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Cardiopulmonary Resuscitation: Effect of Station Training Method on Nursing Students` Competency

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Abstract: **Cardiopulmonary Resuscitation (CPR) training has been inevitable procedure for students in clinical skills' training centers. Station training method is performed to improve nursing students' competency and to be familiarized with equipment and procedures.** ***Aim:*** **This study aims to evaluate the effect of station training method on nursing students` competency regarding CPR.** ***Subjects and Method:*** **This study was used A quasi experimental design to collect data from fundamental lab and clinical pediatric laboratory skills for second year students in Technical Institute of Nursing at Tanta University affiliated to the Ministry of Higher Education.** ***Sample:*** **A convenient sample of 240 students (2nd grade), from the mentioned previous setting. A systemic random sample was selected from the total sample to be evaluated in clinical setting (n=150).** ***Tools*****: Two tools used for data collection, Tool (I): "A structure interview sheet for nursing students" to assess students about cardiopulmonary resuscitation for adult and children. Tool (II): An observation checklist to evaluate students' performance regard CPR for adult and children** ***Results:*** **There was a statistical significance difference between pre / post intervention training period at level of total knowledge and practice as regards CPR for adult and children, whereas observed improvement was indicated post training.** ***Conclusion:*** **station training method had a positive effect on nursing students` competency regarding CPR for the adult and children.** ***Recommendations:*** **There is a need for continuous training on CPR using new training methods and it must be included in undergraduate curricula of nursing students.**

Keywords: **cardiopulmonary resuscitation, adult and children, nursing students' competency.**

1. INTRODUCTION

Cardiopulmonary resuscitation (CPR) is defined as an emergency procedure which is performed in an effort to manually preserve intact brain function until further measures are taken to restore spontaneous blood circulation and breathing in a person of cardiac arrest. In essence, Cardio (heart), Pulmonary (lung), Resuscitation acts as an artificial heartbeat and an artificial respirator for the unresponsive patients with no breathing or abnormal breathing (e.g. Agonal respirations).(2) Training in cardio-pulmonary resuscitation (CPR) is important for nursing students, because the nurses should become active members of the health team during CPR by improving knowledge and skills. Many studies aimed to investigate the impact of cardio-pulmonary resuscitation program for adult and children on knowledge and performance of nursing students at college of nursing. The results of the studies proved that the CPR program succeeded to improve knowledge and performance of nursing students. (3)

Cardiopulmonary resuscitation (CPR) is used during cardiac arrest to oxygenate blood and restore the cardiac output to keep vital organs alive. Blood circulation and oxygenation are required to transport oxygen to the tissues. The brain may undergo damage after stop of blood flow for about four minutes and irreversible damage after about seven minutes.

Typically, if blood flow ceases for 1: 2 hours, the body cells will die. Because of that, CPR is generally only effective if performed within seven minutes of the stop of blood flow. New statistics suggest that a healthy human brain may survive without oxygen for up to 4 minutes without suffering any permanent damage. CPR may not save the victim even when performed properly, but if started within 4 minutes of cardiac arrest, a patient has a 40% chance of survival until emergency arrives. [4,5]

Pediatric cardiopulmonary arrest is a rare event, and timely, high-quality cardiopulmonary resuscitation (CPR) improves outcomes. Pediatrics residents have a critical role in initiating life-saving interventions yet have little opportunity to develop or maintain their resuscitation skills.[6–8] CPR technique differs from infants, children and adolescents according to the American Heart Association.[9] The competency of nurses in the emergency life-saving procedure of cardiopulmonary resuscitation (CPR) permit to respond quickly and effectively to a cardiac arrest situation.[10,11] In many countries the license for passing cardiopulmonary resuscitation training is obligatory for nursing staff before practice the nursing profession [12, 13].

According to Verma (2006), "competencies in education create an environment that fosters empowerment, accountability and evaluation, which is consistent and equitable.[13] The acquisition of competencies can be through talent, experience or training." Nursing educators should take into consideration that successful educational strategies must focus on the equal development of the cognitive, psychomotor and attitudinal domains of competence. Therefore, an effective training strategy should always include elements that not only facilitate the acquisition of knowledge and skills, but also promote individuals' self-efficacy [12].

Station training method is one of the clinical methods of training, which has been implemented in most allied medical science and medical faculties; it's a useful way to assess competence at undergraduate and postgraduate levels. This method, as a completely valid, stable and practical way, has been easily able to assess basic and fundamental skills of learners in specialty categories and cognitive, emotional and psychomotor domains and eliminates the intervention variables by showing students' skills in different stations [17]. The objective structured clinical examination (OSCE) has been considered a modern type of examination for assessment of clinical skills within nursing education. It considered as a useful method of teaching because it is a safe practice to help students gain more confidence when confronted by technical instruments present in the hospital environment. [18]

CPR training has been inevitable procedure for students in clinical skills' training centers during recent years and different teaching methods which are used for students such as replication and lectures, etc. But sometimes, the effect of these methods is under question. So Simulation training of resuscitation improves the knowledge and performance of participants and familiarizes them with equipment and procedures [19, 20]. Rescuers play a vital role in supporting patients' lives, so their knowledge and skills may mean the difference between life and death for many victims. It is up to the rescuer to recognize that emergency medical help is needed to begin first aids and contact the local emergency medical services. [14]

