

# Effect of an Instructional Program about Selected Patient Safety Guidelines on Nurses' Knowledge and Self-reported Practice at a Government Hospital- Egypt

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**Abstract:** Safety measures are crucial to ensure quality nursing care and improve patient outcome. **Aim:** To evaluate the effectiveness of an instructional program about selected patient safety guidelines on nurses' knowledge and self-reported practice at a government hospital. **Design:** Quasi-experimental research design was used. **Sample:** Convenient sample of 30 adult male & female nurses who worked in the selected hospital and met the inclusion criteria. **Setting:** Medical and surgical wards, operating theatre, emergency room, and outpatient clinics at the selected government hospital. **Tools:** (1) Demographic and work-related data sheet, and (2) Patient Safety Guidelines Assessment Sheet (PSGAS) was used to assess nurses' knowledge and self-reported practice regarding infection control measures, patient identification, and safety of transfusion and connections. **Results:** There were statistical significant differences before and after implementing the instructional program on nurses' knowledge and self-reported practice regarding infection control measures, patient identification, and safety of transfusion and connections. **Recommendation:** It is suggested to have periodical safety audit in different work places of the hospital in order to identify the deficiencies and intervene before the occurrence of any health hazard.

**Keywords:** Government hospital, instructional program, nurses' knowledge, patient safety, self-reported practice.

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## I. INTRODUCTION

*“ The most important practical lesson that can be given to nurses is to teach them ”*

*Florence Nitinghlae ,1860*

Safety is a global concept that requires knowledge and skills in many areas. Patient safety is defined by the World Health Organization (WHO), as the absence of preventable harm to a patient during the process of health care and the reduction of the risk of unnecessary harm associated with health care to an acceptable minimal level (WHO, 2017). High mortality and morbidity rates, which associated with medical errors, highlighted the importance of promoting patient safety. Moreover, the high-intensity nature of nurses' work put nurses at great risk of performing errors during providing routine care (Patient Safety Network, 2018), especially because they constitute the largest occupational group in every health care setting (Kale, Gholap, & Shinde, 2012).

The Egyptian Ministry of health and population (MOHP) has launched many programs in collaboration with different international bodies including the WHO, the United State Agency for International Development (USAID), and Japan International Cooperation Agency (JICA), in order to ensure a quality and safety patients care (JICA, 2016 & USAID, 2018). In addition, the Joint Commission Resources (JCR) was the champion in patient safety for more than 60 years through helping health care organizations to improve the quality and safe care. It focused on promoting the six main

international patient safety goals which include: (1) identify patients correctly, (2) improve effective communication, (3) improve safety of high-alert medications, (4) ensure correct site, correct procedure, correct patient surgery, (5) reduce risk of health care-associated infections, and (6) reduce the risk of patient harm resulting from fall (Joint Commission Resources, 2018).

Based on the JCR guidelines, Egyptian MHOP developed standardized safety guidelines being followed by all health care sectors. These guidelines include twelve standards about patient safety. It includes: infection control, avoidance of misconnections, patient falls, pressure ulcers, wrong patient identification, medication errors, and identification of high risk medication, response of oral medical orders, shift reports policy, look like and sound like medications, receiving medication order forms, and finally discharge medication plan (MHOP, 2016). Safe patient care starts with accurately identifying patients in order to provide correct care. Failure to correctly identify patients and match their identity to the decided clinical intervention, can affect patient safety. The JCR (2018) recommends the use of at least two identifiers based on demographic information, such as the patient name, date of birth, or medical record number (The Joint Commission Quality Check, 2018).

The National Egyptian surveillance performed in 2016, showed a high rate of healthcare associated infection (HAIs) (Talaat, et., al., 2016) at the government hospitals. Infection control is very essential for the safety and wellbeing of patients, hospital staff, as well as visitors of the hospital. It aims to prevent micro-organisms from coming in contact with a person in the first place (Chawla, Madan, &Chawla, 2014). Hence, an instructional program has been implemented by the USAID, with an aim to improve quality and safety of healthcare in Egypt, and to reduce the incidence of hospital-acquired infections and supports the Ministry of Health and Population (USAID, 2018).

