

Effect Of An Intervention Program On Nurses' Knowledge Of Initial Assessment Of Burn In Pediatric

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Abstract

Background: Burns are a common and serious injury in children, and nurses are the front line of their care. The knowledge of the nurse is the base of safe and correct care, yet many nurses do not receive special training in pediatric burn management. **Aim:** To evaluate the effect of an intervention (educational) program on nurses' knowledge of pediatric burn at the Mosul Specialized Center for Burns and Plastic Surgery. **Methodology:** A quasi-experimental design with a study group and a control group (30 nurses each, total 60) was used. A structured questionnaire covering the demographic characteristics and seven areas of knowledge about pediatric burn was applied, and the knowledge of both groups was measured at three time levels (pretest, posttest 1, and posttest 2). The data were analyzed by SPSS version 26 using descriptive and inferential statistics. **Results:** At the pretest, both groups had a low level of knowledge (study group 0.31, control group 0.26). After the program, the knowledge of the study group rose to a good level (0.78 and 0.76 at posttest 1 and posttest 2), while the control group stayed at a low level. The change in the study group was significant for all knowledge items ($P = .000$), and the difference between the two groups was significant at posttest 1 and posttest 2 ($P = .000$). The educational level of the nurses had a significant correlation with their knowledge at posttest 1 ($P = .033$). **Conclusions:** The intervention program had a positive and significant effect on the nurses' knowledge of pediatric burn, while the control group did not change. A planned educational program is an effective way to raise nurses' knowledge. **Recommendations:** Continuous educational and training programs about pediatric burn should be provided for nurses, using varied teaching methods and periodic refresher sessions, and further studies with larger samples are recommended.

Keywords: Intervention program; Nurses' knowledge; Pediatric burn; Burn management; Mosul.

1. Introduction

Soon after they become mobile and able to explore their surroundings and interact with new objects, children are naturally curious, and in this way they learn the skills they need to survive in the real world. However, children are also exposed to hazards, such as using a sharp item, fire, or contact with hot objects, that may cause burn injuries and end in serious harm [1].

Burn injuries are a global public health problem and account for an estimated 265,000 deaths every year. Globally, more than half of the disability-adjusted life years lost from fire-related burns occur between the ages of 0 and 14 years, and mortality from burns is higher among children and the elderly; scald injuries account for about 65% of burns in children under five years of age and for about 27% in those aged 5 to 20 years, while non-accidental burns may reach 20% of burn admissions, and inhalational injury increases mortality significantly [2]. Because of the immaturity of their physical and cognitive abilities, children are especially susceptible to burn injuries [3]. Reviews and meta-analyses have shown that pediatric burns are a major cause of childhood injury, with a high burden in emergency departments [4]. Worldwide, burn injuries cause an estimated 180,000 deaths each year, and the great majority of them occur in low- and middle-income countries [5]. Multi-centre reviews from low-resource settings, such as South-East Nigeria, have reported the same heavy burden of childhood burns [6]. As a result, burns are a leading cause of accidental death and injury in children, especially in developing countries [7], and they are the third most common cause of accidental death in children aged 5 to 9 years [3]. Large regional studies, including a one-decade study from the Kurdistan Region of Iraq, have also described the characteristics and the outcomes of burn patients [8].

An estimated six million children worldwide seek medical treatment for burns each year, and most of them receive their care in outpatient facilities; the extent of the burn and the general health of the child determine whether

inpatient care in a specialized burn department is needed [9]. Clear referral criteria help to decide which children need specialized burn care, and adherence to these criteria for pediatric burns has been examined [10]. Systematic reviews have also studied how well the referral criteria for burn patients are followed [11]. General pediatric references describe the assessment and the management of burns in children as well [12].

Nurses are the front line of care, because the care they give makes a real difference in the long-term quality of life of the burned child, and the nursing care of burns in children can be organized into three phases: the emergent, the acute, and the rehabilitation phase [13]. The nurse should be educated about the physiological changes that happen after a burn and must be able to communicate effectively with children, and nurses have a key role in helping burned children to adapt and cope with their new body image and in giving them information about the treatment and the complications of the burn [14]. The first 24 hours after a burn injury need aggressive medical management to ensure survival and to reduce complications, and the nurses who care for these patients face many challenges, including acute critical care management, rehabilitation, and long-term care [15].

