Impact of Simulation-Based Training on Students' Competency Level and Perceived Self-Efficacy in Pediatric Basic Life Support

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Abstract:

Background: Simulation Based Training enhances learning process through facilitating active participation of students as well as enabling them to apply their theoretical knowledge into practice. It provides students with opportunities for repetition of a skill more frequently, gain feedback on specific cognitive or psychomotor tasks, evaluation and reflection without the risk of causing harm to the patient. It has a powerful positive effect on students' achievement outcomes and competency level as well as it improves their self-efficacy regarding performance of skills especially in emergencies.Objective:to find out the impact of simulation-based training on students' competency level and perceived self-efficacy in pediatric basic life support.Design:Pretest and posttest quasi-experimental research design were used.Setting:This study was conducted at simulation skill labs of the Pediatric Nursing Department - Faculty of Nursing- Alexandria University. Subjects: A convenience sampling of 100 students who enrolled in the pediatric nursing course were included in the current study. Tools: Four tools were used for data collection.Student's Knowledge Competency Level Regarding (IBLS) Questionnaire, Student's Skill Competency Level Concerning IBLS Observational Checklist, Student's Skill Competency Level in Managing Infant Chocking Structured Observational Schedule and Student's Self-Efficacy (SSE) Questionnaire SheetResults: This study revealed that there were highly statistically significant differences between the students before and after the application of simulation based training in relation to their knowledge competency level and Skill competency level in addition it increased their self-efficacy regarding performing BLS procedure. Conclusion: Simulation-based training for PBLS created a positive impact on improving the knowledge and skill competency level as well as perceived self-efficacy of the pediatric nursing students so that they can confidently use their skills to resuscitate a child with cardiac arrest. Recommendations: Inclusion of simulation-based training as a method of teaching the pediatric basic life support in the undergraduate pediatric nursing curriculum and Pediatric nursing students should attend annual refresher SBT courses to maintain their competency in performance PBLS.

Keywords:simulation,training,competency,self-efficacy, pediatric basic life support.

I. Introduction

Nursing is a training based discipline in which clinical training assumes an incredibly fundamental role in preparing competent students in both intellectual and psychomotor capabilities [1]. Moreover, nursing is a science that confirm students repeated exposures with upgraded experience would enhance their abilities and certainty. Generally, nursing students are dealing with alive patients in real clinical settings to attain the essential skills [2].

Recently, there are raised numerous challenges to educate nursing students. These challenges result from increasing number of students andlacking opportunities for themto master lifesaving procedures as pediatric basic life support on real victim. Unfortunately, both possibilitiesplace patients at risk and create the potential for student's liability due to inexperience [3,4]. On the other hand, students are obligated to provide competent lifesaving measures and ensure patients' safety. These two competing requirements can sometimes pose a dilemma in nursing education. These are considered as the driving forces behind the introduction of Simulation- Based Training (SBT) as an innovative method of education in pediatric nursing skills [5].

Simulation Based Training (SBT) is a dynamic process that involves the creation of simulated scenarios that incorporates a true representation of reality in a safe environmentas simulation skill lab [5,6]. Itis designated to use simulated patients either manikin or actors, in either a simulated environment as simulation skill lab or simulated situation in the clinical environment which is known as in situ simulation [7,8].

Nowadays, patient simulation can be categorized as low, medium and high fidelity interactive simulators that correspond to actual real life nursing experiences. In the low fidelity simulators, the mannequins are unresponsive and without sounds. While, mannequins in the medium level are making just breathing sounds. Whereas, the highest fidelitymannequins are computer operated and attached to various monitors that show different measurements as evident eye response, chest movements and heart beat that resemble alive person[9,10].

Simulation Based Training(SBT) enhances learning process through facilitating active participation of studentsas well as enabling them to apply their theoretical knowledge into practice. Moreover, it provides students with opportunities for repetition of a skill more frequently, gain feedback on specific cognitive or psychomotor tasks, evaluation and reflection without the risk of causing harm to the patient. Furthermore, SBT offers many chances to students for acquisition and refinement of behavioral skills such as communication and working in a team[11,12].On top of that, the simulation-based learning proved to have a powerful positive effect on students' achievement outcomes and competency level as well as it improvestheir self-efficacy regarding performance of skillsespecially in emergencies[13,14].