Prevention of infection requires special precautions and measures to control transmission of micro-organisms to other patients. Used protective equipment should be discarded into the waste bin, hand washing should be done before and after care provided to any patient, equipment for every unit should stay in one room and never circulate (Malik & Satpal, 2014). Moreover, specialized equipment should be used for cleaning and disinfecting both instruments and the environment. Linens should be handled carefully to avoid spread of microorganisms. Specific personal protective equipment should be used when handling soiled linen with body fluids and should be placed in leak proof bags and securely tied (Sodhi, Shrivastava, Arya & Kumar, 2013).

Patients are frequently connected to many tubes at one time, used for medications, nutrition, lavage/irrigation, and fluid administration. With all these lines, tubing misconnections are prevalent. Tubing misconnection (wrong line to wrong site) makes the patient at risk for serious and potential problems. It can occur with intravenous catheters, feeding tubes, hemodialysis tubes, tracheostomy cuffs, and other devices (Pugliese, 2013). Factors associated with tubing misconnections include: 1) unsecured connections; 2) too many lines close together (spaghetti syndrome); and 3) unlabeled connectors (Vockley, 2011). In order to improve the quality of care and patient safety, many programs were designed to train nurses (Institute of Medicine, 2017). Considering the important role of nurses in ensuring patient safety, the researchers designed and implemented an instructional program to improve nurses' knowledge and practice at a government hospital regarding this issue.

### **SIGNIFICANCE OF THE STUDY**

Errors related to safety measures reach more than 250,000 cases per year and, constitute the third leading cause of death worldwide following heart disease and cancer (Makary & Daniel, 2016). The risk of having healthcare-associated infections in some developing countries is more than 20 times higher than in some developed countries. Because of the importance of following patient safety guidelines, the Egyptian Ministry of Health and Population (MOHP) collaboratively worked with the WHO, to promote the Patient Safety Friendly Hospital Initiative (PSFHI) for the years 2012-2013 (WHO, 2017).

Despite all efforts done in Egypt by the MOHP, to control infection, healthcare-associated infection (HAI) remains the most common cause of all infections. In addition, errors in patient identification and tubing misconnections are common and continue to cause severe patient injury and cause severe harm with reported cases of death (Joint Commission, 2018). However, a recognized number of practicing nurses remain unaware of the extent of the problem, its impact on patients, as well as the burden on the health-care system. Many nurses are also unfamiliar with the strategies applied to reduce the risk of harm (Dimie, Kemebradikumo, Babatunde, George, Chistian, &Sanusi, 2015).

After extensive literature review, and comprehensive need assessment in the actual setting at the selected government hospital, the researchers selected three safety guidelines which are found to be the most common errors submitted by nurses, namely, exposure to infection, wrong patient identification, and tubing misconnections. Therefore, an instructional program was designed and implemented by researchers, which included infection control measures, safety of patient identification as well as transfusion and connections, and evaluated its effect on knowledge and self-reported practice among nurses at the selected government hospital. The results of the research may highlight the need for continuing nursing education, added to the nursing body of knowledge, and raised the need to do further researches in this field.

## II. METHODOLOGY

### AIM OF THE STUDY

The aim of the current study was to evaluate the effectiveness of an instructional program about selected patient's safety guidelines on nurses' knowledge and self-reported practice at a government hospital- Egypt.

### SETTING

The study was conducted in medical and surgical wards, operating theatre, emergency room, and outpatient clinics at the selected government hospital.

### RESEARCH DESIGN

A Pre / Post- test quasi-experimental design was utilized to fulfill the aim of the present study. This design exposed all subjects to a treatment or stimulus (The instructional program). The comparison in this design comes from examining subjects' values and scores of the outcome of interest before and after the exposure to the instructional program (Dutra & Reis, 2016).

### SAMPLE

All of the 30 adult nurses worked at the selected hospital were included in the study. Inclusion criteria included both genders, with different educational backgrounds, and work experience, from different settings and agreed to participate in the study. They were recruited over a period of three months, particularly from August-October (2018), and spent about 1 month of training for a period of 6 hours per week.

### HYPOTHESES

**To achieve the aim of the present study, two research hypotheses were formulated:**

**H1**-Nurses's knowledge scores regarding the selected safety measures will be better after implementing the instructional program than before its implementation.