Nursing students must be able to respond correctly and deal with cardiac arrest both inside and outside hospitals. Most nursing education institutions have resuscitation training within their curricula to meet these expectations and to ensure that students are competent at starting life support in cases of cardiac arrest. Nevertheless, previous studies in the nursing research literature have described poor retention of knowledge and skills in performing resuscitation for adult and children. Many educational methods of improving cardiopulmonary resuscitation (CPR) have tried out but both content and methods lack standardization. [15]

Nurses at the undergraduate level should play an important role in developing the competency of new routines in quality improvement programs for patients [14]. The most effective way to ensure students acquire competencies is to integrate the teaching of those skills into course curricula in a holistic approach to teach disciplinary knowledge and generic skills. The practice of nursing requires a complex combination of various attributes and nursing students require highly specialized competencies to accurately determine patients' states, predict and cope with the problems that may occur during nursing care. Development of nursing practice requires the synchronicity of both knowledge application and clinical skills, and students must demonstrate the ability to integrate these professional requirements of the qualified nurse for which they are being prepared. A consensus was reached regarding strategies for assessing the competence of nursing students as they progress through their program of study based on the views of experienced clinicians and academics [11].

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Finally, nursing students can reach to better patient's survival by minimizing pauses in chest compressions, adopting cardio cerebral resuscitation (CCR) protocols and improving the resuscitation care, which lead to decrease patients' (adult and child) mortality through implementing these measures on a more widespread basis [21]. The nurses must respond quickly and effectively to cardiac arrest. Numerous studies have demonstrated that poor performance was resulted from ineffective training methods and lack of educational program about CPR. [22]

Significance of the Study:

Despite the quality of CPR, which is correlated with the improved patient outcomes, traditional methods of training are not enough to enable healthcare providers to get high quality resuscitation care, in addition to weak knowledge and skill retention following cardiopulmonary resuscitation training for nursing and medical staff. Using simulation methods during resuscitation training can increase subsequent resuscitation quality. In addition, station training method feedback during resuscitation improved CPR performance. [23,24]

Because, the technical institute of nursing at Tanta University used the traditional method for students' clinical training and evaluation, the researchers found that, application of station training method will enhance the students' competency regarding CPR. The aim of this study was to evaluate the effect of station training method on nursing students' competency as regarding cardiopulmonary resuscitation. It is hoped that the competencies demonstrated by students in the station training of CPR will be manifested daily in the lives of their patients as the nursing profession struggles to maintain skillful, high quality, competent nursing care.

Aim of the Study:

This study aimed to evaluate the effect of station training method on nursing students` competency regarding cardiopulmonary resuscitation. This aim was achieved through the following:

1. Identify nursing students' knowledge toward CPR for adult and children.
2. Assess students' knowledge and practice regarding CPR for adult and children.
3. Develop and implement basic students' training station sessions regarding CPR and evaluate its effect on their knowledge and practice.
4. Compare between students' knowledge and practice regarding CPR pre and post intervention period using station training method.

Research hypothesis:

It was hypothized that nursing students' competency regarding CPR for adult and children will be improved after using station training method.

Operational definition:

Nursing students' competency: refers to specific capabilities which often used to describe the knowledge and practice to be able perform at a particular task.

Station training method: It is a modern type of training of clinical skills within nursing education**.**

2. SUBJECTS AND METHOD

Research design:

A quasi-experimental design was used in the present study.

Setting:

The study was conducted at Technical Institute of Nursing at Tanta university affiliated to the Ministry of Higher Education. Students were evaluated in the fundamental and clinical pediatric laboratory skills for second year students

Subjects:

A convenient sample of 240 students (2nd grade), from the mentioned previous setting. A systemic random sample was selected from the total sample to be evaluated in clinical setting (n=150), it represents about two third of the total sample.

Inclusion criteria:

The subjects were recruited based on the following criteria:

- Students who enrolled in second year.

- Students who are willing to participate in the study.

- Students who are not sharing in previous training station about CPR.

Tools of data collection:

Two tools were used to collect the required data as follow:

Tool (I)**: "A structure interview sheet for nursing students"** It was developed by the researchers after a reviewing of the literature. [24] It comprises of two parts:

Part one: Students' sociodemographic data, which includes: age, sex, previous training, previous education and experience.

Part two: knowledge questionnaire sheet of cardiopulmonary resuscitation for adult and children, it was developed by the researchers based on literature review (Pearson Education 2010) [25] to assess nursing students' knowledge regarding CPR, which includes :

- Identification of the consciousness level,

- Correct position to keep open airways.

- Necessity to examine respiration of unconscious victim.

- Method of respiratory examination.

- Positioning of child in case of proper respiration.

- Number of rescue breaths needed in every cycles of CPR.

- Necessity to examine pulse.

- The artery used to examine pulse.

- Evaluation of pulse during CPR.

- Actions to be done in the presence of pulse but no respiration.

- Actions that must be taken in the absence of pulse and respiration.

- Number of cycles of CPR.

- Number of chest compression.

- Proper hand placement in chest compression.

- Space of displacement of sternum.

- Indications of CPR.

- Multiple choice questions: consisted of 16 questions**,** distributed as: 8 questions regards CPR for adult and 8 questions regards CPR for children.