Nursing competency includes core abilities that are required for fulfilling one's role as a nurse. It can be allocated into three theories, which are behaviorism, trait, and holism theory. Behaviorism represents"competency as an ability to perform individual core skills, and is evaluated by demonstration of those skills". Trait theory describes"competency as individual traits necessary for effectively performing duties, critical thinking skills and others". While, Holism views "competency as a cluster of elements, involving knowledge, skills, attitudes, thinking ability and values that are required in certain contexts"[15]. Nursing competency is generally viewed as a complex incorporation of knowledge comprising professional judgment, skills, values and attitude, indicating that holism is widely accepted. The structure of nursing competency consists of four abilities that include the ability to understand needs, provide care, and collaborate in addition to the ability to support decision-making. These four abilities are closely related and utilized in all pediatric nursing practice settings[16].

Perceived self-efficacy is defined as individuals' beliefs about their own capabilities to deliverassigned levels of performance that influence over events. It determines how people feel, think, motivate themselves and behave [17]. It was showed that nursing and medical students reported increased self-efficacy over time in relation to students' skills, experience and capabilities [18]. Recently, Watters et al (2015) verified that simulation based training enhances nurses and doctors' self-efficacy in clinical situations. It also leads to increases in their perceived abilities relating to communication/teamwork and leadership/management of clinical scenarios [19].

Cardiac arrest is defined as a sudden loss of blood flow due to the failure of the heart to pump effectively. It can occur out of hospital when it is called Out of Hospital Cardiac Arrest (OHCA) or in hospital when it is called "In Hospital Cardiac Arrest" (IHCA), cardiac arrest is a major clinical and public health problem, and survival remains poor unless fast recognition and a skilled response, in the form of cardiopulmonary resuscitation, which is an integral component of basic life support (BLS) are given [20].

Although, the evidence confirms that the application of SBT enable the pediatric nursing students to gain multiple training and improve their competency when dealing with pediatric cardiac arrest [21], pediatric nursing students in the Faculty of Nursing, Alexandria University learn infant basic life support (BLS) through watching videos only without demonstration. Therefore, it is impressive to examine the influence of simulation-based training as a teaching strategy on students' competency level and their perceived self-efficacy especially in performing a lifesaving procedure as infant basic life support.

Aim of the Study:
The aim of this study is to findout theimpact of simulation-based training on students' competency level and perceived self-efficacy in pediatric basic life support.

Research hypotheses:
- Pediatric nursing students who are taught by simulation-based training exhibit higher knowledge competency level in pediatric basic life support thanthose who are not.
- Pediatric nursing students who are taught by simulation-based training exhibit high skill competency level in performing pediatric basic life support thanthose who are not.
- Pediatric nursing students who are taught by simulation-based training exhibit high self-efficacy level in performing pediatric basic life support than those who are not.

Operational definition:
In this research, pediatric basic life support is focusing on infant basic life support and management of infant chocking.

II.Materials andMethod

2.1. MATERIALS

Design: Pretest and post-testquasi-experimental research design were usedin this study.

Setting: This study was conducted at simulationskill labs of the Pediatric Nursing Department -Faculty of Nursing- Alexandria University. There were two pediatric skill labs (A and B) that equipped with low and middle fidelity mannequins of different ages including newborns and children. These were used for clinical training of students on pediatric nursing skills.

Subjects:A convenience sampling of 100 students who enrolled in the pediatric nursing course during the second semester of the third academic year 2018-2019were included in the current study.

The study sample was estimated based on Epi info program, which used to estimate the sample size using the following parameters:

Population size is 248students.

Expected frequency is 50%.

Acceptable error 5%.

Confidence coefficient is 97%.

Minimum sample size is 80.

2.2. Tools:

Four toolswere used for data collection.