The nursing care of burns is one of the most challenging specialties in nursing, because it needs sharp clinical skills, including triage, pain management, fluid balance, critical care, stabilization of the acutely burned patient, trauma recovery, and rehabilitation, and the nurse working in the burn unit must be skilled in using different types of equipment and techniques to observe, treat, monitor, and ventilate the patient when needed [16]. The role of the nurse includes fluid and electrolyte replacement, burn care with sterile dressings, debridement and topical ointments, physical therapy, systemic antibiotics, relieving anxiety and fear, and nutritional support; a child with a critical burn injury may need parenteral nutrition, and effective pain control is important to allow complete debridement [1]. Several studies have evaluated the knowledge of nurses about the first aid of burns [17], while others have evaluated the practice of nurses in burn units [18]. The capacity for burn management in low- and middle-income countries has also been assessed [19], and the perspectives of health practitioners on pediatric burn management have been described [20]. Caring for a burned child is a unique challenge even for the most experienced nurse, because few injuries pose a greater threat to the child's physical and emotional wellbeing; the nurse gives sensitive and compassionate care, starts the rehabilitation early, and communicates effectively with the child, the family, and the management team, which helps to ensure quality care and better outcomes for the child [16].

Aims of the Study

The study aims to evaluate the effect of an intervention (educational) program on the nurses' knowledge of pediatric burn at the Mosul Specialized Center for Burns and Plastic Surgery, and to find out the relationship between the nurses' knowledge and their demographic characteristics.

Methodology

A quasi-experimental design with a study group and a control group and with pretest and posttest assessments was used to achieve the aim of the study. A sample of 60 nurses working at the Mosul Specialized Center for Burns and Plastic Surgery was selected and divided into two equal groups: a study group of 30 nurses who received the intervention (educational) program, and a control group of 30 nurses who did not receive it. Nurses who refused to take part or who were not available during the period of data collection were excluded from the study.

Data were collected by a structured questionnaire that was developed depending on the related literature and was prepared in Arabic to suit the participants. The questionnaire was made of two parts. The first part covered the demographic characteristics of the nurses, such as age, sex, level of education, workplace, years of experience, and sharing in training courses. The second part was a knowledge test about pediatric burn that included seven main areas: the anatomy and function of the skin, the definition and causes of burn, the signs and symptoms of burn, assessing the burn, managing the burn, nutrition, and the side effects. Each knowledge item was scored, and the level of knowledge was judged as low (0–0.33), moderate (0.34–0.66), or good (0.67–1).

The content validity of the questionnaire was checked by a panel of seven experts in the nursing and the medical fields, who reviewed and approved the items, and the reliability was assessed and gave a good value ($r = 0.85$), which showed good internal consistency. A pilot study was carried out from December 17 to December 28, 2023, on 10 nurses who were excluded from the main sample, in order to find any difficulty and to estimate the time needed for data collection. The whole study extended from November 15, 2023, to April 15, 2024, and the data were collected

between January 15 and February 28, 2024. The knowledge of both groups was measured at three time levels: before the program (pretest) and after the program at posttest 1 and posttest 2, and the educational program was given to the study group only, covering the seven areas of knowledge in a simple and organized way.

The data were analyzed using the Statistical Package for the Social Sciences (SPSS, version 26). Descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics (repeated-measures ANOVA, t-test, and Pearson's correlation coefficient) were applied, and the level of statistical significance was set at $P \leq 0.05$.

Results of the Study

Table (3.1): Distribution of the Nurses in the Study and Control Groups according to their Demographic Characteristics

Characteristic	Class	Study group		Control group	
		F	%	F	%
Age (years)	Mean $\pm$ SD	34	5.37	33.1	4.9
Sex	Male	18	60	10	33.3
	Female	12	40	20	66.7
Education level	Preparatory degree	2	6.6	3	10
	Diploma degree	14	46.7	15	50
	Bachelor's degree	14	46.7	12	40
Workplace	Ward	20	66.6	22	73.3
	Consultation	5	16.7	3	10
	ICU	5	16.7	5	16.7
Experience (years)	Mean $\pm$ SD	4.1	3.8	3.5	1.8
Sharing in training	Yes	3	10	6	20
	No	27	90	24	80

F = frequency, % = percentage. For Age and Experience the two columns show Mean and SD. Study group $n = 30$; control group $n = 30$.

