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ORIGINAL RESEARCH

Effectiveness of Simulation-Based Education on Nurses Knowledge Regarding Paediatric Basic Life Support

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ABSTRACT

Background: Pediatric basic life support (BLS) involves administering cardiopulmonary resuscitation (CPR) to children experiencing cardiac arrest without the use of equipment, relying on bag-mask ventilation or barrier devices until advanced life support (ALS) is available.
Objectives: The purpose of this study was to determine the effect of simulation-based education on nurses' knowledge in Pediatric Basic Life Support (PBLS).
Methodology: A quasi-experimental pretest-posttest study was carried out with 50 nurses from the pediatric wards of two general hospitals in Al-Najaf City, Iraq, from September 16, 2023, to January 20, 2024. The study subject was a convenience sample of 50 nurses was randomly assigned to two groups of 25, to be treated as intervention or control groups. The intervention group received simulation-based educational program while the control group received no intervention. Descriptive and inferential statistics were calculated. While data collection tools were a structured self-administered questionnaire with two parts related to socio-demographic characteristics and nurses' knowledge of paediatric basic life support. The education passed through 3 phases e, pre-test, implementation and post-test phase.
Results: The study's findings showed that the implementation of a simulation education program led to an improvement in the knowledge of the study group.
Conclusion: The study concluded that simulation based education improved nurses' knowledge related pediatric basic life support and the study provides aline to enhance the simulation integration as active education strategies to develop nurses' knowledge in applying clinical skills.
Recommendations: Further studies are recommended to evaluate the impact of simulation on nurses' education outcomes, providing more evidence that simulation would be beneficial for nurses' improvement. The researcher also suggests encouraging nurses to improve their knowledge and performances through increased participation in Basic Life Support (BLS) and Cardiopulmonary Resuscitation (CPR) courses, at least every six months.

Keywords: Efficacy, Simulation based education, Nurses knowledge, Pediatric basic life support.

INTRODUCTION

Basic life support (BLS) involves identifying critical conditions like heart attacks, sudden cardiac arrest, airway obstructions, or strokes, followed by administering cardiopulmonary resuscitation (CPR) and defibrillation using an automated external defibrillator.

The American Heart Association highlights that providing CPR and defibrillation within the initial three to five minutes of a collapse can result in survival

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rates ranging from 49% to as high as 75%. Notably, CPR has been shown to double or triple survival rates in witnessed sudden cardiac arrest situations (Alkubati et al., 2022).

The American Heart Association strongly encourages healthcare team members to gain competency in cardiopulmonary resuscitation (CPR) techniques to reduce the incidence of sudden cardiac arrests (Kose et al., 2020).

The aim of Basic Life Support (BLS) is to maintain a distribution of oxygen-rich blood through survival organs, especially the brain and heart, through temporary artificial circulation until normal cardiac activity and breathing are restored. The most crucial factor in the success of BLS is effective time management. It is essential to diagnose and initiate treatment promptly (Rajesh, 2020).

Nurses, being often the primary healthcare providers to deliver basic life support (BLS) in emergencies, must uphold their proficiency in cardiopulmonary resuscitation (CPR) to effectively save lives. Insufficient initial evaluation, improper interventions, and inadequate supervision are key factors leading to unfavorable CPR results (Rajeswaran & Ehlers .2014; Diaa et al., 2023).

The ability to effectively provide Basic Life Support (BLS) and Advanced Life Support (ALS) is crucial for nurses in managing serious medical crises, as it directly impacts the success rates of cardiopulmonary resuscitation. Nurses must be proficient in BLS and able to perform it in emergency situations, as it can significantly increase the chances of survival and prevent long-term complications such as brain damage. Regular training and assessment are essential for nurses to maintain their BLS skills and knowledge, as they can deteriorate within three to six months of biannual training. Increasing the frequency of training can improve the quality of CPR, including compression depth and rate, hand positioning, and recoil. Nurse educators can also benefit from higher certification to train others in essential BLS skills (Kelkay et al., 2018).

Simulation education plays a crucial role in imparting knowledge and skills related to cardiopulmonary resuscitation (CPR) and basic life support (BLS). Both CPR and BLS are vital life-saving skills during cardiac arrest situations, and nurses' proficiency in these skills is essential to prevent fatalities and ensure better quality of life outcomes. Recognizing the significance of these skills, the American Heart Association has recommended the use of simulation, response devices, simulators, and online learning courses as resources for teaching and learning BLS since 2015. These educational tools aim to enhance nurses' competence in CPR and BLS, ultimately improving patient outcomes and reducing the risk of adverse events in emergency situations (Kasem & Abuhammad, 2022).