Tool I: Student's Knowledge Competency Level Regarding Infant Basic Life Support (BLS) Questionnaire Sheet:

This tool was developed by the researcher and guided by the American Heart Association Guidelines of infant BLS (2016) [22].It was used to assess student's knowledge about infant BLS. It included the following items: definition of sudden cardiac arrest and its causes, indication for rescue breathing, its frequency and technique, correct compression/ventilation ratio for single and two rescuers, correct chest compression depth, indication for Automated ExternalDefibrillator (AED),site and size of its pad, precautions that must be followed during AED.

This tool included14 multiple-choice questions (MCQs). Each question has four alternatives with only one correct response. The total score of student's knowledge is 14 grades. It will be converted into percentages. The student's knowledge competency level will be assessed based on Benner's stages of competence (proficiency) that is described as follow[23]:

Total student's score	Category	Level of competency
≥ 90%	Excellent	Proficient
80% to 89%	Very good	Competent
70% to 79%	Good	Advanced beginner
60% to 69%	Fair	Novice
< 60%	Fail	-

Personal and academic student's characteristics as age, gender, GPA and receiving of previous training about infant BLS will be attached to the tool.

Tool II: Student's Skill Competency Level Concerning Infant BLSObservational Checklist:

The researcher developed this tool based on the American Heart Association (AHA) guidelines (2016) that include infantBLS[22]. It wasused to assess student's skill in performing infantBLS.

It is composed of two scenarios of arrested infant:

A: Prehospital scenario: It was applied on the scene un-witnessed. It described an infant who is not breathing.

B: Hospital scenario: it was implemented in hospital or clinic. It described a condition of mother carrying infant and shout because the infant was not breathing or the health care provider present during infant's arrest.

It consisted of 17competencies. Each competency was graded as follows: three grades were awarded for correct and complete action, two grades for correct and incomplete action and one for incorrect or not done action. The total score of student's skillwas51 grades. This score was converted into percentages. The student's skill competency level was assessed based on Benner's stages of competence (proficiency) that was described as follow [22]:

Total student's score	Category	Level of competency
≥ 90%	Excellent	Proficient
80% to 89%	Very good	Competent
70% to 79%	Good	Advanced beginner
60% to 69%	Fair	Novice
< 60%	Fail (if the skill is not performed or performed incomplete)	

Tool III: Student's Skill Competency Level in Managing Infant Chocking Structured Observational Schedule:

The researcher developed this tool based on the American Heart Association (AHA) guidelines (2016) that include infantBLS[22]. It was used to assess student's skill in managing infant chocking. It included 11 steps that must be followed in management of infantchocking. Three grades were awarded for correct and complete action; two grades for correct and incomplete action while one grade were given for incorrect or not done action. The total score of student's skill was 33 grades. This score was converted into percentages. The student's skill competency level was assessed based on Benner's stages of competence (proficiency) that was described as follow [23]:

Total student's score	Category	Level of competency
≥ 90%	Excellent	Proficient
80% to 89%	Very good	Competent
70% to 79%	Good	Advanced beginner
60% to 69%	Fair	Novice
< 60%	Fail (if the skill is not performed or performed incomplete)	

Tool IV: Student's Self-Efficacy (SSE) Questionnaire Sheet:

This tool wasadopted from RowBotham, and Schmitz (2013)[24].It consists of fourareas, whichincluded student'sacademic performance,skill and knowledge development, social interaction with faculty and coping with academic stress. It consists of ten-point scale. The scale was answeredon a four-point response format as follow:

Not at all true (one), hardly true (two), moderately true (three),and exactly true (four). The resulting scores were ranged from 10-40 with higher scores representing higher student's self-efficacy.

From 10 to less than 20 represents low student's self-efficacy.

From 20 to less than 30 denotes moderate student's self-efficacy.

From 30 to 40 refers to high student's self-efficacy.