Scoring system for students' knowledge regarding multiple choice questions was:

The total score was 16 and every item was evaluated as:

- Correct answer was scored (1)

- Incorrect answer was scored (0)

International Journal of Novel Research in Healthcare and Nursing
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- **Open ended questions**: it consisted of 6 questions distributed as: 3 questions regards CPR for adult and 3 questions regards CPR for children as:

- Objectives of cardiopulmonary resuscitation

- Definition of cardiopulmonary resuscitation

- Causes of cardiac arrest in childhood

- Early signs and symptoms of cardiac arrest

- Nursing intervention for cardiac arrest

- Stopping of CPR technique

Scoring system for students' knowledge regarding open ended questions was:

The total score was 12 and every item was evaluated as:

- Correct and complete answer was scored (2)

- Correct and incomplete answer was scored (1)

Incorrect and incomplete answer was scored (0)-

The total score of students' knowledge questionnaire was calculated as follows:

- Less than 65% considered poor.

- 65 - less than 75% considered average.

- 75-100% considered good.

Tool (II): "Students' Performance Observational checklist "it was used to assess the nursing students' practice regarding CPR for adults and children. It will adopted by the researchers according to American Heart Association, Program basic life support for pediatric (2010)[9]. The students' performance observational checklist comprised of 29 items. It includes the following: Responsiveness include (3)items, position and examination include (6)items, performance of chest compressions which include two categories, the first category was the hand /fingers position which include (5 items) and the second category was do compression include (6 items), performance of ventilation (breathing) include (6 items) and reassessment which include (3 items).

Scoring system for students' practice regarding CPR was evaluated as:

-Correct and complete answer was scored (2)

- Correct and incomplete answer was scored (1)

-Incorrect and incomplete answer was scored (0)

Total scoring system for students' performance observational checklist classified as follow:

- Less than 65% considered unsatisfactory.

- 65 - less than 75% considered satisfactory.

- 75-100% considered good.

3. METHOD

Validity and reliability:

Content validity was ascertained by a group of experts from Medical–Surgical Nursing and pediatric Nursing .Their opinions were elicited regarding to the tools format layout, consistency and scoring system. Contents of the tools were tested regarding to the knowledge accuracy, relevance and competence. In addition the content validity was done also, for the proposed protocol to test its consistency, accuracy, applicability, relevance and feasibility. Testing reliability for each student using the nonparametric paired Wilcoxon test at the significance level of 0.05.

Ethical considerations:

- First, an official letter was issued to the administrators of the previously mentioned settings to get permission for data collection and training intervention. All nursing students were informed about the purpose of the study and their rights according to medical research ethics that they were free to decide whether or not they would participate in the study. Then a written informed consent was obtained from each student who agreed to participate in the study.

- Pilot study:

A pilot trial was carried out on 10% of the total study sample to test the clarity and practicability of the tools, in addition to subjects and setting. Pilot subjects were later included in the study as there were no radical modifications in the study tools.

Procedure of the Study:

- Sampling was started and completed within 6 months.

- The training was designed based on analysis of the actual educational needs assessment pre training by using the pre-constructed tools.

- Needs were taken into consideration when preparing the training intervention content.

- Number of training sessions were 5 sessions, which distributed as 2 theoretical and 3 practical sessions for each group.

- Beginning of the training included; orientation of students about the objectives of training, outline and schedule, expected outcomes/benefits. The conduction of theoretical part was performed through lectures and group discussions, using power point and videotapes as media. The theoretical part was taken in 4 hours for 2 sessions, which were covered on one week. The sessions covered the following items; definition of cardiopulmonary resuscitation, objectives of CPR, causes of cardiac arrest, early signs and symptoms of cardiac arrest, nursing intervention for cardiac arrest, stopping of CPR technique.

- The practical part began at the previously mentioned settings by distribution of total sample (150 students) into 10 groups. Each group obtained 3 sessions (three sessions weekly for 2 hours). **First session:** CPR for adult which include (Responsiveness, position and examination, performance of chest compressions, performance of ventilation (breathing), assessment and reassessment and recovery position). **Second session:** demonstration of CPR for children. **Third session:** re-demonstration of CPR for adult and children.

- Knowledge sheet was filled by the students within 20 minutes, hand observational check list was filled by the researchers within 30 minutes for each student (pre test).

d- Tool I and II were collected before implementation of CPR training to assess the students' knowledge and practice regarding CPR for adult and children.

- The researchers utilized the following instructional media and materials during training sessions (power point presentation, video tape film, posters and booklet) in the theoretical part and CPR simulator manikin and role play for demonstration and re-demonstration in the practical part.

- Objective of the study was prepared based on the aim and needs of the study.

- CPR procedure was performed using station training method to each student by the researchers.

- Evaluation of training was done through pre/post test using Tool (I) part two and Tool (II) which re-evaluated after implementation of training period to assess the effect of CPR training intervention using station method on nursing students' knowledge and practice.

- Evaluation of the students was done using "Objective Structured Clinical Examination" (OSCE). It is an examination for determining the clinical competency based on practical test that is done using simulated environments and stations. In this test the actual condition variables are removed, but the studied manikin is put within a condition which is almost similar to the actual condition. In designing this test, four stations were used by the researchers to evaluate the performance of students. In this method, each student entered a lab and performed the asked procedures in the given station on the model without any contact with others. Thus the sample's skills in doing the necessary operations and procedures were assessed. This method for test evaluation was used to assess the students' performance regarding CPR after station training period.