AIMS OF THE STUDY

To evaluate the effectiveness of simulation based education on nurses knowledge regarding paediatric basic life support.

METHODOLOGY

Design and Setting:

A quasi-experimental pretest-posttest study was conducted on nurses working at Al-Zahra Teaching Hospital and Al-Manathera General Hospital, Al-Najaf, Iraq from September 16, 2023, to January 20, 2024.

Study Sample:

50 nurses were conveniently recruited and randomly assigned to two groups of 25, to be treated as intervention or control groups.

Tools for data collection:

Data was gathered through two parts:

Part one: Socio-Demographic Characteristics:

Socio-Demographic information sheet and related factors included (age, gender, education level, years of experience, and participation in training sessions regarding pediatric basic life support).

Part two: Nurses knowledge regarding pediatrics basic life support:

This part was constructed to assess nurses knowledge about pediatric basic life support. It consisted of (32) items of multiple choice and (5) true or false questions to measure Nurses knowledge that covered airway obstruction and Cardiac arrest, pediatric cardio-pulmonary resuscitation and Using an automated external defibrillator.

Scoring system

The Scoring system of this part Included (37) items. The knowledge of respondents of each question was scored with two points. The Semantic scale was used for the purpose of items' rating which are scored as follows: (1) for correct answer and (0) for incorrect answer. The level of knowledge was estimated by calculating the mean of score and the cutoff point for the total score of knowledge as follow: poor knowledge (0-12), moderate knowledge (13-25), and good knowledge (26- 37). The level of knowledge assessment for each item was estimated by calculating the cutoff point for the mean of score and scored as follows: poor (0-0.33), moderate (0.34-0.67), and good (0.68-1).

Content validity:

A panel of 10 experts, including nine nursing professors and one emergency doctor, were asked to assess the face and content validity of the study questionnaire's components in terms, as well as their readability and relevance. After their amendments were made, they confirmed the content validity.

Reliability assessment:

To assess the questionnaire's reliability, data were collected from nurses, and the test was administered to 10 subjects from the study population who were not part of the original sample. Cronbach's alpha was (r=0.81).

Intervention

The program consisted of two parts, including a theoretical and a practical part outlined in Table 1. The program was developed by the researcher following AHA guidelines and consisted of two parts: a theoretical and a practical part,. It was implemented over four consecutive days in December 2023. The theoretical part consisted of four 45-minute sessions, each including PowerPoint-enhanced lectures, discussions, and role-playing using a manikin and an automated external defibrillator (AED). The sessions were held at one of the hospitals' continuing medical education halls and were led by the first author, under the supervision of the second author. The pretest was administered before the sessions began, and the posttest was administered one month after the end of the intervention. The control group received no intervention, but they were evaluated at the same time as the intervention group.

Statistical Methods:

All the data in the current study were entered into the SPSS program (version 20). The minimum values, the maximum values, the means, and the standard deviation were calculated. Chi-square (non-parametric test) was used for qualitative data. One way ANOVA, independent t test, Paired t test, Kruskal–Wallis test, Mann-Whitney U-test were used for quantitative data according to the fulfillment of the conditions required for each test. P-value ≤0.05 was considered statistically significant.

RESULTS

Most of the nurses in the intervention and control groups were in the age group 26-30 years old, held a Bachelor's degree in nursing, and had less than 5 years of professional experience. Furthermore, 56% of nurses in the intervention group and 52% of the control group reported previous training in BLS (P = 0.77). The two groups were homogenous in all socio-demographic characteristics (Table 1).

At baseline, the nurses in the intervention group exhibited a significant improvement in their knowledge of pediatric basic life support, with a mean score increasing from a moderate level of 0.46 in the pre-test to a good level of 0.89 in the post-test. In contrast, No notable changes were observed in the

knowledge of the control group at the end of the study (Table 2).

Figure 1 and 2 illustrate that initially, 56% of nurses exhibited poor knowledge in Basic Life Support (BLS) during the pretest. However, following the intervention, 96% of them demonstrated proficient knowledge in BLS during the posttest.