2.3. METHOD

1. An official permission to conduct the study was obtained from the ethical committee in the Faculty of Nursing, Alexandria University.
2. Approval was gained from head of Pediatric Nursing Department in the Faculty of Nursing, Alexandria University to conduct the research after explaining the aim of the study.
3. Tool I , II and IIIwere developed by the researchers based on American Heart Association Guidelines of infant basic life support and infant chocking (2016)
4. Tool I, II and III were tested for their content validity by five experts in the pediatric nursing field. No modifications were done.
5. Reliability of the tool I, II and IIIwere ascertained using the Cronbach Alpha test (internal consistency of the tool items were 0.97, 0.92, 0.97 respectively).
6. Reliability of the adopted tool IV was 0.82.
7. A pilot study was carried out on 10 students (10% of sample size) who were selected randomly from the same setting to evaluate the clarity and applicability of the research tools. No modification was made.These studentswere excluded from the study sample.
8. Two simulation scenarios of witnessed and unwitnessed arrested infant and two simulation scenarios of infant chocking were prepared and revised by five experts in pediatric nursing field.
9. The researcher divided students into 10small groups; each group consists of 10 students.
10. The application of simulation based-training activity was established through four consecutive phases [24]:

A: The briefing phase:

The researchers prepared themselves, the content, the instructional media (power point presentation of infant BLS and infant chocking), students, and pediatric nursing simulation skill lab and the required mannequins.

➤ Researchers preparation:

● Before starting data collection, the pediatric researcher received a training course for 72 hours about Pediatric Basic Life Support (PBLS), and Pediatric Advanced Life Support (PALS) based on American Heart Association and American Academy of Pediatrics (PALS) guidelines. Therefore, the pediatric researcher had a license of official BLS and PALS provider.

➤ Content preparation:

● The intellectual and practical intended learning outcomes were prepared. The researcher explained the intended learning outcomes and foundation of theoretical part about infant BLS and infant chocking. These included definition of cardiac arrest, its causes, criteria of high quality cardiopulmonary resuscitation

(CPR), indication for rescue breathing, its frequency and technique, correct compression/ventilation ratio for single and two rescuers, correct chest compression depth, indication for Automated External Defibrillator (AED), site and size of its pad, precautions that must be followed during AED. In addition to management of infant chocking and removal of foreign body in case of infant's airway obstruction using back blows and chest thrust.

- Booklet about infant BLS and infant chocking was prepared and guided by the American Heart Association Guidelines of infant BLS (2016) [21].
- The researcher prepared the power point presentation based on the guided content.

C: Environment (Pediatric nursing simulation skill lab):

- The researcher checked the efficiency of data show, adequate lightening, ventilation and chairs in the skill lab.
- The needed equipment were prepared andcheckedfor their efficiency for use in the pediatric nursing skill lab A and B which included middle fidelity manikin with feedback device, bag and mask device, pocket mask, AED andinfant manikin.

D: Students:

- Students in each group were arranged in the skill lab in a figure of U shape to facilitate their observation during researcher's explanation and demonstration on the manikin.
- In all groups, the researcher used tool I to collect students' personal and academic data as well as assess their knowledge about infant BLS using multiple-choice questions through pretest.
- Students were asked to observe the researcher carefully during demonstration of infant BLS and management of infant chocking because every one of them will be re-demonstrate the procedure and the researcher as well as their peers will evaluate them.
- The researcher explained the approach of debrief and feedback to provide more relaxed educational atmosphere.
- At the end of this phase, the researcher concluded the main points of previously mentioned theoretical background regarding infant BLS and infant chocking.

B: The immersion in the simulation-based experiencephase:

- Simulation scenarioswaredisseminated to students that incorporate a true representation of reality as sudden arrested, unresponsive infant, has no pulse or no breathing.Four different scenarios including hospital scenario of witnessed or unwitnessed arrested infant and prehospital scenario were issued to the students to help familiarize themselves with the arrested infants.
- The researcher disseminated infant BLS Algorithm of American Heart Association – 2016 of one or two rescuers as well as infant choking Algorithm to help students to follow the steps easily.
- The researcher explained a scenarios of witnessed or unwitnessed arrested infant then demonstrated infant BLS skill in the appropriate sequence as the following:
a) Check safety of the scene.
b) **Assess victim and activates emergency response system :**
- Check for responsiveness of the infant by tapping on the shoulder and shouting.
- Shouts for help/ direct someone to call for help and get emergency equipment (as AED).
- Checks for no breathing or no normal breathing (only gaping).
- Scans from the head to the chest for a minimum of 5 seconds and no more than 10 seconds.
- Checks brachial pulse.It can be done simultaneously with check for breathing.Checks are done for a minimum of 5 seconds and no more than 10 seconds.
c) **Performs high quality chest compressions during one rescuer CPR (initiate compressions within 10 seconds of identifying cardiac arrest):**
- Correct placement of hands/ fingers in center of chest.
One rescuer:Two fingers just below the nipple line.
- Compression rate of 100 to 120 /min: Delivers 30 compression in 15 to 18 seconds.
- Adequate depth for age:Infant: at least one-third the depth of the chest (about 4 cm)
- Complete chest recoil after each compression.
- Appropriate ratio for age and number of rescuers: Onerescuer CPR: 30 compressions to 2 breaths.
- Minimizes interruptions in compressions: Delivers two breaths so less than 10 seconds elapses between last compression of one cycle and first compression of next cycle.