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Statistical Analysis: All data were coded, entered and analyzed using SPSS (version 20). Descriptive statistics (frequency numbers and percentages) identified demographic characteristics and students responses to the questionnaire. Chi-square test analyzes the differences and a significant difference was set at P value

4. RESULTS

Table (1): Percentage distribution of the studied students according to their sociodemographic data

Categories	The studied students (n=150)	
	N	%
Age in years:		
▪ <20 years	88	58.7
▪ ≥20years	62	41.3
Range	**(16-20)**	
Mean±SD	**17.53±0.757**	
Sex:		
▪ Male	47	31.3
▪ Female	103	68.7
Previous education about CPR		
▪ No	5	3.3
▪ Yes	145	96.7
Previous experience about CPR		
▪ No	98	65.3
▪ Yes	52	34.7
Previous Training program about CPR		
▪ No	112	74.7
▪ Yes	38	25.3

Table (1): Shows the distribution of the studied students according to their sociodemographic data. It was observed that more than half (58.7%) of the studied students were aged of less than 20 years, and more than two third of them were females (68.7%). The majority of the students (96.7%), had previous education regarding CPR, but more than two third (65.3%) of them had no previous experience about CPR and about three quarter of the studied students (74.7 %) had no previous training program regarding CPR.

Table (2): Percentage distribution of the studied students regarding their total knowledge score about CPR

Total knowledge score		The studied students (n=150)				χ^2 P
		Pre		Post		
		N	%	N	%	
CPR for Adult	▪ Poor	134	89.3	1	0.7	253.43 0.00*
	▪ Average	13	8.7	19	12.7	
	▪ Good	3	2.0	130	86.7	
Range Mean±SD		**(1-9) 4.15±1.58**		**(8-10) 9.43±0.66**		**Z=10.635 P=0.00***
CPR for Children	▪ Poor	144	96.0	8	5.3	246.84 0.00*
	▪ Average	0	0.0	23	15.3	
	▪ Good	6	4.0	119	79.3	
Range Mean±SD		**(0-4) 1.96±0.996**		**(3-5) 4.82±0.40**		**Z=10.686 P=0.00***

Z - Wilcoxon Signed Ranks Test

* Significance at P <0.05.

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Table (2): Demonstrates the percentage distribution of the studied students regarding their total knowledge score about CPR. The students' total knowledge regarding CPR for adult was poor pre intervention period (89.3%) while scored good knowledge level post intervention one (86.7%), So there was a significant difference between total knowledge score regarding CPR for adult pre / post intervention period, X^2=253.43, P=0.00. Also the total students' knowledge regarding CPR for children was poor pre intervention period (96.0%) but scored good level of knowledge post intervention one (79.3%), So there was a significant difference between total knowledge score regarding CPR for children pre / post training period , X^2=246.84, P=0.00.

There was significant differences between mean scores of total knowledge of studied students regarding CPR for adult and children in pre and post studied periods, P=0.00 for both.

Table (3): Mean scores of practice domains scores among studied students.

Practice domains of CPR		Range Mean ± SD		Z P
		Pre	Post	
▪ **Responsiveness**	Adult	(0-4) 1.81±1.103	(3-6) 5.55±0.720	**10.557** **0.00***
	Children	(0-4) 1.90±1.067	(3-6) 5.44±0.847	**10.63** **0.00***
▪ **Position & Examination**	Adult	(1-8) 3.68±1.704	(6-12) 11.41±1.018	**10.654** **0.00***
	Children	(1-8) 3.59±1.551	(7-12) 10.74±1.481	**10.65** **0.00***
▪ **Hand/fingers position**	Adult	(0-7) 3.11±1.522	(6-10) 9.53±0.757	**10.662** **0.00***
	Children	(0-7) 3.11±1.484	(5-10) 8.96±1.284	**10.66** **0.00***
▪ **Do compressions**	Adult	(0-16) 3.45±1.884	(9-12) 11.49±0.801	**10.657** **0.00***
	Children	(0-8) 3.47±1.570	(7-12) 10.82±1.285	**10.66** **0.00***
▪ **Performance of ventilations(breathing)**	Adult	(0-14) 3.51±1.816	(8-12) 11.41±0.861	**10.667** **0.00***
	Children	(0-14) 3.51±1.906	(7-12) 10.79±1.374	**10.64** **0.00***
▪ **Re-assessment**	Adult	(0-4) 1.75±1.117	(3-6) 5.87±0.501	**10.667** **0.00***
	Children	(0-4) 1.85±1.095	(3-6) 5.61±0.694	**10.63** **0.00***

Z - Wilcoxon Signed Ranks Test

* Significant at P <0.05.

Table (3) shows the mean scores of practice domains of CPR for adult and children among studied students. It was observed that there was a significant difference between mean score of pre and post intervention period among studied students and the practice domains of CPR for adult and children regarding responsiveness, position & examination, hand/fingers position, Chest compressions, performance of ventilations(breathing) and re-assessment, where P=0.00 in all.