**H2**-Nurses's self-reported practice scores regarding the selected safety measures will be better after implementing the instructional program than before its implementation.

### TOOLS

**Two main tools were utilized to collect data pertinent to the current study:**

**First:** Demographic and work-related data sheet: This tool included data such as age, gender, years of experience in the nursing field, educational background and safety measures courses attended before.

**Second:** Patient Safety Guidelines Assessment Sheet (PSGAS): It was divided into two main sections, which were (1) knowledge assessment questionnaire & (2) self-reported practice checklist. The first one was utilized to assess nurses' knowledge regarding infection control measures, safe patient identification, safe transfusion and connections. While the second one was utilized to assess their performance regarding the same three safety measures.

#### **1-Knowledge assessment questionnaire:**

**a- Infection Control Measures:** which included eight questions concerning the following: 1) General information about infection control. The second one about hand hygiene and its types. Third one about safe injections. Fourth one related to methods of sterilization and disinfections. Fifth one concerning environmental cleaning. While the last three questions were about waste disposal, equipment care and linen handling. Each correct answer was equal to 1 grade while the

incorrect one was equal to 0. The total scores were calculated out of eight degrees. The ratio from 0-80% of the total scores was considered unsatisfactory, while more than 80% was considered satisfactory.

**b- Patient Identification Safety Measures:** consisted of five true or false questions asking about their information regarding the use of patient's full name in every contact with the patient, giving each patient a number, using a patient identifier with patient's full name, asking the patient about his name before any procedure, and labeling each blood sample container with patient's full name. Each correct answer was equal to 1 grade, while the incorrect one was equal to 0. The total scores were calculated out of five degrees. The ratio from 0-80% of the total scores was considered unsatisfactory, while more than 80% was considered satisfactory.

**c- Safety of transfusion and connections:** involved five true or false questions about their information concerning: cannula insertion, recording date and time on the site of insertion and in patient file, importance of making double check after insertion to ensure safety of insertion, documentation of catheter type, site, route, method of insertion, and finally, how to check all connections before providing infusions. Each correct answer was equal to 1 grade, while the incorrect one was equal to 0. The total scores were calculated out of five degrees. From 0-80% of the total scores was considered unsatisfactory, while more than 80% was considered satisfactory.

## 2-Self-reported Practices checklist:

**a- Infection Control Measures:** consisted of list of steps regarding hand hygiene practices, safe injection, sterilization and disinfection, environmental cleaning, waste disposal, equipment care, and linen handling. Nurses were asked to mark in front of each step whether performed or not (yes=1 or No=0). The total scores were calculated out of seven degrees. From 0-80% of total steps performed correctly were considered unsatisfactory, while more than 80% were considered satisfactory.

**b- Patient Identification Safety Measures:** consisted of five steps about using of patient's full name in every contact with the patient, giving each patient a number, using a patient identifier with a patient full name, asking the patient his name before any procedure, and labeling each blood sample container with patient's full name on. Each correct answer was equal to 1 grade, while the incorrect one was equal to 0. The total scores were calculated out of five degrees. The nurse had to check in front of each one whether it was performed or not (yes or No). From 0-80% of total steps performed correctly were considered unsatisfactory, while more than 80% were considered satisfactory.

**c- Safety of transfusion and connections:** contained five steps concerning: cannulation procedure, recording date and time on the site of insertion and in patient file, performing double check after insertion to ensure safety of insertion, indicating clearly type of catheter, site route, method of insertion, and finally, checking all connections before providing infusions. Nurses had to check in front of each step whether they applied it or not by yes or no. Each correct answer =1 grade, while the incorrect one= 0. The total scores were calculated out of five degrees. From 0-80% of total steps performed correctly were considered unsatisfactory, while more than 80% were considered satisfactory.

## TOOLS VALIDITY & RELIABILITY

These tools were developed by the researchers, and tested for validity by a panel of five experts in the field of nursing sciences and medical-surgical nursing. Comments were received and tools were modified accordingly. Reliability of the tools was tested with Cronbach's Alpha test, and it was 0.805.