d) **Provides effective breaths with bag-mask device during two rescuer CPR:**
- Opens airway adequately by keep the infant head in sniffingposition.
- Delivers each breath over one second.
- Delivers breaths that produce visible chest rise.
- Avoids excessive ventilation.
- Resumes chest compressions in less than 10 seconds.

e) Switches compression technique at appropriate interval as prompted by the researcher (for purpose of this evaluation). Switch should take no more than five seconds.

f) Performs high quality chest compressions during two rescuer CPR:
- Correct placement of hands/ fingers in center of chest: Two rescuers:two thumb encircling hands just below the nipple line.
- Compression rate of 100 to 120 /min: Delivers 30 compression in 15 to 18 seconds.
- Adequate depth for age:Infant : at least one third the depth of the chest (about 4 cm)
- Complete chest recoil after each compression.
- Appropriate ratio for age and number of rescuers.

Tworescuers: 15 compressions to two breaths.
- Minimizes interruptions in compressions.

Delivers two breaths so less than 10 seconds elapses between last compression of one cycle and first compression of next cycle.

g) When the second rescuer arrived and get AED, the researcher performed simulated defibrillation follow the instruction in AED device as establishment of ground rules for students to ensure their safety, application of AED pads in anteroposterior site, using of small size pads for infant and can use the adult pads but not be overlapped , plug in the wire, clear for analysis of infant's heart rhythm to decide if it shockable to deliver a charge or non-shockable

h) The researcher checked heart rate of arrested infant and continues until heart rate is regained or emergency response system arrived.

i) This was well exemplified by the use of rapid cycle of rescue breathing,chest compression and use of AED.

j) In case of infant chocking due to upper or lower airway obstruction, the researcher explained how to verify chocking of infant, demonstrate correct handling of infant on the forearm which is resting on the thigh and his face is facing down to facilitate withdrawal of the foreign body by gravity.
- The researcher deliveredfive back blows between the shoulder blades of the infant with the heel of the researcher's hand.
- Then, turn the infant face up on the other forearm with the head is lower than his chest.
- The researcher performedfive chest thrust by placing the pads of two fingers of free hand in the center of the infant's chest on the breastbone, just below the nipple line.
- Observe the infant's mouth to remove the foreign body if it is obvious. If there is no improvement repeat five back blows and five chest thrust until the condition is improved or the infant is deteriorated and arrested.
- The researcher concluded the simulation session events carefully and clarifies any unrecognized or unclear step.

C: The debriefing phase:
- The researcher provided time and space fordebriefing to enhance student's performance through discussion.
- Two debriefing sessions were prepared. One for infant BLSand the other for infant chocking. Each debriefing session included two simulation scenarios.
- Allowing student's repetitive practice on all simulation scenarios. The researcher provided constructive feedback and ensuring safety of both the rescuer and victim.
- The researcher gave immediate and objective feedback to students on high quality of infant CPR elements such as rate of ventilation and correct position and depth of chest compressions as well as back blows and chest thrust techniques for removal of foreign body in case of aspiration.

D: An action plan to change or transform performance phase:
An action plan was implemented to transfer learning from the simulated environment to the workplacewas established through the following steps:

- Every student wasexposed to hospital and prehospital scenarios of arrested infant and infant chocking.Every one demonstrated all steps of infant BLSin case of one and two rescuers as well as management of infant chocking.
- Knowledge competency level of all students was evaluated regarding theoretical background of infant BLS (posttest) using tool I.
- Skill competency level of every student was evaluated regarding infant BLS using tool II and management of infant chocking using tool III.