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Table (4): Percentage distribution of the studied students according to their total practice level

Total practice level		The studied students (n=150)				χ^2 P
		Pre		Post		
		N	%	N	%	
CPR (Adult)	▪ Unsatisfactory	133	88.7	5	3.3	235.36 0.00*
	▪ Satisfactory	15	10.0	25	16.7	
	▪ Good	2	1.3	120	80.0	
Range Mean±SD		(8-31) 17.31±3.903		(46-58) 55.26±2.295		Z=10.631 P=0.00*
CPR (Children)	▪ Unsatisfactory	150	100.0	1	0.7	296.03 0.00*
	▪ Satisfactory	0	0.0	13	8.7	
	▪ Good	0	0.0	136	90.7	
Range Mean±SD		(8-31) 17.42±3.753		(37-58) 52.35±4.770		Z=10.63 P=0.00*

* Significance at P <0.05.

Z - Wilcoxon Signed Ranks Test

Table (4) explains the distribution of the studied students according to their total practice levels. There were significant differences between total practice levels of the studied students and mean score of pre and post observational periods regarding adult and children CPR, P=0.00 for both, where the total practice level of students regarding adult and children CPR was unsatisfactory in pre observational period (88.7%&100.0%) resp. rather than the total practice levels of students regarding adult and children CPR in post observational period was good (80.0%&90.7%) respectively.

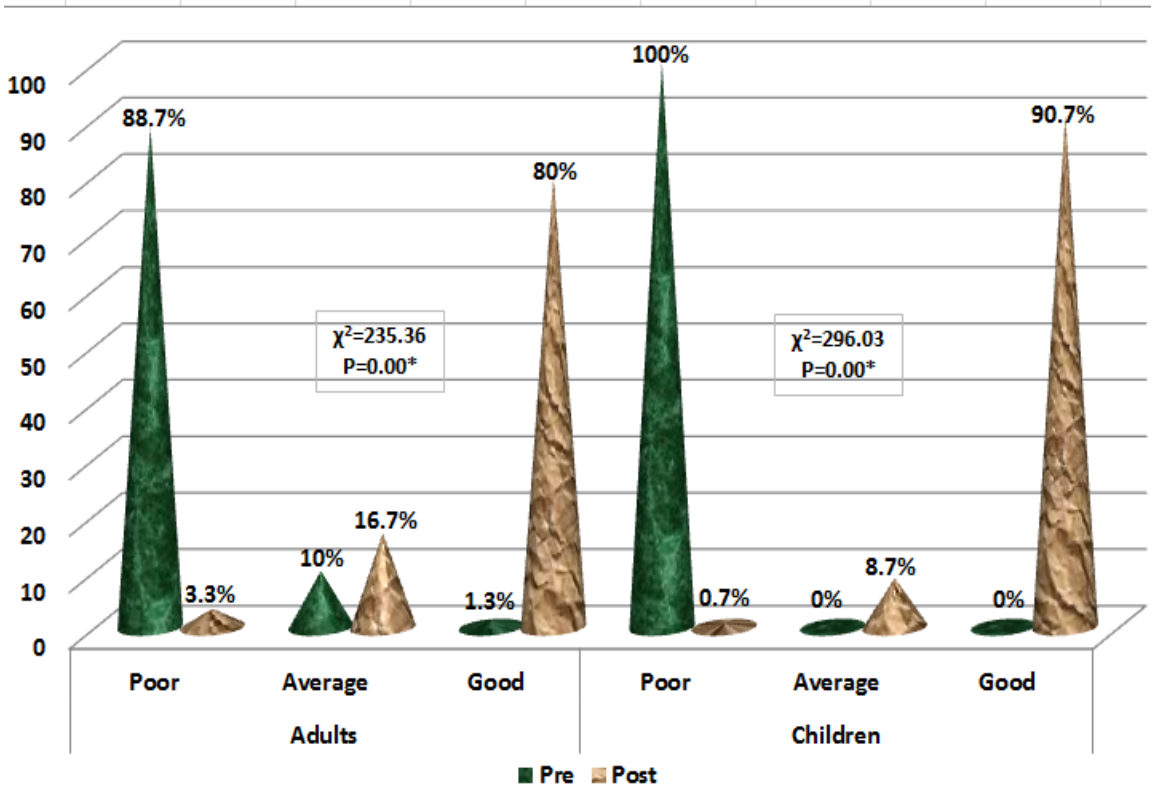

Figure (1): Percentage distribution of the studied students according to their total practice level

International Journal of Novel Research in Healthcare and Nursing
Vol. 5, Issue 1, pp: (21-37), Month: January - April 2018, Available at: www.noveltyjournals.com

Figure (1): illustrates the distribution of the studied students according to their total practice level. There were significant differences between total practice levels of the studied students and mean score of pre and post observational periods regarding adult and children CPR, P=0.00 for both, where the total practice level of students regarding adult and children CPR was poor in pre observation period (88.7%&100.0%) resp. While the total practice level of students regarding adult and children CPR in post observational period was good (80.0%&90.7%) resp.

Table (5): Comparison between both of total knowledge and total practice levels regarding adult CPR among the studied students throughout periods of study.

Total practice Levels for adult		Total knowledge levels for adult						χ^2	P
		Poor		Average		Good			
		N	%	N	%	N	%		
Pre	Unsatisfactory (n=133)	120	89.6	10	76.9	3	100.0	5.28	0.26
	Satisfactory (n=15)	13	9.7	2	15.4	0	0.0		
	Good (n=2)	1	0.7	1	7.7	0	0.0		
Total		**134**	**100.0**	**13**	**100.0**	**3**	**100.0**		
Post	Unsatisfactory (n=5)	1	100.0	2	10.5	2	1.5	**40.59**	**0.00***
	Satisfactory (n=25)	0	0.0	7	36.8	18	13.8		
	Good (n=120)	0	0.0	10	52.7	110	84.7		
Total		**1**	**100.0**	**19**	**100.0**	**130**	**100.0**		

* Significance at P <0.05 .

