

## The Impact of Health Education Intervention on Nurses' Knowledge and Practice for Preventing Infection in Operating Rooms in Zagazig University Hospitals

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### Abstract:

**Background:** Infection is one of the major problems in the operating rooms. Many studies showed that nurses are dangerously exposed to many hazards; such as needle stick and sharps injuries with high incidence in the operating room due to many factors such as lack of experience, cross infection, and work overload. Nurses need more attention for ensuring effective compliance with universal precautions. **Aim of study:** Assess nurses' knowledge and practice about universal precautions, plan and implement health education program for nurses about universal precautions and evaluate the impact of health education on nurses' knowledge and practice about universal precautions. **Setting:** emergency hospital (ambulatory surgery unit), and new surgery hospital. **Study sample:** consists of 70 nurses, 30 nurses from the operating rooms in the emergency hospital and 40 nurses from operating rooms in the new surgery hospital. A quasi – experimental design was used in this study. **Tools:** included questionnaire sheet about nurses' demographic characteristics and their knowledge about universal precautions, an observational checklist for assessing practice and health education program. **Results:** the study findings showed statistical significant relationship between nurses' knowledge related to infection cycle pre & post program, ( $p < 0.05$ ), universal precautions pre post program, ( $p = 0.000$ ), waste management pre & post program, ( $p < 0.005$ ), role of scrub and circulatory nurse and their personal characteristics pre post program ( $p = 0.000$ ). Regarding nurses' observed practice most of nurses practiced its items correctly pre program and improved post program. ( $p = 0.000$ ). **Conclusion:** from the findings of the present study, it can be concluded that nurses' knowledge level was low concerning most of the items such as infection cycle, disinfection and sterilization pre program among both groups of nurses (study & control) and increased post program among the intervention group. **The study recommended** that all nurses must be medically checked up periodically; and continuous in-service training should be conducted for nurses related to infection control in operating rooms.

**Key words:** infection, operating room, universal precautions, ambulatory surgery

### Introduction:

Operating room staff and especially nurses are exposed to many hazards due to their direct involvement in the surgical operation. They may suffer from cuts, stabs, scratches, and stings stemming from the use of syringes and scalpels exposing them to the danger of infection with various diseases. They may be exposed to anesthetic gases, drugs, and radiation.

Operating room nurses use cleaning, disinfecting, and sterilizing agents that may damage the skin, mucous membranes, and respiratory system. Contact with hot surfaces, faulty electrical equipment, etc. may cause skin burns (**Encyclopedia of occupational health and safety, 2004**).

Data collected between 2000 and

2005 from the National Surveillance System for Health Care Workers (NaSH) show that the OR had the second highest number of hospital-based blood exposure events, representing 45 percent of all exposures (CDC, 2006).

Data collected between 1999 and 2004 from the Duke Health and Safety Surveillance System (DHSSS) show that surgical-OR technical staff sustained the highest rate of percutaneous exposures and the third highest rate of mucocutaneous or skin exposure of all hospital staff (Dement et al., 2004).

Continuing education activity will provide nurses, and operating room staff with the information they need to successfully and safely to fulfill their responsibilities in the operating room, while protecting the safety, and rights of patients, and themselves (WHO, 2008).

#### **Aim of the study:**

1. Assess nurses' knowledge and practice about universal precautions.
2. Plan and implement health education program for nurses about universal precautions.
3. Evaluate the impact of health education on nurses' knowledge and practice about universal precautions.

#### **Hypothesis:**

After the program there should be significant improvement in nurses' knowledge and practice related to universal precautions.

#### **Significance of the study:**

The operating room (OR) unit is one of the most sensitive units of the hospital. Unfortunately, only limited efforts have been made so far to

optimize the OR towards being an ergonomic work place. Due to a lack of ergonomics, awkward postures, and adaptation to sub-optimal conditions, combined with not taking all proper safety measures and precautions while dealing with instruments and patients, potential hazards for the OR staff as well as for the patients are a normal course of life within operating rooms and OR units. Operating room staff and especially nurses are exposed to many hazards due to their direct involvement in the surgical operation. Observational studies of operative procedures have recorded some type of blood exposure to OR staff in 7% to 50% of exposures in the OR (WHO, 2008).

Data collected between 2000 and 2005 from the National Surveillance System for Health Care Workers (NASH) show that the OR had the second highest number of hospital-based blood exposure events representing 45 % of all exposures and that surgical-OR technical staff sustained the highest rate of percutaneous exposures and the third highest rate over 35% of mucocutaneous or skin exposure of all hospital staff (CDC, 2006).