10. Finally, all studentswere asked about their opinion regarding their self-efficacy in performing infant BLS skill independently using tool IV.

Ethical Consideration:
- Written witness consent was obtained from students after providing appropriate explanation about the purpose of the study.
- Confidentiality of student's data was ascertained.
- Privacy was maintained.
- Students have the right to withdraw from the study at any time without penalties.

Data analysis:
Descriptive statistics for data analysis were as follows:
- Background data analysis by using frequency and percentage to describe the personal and academic characteristics of the students.
- Mean and standard deviation of the pre-test and post- test of knowledge and performance scores.
- Data were checked for normal distribution using the Kolmogorov-Smirnov test. If a presumed normal distribution was accepted, statistical differences were evaluated using the paired t test for within-group comparisons regarding knowledge and skill competency scores. Otherwise, we used the Mann-Whitney U test for non-normal distributions.
- Data related to student's self-efficacy was analyzed using descriptive statistics as frequency, and percentage.

III. Results

Table (1) represents the pediatric nursing students' personal and academic characteristics. It can be observed that the age of the majority of students (84%) were from 20 to less than 22 years. Their mean of age was 20.59 years. Regarding gender, the highest percent of students (70%) was male. All students were in the 6th semester. The last certificate of ninety three percent of students was secondary school. Approximately, three quarter (73%) of students had B+ score in the previous semester.

Table (1): percent distribution of pediatric nursing students' personal and academic characteristics

Personal and academic characteristics	N (100)
Age/years	
20 -<22	84
22 and more	16
X± SD 20.59± 1.11096	
Gender	
Male	70
Female	30
Academic semester	
Sixth level	100
Last Certificate	
Secondary school	93
Associate degree of nursing	7
Semester GPA	
B+	73
B-	20
C	6

Table (2) revealed that before conducting simulation based training about PBLS, most of pediatric nursing students (93%) failed in their knowledge competency level. Whereas, after conduction of simulation training, it was found that 61% of students were proficient (excellent), twenty two percent of them were

competent, only seven percent of them were advanced beginner compared to only two percent of students who failed in performing PBLS.

Table (2): Student's knowledge competency level before and after conduction of simulation based training

Knowledge Competency level	Pre SBT (t1) N0 (100)	Post SBT (t2) N0(100)	t(P)
Proficient (Excellent) ≥ 90%	0.0	61.0	
Competent (Very good) 80%-89%	0.0	22.0	
Advanced beginner (good) 70%- 79%	0.0	7.0	31.595 (.000)*
Novice (Fair) 60%-69%	7.0	8.0	
(Fail) <60%	93.0	2.0	

t= paired sample t test   *** P= ≤0.05 (significant**

Student's skill competency level after conduction of simulation-based training is illustrated in table (3). It is clear from the table that most of pediatric nursing students (91%) become proficient , 8% of them were competent and only one percent of them were advanced beginner or gains good competency level in PBLS skill.

Table (3): Student's skill competency level after conduction of simulation based training

Skill competency level	Post SBT (t2) N0 (100)
Proficient (Excellent) ≥ 90%	91
Competent (Very good) 80%-89%	8.0
Advanced beginner (good) 70%- 79%	1.0
Novice (Fair) 60%-69%	0.0
(Fail) <60%	0.0

Table (4) illustrates the student's skill competency level after conduction of simulation training in infant's choking. It was observed that the majority of pediatric nursing students (85%) were proficient (excellent) in their skill competency level, thirteen percent of students were competent, only two percent were advanced beginner.

Table (4): Student's skill competency level after conduction of simulation training about infant choking

Infant choking Skill Competency level	Post SBT (t2) N0 (100)
Proficient (Excellent) ≥ 90%	85
Competent (Very good) 80%-89%	13
Advanced beginner (good) 70%- 79%	2.0
Novice (Fair) 60%-69%	0.0
(Fail) <60%	0.0

Table (5) represents students mean scores pre and post simulation training. It was found that students' mean score were improved regarding their PBLS knowledge, PBLS algorithm, PBLS skill and total time of PBLS sequence in seconds (6.020 ± 1.563 to 13.480 ± 1.925, 8.124 ± 1.780 to 10 ± 1.320, 40.05 ± 2.335 to 49.14 ± 1.432, 190 ± 4.754 to 135 ± 2.132 respectively) with statistical significant differences.

