, <0.006, <0.006$ respectively, While there were no significant statistically differences in items; improve compliance to recommended PPE, punishment for staff who don't wear protective equipment and Type of punishment ($p=>0.05$).

Table (5) reveals that, there were statistically significant differences between nurses' compliance to personal protective equipment pre / post program implementation in all items except items number 6,9,11,17,19 and 21 ($t= 1.83, 1.95,1.78,1.89,$ and 1.75 , at $p=>0.05$) respectively where the difference were insignificant .

Table (6) shows that there were highly statistically significant relation between nurses' marital status and their knowledge about personal protective equipment preprogram implementation ($t= 13.98$, ($p<0.007$).

Table (7) indicates that there were no statistically significant relations between nurses' socio-demographic data and their knowledge about personal protective equipment post program implementation.

Table (8) shows that there were no statistically significant relations nurses' socio-demographic data and their compliance to personal protective equipment preprogram implementation.

Table (9) reveals that there were no statistically significant differences between nurses' socio-demographic data and their compliance to personal protective equipment post program implementation.

Table (10) showed that there were a correlation between nurses' knowledge and their compliance to personal protective equipment post program implementation ($r=0.50$, at $p<0.05$).

Discussion:

Close contact is defined as a) any person who provided care for the patient, including a healthcare worker or family member, or had similarly close physical contact; or b) any person who stayed at the same place (e.g. lived with, visited) as the patient while the patient was ill Tait et al ⁽²⁹⁾. So, standard precautions, a cornerstone for providing safe health care and reducing the risk of further infection, should always be applied in all health-care settings. The study was carried out for the purpose of evaluating the effect of an educational intervention on nurse's knowledge & compliance using personal protective equipment in icu. as regards to socio-demographic data of nurses, the present study revealed that, regarding to sex most of nurses were female. Regarding to age for less than three quarter of sample there age ranged between 21-30. for marital status more than half of nurses was were married.

Concerning nurses' knowledge about personal protective equipment

pre / post program implementation, the present study finding that, there were statistically significant differences between nurses' knowledge about personal protective equipment pre / post program implementation in items of definition of wearing PPE and purpose respectively. However there were highly statistically significant differences between nurses' knowledge about personal protective equipment pre /post program implementation in items of importance, types, potential risk and different health hazards and respectively. This finding on line with that of another study by khatab ⁽³⁰⁾. nurses' where had unsatisfactory knowledge regarding IC measures preprogram this may be due to that the majority of the studied nurses were not qualified and their years of experience were less than 5 years, This finding was incongruent with those of another study Abo shadi ⁽³¹⁾ who found that about two third of the studied nurse had satisfactory knowledge about infection , but this finding was similar to that of another study Alexander ⁽³²⁾ which found that more than two third of the studied nurses had unsatisfactory knowledge related to infection . According to another study krenzicheck & Clifford ⁽³³⁾ which stated that only well trained personnel should conduct cleaning and disinfection of sterilization procedures and should be knowledgeable about cleaning and disinfection of endoscope and the infectious and chemical hazards associated with these procedures another study CDCP ⁽³⁴⁾ stated that, when deciding whether to sterilize or disinfect the endoscope, it is important to refer to the levels of sterilization. Additionally Stain ⁽³⁵⁾ a study on patient safety emphasized that

orientation lecture is to be given to all newly employed personnel at any department including IC principles, policies, and basic knowledge of hygiene, and infectious diseases. World alliance for patient safety.

According to the W A P S⁽³⁶⁾ each year an estimated 100 million workers are injured, 200,000 die each year in occupational accidents and 68 million to 157 million new cases of occupational disease are attributed to hazardous exposures in work places. Such high numbers of adverse health outcomes impact significantly on the health of the world's population. By affecting the health of the working population, occupational injuries and diseases have profound effects on work productivity and on the economic and social well-being of workers, their families and dependents.

The Joint WHO-ILO-UNAIDS Policy Guidelines on Improving Health Worker access to HIV and TB prevention and treatment Holland& Llankshear⁽³⁷⁾.

Regarding to nurses' knowledge about usage of personal protective equipment pre/post program implementation. the present study showed that, there were statistically significant differences between nurses' knowledge about usage of personal protective equipment pre /post program implementation in items hand washing with soap and water or alcohol rub, and PPE eliminates need for hygiene .As well, there were highly statistically significant differences in items; PPE interferes with patient treatment and nursing care, hand washing with an alcohol when soiled wash hands and PPE is available in ICU respectively, However, there were

no significant statistically difference in items; Improve compliance to recommended PPE, Punishment for staff who don't wear protective equipment and type of punishment Holland&Cawthon⁽³⁷⁾.