Table (5): proves the comparison between both of total knowledge and total practice levels regarding adult CPR among the studied students throughout periods of study. The majority of students (89.6%) who have poor knowledge level reported also unsatisfactory level of practice regarding CPR for adult pre intervention period, so there was no statistical significance difference between total knowledge level and total practice regarding CPR for adult pre intervention period.

Almost the majority of students (84.7%) who had good level of knowledge recorded good level of practice regarding CPR for adult post intervention period, so there was a significant difference between total knowledge and total practice level of students regarding CPR for adult post intervention period. P=**0.00**

Table (6): Comparison between both of total knowledge and total practice levels of CPR for children among the studied students throughout periods of study.

Total practice Level of CPR for Children		Total knowledge level of Children						χ^2	P
		Poor		Average		Good			
		N	%	N	%	N	%		
Pre	Unsatisfied (n=150)	144	100.0	0	0.0	6	100.0	-	-
Total		**144**	**100.0**	**0**	**0.0**	**6**	**100.0**		
Post	Unsatisfied (n=1)	0	0.0	0	0.0	1	0.8	2.93	0.57
	Satisfied (n=13)	1	12.5	0	0.0	12	10.1		
	Good (n=136)	7	87.5	23	100.0	106	89.1		
Total		**8**	**100.0**	**23**	**100.0**	**119**	**100.0**		

* Significance at P <0.05.

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Table (6): reveals the comparison between both of total knowledge and total practice levels of CPR for children among the studied students throughout periods of study. The majority of students who had poor knowledge level scored unsatisfactory practice level regarding CPR for children pre intervention period, while the minority of students who had good knowledge level having unsatisfactory level of practice.

There was no significant difference between total knowledge and total practice level regarding CPR for children in pre intervention period. Also the majority of students (89.1%) who had good knowledge level scored good practice level regarding CPR for children post intervention period.

Table (7): Relation between total knowledge levels before and after intervention as regards sociodemographic data of the studied students

Total knowledge Level of CPR	Sociodemographic data (n=150)					
	Age		Experience		Training	
	<20 (n=88)	≥20 (n=62)	No (n=98)	Yes (n=52)	No (n=112)	Yes (n=38)
	%	%	%	%	%	%
Adult (Pre)	89.8	88.7	91.8	84.6	92.9	78.9
Poor	9.1	8.1	6.1	13.5	6.3	15.8
Average Good	1.1	3.2	2.0	1.9	0.9	5.3
χ^2 , P	**0.843 , 0.656**		**2.312 , 0.315**		**6.303 , 0.043***	
Children (Pre)	96.6	95.2	96.9	94.2	97.3	92.1
Poor Good	3.4	4.8	3.1	5.8	2.7	7.9
χ^2 , P	**0.194 , 0.660**		**0.649 , 0.421**		**2.010 , 0.156**	
Adult (Post)	0.0	1.6	0.0	1.9	0.0	2.6
Poor	13.6	11.3	12.2	13.5	8.0	26.3
Average Good	86.4	87.1	87.8	84.6	92.0	71.1
χ^2 , P	**1.580 , 0.454**		**1.963 , 0.375**		**11.864 , 0.003***	
Children (Post)	0.0	12.9	2.0	11.5	0.9	18.4
Poor	15.9	14.5	16.3	13.5	20.5	0.0
Average Good	84.1	72.6	81.6	75.0	78.6	81.6
χ^2 , P	**12.008 , 0.002***		**6.116 , 0.047***		**24.181 , 0.00***	

* Significance at P <0.05.

Table (7): Shows the relation between total knowledge levels before and after intervention as regards sociodemographic data of the studied students. There were significant differences between total knowledge level of students regarding CPR for adult in relation to previous training pre and post intervention period, P=**0.043** &**0.003** respectively. Where the vast majority of the students (92.9%) who haven't previous training recorded poor knowledge level regarding CPR for adult pre intervention period. And almost the same percentage of students (92%) how haven't training, reported good knowledge level regarding CPR for adult post intervention period.

On the other hand there was no significance difference between total knowledge levels of students regarding CPR for children in relation to previous training pre intervention period. While there were significant differences between total knowledge levels of students regarding CPR for children in relation to age, experience and training post intervention period. Where both of the students' age in years reported good level of knowledge regarding CPR for children post intervention period(84.1% & 72.6%), as well as the students who haven't previous experience and training recorded good knowledge level regards CPR for children after intervention period (81.6%& 78.6%) respectively than pre intervention period (3.1%& 2.7).