Table (5): Comparison of pediatric nursing students' scores pre and post simulation based training

Scored items	Pre SBT (t1) X±SD	Post SBT(t2) X±SD	P
BLS knowledge (n= 14)	6.020±1.563	13.480±1.925	.000*
Adherence to BLS algorithm (n=12)	8.124±1.780	10±1.320	.000*
PBLS Skill (n=51)	40.05±2.335	49.14± 1.432	.003*
Total time of PBLS sequence in seconds	190±4.754	135±2.132	.001*

t= paired sample t test   *** P= ≤0.05 (significant**

Table (6) illustrates students' self-efficacy after conduction of simulation based training. It shows that the highest percent of students reported that they able to successfully learn all relevant subject, they can maintain a positive attitude toward SBT, they can obtain the academic goals, they able to learn even the most difficult content as well as they can finish the assigned simulation training and earn the grade they want, even when others think they cannot (81%, 81%, 81%, and 77% respectively)

Table (6): Distribution of pediatric nursing students according to their self-efficacy after conduction of simulation training

Items of self- efficacy	Not at all true %	Hardly true %	Moderately true %	Exactly true %
I am able to successfully learn all relevant subject	2	0.0	17	81
I can maintain a positive attitude toward this simulation training even when tension arise	0.0	0.0	19	81
When I try hard, I am able to learn even the most difficult content.	0.0	0.0	27	73
I am convinced that , as time goes by, I will continue to become more and more capable of learning the content of this simulation training	3	0.0	31	66
Even if I get distracted in class, I am confident that I can continue to learn well.	0.0	0.0	34	66
I am confident in my ability to learn, even if I am having a bad day.	5	3	36	56
If I try enough, I can obtain the academic goals I desire.	0.0	4	15	81
I am convinced that I can develop creative ways to cope with the stress that may occur while taking this simulation training.	0.0	5	31	64
I know that I can stay motivated to participate in the simulation training.	0.0	3	22	75
I know that I can finish the assigned simulation training and earn the grade I want, even when others think I can not	0.0	3	20	77

It is obvious in table (7) that after conduction of simulation-based training, most of students (95%) achieved high self-efficacy level while, only 5% of them attained moderate self-efficacy level.

Table (7) Distribution of pediatric nursing students according to their level of self-efficacy post conduction of simulation-based training

Levels of self-efficacy	Post SBT N0 (100)
High self-efficacy (31-40)	95
Moderate self-efficacy (21-30)	5.0

IV.Discussion

Pediatric arrest occurs rarely but requires a high level of competency to save children's life can be practiced easily [26, 27]. The etiology of cardiac arrests in children differs from the patterns seen in adults. A high proportion of cardiac arrests occur secondary to respiratory or circulatory failure rather than primary arrests caused by arrhythmias [28]. Simulation has been used as a training tool to improve procedural skills related to pediatric resuscitation. The use of simulation in health care education has become a core component in both undergraduate and postgraduate programs in the past two decades. Currently, it is used in training, assessment and research [29]. The ability to provide a safe learning environment through simulation based training where learners can make mistakes, review their performance and gain feedback, without risk to patients [30].

Clinical simulation is a dynamic process that involves the creation of a scenario that incorporates a true representation of reality, facilitating the active participation of students and integrating the complexities of practical and theoretical learning with opportunities for repetition, feedback, evaluation and reflection without the risk of causing harm to the patient [31]. In the current study, it was evident in table (2) about PBLS, most of pediatric nursing students failed in their knowledge competency level before conducting simulation based training. These could be due to several factors such as the lack of knowledge, poor training, and inadequate skills. Whereas, after conduction of simulation training, it was found that the majority of them were ranged from proficient (excellent) to competent level in performing PBLS. This result was congruent with Flo, Flaathen and Fagerström (2013) who ascertained that nursing students after experiencing simulation sessions confirmed that the simulation is quite beneficial because it improved their practical and theoretical learning [32].