The occupational health nurse contacts workers continually, evaluates the impact of any information given to them, teaches the workers to maintain their high level of wellness Lawson & Llankshear⁽³⁸⁾.

Regarding to nurses compliance to personal protective equipment pre / post program implementation. The researchers were agreeing with all results and mention it at hypothesis. The present study showed that, there were statistically significant differences between nurses' compliance to personal protective equipment pre /post program implementation in all items of except items number 6,9,11,17,19 and 21 (t= 1.83, 1.95,1.89,1.75, respectively).

Conclusion

The study concluded that the educational intervention was effective and its results had great improvements in nurses' knowledge and compliance with the use of the personal protective equipment than ever before.

Recommendations:

- Developing standard of safe environment.
- Developing a manual for safety measures in the ICU to be used as references.
- Studying the relation between the application of safety personal protective equipment and the incidence of complications.
- Determining the barriers hindering the nurses' application of safety practices for ICU use of personal protective equipment

Table (1) Socio-demographic characteristics of nurses (n=56)

Socio-demographic characteristics	N	%
Sex		
• Male	2	3.6
• Female	54	96.4
Age		
• 21-30	40	71.4
• 31-40	14	25.0
• 40+	2	3.6
Marital status		
• Married	32	57.1
• Single	22	39.3
• Widowed	2	3.6
• Divorced	0	0.0
Occupation		
• Head nurse	8	14.3
• Registered nurse	8	14.3
• Assistant nurse	40	71.4

Table (2) Number and percentage distribution of hazards that the nurses are exposed to inside hospital (n=56)

Item	N	%
Exposure to biological hazards		
• Blood	38	67.9
• Urine	6	10.8
• Sputum	4	7.1
• Feces	4	7.1
• Pleural fluid	4	7.1
• Cerebrospinal fluid	0	0.0
Awareness of the potential harm		
• Yes	48	85.7
• No	8	14.3
Types of harm		
• HIV	4	8.3
• Hepatitis A/B/C	24	50.0
• HTLV	22	45.8
• Bacterial infections	6	12.5
• Influenza		8.3
Methods of disposing of biohazard materials		
• Carton box	4	7.1
• Biohazard bag	38	67.9
• Specialized sharp container	8	14.3
• Plastic container	6	10.7
• General garbage area	0	0.0

Methods of disposing of sharp objects		
• Carton box	4	7.1
• Biohazards bags	2	3.6
• Specialized sharps container	50	89.3
• Plastic container	0	0.0
• General garbage area	0	0.0
Direct exposure to chemicals hazardous		
• Concentrated acid	4	7.1
• Diluted acid	4	7.1
• Bleach	12	21.4
• Other cleaning agents	10	17.9
• Radioactive isotopes	2	3.6
• Xylene	4	7.1
• Toluene	2	3.6
• Formaldehyde	18	32.1
Awareness of the potential harm when exposed to these chemicals		
• Yes	50	89.3
• No	6	10.7
Types of potential harm		
• Burns	22	39.3
• Allergies	16	28.6
• Cancer	4	7.1
• Sexual dysfunction	2	3.6
• Birth defects	6	10.7
• Poisoning	6	10.7
Accidents at nurses comfort hospital		
• Needle stick	32	57.1
• Cuts from other sharp objects	8	14.3
• Splashes from bodily fluid	6	10.7
• Falls	2	3.6
• Burns	6	10.7
• Splashes from hazardous chemicals	2	3.6
Received vaccination for infectious diseases		
• Yes	40	71.4
• No	16	28.6
Types of vaccination received		
• TB	8	20.0
• HIV	8	20.0
• Measles	24	60.0
Treating and caring for patients with infectious diseases		
• Yes	36	64.3
• No	20	35.7
Appropriate vaccinations received before dealing with the patients with Infectious diseases		
	30	53.6
• Yes	26	46.4
• No		
Vaccination type		
• TB	10	33.3
• HIV	12	40.0
• Measles	8	26.7

Table (3) Mean scores and standard deviations of nurses' knowledge about personal protective equipment pre / post program implementation (n=56)