Table 3.1 presented that the mean age of the study group was 34 years old with SD 5.37, and it was 33.1 years old with SD 4.9 for the control group. 60 percent of the study group were males, while 66.7 percent of the control group were females. The highest proportion of both groups had a diploma degree (46.7 percent of the study group and 50 percent of the control group). Most of the study group (66.6 percent) and the control group (73.3 percent) were working in the ward. The study group had 4.1 years of experience in burn management and the control group had 3.5 years. 90 percent of the study group and 80 percent of the control group did not share in training about burn management.

Table (3.2): Mean Scores of Nurses' Knowledge about Pediatric Burn by Item at the Three Time Levels

No	Knowledge item	Pretest		Posttest 1		Posttest 2	
		Study	Control	Study	Control	Study	Control
1	Anatomy and function of the skin	.31	.31	.74	.30	.73	.30
2	Definition and causes of burn	.32	.34	.78	.32	.73	.33
3	Signs and symptoms of burn	.32	.22	.79	.24	.80	.25

No	Knowledge item	Pretest		Posttest 1		Posttest 2	
		Study	Control	Study	Control	Study	Control
4	Assessing burns	.31	.19	.87	.10	.79	.20
5	Managing burns	.31	.24	.80	.16	.79	.21
6	Nutrition	.34	.34	.72	.10	.77	.33
7	Side effects	.23	.22	.80	.20	.74	.23
	Total knowledge	.31	.26	.78	.20	.76	.26

Knowledge score: 0–0.33 = low, 0.34–0.66 = moderate, 0.67–1 = good.

Results in table 3.2 presented nurses' knowledge about pediatric burn by item at the three time levels. The study group moved from low knowledge at pretest (total mean 0.31) to good knowledge at posttest 1 and posttest 2 (0.78 and 0.76). The control group kept a low level at the three times (0.26, then 0.20, then 0.26).

Table (3.3): Within-Group Change in Nurses' Knowledge across the Three Time Levels (Repeated-Measures ANOVA)

Knowledge item	Study group F (p)	Control group F (p)
Anatomy and function of the skin	793.50 (.000)	182.30 (.041)
Definition and causes of burn	967.04 (.000)	18.30 (.061)
Signs and symptoms of burn	990.28 (.000)	0.635 (.43)
Assessing burns	991.80 (.000)	0.105 (.78)
Managing burns	1023.90 (.000)	0.479 (.49)
Nutrition	583.10 (.001)	0.016 (.91)
Side effects	1469.10 (.000)	0.090 (.74)
Total knowledge	26431.10 (.000)	0.004 (.94)

Each cell shows the F value with its p value in brackets. p significant at $\leq .05$ (shown in bold).

Results in table 3.3 presented the within-group change of nurses' knowledge across the three time levels using repeated measure ANOVA. The study group showed significant change for all items ($P = .000$). The control group showed a significant change only in anatomy and function of the skin ($P = .041$), and the rest of the items and the total knowledge were not significant.

Table (3.4): Difference in Total Knowledge between the Study and Control Groups at Each Time Level (t-test)

Statistic	Pretest	Posttest 1	Posttest 2
t-test value	1.94	20.20	20.30
p-value	.062	.000	.000

Comparison of the total knowledge score between the two groups. p significant at $\leq .05$ (shown in bold).

Results in table 3.4 presented the difference in total knowledge between the study group and the control group at each time level. At pretest there was no significant difference between the two groups ($P = .062$). At posttest 1 and posttest 2, the difference became significant at P less than .05 (.000), in favor of the study group.

Table (3.5): Correlation of Nurses' Characteristics with their Knowledge at Each Time Level

Time level	Age	Sex	Education	Workplace	Experience	Training
Knowledge pretest	.257 (.170)	.042 (.827)	.189 (.317)	-.099 (.603)	.130 (.495)	-.064 (.738)

Time level	Age	Sex	Education	Workplace	Experience	Training
Knowledge posttest 1	-.170 (.368)	.003 (.989)	.390* (.033)	.155 (.414)	-.054 (.775)	.292 (.117)
Knowledge posttest 2	-.120 (.528)	.127 (.503)	.217 (.249)	-.176 (.353)	.202 (.285)	-.075 (.693)

Values are Pearson correlation coefficient (Sig. 2-tailed). N = 30. * $p < .05$ (shown in bold).