#### **Subjects and methods:**

##### **Research design:**

A Quasi – experimental design is used in this study.

##### **Setting:**

The study was conducted in the operating rooms in Zagazig university hospitals including the emergency hospital (ambulatory surgery unit for one day surgery) and new surgery hospital.

##### **Sample:**

The subjects, all nurses included 70 nurses working in the above

mentioned settings, and had the following inclusion criteria:-

- Had more than one year of experience in OR.
- Deal with all kinds of operation.
- Accept to participate in the study.

The subjects were divided into two groups (30) nurses working in the operating department in the emergency hospital (ambulatory surgery unit) and (40) nurses working in the operating department in the new surgery hospital. Names of hospitals were written each in a separate paper, and then folded and random selection of one folded paper was done by another person to determine which one of the 2 hospitals is to implement the health education program. The emergency hospital was the intervention group on which the educational program was implemented and the new surgery hospital was the control group.

#### **Data collection tools:**

Two tools were used in this study, namely a questionnaire sheet and observation checklist.

1. **Questionnaire sheet:** This questionnaire aimed at collection of data, pertaining to personal characteristic of the study subjects, services provided to nurses in the hospital, evaluating nurse's knowledge regarding: source of infection, infection cycle, disinfection and sterilization, operating room polices, infection control, universal precaution, role of scrub and circulatory nurse in OR, nurse's knowledge about cleanliness of used instruments, and waste disposal.
2. **Observation checklist:** concerned with the steps of surgical hand washing before operation, putting on and off the mask, gowning performed by nurses, and wearing and taking off gloves

#### **Field work:**

- The data collection was done first using questionnaire sheet. The average time taken by nurses to fill out the form was 15 to 20 minutes. Then observation was done in order to collect data about nurses' performance. Observing span was 4 hours / day at morning shift the full sheet was completed on the same day.
- The identified needs were translated to aim and objectives. The content of the program were selected on the base of identified needs, objectives & educational background of nurses.
- The program implementation was within the schedule of their working hours, 13 sessions were applied in 13 days and repeated six times (6 group of nurses, each contains 5 nurses).
- Teaching methods included lecture, small group discussion, real life situation, and/or direct training. Various teaching aids were cited including a small booklet of the program, some equipment and supplies such as mask, gown, overhead, overshoes, gloves and real surgical instruments were used.
- Evaluation was applied before and after program implementation in order to identify differences, similarities and areas of improvement.
- The program developed during the period from June 2009 to July 2009, and implemented during August 2009- up to December 2009. Then the same technique for data collection before the program was applied after program.

#### **Scoring system:**

For knowledge items, a complete correct answer was scored 2, incomplete correct answer was scored 1 and wrong or no answer was scored

zero. For each part, the score of the items were summed up and divided by the total of items, giving a mean score of the part. These scores were converted into percent score. Nurses' knowledge was considered adequate if the percent score was 60% or more and inadequate if less than 60%.

For practice items the item done was scored one and not done scored zero for each part, the scored items were summed up and the total divided by the number of the items, given mean score for the part. These scores were converted into percent score. The performance was considered satisfactory if the percent core was 60% or more and unsatisfactory if less than 60%.

#### ***Pilot study:***

Before performing the main study, a pilot study was carried out on 10% from the total number of the sample. According to the answers and comments of the participants, the researcher modified some of the test questions thus the developed questionnaire & checklist form were finalized in most suitable form. Those nurses who shared in the pilot study were excluded from the main study sample.

#### ***Administrative design and ethical considerations:***

Permission for data collection and implementation of the educational program at Zagazig University hospitals (operating rooms in emergency hospital and new surgery hospital) were obtained from hospital administration. Before data collection, nurses were informed about the aim of the study, they were given an opportunity to refuse to participate & they were notified that they can withdraw at any stage of the research; also they were assured that the information will remain confidential and

will be used for the research purpose only.

#### ***Statistical design:***

Data entry and analysis were done using spss version 11.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means and standard deviations for quantitative variables. Qualitative categorical variables were compared using chi-square test wherever the expected values are one or more of cells in 2x2 tables were less than 5. Fisher-exact test was used instead in larger than 2x2 cross tables, no test could be applied wherever the expected value is 10% or more of the cells was less than 5. Statistical significance was considered  $p$  value  $< 0.05$  and  $0.001$ . Mc Nemar and marginal homogeneity tests were used for comparing pre and post results.