## ETHICAL CONSIDERATION

Once official permission was obtained from the director of the hospital, study subjects received full explanation about the aim of the current study, then informed consent was taken from each subject. The researchers assured each subject about the ethical principles and that anonymity and confidentiality were assured through coding of the data. Researchers also emphasized that participation in the study is voluntary and that withdrawal at any stage of the study is permitted without giving any explanation and will not affect their work.

## PROCEDURE

**The data of the current study was implemented within the following 3 phases:**

**a- Preparation phase:** Pre interventional phase: in which initial assessment of nurses' needs regarding safety measures was done, and revealed defect in certain measures particularly infection control, patient identification, as well as

transfusion and connections. Following this step, researchers prepared the related assessment tools which included both demographic, knowledge assessment questionnaires, and self-reported practice about the selected safety measures based on the MHOP Safety guidelines. Consequently, official approval was obtained from the medical, and executive director of the selected government hospital to assess their knowledge and practice regarding the selected safety measures. All nurses were invited to participate in the study, and informed consent was taken from each participant. Anonymity and confidentiality were ensured to all participants through coding their data. Then, researchers started the research process by collecting demographic and work-related data, which was done once. Base-line data about knowledge and practice concerning infection control, patient identification and safety of transfusion and connections was tested utilizing pre-test questionnaire and self-reported practice checklists. These tools took about 20 minutes to be filled by the hospital nurses.

**b- Implementation phase:** Interventional phase, and involved making an orientation regarding the instructional program designed by the researchers. In this phase, the study subjects spent a period of one month of training during July, August and September (2018), once per week for a period of 6 hours from 9am to 3pm. Three sessions for infection control measures, and two sessions for the patient safety guidelines were given to all participants. Handouts of infection control measures and patient safety guidelines of the Ministry of Health (MOH), Egyptian version (2017) was handed over to each subject. Lectures, group discussions, demonstration and re-demonstration, and real equipment was used by the researchers as a different teaching methodology involved in the program. The instructional program was implemented to the study subjects in small groups (five nurses in each group).

**c- Evaluation phase:** This phase was the post-interventional phase, which followed the implementation of the instructional program. In this phase, the same questionnaire and checklists were administered to the study subjects to reassess their knowledge and practice regarding infection control, patient identification, and safety of transfusion and connections. It was mandatory to fill all the fields. Both the knowledge and self-reported practice scores ranging from 0-80% were considered unsatisfactory, while the range more than 80% was considered satisfactory. These ranges were set by the researchers based on extensive literature review of different scoring systems regarding safety measures. Moreover, written feedback was taken from each nurse which gave them the opportunity to share their experiences and describe the barriers that they faced when applying the knowledge and skills given.

**STATISTICAL ANALYSIS**

The Statistical Package for the Social Sciences (SPSS) version 20 (IBM: Armonk, New York, United States) was utilized for data entry. Data was collected, coded, organized and analyzed by the researchers themselves. Descriptive statistics was analyzed to summarize the patients' demographic and work-related data. A nonparametric statistical Chi-square test was utilized to compare the difference between pre-pot test scores regarding the nurses' knowledge and self-reported practices. Additionally, a correlation test (*r*) was done to correlate the nurses' knowledge scores with their self-reported practices. The statistical level of significance was set at  $p \leq 0.05$ .

**III. RESULTS**

Results of this study are presented in two main sections: **First section** describes demographic and work-related data of the study subjects, while the **second section** assesses both knowledge and self-reported practice levels regarding safety measures (**Infection Control Measures, Patient Identification, Safety of Transfusion and Connections**) before and after implementing the instructional program among the study subjects.

**SECTION (1) DEMOGRAPHIC AND WORK-RELATED DATA OF THE STUDY SUBJECTS**

**Table 1: Frequency and Percentage Distribution of Demographic and Work-Related Data of Subjects (n=30):**

Variable	No.	%
<b>Age Group (years)</b>		
20<30	27	90%
30<40	2	6.7%
40<50	1	3.3%
<b>Mean ±SD</b>	<b>24.8 ±6.4</b>	

<b>Gender</b> Male Female	3 27	10.0% 90.0%
<b>Education Qualification</b> Non-bachelor degree Bachelor Degree	28 2	93.4% 6.6%
<b>Work Experience (years)</b> 0-< 2 2-< 5 5-<8 >8	6 14 8 2	20.0% 46.7% 26.7% 6.6%
<b>Mean ±SD</b>	<b>2.9±2.0</b>	
<b>Participation in Safety Measures Training courses</b> Yes No	7 23	23.3% 76.7%

Table (1) shows that, 90% of the study subjects aged less than 30 years, females, and 46.7% had from 2 to less than 5 years of experience in the nursing field. Regarding their qualifications, 93.4 % were non-bachelor degree nurses, and only 23.3% of them participated in safety measures training courses.