Items	Preprogram nurses knowledge	Post program nurses knowledge	T	p
	Mean ± SD	Mean ± SD		
Definition	1.64±0.67	1.96±0.42	2.02	<0.05
Importance	1.57±0.74	2.81±0.44	7.96	<0.001
Types	1.64±0.55	2.87±0.31	10.24	<0.001
Purpose of wearing PPE	1.71±0.65	2.03±0.42	2.35	<0.05
Potential risk	1.53±0.74	2.75±0.64	6.71	<0.001
Different health hazards	1.67±0.66	2.67±0.66	5.39	<0.001

Table (4) Mean scores and standard deviations of nurses knowledge about usage of personal protective equipment pre / post program implementation (n=56)

Items	Preprogram nurses knowledge	Post program nurses knowledge	T	p
	Mean ± SD	Mean ± SD		
*Hygiene				
• When soiled wash hands with alcohol	0.31±0.54	0.64±0.67	2.02	<0.05
• Hand washing with an alcohol when soiled	0.39±0.49	1.00±0.76	3.86	<0.001
• PPE eliminates need for hygiene	1.00±0.66	1.46±0.83	2.37	<0.05
• PPE interferes with patient treatment and nursing care	0.82±0.54	1.42±1.13	3.01	<0.006
• PPE is available in ICU	0.78±0.56	1.28±0.80	3.00	<0.006
• Improve compliance to recommended PPE	0.53±0.69	0.71±0.65	0.92	>0.05
• Punishment for staff who don't wear protective equipment	0.75±0.44	0.64±0.48	0.82	>0.05
• Type of punishment	1.00±1.41	1.50±0.70	1.00	>0.05

Table (5) Mean scores and standard deviations of nurses' compliance to personal protective equipment pre / post program implementation (n=56)

Item	Pre program	Post program	t	P
	Mean ± SD	Mean ± SD		
1. Washing hands between patient contacts.	2.21±0.56	2.53±0.74	2.35	<0.05
2. Using water only for hand washing.	1.89±1.16	1.10±1.34	3.16	<0.004
3. Using alcoholic hand rubs as an alternative if hands are not covered.	2.53±0.57	2.00±0.94	2.73	<0.05
4. Recapping used needles after giving an injection.	2.60±0.56	1.96±1.10	3.10	<0.004
5. Putting used sharp articles into sharps boxes.	2.28±0.53	2.67±0.66	2.26	<0.05
6. Disposing the sharp box only when it is full.	2.35±0.73	1.96±1.07	1.83	>0.05
7. Removing personal protective Equipment (PPE) in a designated area.	2.21±0.56	2.67±0.72	2.93	<0.007
8. Removing all personal protective equipment after use so do not touch my body or personal clothing.	2.21±0.41	2.60±0.68	2.49	<0.05
9. Taking a shower in case of extensive splashing after putting on personal protective Equipment (PPE).	1.92±0.71	2.32±0.98	1.95	>0.05
10. Covering wound with waterproof dressing before patient contact.	1.85±0.65	2.32±0.77	2.29	<0.05
11. Wearing gloves when exposed to body fluids & blood products.	2.17±0.61	2.53±0.88	1.78	>0.05
12. Washing hands before wearing gloves.	1.82±0.81	2.46±0.88	2.92	<0.007
13. Changing gloves between patient contacts.	2.10±0.68	2.50±0.83	2.09	<0.05
14. Decontaminating hands immediately after removing gloves.	1.82±0.61	2.42±0.79	3.50	<0.002
15. Wearing mask alone or in combination with goggles, face shield and apron or gown whenever there is a possibility of a splash splatter.	1.92±0.71	2.32±0.86	2.26	<0.05
16. Covering mouth and nose when wearing a mask.	1.78±0.68	2.35±0.86	2.74	<0.05
17. Reusing a mask or disposable personal protective equipment (PPE).	1.14±1.29	1.85±1.32	1.89	>0.05
18. Wearing a gown when exposed to blood, body fluids or any patient excretion.	1.67±0.61	2.60±0.68	6.04	<0.001
19. Placing contaminated waste with blood, body fluids, secretion and excretion in red plastic bags irrespective of the patient status.	1.92±0.85	2.35±0.98	1.75	>0.05
20. Decontaminating surfaces and equipment after use.	2.14±0.80	2.57±0.69	2.58	<0.05
21. Cleaning up spillage of blood or other body fluids immediately with disinfectants.	2.39±0.56	2.64±0.67	1.56	>0.05
22. Wearing gloves to decontaminate used equipment.	2.46±0.69	2.75±0.64	2.52	<0.05