#### ***Results:***

**Table (1)** illustrated the general characteristics of the studied sample, according to the table the mean age of the control group was  $29.53 \pm 5.5$  years, while the mean age for the intervention group was  $24.47 \pm 2.9$  years. Significant difference was noticed between both groups ( $p = 0.000$ ).

As regard qualification, 93.3% of the intervention group nurses had nursing diploma and only 6.7% belonged to intervention group graduated from technical nursing institution.

As regard the nurses' years of experience, less than half of the control group (47.5%) had a working experience more than 6 years compared to less than half (46.7%) among the intervention group had more than one year of experience in nursing, with mean  $6.82 \pm 2.9$  years and  $4.26 \pm 2.43$  years among control

and intervention groups respectively. Significant difference was noticed between both groups ( $p= 0.005$ ).

Concerning attending training courses, the nurses in the control group less than half of them (47.4%) attended training courses since 1-3 years compared to more than half (55.6%) of the intervention group.

**Table (2)** showed the relationship between the nurses' personal characteristics and their knowledge about infection cycle, adequate knowledge about infection cycle was increased significantly in post program for the intervention group in relation to age < 25 years old, experience 4 - < 6, having nursing diploma and those who had no training before ( $p= < 0.05$ ).

In the control group significant improvement in post test was only related to long experience (6 years and more).

**Table (3)** portrayed no statistical significant relation between nurse's personal characteristics and their knowledge about universal precautions.

**Table (4)** revealed the relationship between nurses' personal characteristics and their knowledge about total waste disposal, it was observed that adequate knowledge about waste disposal was increased significantly in post program for the intervention group in relation to age < 25, having nursing diploma and those who had no training before ( $P = < 0.05$ ).

Concerning the control group statistical significant relationship was found between nurses' knowledge about waste disposal and their age < 25 and  $25 \leq$  years, their experience (from 4 - 6 years and more), those having

nursing diploma and nearly half of them had attended training courses.

**Table (5)** showed the relationship between the nurses' personal characteristics and their knowledge about scrub nurse, it was found that no statistical significant relationship between nurses' personal characteristics and their knowledge about the scrub nurse in both the intervention and control group pre post program.

**Table (6)** showed the relationship between the nurses' personal characteristics and their knowledge about circulating nurse, the table illustrated that adequate knowledge about operating room policy was increased significantly in post program for the intervention group in relation to age < 25, experience < 4 years, having nursing diploma and those who had no training before ( $P= < 0.05$ ). While no statistical significant relationship was detected between control group nurses' knowledge about circulating nurse and their personal data.

## Discussion

Concerning demographic data, in the present study nearly half of the intervention group had from 1- 4 years of experience, nearly one third of them had experience from 4-6 years and less than one quarter had experience more than 6 years .while in the control group, two fifth of them had an experience from 4- 6 years and nearly half had experience 6 years and more. Nurses of the intervention group have been improved after the implementation of the program in spite of not having the same level of experience as the control group. In contrast, **Ahmed (2005)** and **Abdella (2007)** found that nurses with longer years of experience had better practice of universal precautions. Also, **Sultan**

(2006) and **Gohary (2007)** found that there was an improvement in the level of performance with the increase in years of experience. In a study conducted by **Fareed (2005)** in Alexandria among nurses and lab technicians showed poor knowledge and compliance among the sample, they are continuing to ignore or unaware of the benefits of standard precautions, the mean score sample's knowledge and compliance were decreasing with increasing years of experience, no statistically significant relation was found.

**Berger and Heeler (2005)** emphasized on that continuous in-service education is needed to improve, supplement and update knowledge in this field after basic training even for nurses with long experience.

Concerning nurses' qualification the study shows that nearly all nurses of the intervention group were having nursing diploma compared to all nurses of the control group. In a study conducted by **Copp et al., (2008)** most of nurses were registered nurses. Nearly half of the respondents obtained a bachelor's degree in nursing.

In relation to the training courses, in the present study nearly one third of the intervention group reported attending training courses compared to less than half of the control group. For the intervention group there was a statistical significant difference pre post program concerning knowledge and practice, this goes on line with **Attia (2004)** who explained that a highly significant difference was found concerning total nurses' knowledge scores in post test. In the current study, there was a significant difference in the pre - post education. In a study conducted by **Leaper (2008)** in Southmead hospital in England more than half of nurses, had not attended in the past any post-registration courses

or seminars related to universal precautions.