**SECTION (2) ASSESSMENT OF KNOWLEDGE AND SELF-REPORTED PRACTICE LEVELS REGARDING SAFETY MEASURES (INFECTION CONTROL MEASURES, PATIENT IDENTIFICATION, SAFETY OF TRANSFUSION AND CONNECTIONS) BEFORE AND AFTER IMPLEMENTING THE INSTRUCTIONAL PROGRAM AMONG THE STUDY SUBJECTS**

**2.a. Knowledge Assessment Data:**

**Table 2: Description of Nurses' Knowledge Sub- Scores regarding Infection Control Measures before and after Implementing the Instructional Program (n= 30)**

Infection Control Measures	Nurses' s Knowledge		t-test	P. value
	Pre –test Mean ±SD	Post –test Mean ±SD		
<b>1. General information</b>	9.4±3.04	15.5 ±1.8	17.09	0.000*
<b>2. Hand Hygiene</b>	10.4±2.5	16.4±2.23	22.3	0.000*
<b>3. Sterilization &amp; Disinfection</b>	5.6±2.06	7.5±1.04	14.7	0.000*
<b>4. Safe injection</b>	4.18±1.9	7.4±1.28	11.9	0.000*
<b>5. Environmental cleaning</b>	4.8±1.6	8.6±0.95	3.22	0.000*
<b>6. Waste disposal</b>	4.7±1.4	8.76±0.8	17.8	0.000*
<b>7. Linen handling</b>	4.2±1.6	8.6±0.9	13.97	0.000*
<b>8. Equipment care</b>	4.1±1.6	7.4±1.2	13.5	0.000*

\* Significant at p≤0.05

Table (2), shows the mean sub-scores of nurses' knowledge regarding infection control measures. This table illustrates statistically significant differences between pre and post-tests regarding general information about infection control, hand hygiene , methods of sterilization and disinfection, safe injection measures, environmental cleaning, waste disposal, linen handling, equipment care , with a t-test = 17.09, 22.3,14.7, 11.9, 3.22, 17.8, 13.97, & 13.5, respectively.

**Table 3: Description of Nurses' Total Knowledge Assessment Score regarding Infection Control Measures before and after Implementing the Instructional Program (n=30)**

Total scores	Nurses' Knowledge				t-test	P. value
	Pre -test		Post -test			
	N	%	N	%		
0 -40%**	0	0	0	0	27.4	0.000*
>40-60%**	13	43.4	2	6.6		
>60 -80%**	15	50	4	13.4		
> 80%	2	6.6	24	80		

\* Significant at  $p \leq 0.05$   
from 0-80%

\*\*Unsatisfactory level ranged

Table (3), shows that, the majority of the study subjects in the pre-test had unsatisfactory level of knowledge regarding infection control total scores. While in the post-test, 80 % of them had satisfactory levels in infection control knowledge total scores (> 80%).

**TABLE 4: Comparison of Nurses' Knowledge Mean Scores regarding Infection Control Measures, Patient Identification, Safety of Transfusion and Connections (n= 30)**

Variable	Nurses' Knowledge		t-test	P. value
	Pre -test Mean $\pm$ SD	Post -test Mean $\pm$ SD		
Infection Control	46.2 $\pm$ 9.2	61.6 $\pm$ 12.1	27.4	0.000*
Patient Identification	7.76 $\pm$ 1.9	8.6 $\pm$ 1.9	22.7	0.000*
Transfusion and Connections	4.4 $\pm$ 1.6	5.6 $\pm$ 0.47	14.9	0.000*