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Table (8): Relation between total practice levels before and after intervention as regards sociodemographic data of the studied students

Total practice Levels of CPR	Sociodemographic data (n=150)					
	Age		Sex		Training	
	<20 (n=88)	≥20 (n=62)	Male (n=47)	Female (n=103)	No (n=112)	Yes (n=38)
	%	%	%	%	%	%
Adult (Pre)						
Unsatisfactory	93.2	82.3	97.9	84.5	92.0	78.9
Satisfactory	4.5	17.7	0.0	14.6	6.3	21.1
Good	2.3	0.0	2.1	1.0	1.8	0.0
χ^2 , P	**8.233 , 0.016***		**7.823 , 0.02***		**7.438 , 0.024***	
Children (Pre)						
Unsatisfactory	100.0	100.0	100.0	100.0	100.0	100.0
χ^2 , P	-		-		-	
Adult (Post)						
Unsatisfactory	0.0	8.1	0.0	4.9	0.9	10.5
Satisfactory	12.5	22.6	10.6	19.4	11.6	31.6
Good	87.5	69.4	89.4	75.7	87.5	57.9
χ^2 , P	**10.811 , 0.004***		**4.524 , 0.104**		**17.798 , 0.00***	
Children (Post)						
Unsatisfactory	0.0	1.6	0.0	1.0	0.0	2.6
Satisfactory	0.0	21.0	0.0	12.6	1.8	28.9
Good	100.0	77.4	100.0	86.4	98.2	68.4
χ^2 , P	**21.917 , 0.00***		**7.046 , 0.03***		**29.878 , 0.00***	

* Significance at P <0.05.

Table (8) shows the relation between total practice levels before and after intervention as regards sociodemographic data of the studied students. It was recorded that there were significant differences between total practice, age, sex and training regarding CPR for adult pre intervention period. **χ^2, P=8.233 - 0.016& 7.823 - 0.02 &7.438 - 0.024** respectively, and regarding age and previous training post intervention period, where **χ^2 , P=10.811- 0.004** & **17.798 - 0.00** respectively.

While there were no significance differences between total practice level and sociodemographic data of students regarding CPR for children pre intervention period**,** but there were significance differences between total practice level, age, sex and training regarding CPR for children post intervention period**. χ^2 , P=21.917 , 0.00** &**7.046 , 0.03** & **29.878 , 0.00**

5. DISCUSSION

Nowadays the comprehensive knowledge and skills of Cardio Pulmonary Resuscitation (CPR) is very important for all nursing staff. The training by simulation is consider an effective method for developing students 'clinical skills in resuscitation, this method develops participants' skills and helps them to learn about new equipment and procedures. [(24)].

Recently, training centers were established in universities of medical sciences and strengthened for providing practical training skills. Several educational programs were held as workshops, such as: cardiopulmonary resuscitation or cardiac surgery. The conducted evaluations confirmed it's highly positive effect on increasing the knowledge and enhancing students' performance. Other reports suggest that education by station training simulation method decrease the students' errors [(25-27)] .

Regarding socio-demographic characteristics, the study results revealed that more than half (58.7%) of the studied students were aged of less than 20 years old. This is because the most common age for join to the technical institute of nursing in Egypt is from 18-19 years. In relation to sex more than two third of the students (68.7%) were females, this may be due to the technical institute of nursing was accepted female students only in the past but recently it permits of male students enrolled in it. The majority of the students had previous education regarding CPR, this result may be due to the CPR was already taught in the medical surgical curriculum at first year [(28,29)]. These results was contradictor with **Abdel-Hay et al. (2015)** [(30)], who said that the two fifth of the students were in the age group (15-16) years old In relation

to gender half of students were male and other half were female. In addition to about three quarter from the students have not any previous knowledge about first aid and basic life support.

More than two third (65.3%) of students had no previous experience about CPR, this is may be revealed to the CPR re-demonstrated was done through simulation and it is difficult to find and applied it in actual life situation. Regarding training there were about three quarter of the study's sample had not previous training program regarding CPR, this may be due to the majority of the students not attended to CPR workshops or educational training program related to CPR, So these results necessitate the need for educational interventions. These results agree also with **Jafari et al. (2015)**[31], who emphasize on the importance of education about end-of-life care. This result was in agreement with **Dasgupta et al., (2014)**[32], who emphasized that (95.2%) of students had never been exposed to any sort of first aid training before this study was undertaken.

Regarding the percentage distribution of the studied students on their total knowledge score about CPR, the result revealed that the students' total knowledge regarding CPR for adult and children were improved post intervention (86.7%) & (79.3) respectively than pre one, moreover there was a strong significant difference between total knowledge score regarding CPR for adult, children and the pre/post intervention periods. This was in agreement with **Abdel-Hay et al. (2015)**[30], who said that there were significant improvement in the level of knowledge among students post basic life support program.

Regarding mean scores of practice domains of CPR for adult and children among studied students. It was observed that there was a significant difference between mean score of pre and post intervention periods among studied students and the practice domains of adult and children CPR regarding responsiveness, position & examination, hand/fingers position, Chest compressions, performance of ventilations(breathing) and re-assessment, where P=0.00 in all. This result may reveal to the CPR intervention training using station training method improved the students' performance post intervention period. This result was in agreement with **Abdollahi et al. (2010)**[33], reported that students' performance in basic and advanced CPR demonstrated a significant difference before and after station training.