**El Toukhy (2006)** commented that the hospital is responsible for performing continuous in- service education particularly related to those who have higher incidence of nosocomial infections. A Study by **Larson et al., (2009)** recommended that attending continuing education courses about hospital infection had a positive effect on infection control procedures and compliance with universal precautions. In contra study conducted by **Mahmoud, Aly and AbdAllah (2008)**, about two thirds of nurses attended training courses about infection control. The interrelationships between the various study outcomes namely; Knowledge and practice were investigated. Analysis of data showed that no statistically significant correlations between subjects' practice of infection control measures and their attendance of training courses.

Concerning personal data and their knowledge, nurses of the intervention group showed significant improvement after the program in relation to knowledge about infection, the role of circulating nurse, and dealing with wastes in relation to their age, experience, qualification and training( $p < 0.005$ ), compared to the control group. Most of the studied nurses were younger than 25 years old, having nursing diploma, had less than 6 years of experience and more than half of them had no training before (**tables 2-6**). This is agreed with **Ronk and Girard (2006)**, **Moussa and Anwar (2008)**, **Roberts (2009)**, and **Nelsing (2009)**.

### Conclusion:

It can be concluded that health education intervention was successful for all nurses of the intervention group

who didn't receive any training courses pre program as they were improved after the program developed by the researcher concerning most of the items related to knowledge and practice related to universal precautions.

The results showed statistical significant relationships between nurses' knowledge related to infection cycle, waste disposal, role of scrub and circulatory nurse, performance of surgical hand washing, wearing and taking off mask, gown and gloves and their age (< 25 years), experience (4-6 years) and nurses having nursing diploma.

The study recommended that:

- Continuous in-service training programs to update their knowledge and practice about universal precautions.
- The booklet prepared by researcher containing information about infection control measures and universal precautions should be available to all nurses in the OR.
- Hospital should provide operating rooms with all supplies and equipment needed for controlling infection.
- Repeat this research for the same nurses to assess the impact of the implemented health education and training program after 1 year.

**Table (1): General characteristics of the studied sample**

Items \ Groups	Control group		Intervention group		$\chi^2$	P
	No.	%	No.	%		
<b>Age</b>						
20-	11	27.5	21	70	12.47	0.0*
25+	29		9	30		
<b>Mean <math>\pm</math>SD</b>	29.53 $\pm$ 5.5	72.5	24.47 $\pm$ 2.9			
<b>Qualification:</b>					--	0.1
Nursing diploma	40	100	28	93.3		
Nursing technical institute	0	0.0	2	6.7		
<b>Years of experience:</b>					10.54	0.0*
1-	5	12.5	14	46.7		
4-	16	40	9	30		
6-	1	47.5	7	23.3		
<b>Mean <math>\pm</math>SD</b>	6.82 $\pm$ 2.9		4.26 $\pm$ 2.43			
<b>Attendance of training courses:</b>					2.18	0.1
No	21	52.5	21	70		
Yes	19	47.5	9	30		
<b>Last training time:</b>					2.70	0.2
<1 year	1	5.3	2	22.5		
1-3	9	47.4	5	55.6		
4+	9		2	22.5		
<b>Mean <math>\pm</math>SD</b>	4.2 $\pm$ 3.5	47.4	2.11 $\pm$ 1.9			

**Table (2) the relationship between nurses' personal data and their knowledge about infection cycle pre-post program**

Personal data		Intervention group (n=30)				P #	Control group (n=40)				P #
		Infection pre		Infection post			Infection pre		Infection post		
		No.	%	No.	%		No.	%	No.	%	
Age < 25	Inadequate	9	42.9%	1	4.8%	0.021*	10	90.9%	7	63.6%	0.375
	Adequate	12	57.1%	20	95.2%		1	9.1%	4	36.4%	
≥ 25	Inadequate	0	0	0	0	NA	22	75.9%	24	82.8%	0.774
	Adequate	9	100%	9	100%		7	24.1%	5	17.2%	
Experience 1-	Inadequate	6	42.9%	1	7.1%	0.125	3	60%	4	80%	0.564
	Adequate	8	57.1%	13	92.9%		2	40%	1	20%	
4-	Inadequate	3	33.3%	0	0	0.004**	10	62.5%	13	81.3%	0.317
	Adequate	6	66.7%	9	100%		6	37.5%	3	18.8%	
6+	Inadequate	0	0	0	0	NA	19	100%	14	73.7%	0.025*
	Adequate	7	100%	7	100%		0	0	5	26.3%	
Qualification Nursing Diploma	Inadequate	8	28.6%	1	3.6%	0.02*	32	80%	31	77.5%	0.808
	Adequate	20	71.4%	27	96.4%		8	20%	9	22.5%	
Nursing technician	Inadequate	1	50%	0	0	NA	0	0	0	0	NA
	Adequate	1	50%	2	100%		0	0	0	0	
Training No	Inadequate	7	33.3%	0	0	0.016*	21	100%	18	85.7%	0.083
	Adequate	14	66.7%	21	100%		0	0	3	14.3%	
Yes	Inadequate	2	22.2%	1	11.1%	0.564	11	57.9%	13	68.4%	0.593
	Adequate	7	77.8%	8	88.9%		8	42.1%	6	31.6%	