Table (6) Relation between nurses socio-demographic data and their knowledge preprogram implementation (n=56)

Socio-demographic characteristics	Knowledge						X ²	P
	Poor (2)		Average (23)		Good (3)			
	N	%	N	%	N	%		
Sex								
• Male	0	0.0	1	4.3	0	0.0	0.22	>0.05
• Female	2	100.0	22	95.7	3	100.0		
Age								
• 21-30	1	50.0	17	73.9	2	66.7	1.05	>0.05
• 31-40	1	50.0	5	21.7	1	33.3		
• ≥40	0	0.0	1	4.4	0	0.0		
Marital status								
• Married	1	50.0	13	56.5	2	66.7	13.98	<0.007
• Single	0	0.0	10	43.5	1	33.3		
• Wildwood	1	50.0	0	0.0	0	0.0		
• Divorced	0	0.0	0	0.0	0	0.0		
Occupation								
• Head nurse	0	0.0	4	17.4	0	0.0	2.43	>0.05
• Registered nurse	0	0.0	4	17.4	0	0.0		
• Assistant nurse	2	100.0	15	65.2	3	100.0		

Table (7) Relation between nurses socio-demographic data and their knowledge post program implementation (n=56)

Socio-demographic characteristics	Knowledge						X ²	P
	Poor (2)		Average (23)		Good (3)			
	N	%	N	%	N	%		
Sex								
• Male	0	0.0	0	0.0	1	3.8	0.08	>0.05
• Female	0	0.0	2	100.0	25	96.2		
Age								
• 21-30	0	0.0	1	50.0	19	73.1	0.75	>0.05
• 31-40	0	0.0	1	50.0	6	23.1		
• 40+	0	0.0	0	0.0	1	3.8		
Marital status								
• Married	0	0.0	2	100.0	14	53.8	1.61	>0.05
• Single	0	0.0	0	0.0	11	42.4		
• Wildwed	0	0.0	0	0.0	1	3.8		
• Divorced	0	0.0	0	0.0	0	0.0		
Occupation								
• Head nurse	0	0.0	0	0.0	4	15.4	0.86	>0.05
• Registered nurse	0	0.0	0	0.0	4	15.4		
• Assistant nurse	0	0.0	2	100.0	18	69.2		

Table (8) Relation between nurses' Socio-demographic characteristics and their compliance to personal protective equipment pre program implementation (n=56)

Socio-demographic characteristics	Compliance				X ²	P
	noncompliance (16)		Compliance (12)			
	No	%	No	%		
Sex						
• Male	0	0.0	1	8.3	1.38	>0.05
• Female	16	100.0	11	91.7		
Age						
• 21-30	12	75.0	8	66.7	1.40	>0.05
• 31-40	3	18.8	4	33.3		
• ≥40	1	6.2	0	0.0		
Marital status						
• Married	8	50.0	8	66.7	2.75	>0.05
• Single	8	50.0	3	25.0		
• Wildwed	0	0.0	1	8.3		
• Divorced	0	0.0	0	0.0		
Occupation						
• Head nurse	2	12.5	2	16.7	3.50	>0.05
• Registered nurse	4	25.0	0	0.0		
• Assistant nurse	10	62.5	10	83.3		

Table (9) Relation between nurses' Socio-demographic characteristics and their compliance to personal protective equipment post program implementation (n=56)

Socio-demographic characteristics	Compliance				X ²	P
	Incompliance (16)		Compliance (12)			
	N	%	N	%		
Sex						
• Male	0	0.0	1	4.8	0.34	>0.05
• Female	7	100.0	20	95.2		
Age						
• 21-30	4	57.1	16	76.2	1.79	>0.05
• 31-40	3	42.9	4	19.0		
• ≥40	0	0.0	1	4.8		
Marital status						
• Married	5	71.4	11	52.4	4.81	>0.05
• Single	1	14.3	10	47.6		
• Wildwood	1	14.3	0	0.0		
• Divorced	0	0.0	0	0.0		
Occupation						
• Head nurse	2	28.6	2	9.5	2.66	>0.05
• Registered nurse	0	0.0	4	19.0		
• Assistant nurse	5	71.4	15	71.4		

Table (10) Correlation between nurses knowledge and their compliance to personal protective equipment pre and post program implementation (n=56)

Quality	Coping strategies			
	Pre program		Post program	
	R	P	R	P
Pre program	0.35	>0.05	0.24	>0.05
Post program	0.25	>0.05	0.50	<0.05

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