The comparison between pre-test and post-test assessments revealed a significant improvement in knowledge within the study group ($P < 0.01$). This suggests that the educational program led to a notable enhancement in nurses' understanding. Conversely, in the control group, there was no significant difference in knowledge before and after the program (Table 3).

DISCUSSION:

Recent Studies indicates that simulation significantly advances nursing knowledge, enhances practice, critical thinking abilities, communication skills, and boosts self-efficacy, ultimately aiding in clinical decision-making. Simulation education is an interactive approach employed to replicate realistic clinical scenarios within a secure environment, facilitating nurses' acquisition of both theoretical understanding and practical skills, particularly in resuscitation techniques (Waznonis, 2015). The current study aim is to evaluate the efficacy of using simulation based education on nurses' knowledge regarding pediatric basic life support (PBLS).

Regarding socio-demographic characteristics of studied nurses **(Table1)**, the present study showed that most of the nurses in both groups are those in the ages group (26-30) years old. In addition, the table shows that the high percentages of participants in both groups (56% and 52%) were males in the study and control groups respectively. Concerning the level of education, (48%) and (52%) of the study and control groups, respectively, both graduated from Bachelor. Regarding the years of experience in the nursing field, the table shows that (48%) of the sample in the study group and (52%) of the sample in the control group have (<=5) years. Regarding participation in training courses in pediatric basic life, (56%) of the study group had training course, and (52%) of the control group had training course.

Concerning nurses' knowledge about pediatric BLS before and after implementation, the findings revealed that the majority of nurses' knowledge were increased after implementation **(Table 2)**. This finding might be because of that simulations increase critical thinking talents, students learning experience, and skill performance. The present study is congruent with Bahig Anwr Akl etal (2021) stated that the majority of nurses' knowledge were increased after implementation of simulation training. Also this result is agree with Partiprajak & Thongpo, 2016 Presented that retention of basic life support knowledge, self-efficacy and chest compression performance, who found that CPR training has a vital direct effect on knowledge. Study by Pauly-O'Neill& Prion, 2013, who demonstrated the using integrated simulation in a nursing program and revealed that there was a rise in knowledge about essential medication administration skills for the pediatric population after simulation based learning.

(Table 3) presents the t-test analysis for measuring an effectiveness of the program. the table reveals the differences in knowledge assessment between the pre-test and post-test of both the study and control groups; it shows a highly significant difference ($P <0.01$) between pre-test and post-test assessments in the study group, while the assessment of nurses' knowledge shows no significant difference at a P-value more than (0.05) among pre-test and post-test assessments in the control group. This mean that there is an improvement in the nurses' knowledge after the program. From point of researcher's insight, this type of education that used in this study were effective in improving knowledge of the nurses in the study group and reinforced their learning. This study reveals that the majority of nurses have had unsatisfactory knowledge toward pediatric basic life support before

execution of the educational program and after applying the program, their responses and knowledge, have been improved.

CONCLUSIONS:

The current study indicates that simulation-based education enhanced nurses' knowledge, enabling them to effectively use their abilities to resuscitate a child experiencing cardiac arrest. Furthermore, it facilitates the incorporation of simulation as an active approach to improve nurses' proficiency in utilizing clinical skills. Moreover, the study shows the significance of incorporating both conventional and simulation-based methods into nursing education. However, since we had no follow-up, further studies are warranted to evaluate the long-term effects of simulation-based PBLS education.

RECOMMENDATIONS:

The study recommend to assess the effects of simulation-based training on the nurses' satisfaction and confidence with PBLS. The Ministry of Health in Iraq has developed pediatric CPR guidelines for use in Iraqi hospitals, intending to educate nurses to recognize and respond to pediatric cardiac arrest. All hospitals in Iraq are recommended to implement this type of education program.

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Authors' contributions

All authors equally and substantially contributed to the work design, acquisition, analysis, and interpretation of the data, and drafting and revising the manuscript. All authors read and approved the final manuscript and take responsibility for the integrity of the data and the accuracy of the data analysis.

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Availability of data and materials

The data used in this study will be available at reasonable request.

Ethics approval and consent to participate

Scientific Research Ethical Committee, University of Kerbala/Nursing Faculty granted approval. Each participant in this study provided informed consent prior to enrolment.

Consent for publication

By submitting this document, the authors declare their consent for the final accepted version of the manuscript to be considered for publication.