(\*) Statistically significant at  $p < 0.05$ (\*\*) statistically significant difference,  $P < 0.001$



**Table (3) the relationship between nurses' personal data and their knowledge about universal precautions pre-post program**

personal data	Knowledge	Intervention group (n=30)				P #	Control group (n=40)				P #
		precautions pre		precautions post			precautions pre		precautions post		
		No.	%	No.	%		No.	%	No.	%	
Age < 25	Inadequate	1	4.8%	0	0	1.000	7	63.6%	4	36.4%	0.375
	Adequate	20	95.2%	21	100%		4	36.4%	7	63.6%	
≥ 25	Inadequate	0	0	0	0	NA	4	13.8%	6	20.7%	0.727
	Adequate	9	100%	9	100%		25	86.2%	23	79.3%	
Experience 1-	Inadequate	1	7.1%	0	0	1.000	1	20%	2	40%	1.000
	Adequate	13	92.9%	14	100%		4	80%	3	60%	
4-	Inadequate	0	0	0	0	NA	6	37.5%	5	31.3%	1.000
	Adequate	9	100%	9	100%		10	62.5%	11	68.8%	
6+	Inadequate	0	0	0	0	NA	4	21.1%	3	15.8%	1.000
	Adequate	7	100%	7	100%		15	78.9%	16	84.2%	
Qualification Nursing Diploma	Inadequate	1	3.6%	0	0	1.000	11	27.5%	10	25%	1.000
	Adequate	27	96.4%	28	100%		29	72.5%	30	75%	
Nursing technician	Inadequate	0	0	0	0	NA	0	0	0	0	NA
	Adequate	2	100%	2	100%		0	0	0	0	
Training No	Inadequate	1	4.8%	0	0	1.000	11	52.4%	4	19%	0.016*
	Adequate	20	95.2%	21	100%		10	47.6%	17	81%	
Yes	Inadequate	0	0	0	0	NA	0	0	6	31.6%	0.031*
	Adequate	9	100%	9	100%		19	100%	13	68.4%	

(\*) Statistically significant at  $p < 0.05$

**Table (4) the relationship between nurses' personal data and their knowledge about total waste disposal pre-post program**

personal data		Intervention group (n=30)				P #	Control group (n=40)				P #
		Total disposal pre		Total disposal post			Total disposal pre		Total disposal post		
		No	%	No	%		No	%	No	%	
Age < 25	Inadequate	9	42.9%	1	4.8%	0.021*	11	100%	1	9.1%	0.002**
	Adequate	12	57.1%	20	95.2%		0	0	10	90.9%	
≥ 25	Inadequate	5	55.6%	0	0	0.063	28	96.6%	9	31%	0.000**
	Adequate	4	44.4%	9	100%		1	3.4%	20	69%	
Experience 1-	Inadequate	7	50%	1	7.1%	0.070	5	100%	0	0	0.063
	Adequate	7	50%	13	92.9%		0	0	5	100%	
4-	Inadequate	3	33.3%	0	0	0.250	15	93.8%	3	18.8%	0.002**
	Adequate	6	66.7%	9	100%		1	6.3%	13	81.3%	
6+	Inadequate	4	57.1%	0	0	0.125	19	100%	7	36.8%	0.000**
	Adequate	3	42.9%	7	100%		0	0	12	63.2%	
Qualification Nursing Diploma	Inadequate	13	46.4%	1	3.6%	0.002**	39	97.5%	10	25%	0.000**
	Adequate	15	53.6%	27	96.4%		1	2.5%	30	75%	
Nursing technician	Inadequate	1	50%	0	0	1.000	0	0	0	0	NA
	Adequate	1	50%	2	100%		0	0	0	0	
Training No	Inadequate	9	42.9%	1	4.8%	0.021*	20	95.2%	6	28.6%	0.001**
	Adequate	12	57.1%	20	95.2%		1	4.8%	15	71.4%	
Yes	Inadequate	5	55.6%	0	0	0.063	19	100%	4	21.1%	0.000**
	Adequate	4	44.4%	9	100%		0	0	15	78.9%	