Regarding comparison between both of total knowledge and practice levels among the studied students regarding CPR for adult &children throughout periods of study. It observed that the majority of students, who have poor knowledge level, reported unsatisfactory level of practice regarding CPR for adult &children pre intervention period, so there was no statistical significance difference between total knowledge level and practice regarding CPR for adult &children pre intervention period. While there was a significant difference between total knowledge and total practice level of students regarding CPR for adult &children post intervention period. This may be due to the CPR intervention using station training method improved the students' knowledge and practice of CPR for adult &children. This was agreement with **Gad and Kameo et al. (2016)**[34,35],who reported that the improvement in OSCE achievement's score was obtained post implementation of OSCE blending with simulation & providing training sessions for both students and clinical educators in 51.1% and 44.3% of 1st and 2nd year nursing students respectively. While there was no significant difference between total knowledge and total practice level regarding CPR for children pre /post intervention periods, but students' knowledge and practice level was improved after intervention.

Regarding Relation between total knowledge levels before and after intervention as regards sociodemographic data of the studied students, this study reported that there was significant difference between total knowledge level of students regarding CPR for adult in relation to previous training pre/post intervention, Where the majority of the students, who haven't previous training recorded poor knowledge regarding CPR for adult pre intervention period than post intervention period. This revealed to there was no enough previous training of CPR for adult during the clinical session of medical surgical course at the first year curriculum, but after educational session of CPR using station training method the students' knowledge improved than before intervention .This result was corresponding to the view of **Hamed (2011)** [36], who mentioned that there was a significant statistical differences pre-program CPR regarding knowledge and performances between two study groups, where the previously trained group had a higher level of knowledge and performance than no previous training one.

On the other hand there was no significance difference between total knowledge levels of students regarding CPR for children in relation to previous training pre intervention period. While there were significant differences between total knowledge levels of students regarding CPR for children in relation to age, previous education and previous training post intervention period. This result revealed to the students studied CPR for adult in the first year through medical surgical clinical course and not concern on studying of CPR for children unless in the second year with pediatric course. Moreover

the effect of CPR education using station training method with the simulation enhanced the students' knowledge regarding CPR for children. These findings could refer to the success of the program that empowered un-trained group to progress and obtain skills level similar to the previously trained one. These results are consistent with **Williamson et al. (2005)**[37], who revealed that CPR performance among participants was significantly better after training, than before training, **Bjørshol et al. (2009)**[38],supported the previous interpretation and clarified that there was advancement in the participants' level of performance post program.

The study recorded that the majority of students from both ages (less than, 20 years old and more), were reported a good level of knowledge regarding CPR for children as well as in previous education and training post interventional period. From the researchers point of view this may be due to effectiveness of CPR training and education using station methods on their knowledge beside their studies of CPR for children in the curriculum of pediatric clinical course in the second year. This result was in agreement with **Fahmy (2011)** [39],who said that The importance of knowledge in the health education must not be ignored because improvement in This knowledge is the first step toward proper practice and behavior modifications, so many studies must incorporated knowledge in their training programs to reach to this goal and also this result was corresponding to **Abd El Hay et al. (2015)** [30] ,who recorded that Concerning level of knowledge about first aid and basic life support among studied students revealed that there were highly statistically significant improvement in the level of knowledge regarding first aid and basic life support from poor to good level post training program at P = 0.001.

Regarding effect of sociodemographic data of the studied students on the total practice level before and after intervention. It was observed that there were significant differences between total practice level, age in years, sex and previous training regarding CPR for adult pre intervention period, where the students from both ages, sexes and who haven't previous training about CPR had unsatisfactory performance level regarding CPR for adult pre intervention period. This result may revealed that the lack of the students' skills and experience regarding CPR training. While in post observational period the significance was regarding age in years and previous training only and they scored good practice level regarding CPR for adult. This agreeable with **Bijari et al. (2006) and Mater et al. (2014)** [16,40], who said that CPR training station can lead to improvement of nursing and midwifery students' performance in the field of basic and advanced cardiopulmonary resuscitation if performed correctly and applicably .Regarding the Differences in CPR performance between group one and group two, this study found observable advancement in nursing students' CPR performance post program in comparison to pre-program implementation. In addition, there was no significant statistical difference between group one and group two related to their CPR performance post program and after four months which recorded by **Hamed (2011)** [36].

On the other hand there were significance differences between total practice level, age in years, sex and previous training regarding CPR for children post interventional period only. Where the students scored good practice level post intervention than pre one. This revealed to good training and effective station method for CPR training program than traditional one where scenario and role play simulation which improved the students' performance and keeping in their mind .this corresponding with **Abdollahi A. et al.,(2010)** [33] who showed that there was a statistically significant difference before and after intervention, with confidence coefficient of 95% ($p < 0.001$), indicating that the method of station training can change the students' performance. In the performance of advanced CPR a significant difference was observed compared to basic CPR; the advanced performance score of students was higher than their basic performance

6. CONCLUSION

In the light of the current study it can be concluded that, there is a change in students' knowledge toward CPR post intervention and improvement in their knowledge and practice after using station training method regarding CPR. Overall, training intervention was helpful in the effectiveness of nursing students' competency toward CPR.

7. RECOMMENDATIONS

Based on the results of the present study, it can be recommended that:

- Using station training method as a method of training and evaluation for all clinical nursing procedures.

- There is a need for continuous training regarding CPR using new teaching methods which must be included in undergraduate curriculum of nursing students.

- This study should be replicated with more participants and at several institutions to determine measurable outcomes and to generate larger statistical power with adverse group of students.

- Research studies need to be conducted to see if the station training method (OSCE) has an effect on transfer of learning to the clinical environment.

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