Results in table 3.5 presented the correlation of nurses' characteristics with their knowledge at each time level. There was a significant correlation between the education level of nurses and their knowledge at posttest 1 ($P = .033$). The other characteristics did not show a significant correlation with knowledge.

Discussion

The present study showed that most of the nurses in the study and control groups were young, with a mean age of 34 and 33.1 years, and the highest proportion of them held a diploma degree. Their experience in burn management was limited, and most of them (90% of the study group and 80% of the control group) had not attended any previous training course about burn care. Nurses who do not receive special training usually have weak knowledge about burn management, and a similar lack of trained staff was reported by Baiez and Mohammed in a burns and plastic surgery centre [15]. Kut and colleagues also found clear gaps in the knowledge and behaviour of health workers toward burn cases [21].

At the pretest level, the total knowledge score of both groups was at the low level (0.31 for the study group and 0.26 for the control group). This means that, before the program, the nurses did not have enough knowledge about pediatric burn. Knowledge is the base of safe nursing care, and a low level of knowledge may lead to wrong or late management of the burned child. The same low baseline knowledge was reported by Kadhim and Hamza, who studied the effect of an educational program on nurses' knowledge of burn management [22].

The knowledge in this study was measured in seven main areas: the anatomy and function of the skin, the definition and causes of burn, the signs and symptoms, assessing the burn, managing the burn, nutrition, and the side effects. These areas cover the basic knowledge that the nurse needs to take care of a burned child in a correct way [23,24]. The low scores in most of these items at the pretest showed that the nurses needed a structured program to build this knowledge.

Some of these areas are very important for the daily care of the burned child. For example, knowing the signs and symptoms and how to assess the burn helps the nurse to find the danger early and to estimate the size and the depth of the burn, which is known to be a difficult task in children [28]. Knowing the correct management and the right nutrition also helps the child to heal faster and to avoid complications [23,24]. For this reason, raising the knowledge of the nurses in these areas is expected to be reflected later on the quality of the care that is given to the child.

After the application of the program, the knowledge of the study group improved clearly. The total score rose from the low level (0.31) to the good level (0.78 and 0.76) at posttest 1 and posttest 2, while the control group stayed at the low level (0.26, then 0.20, then 0.26). This result is in line with Kadhim and Hamza, who found that an educational program significantly improved nurses' knowledge of burn management in the study group ($P < 0.01$) while the control group did not change ($P > 0.05$) [22]. It also agrees with Farthing and colleagues, who reported that an e-learning training raised the knowledge of novice nurses in pediatric burn care [25], and with Meschial and colleagues, who found that active teaching strategies improved nurses' knowledge and skills in caring for burn victims [26]. The same benefit of a planned intervention program in this field was reported by Baiez and Mohammed [15].

The repeated-measures ANOVA confirmed that the change in the study group was significant for all the knowledge items ($P = .000$), with high F values. This means that the improvement was wide and covered all areas of knowledge, and not only one or two items, which reflects the strength of the educational program [22].

When looking at the single items, the improvement was clear in all of them. The items that were the lowest at the pretest, such as assessing the burn and the side effects, reached a good level after the program; for example, the score of assessing the burn rose from 0.31 to 0.87. This shows that the program was able to cover even the difficult parts of the knowledge, and that the nurses could learn the new information when it was given to them in an organized way

[23,26].

In the control group, the repeated-measures ANOVA showed a significant change only in one item, which was the anatomy and function of the skin ($P = .041$), while all the other items and the total knowledge did not change in a significant way. This small change may be due to the repeated contact of the nurses with the same test during the study, but the control group did not reach the good level at any time. This supports the idea that a real gain in knowledge needs a planned program and does not happen by itself [22].

The comparison between the two groups by the t-test gave more support to this result. At the pretest there was no significant difference between the study and control groups ($P = .062$), which shows that the two groups started from a similar level. At posttest 1 and posttest 2, the difference became significant in favour of the study group ($P = .000$). This means that the gain in knowledge was the result of the program and not of other factors, which is the expected result of a controlled educational design [22].