(\*) Statistically significant at  $p < 0.05$ (\*\*) statistically significant difference,  $P < 0.001$

Table (5) the relationship between nurses' personal data and their knowledge about scrub nurse pre-post program

personal data	Knowledge	Intervention group (n=30)				P #	Control group (n=40)				P #
		scrub nurse pre		scrub nurse post			scrub nurse pre		scrub nurse post		
		No.	%	No.	%		No.	%	No.	%	
Age <25	Inadequate	6	28.6%	1	4.8%	0.063	11	100%	9	81.8%	0.500
	Adequate	15	71.4%	20	95.2%		0	0	2	18.2%	
≥ 25	Inadequate	9	100.%	9	100.%	NA	27	93.1%	0	0	0.500
	Adequate	0	0	0	0		2	6.9%	29	100%	
Experience 1-	Inadequate	6	42.9%	1	7.1%	0.063	5	100%	4	80%	1.000
	Adequate	8	57.1%	13	92.9%		0	0	1	20%	
4-	Inadequate	0	0	0	0	NA	16	100%	15	93.8%	1.000
	Adequate	9	100%	9	100%		0	0	1	6.3%	
6+	Inadequate	0	0	0	0	NA	17	89.5%	19	100%	0.500
	Adequate	7	100%	7	100%		2	10.5%	0	0	
Qualification Nursing Diploma	Inadequate	6	21.4%	1	3.6%	0.063	38	95%	38	95%	1.000
	Adequate	22	78.6%	27	96.4%		2	5%	2	5%	
Nursing technician	Inadequate	0	0	0	0	NA	0	0	0	0	NA
	Adequate	2	100%	2	100%		0	0	0	0	
Training No	Inadequate	3	14.3%	1	4.8%	0.500	20	95.2%	20	95.2%	1.000
	Adequate	18	85.7%	20	95.2%		1	4.8%	1	4.8%	
Yes	Inadequate	3	33.3%	0	0	0.250	18	94.7%	18	94.7%	1.000
	Adequate	6	66.7%	9	100%		1	5.3%	1	5.3%	

**Table (6) the relationship between nurses' personal data and their knowledge about circulating nurse pre-post program**

personal data	Knowledge	Intervention group (n=30)				P #	Control group (n=40)				P #
		Circulating nurse pre		Circulating nurse post			Circulating nurse pre		Circulating nurse post		
		No	%	No	%		No	%	No	%	
Age < 25	Inadequate	16	76.2%	6	28.6%	0.002**	11	100%	10	90.9%	1.000
	Adequate	5	23.8%	15	71.4%		0	0	1	9.1%	
≥ 25	Inadequate	6	66.7%	1	11.1%	0.125	29	100%	29	100%	NA
	Adequate	3	33.3%	8	88.9%		0	0	0	0	
Experience 1- 4- 6+	Inadequate	12	85.7%	4	28.6%	0.008**	5	100%	4	80%	1.000
	Adequate	2	14.3%	10	71.4%		0	0	1	20%	
	Inadequate	6	66.7%	2	22.2%	0.125	16	100%	16	100%	NA
	Adequate	3	33.3%	7	77.8%		0	0	0	0	
	Inadequate	4	57.1%	1	14.3%	0.375	19	100%	19	100%	NA
	Adequate	3	42.9%	6	85.7%		0	0	0	0	
Qualification Nursing Diploma	Inadequate	21	75%	6	21.4%	0.000**	40	100%	39	97.5%	1.000
	Adequate	7	25%	22	78.6%		0	0	1	2.5%	
Nursing technician	Inadequate	1	50%	1	50%	1.000	0	0	0	0	NA
	Adequate	1	50%	1	50%		0	0	0	0	
Training No	Inadequate	14	66.7%	4	19%	0.006**	21	100%	21	100%	NA
	Adequate	7	33.3%	17	81%		0	0	0	0	
Yes	Inadequate	8	88.9%	3	33.3%	0.063	19	100%	18	94.7%	1.000
	Adequate	1	11.1%	6	66.7%		0	0	1	5.3%	

(\*\*) statistically significant difference,  $P < 0.001$

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