\* Significant at  $p \leq 0.05$

Table 4 shows the mean scores of nurses' knowledge regarding infection control. It is obvious that the pre and post- test mean scores were 46.2  $\pm$ 9.2 & 61.6  $\pm$ 12.1 respectively, with statistically significant difference and t-test= 27.4 at p-value=0.000. For patient identification safety measure, the mean scores of nurses knowledge were 7.76 $\pm$ 1.9 & 8.6 $\pm$ 1.9 respectively, with statistically significant difference and t-test = 22.7 at p=0.000. In relation to nurses' knowledge regarding safety of transfusion and connections, the pre and post- test mean scores were 4.4  $\pm$ 1.6 & 5.6  $\pm$ 0.47 respectively, with statistically significant difference and t-test = 14.9 at p=0.000.

**2. b. Self-Reported Practice regarding Infection Control, Patient Identification, Safety of Transfusion and Connections:**

**TABLE 5: Description of Nurses' Self-reported Practice regarding Application of Infection Control Measures (n= 30)**

Measure	Nurses' Self-Reported practice				X <sup>2</sup>	P. value
	Pre -test		Post test			
	N	%	N	%		
1-Hand Hygiene	9	30	24	80	4.08	0.001*
2.Sterilization and disinfection	0	0	11	36.6	6.53	0.011*
3. Safe Injection	12	40	26	96.6	1.2	0.02*
4. Environmental cleaning	13	43.3	26	86.6	0.55	0.01*
5.Waste disposal	14	46.6	22	73.3	0.13	0.01*
6. Linen handling	7	23.3	25	83.3	8.53	0.03*
7.Equipment care	11	36.6	27	90	2.13	0.00*

\* Significant at  $p \leq 0.05$

Table (5) shows that, there were statistically significant differences between the pre and post- nurses' self-reported practices checklist regarding all the seven fields of infection control measures with  $X^2 = 4.08, 6.53, 1.2, 0.55, 0.13, 8.53, 2.13$  respectively.

**TABLE 6: Description of Nurses' Self-reported Practice regarding Application of Patient Identification Safety measures (n= 30).**

Patient Identification	Nurses self-reported practice				$X^2$	P. value
	Pre -test		Post -test			
	N	%	N	%		
1.Using patient's full name in every contact with the patient	10	33.3	18	60	0.62	0.05*
2.Giving each patient a number	10	33.3	17	56.7	3.32	0.01*
3.Using a patient identifier with a patient full name	13	43.3	20	66.6	0.53	0.01*
4.Asking the patient his name before each procedure	10	33.3	26	86.6	3.33	0.00*
5.Labelling each blood sample container with patient's full name	11	36.7	24	80	2.13	0.05*

\* Significant at  $p \leq 0.05$

Table (6), shows that the nurses' self-reported practice regarding safety of patient identification in the pre -test regarding using patients full name in every contact with him/her, giving number for each patient, using a patient identifier, asking patient about name before each procedure and labelling blood sample were 33.3%, 33.3, 43.3 % 33.3% & 36.7 % respectively. While in the post-test, they were 60%; 56.7%, 66.6, 86.6 & 80%. The table also shows that there was statistically significant difference between pre and post self-reported practice in all fields with  $X^2=0.62, 3.32, 0.53, 3.33, \& 2.13$  at  $p\text{-value} \leq 0.05$

**TABLE 7: Description of Nurses' Self-Reported Practices regarding Safe Transfusion and Connections (n= 30)**

Transfusion and Connections	Nurses' self-reported practice				$X^2$	P. value
	Pre -test		Post -test			
	N	%	N	%		
1.Having an experience in cannulation procedure	11	36.7	30	100	14.6	0.01*
2.Recording date and time of insertion on the site of insertion and patient file	0	0	25	83.3	4.8	0.02*
3.Making a double check after insertion to ensure the safety of insertion	7	23.3	28	93.3	8.56	0.05*
4.Indicating clearly the type of catheter, site route, method of insertion	9	30	25	83.3	4.8	0.01*
5. Checking all connections before providing infusions	14	46.7	30	100	0.03	0.02*

\* Significant at  $P \leq 0.05$



Table (7), shows that nurses' self-reported practices regarding safety of transfusion and connections in the pre-test regarding having an experience in cannulation procedure, recording date and time of insertion on the insertion site, making double check after insertion, indicating clearly the type of catheter, and checking all connections before any infusion were 36.7%, 0%, 23.3% ,30% , & 46.7 % respectively. While in the post-test the nurses self-reported practice was reported as 100%, 83.3%, 93.3%, 83.3%. & 100% respectively. The table also shows that there was statistically significant difference between the pre and post self-reported practices in all fields, with a  $X^2= 14.6, 4.8, 8.56, 4.8$  &  $0.03$  respectively, and a significance level with  $p \leq 0.05$ .