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TABLES & FIGURES:

Table (1): Comparison of the intervention and control groups in terms of their socio-demographic characteristics

Variables		Group		P-value
		Intervention (No & %)	Control (No & %)	
Age (Years)	≤ 25	1 (4)	1 (4)	0.98 [a]
	26 – 30	17 (68)	16 (64)	
	31 – 35	3 (12)	3 (12)	
	36 – 40	2 (8)	3 (12)	
	≥ 41	2 (8)	2 (8)	
	Mean ± SD	30.24 ± 5.88	31.12 ± 6.01	
Sex	Males	14 (56)	13 (52)	0.77 [b]
	Females	11 (44)	12 (48)	
Education level	Nursing school	4 (16)	5 (20)	0.93 [a]
	Diploma	8 (32)	6 (24)	
	Bachelor	12 (48)	13 (52)	
	Master and doctorate	1 (4)	1 (4)	
Years of experience	≤ 5	12 (48)	13 (52)	0.49 [a]

	6 – 10	8 (32)	6 (24)	
	11 – 15	3 (12)	1 (4)	
	≥ 16	2 (8)	5 (20)	
	Mean ± SD	6.92 ± 4.46	7.84 ± 5.67	
Having previous training for PBLS?	Yes	14 (56)	13 (52)	0.77 [b]
	No	11 (44)	12 (48)	

a: Fisher's Exact test, b: Chi-square

Table (2): Overall Evaluation of the Study and Control Groups Knowledge Regarding pediatric basic life support at the Pre-test and Post-test level

	Study Group (*n*=25)						Control Group (n=25)					
	Pre-Test			Post-Test			Pre-Test			Re-Test		
Knowledge Regarding PBLS	f	%	SD	f	%	SD	f	%	SD	f	%	SD
Poor	8	32	0.46	0	0	0.89	7	28	0.47	6	24	0.47
Moderate	14	56		1	4		16	64		16	64	
Good	3	12		24	96		2	8		3	12	

Poor (mean of scores 0-0.33), Moderate (mean of scores 0.34-0.67), Good (mean of scores 0.68 and more), SD: Standard Deviation