Pediatric basic life support (PBLS), is usually simulation-based with the need for evaluating learners' performances. Although there is evidence that simulator training is effective to improve basic life support performance, literature comparing various methods of training is scarce [33,34].After conduction of simulation-based training in the present study, most of pediatric nursing students become proficient in their skill competency level during demonstration of PBLS as illustrated in table (3). It could be due to corrective steps that were taken by the students based on the feedback indications given to them by the manikins, which helped in ensuring high-quality CPR that is crucial for resuscitation. Inaddition, the repetition of these essential skills that was done by the students themselves has shown to improve their retention of CPR skills. Likewise, Daniel and Evangeline (2018)reported that simulation-based hands-on training improved medical students' psychomotor skills better than practical skills compared to students who only underwent conventional training, in view of more interaction [35]. On the other hand, Motola etal acknowledged the use of Audio-visual (AV)

recordings during simulation training within the debriefing because it can assist in the reflection process when learners are not aware of their actions or do not recall exactly what was said or done. In addition, AV recording can be used to recall events and illustrate a critical event during the scenario [36].

The presented results support the subjective perceptions of students. Most of students reported that they maintain a positive attitude toward simulation -based training, reported that they can obtain the academic goals by using this modality of teaching. Furthermore, most of them perceived high self-efficacy after conduction of simulation based training (table 6,7). It could be due to implementation of debriefing after a simulation that involves a discussion of the events/actions that occurred beside the reasons behind the decisions made. It also involves an exploration of the feelings and emotions evoked by the simulation. All of these interventions promote students' attitude toward SBT. This result was supported by Lockman et al (2015) who confirmed that debriefing is necessary to minimize negative psychological effects of SBT for learners [37]. Moreover, Kalaniti and Campbell (2015) reported that simulation programs also provide feedback to students on their performance and an opportunity to reflect through the debriefing process. It can provide an effective educational climate, which allows the learners to feel safe and encourages them to express themselves without judgement [38]. Moreover, Kane et al (2011) prove that simulation-based educational programs improve self-reported knowledge, skills, and comfort of intensive care unit nursing staff when caring for critically ill children [39].

Simulation fidelity has often referred to the manikin that describes the degree to which the simulator replicates reality [40]. In the present study, low fidelity manikin was used during simulation-based training about PBLS of students as mentioned in the methodology. It was clear from table (5) that the students' mean scores are raised in their knowledge, skills, adhering the PBLS algorithm. This finding is congruent with the findings of Makal (2019) who showed that student nurses believe low-fidelity simulation was an educational method that improved skills, provided effective learning, and enhance their satisfaction levels[41].

Furthermore, Massoth et al (2019) concluded that the use of high-fidelity simulation led to equal or even worse performance and growth in knowledge as compared to low-fidelity simulation, while also inducing undesirable effects such as overconfidence [42].

Additionally, Schoenherr and Hamstra (2017) suggest that high fidelity is neither necessary nor sufficient to ensure effective training [40].

V. Conclusion

Based on the findings of the current study, it can be concluded that simulation-based training for PBLS created a positive impact on improving the knowledge and skill competency level as well as perceived self-efficacy of the pediatric nursing students so that they can confidently use their skills to resuscitate a child with cardiac arrest.

VI. Recommendations

Based on the results of the current study, it can be recommended that:
1. Inclusion of simulation-based training asa method of teaching the pediatric basic life support in the undergraduate pediatric nursing curriculum.
2. Health care educators should consider the use of both low and high fidelity simulators to teach PBLS
3. Debriefing, as a mean of terminal feedback, is the most important part of simulation-based training to help to achieve optimal learning outcomes and enhance students' knowledge and skill competency.
4. Pediatric nursing students should attend annual refresher SBT courses to maintain their competency in performance PBLS.
5. Combination of video recording during SBT during debriefing will facilitate and prove accurate evaluation of student's skill competency level.
6. Utilization of a variety of simulation modalities (summative, formative, high stakes, and remedial) for evaluative purposes of pediatric nursing students.

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