**TABLE 8: Comparison of Nurses' Pre and Post-Tests of Self-Reported Practices regarding Infection Control Measures, Safe Patient Identification and Safety of Transfusion and Connections (n=30)**

Safety Measure	Nurses self-reported Practices				t. test	P. value
	Pre -test		Post -test			
	N	%	N	%		
<b>Infection control</b>						
0 -40% **	0	0	0	0	30.9	0.000*
>40-60% **	7	23.3	0	0		
>60 -80% **	20	66.7	5	16.7		
> 80%	3	10	25	83.3		
<b>Safety of transfusion and connections</b>						
0 -40% **	6	20	1	3.3	23.8	0.000*
>40-60% **	15	50	4	13.3		
>60 -80% **	7	23.3	6	20		
> 80%	2	6.7	19	63.4		
<b>Safe Patient identification</b>						
0 -40% **	0	0	0	0	21.7	0.000*
>40-60% **	5	16.7	0	0		
>60 -80% **	15	50	3	10		
> 80%	10	33.3	27	90		

\* Significant at  $P \leq 0.05$   
80%

\*\*Unsatisfactory level ranged from 0-

Table (8), shows that more than two thirds of the study subjects had unsatisfactory practice levels in the pre-test regarding infection control measures, safety of transfusion and connections as well as safe patient identification while the majority of them had satisfactory levels regarding the three fields in the post test . Moreover, there was statistically significant difference between pre and post- test in nurses' self-reported practices regarding infection control measures, safety of transfusion and connections, and safe patient identification, with a t-test = 30.9 , 23.8, & 21.7 respectively, at p-value=0.000.

**TABLE 9: Comparison between Nurses Post-Test Knowledge Scores and Self-reported Practice Scores regarding, Infection Control Measures, Safe Patient Identifications, and Safety of Transfusion and Connections (n=30)**

Post-Test Knowledge Scores	Post-test self-reported practices					
	Infection Control		Patient identification		Transfusion & connections	
	$X^2$	P. Value	$X^2$	P. Value	$X^2$	P. Value
<b>-Infection Control</b>	29.6	0.000*	5	0.000*	11.8	0.000*
<b>-Patient Identification</b>						
<b>-Transfusion &amp; connections</b>						

\* Significant at  $P \leq 0.05$  0.000\*

Table (9 ) shows that, there was a statistically significant difference between nurses' total post-test knowledge and self-reported practice scores regarding infection control measures, safe patient Identification and safety of transfusion and connections with  $X^2 = 29.6, 5, \& 11.8$ , respectively and p-value of 0.000.

#### IV. DISCUSSION

Findings of the present study supported the tested research hypotheses, and revealed a significant positive impact of the designed instructional program on nurses' knowledge and self-reported practice related to the selected safety measures particularly infection control, patient identification, and safety of transfusion and connections. Study results were classified into two main sections. The first section presented demographic and work-related data. While the second section described nurses' knowledge and self-reported practice in relation to the selected safety measures.

Findings showed that, more than two thirds of the study sample aged less than 30 years, and domination of female gender was observed. Different studies concerning gender ratios in healthcare jobs supported the present study results and revealed that, nursing is the most dominated occupation among females, and the most common age group is 18-44 years (Murray, Pole, Ciarlo, & Holmes, 2016). Adding to these results was the study conducted by Feleke, Mulatu, & Yesmaw, in 2015, and showed that, nurses aged from 18–30 years were 3 times more liable to make errors than those aged greater than 40 year; while those aged from 31–40 years were 2 times more liable to commit errors than those aged greater than 40 years.