The study also showed that the educational level of the nurses had a significant positive correlation with their knowledge at posttest 1 ($r = .390$, $P = .033$). This means that the nurses with a higher educational level gained or kept the knowledge in a better way, which agrees with the idea that education and training are important factors for the knowledge of the nurse [21,22]. The other factors, such as age, sex, workplace, years of experience, and sharing in training, did not show a significant correlation with knowledge, and this may be related to the small size of the sample.

It is important to say that good knowledge is necessary but is not enough by itself, because the nurse also needs the skill and the chance to use this knowledge in the real care of the child. The gain in knowledge that was found in this study should therefore be followed by training on the practical skills and by a suitable work environment, so that the knowledge can change into a better daily practice and a better outcome for the burned child [15,26].

The knowledge of the study group was kept at the good level at posttest 2, which was measured later than posttest 1, with only a very small drop. This shows that the nurses retained most of the knowledge they had gained, and it supports the value of continuing education and refresher sessions for the nurses in the burn unit [25,26]. Repeating the teaching from time to time helps to keep the knowledge at a good level.

The good effect of the program may be explained by the way the knowledge was given. The content was built on the real needs of the nurses and was presented in a simple and organized way, with repetition in more than one session. Studies that used active and modern teaching methods, such as e-learning and case-based learning, reported the same good effect on the knowledge of the nurses [25,26]. This means that the method of teaching is as important as the content itself, and the burn unit should choose the methods that fit the nurses and keep their attention.

Building the knowledge of the nurse is the first step toward better practice and safer care for the burned child. The nurse who knows the causes, the signs, and the management of burns can give faster and more correct care, and can also teach the family about prevention, because most burns in children are caused by scald at home [28,29]. Knowledge about the side effects and the long-term problems of burns is also important, because burn injuries may leave mental effects on the survivors, and the nurse has a role in the early support of the child and the family [27]. Correct knowledge of first aid in the early minutes after the burn can also reduce the damage [30].

This study has some limitations. The sample was small (30 nurses in each group) and was taken from one center only, the Mosul Specialized Center for Burns and Plastic Surgery, and the knowledge was measured by a questionnaire over a limited period of follow-up. For these reasons, the results should be generalized with care, and further studies with a larger sample, more than one center, and a longer follow-up are recommended to confirm the effect of the program and to link the gain in knowledge with the actual nursing practice.

Conclusion

The intervention program had a positive and significant effect on the nurses' knowledge about pediatric burn. Before the program, the nurses in both groups had a low level of knowledge, and most of them had not attended any previous training. After the program, the knowledge of the study group improved from the low level to the good level and stayed at this level at the later assessment, while the control group remained at the low level. The comparison between the two groups confirmed that the gain in knowledge was caused by the program, and the educational level of the nurses was related to their knowledge. These results show that a planned educational program is an effective

way to raise nurses' knowledge of pediatric burn at the Mosul Specialized Center for Burns and Plastic Surgery, and this is the first step toward better and safer care for the burned child.

Recommendations

- Provide continuous educational and training programs to raise and update the nurses' knowledge about pediatric burn.
- Include the main burn topics (anatomy of the skin, causes, signs and symptoms, assessment, management, nutrition, and side effects) in the orientation program for new nurses.
- Use varied teaching methods, such as lectures, e-learning, simulation, and booklets, to support both the gain and the retention of knowledge.
- Give the nurses simple written materials and posters about pediatric burn care to use as a quick reference.
- Repeat the knowledge assessment from time to time and give refresher sessions to keep the knowledge at a good level.
- Encourage nurses to continue their higher education and to attend scientific activities about burn care.
- Conduct further studies with a larger sample, in more than one center, and with a longer follow-up, and link the gain in knowledge with the actual nursing practice and the patient outcomes.

Ethical Considerations

- Approval of the study was obtained from the research ethics committee of the College of Nursing, University of Baghdad.
- Administrative permission was taken from the Nineveh Health Directorate and the Mosul Specialized Center for Burns and Plastic Surgery before the start of data collection.
- Each nurse was informed about the purpose and the nature of the study, and consent was obtained from the nurse before participation.
- Participation was voluntary, and the nurse had the right to withdraw at any time without any effect on her or his work.
- The information of the participants was kept private and confidential, and it was used only for the purpose of the research.
- The nurses of the control group were given the same educational program after the end of the study, to keep fairness between the two groups.
- The study was carried out according to the principles of the Declaration of Helsinki for research involving human participants.

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