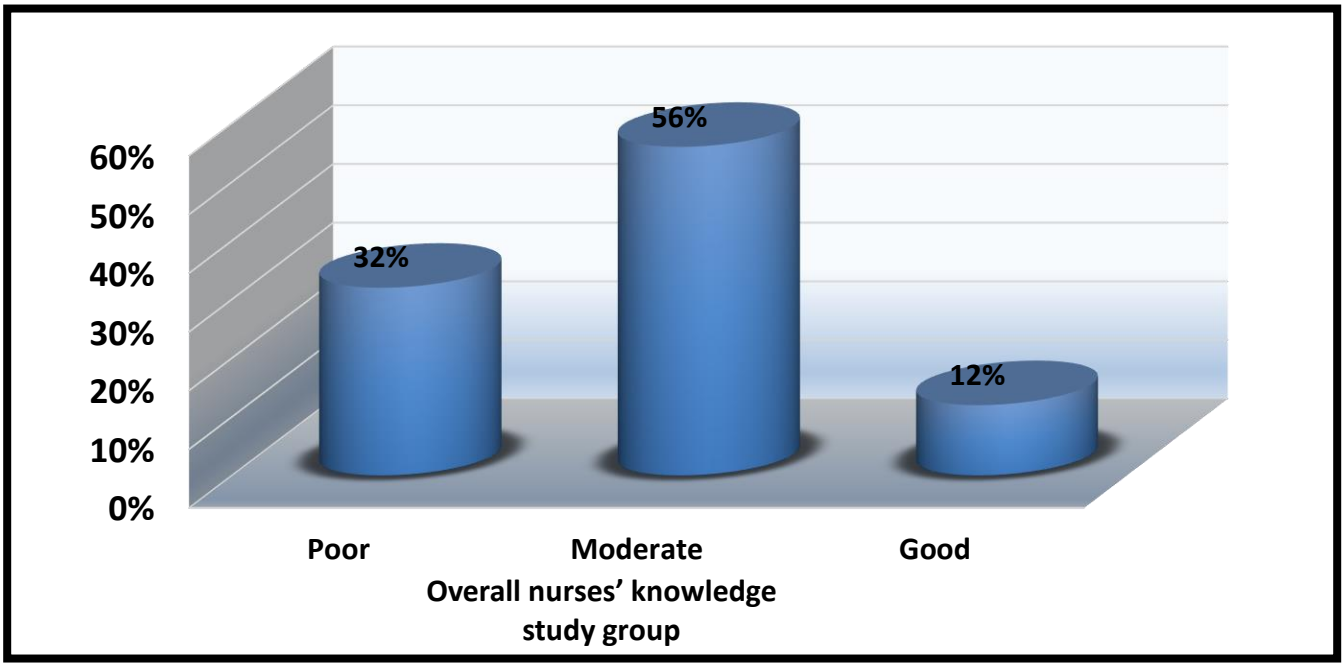

Figure (1): overall assessment of nurses' knowledge for study group at the pre-test

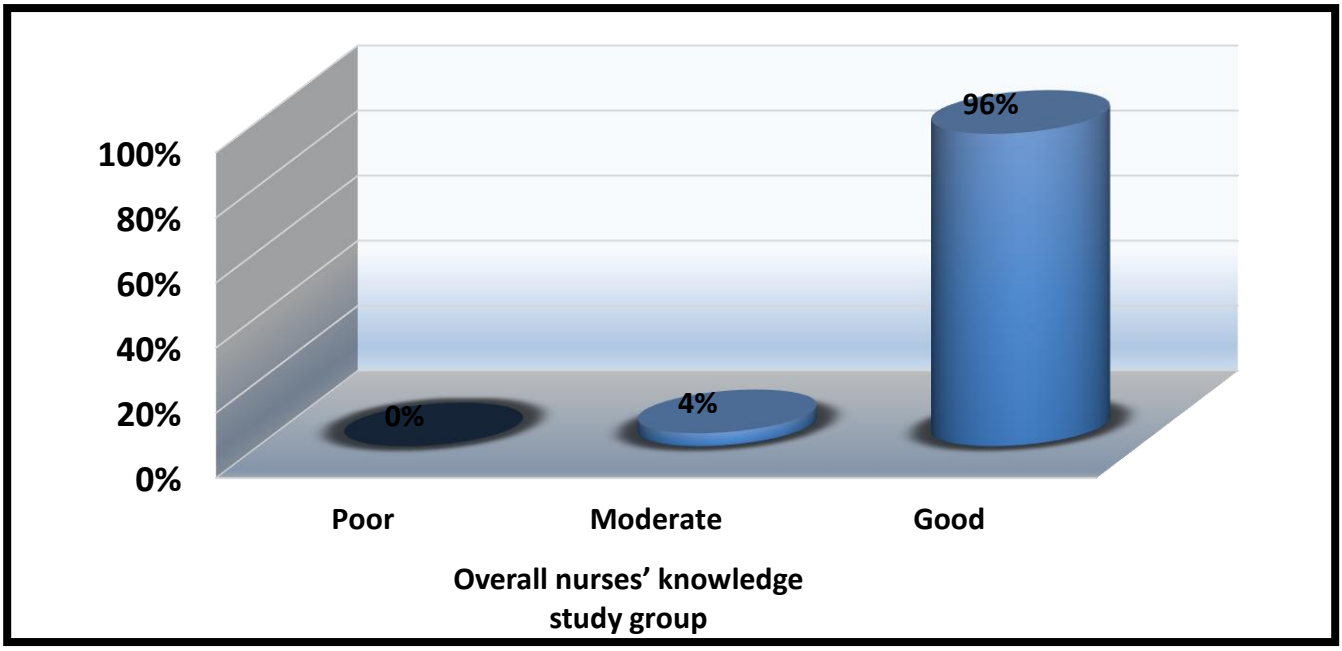

Figure (2): overall assessment of nurses' knowledge for study group at the post-test

Table (3): Mean Difference (Paired T-Test) of the Study and Control Groups Knowledge at Two Periods of Measurements (Pre-test and Post-test).

Overall Items	Groups	Periods of Measurements	M.S.	SD	t-value	d.f	p-value
Nurses' Knowledge	Study	Pre-test	.46	.15	18.947	24	0.0001
		Post-test	.89	.08			HS
	Control	Pre-test	.47	.15	0.249	24	0.805
		Post-test	.47	.15			NS

M.S.= Mean of Score; SD = Standard deviation; d.f = degree of freedom, P = probability value. NS= Non Significant at (P > 0.05), HS: High Significant at (P< 0.01).