Regarding the level of education, results of the present study revealed that, the highest percentage of the study subjects were non-bachelor degree nurses, and only two nurses had bachelor degree and 2-5 years of experience in nursing field. This could be expected to be the reason for poor practice before implementing the designed instructional program regarding the selected safety measures in the study group. Many studies had examined the association between nursing education levels and the quality of provided care. Some of them linked the number of bachelor degree nurses in a hospital to decreased mortality rate among patients (Aiken, Cimiotti, & Sloane, 2011). Moreover, few studies examined the impact of bachelor education on other patient outcomes, but did not find any beneficial effects. While, another studies conducted in 2013 showed that nurses who had work experience of less than 10 years were 2 times more liable to make errors than those who had experience more than 10 years (Blegen, Goode, Park, Vaughn & Spetz, 2013).

Regarding application of safety guidelines, the present study showed that, more than three quarters of the study sample had unsatisfactory level of knowledge in the pre-intervention phase of the study. This is an alarming finding which could have attributed to the low level of performance in the majority of the study sample in the same phase. Supporting these findings, was the study conducted in South Africa, which revealed that, health care providers' knowledge regarding infection control and safety measures was always poor and need to be improved (Dramowski, Cotton, Rabie, & Whitelaw, 2015). Poor knowledge in the study group before implementing the instructional program could be explained in the light of understanding the fact that, the type of knowledge being examined was beyond the level and qualification of the non-bachelor degree nurses.

Gogia and Das (2013), conducted a study in two different intensive care units in a tertiary care hospital, located in Delhi to examine knowledge and practice levels regarding infection control measures among both doctors and nurses. The study had surprising results as it showed the role of various other factors which were found to be responsible for the poor infection control practices among nurses and doctors in hospital setup despite of the presence of high awareness among them, one of them was increased work burden.

Results of the current study also showed a deficiency in nurses' self-reported practices before implementing the instructional program related to infection control, patient identification as well as transfusion and connections. This alarming finding may have many explanations. Firstly, there was inadequate training of nurses especially when the majority of them were non-bachelor degree nurses, and approximately more than three quarters of them never attended any training courses regarding safety measures and infection control. Secondly, there was inadequate equipment and supplies required for application of safety and infection control measures. Lastly, there was lack of close supervision and monitoring of nurses' application of safety and infection control measures. Additionally, the predominance of female nurses could be a negative contributory factor for poor knowledge and practice scores. This could be due to the fact that male nurses are more motivated to learn in order to show themselves in a profession which is female dominated. In agreement with this point of view, a study in Germany revealed that male nurses had better knowledge and practice of infection control measures compared with female nurses (Mutters, Hagele, Hagenfeld, Hellwig, & Frank, 2014).

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After implementing the designed instructional program, significant improvement was witnessed in nurses' knowledge and practice levels in all areas, which supported our hypotheses. Following the same line, a study was conducted in Egypt and found a significant improvement in the knowledge and practice scores among nurses regarding infection control and safety measures after implementing the designed educational program (Ibrahim, 2013). A similar positive impact of an educational program in infection control for nurses was reported in another study conducted in England (Gilbert, Darlow, Zin, Sivasubramaniam, Shah, Gianini, Beecroft, & Lopes, 2014).

To summarize, from the researchers' point of view, the effectiveness of the study's instructional program could be due to many factors. This success could be related to the content of the instructional program, which fulfilled the needs of the study subjects, the simple language and adequacy of information. Supporting this point of view, a number of researches emphasized that, effective instructional programs are those that provide nurses with the necessary knowledge, attitude and behavior skills necessary for efficient practice in nursing field (Ozkurt, Altoparlak, ilmaz, & Kemalettin, 2012).

**V. CONCLUSION**

The study concluded that nurses' mean scores in knowledge and self-reported practice are higher in the post-test than their score in the pretest, which emphasizes the fact that there is a huge need to teach and train nurses about patients' safety measures.

**VI. RECOMMENDATIONS**

**Based on the study findings, the following recommendations are suggested:**

- Replication of the study on a larger probability sample in different settings to ensure generalization of results.
- Have a periodic safety audit in different work places of the hospital, in order to identify the deficiencies and intervene before occurrence of any health hazard.
- Always keep nurses up to date through continuous monitoring and constructive training.
- Decrease the work burden on nurses in order to decrease the risk of submitting errors.

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