

Effectiveness of Competency Based Program on Nurses' Performance Regarding Care of Neonates Undergoing Cooling Therapy

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ABSTRACT

Introduction: Cooling therapy is a treatment for moderate to severe hypoxic ischemic encephalopathy to minimize neurological damage from deprivation of oxygen. Nursing competency and performance significantly impact the quality of nursing care and improve neonates' outcome. **Aim:** to evaluate the effectiveness of implementing competency-based program on nurses' knowledge, attitudes and performance regarding care of neonates undergoing cooling therapy.

Methods: A quasi-experimental study pre and post was conducted with 50 nurses in Neonatal Intensive Care Units at Ain-Shams University Hospitals, Cairo, Egypt, using a predesigned questionnaire format, an observational checklists and attitude rating scale. **Results:** there was significantly improved knowledge, attitudes and practice for the majority of nurses' post implementation of the program. There was improvement in post implementation of the program compared to baseline for total knowledge score, cooling therapy, care of mechanical ventilation, developmental care and prevention of ventilator associated pneumonia, $p = 0.00$, respectively. There was improvement in the post program implementation, compared to baseline for the total attitudes score, $p = 0.00$, preparing for cooling, $p = 0.00$; nursing care during active cooling $p = 0.00$; rewarming practices $p = 0.00$; total practice score, $p = 0.00$. The competency-based program is effective for improvement of overall nurses' performance. Continuous training, feedback, and monitoring should be recommended to maintain the improvement gained knowledge, attitudes and performance.

Keywords: Competency Based Program, Cooling therapy, hypoxic ischemic encephalopathy, nurses' performance.

INTRODUCTION

Cooling therapy is a standard treatment for neonates with moderate or severe hypoxic-ischemic encephalopathy (HIE) to reduce subsequent brain injury and improve neurodevelopmental outcomes (Bacon, 2025), it provides neuroprotection by alleviating the effects of reactive oxygen and inflammatory mediators, which are the main contributors of brain damage secondary to HIE. (Ranjan and Gulati, 2023; Malik et al., 2020). Cooling should be initiated as early as possible within 6 hours after birth (Chen et al., 2023) to optimize the neuroprotective effect in neonates with HIE (Lumba et al., 2019). The process of cooling induces mild hypothermia to approximately 34°C below baseline temperature (Korsakov. et al., 2025). Neonate undergoing cooling therapy was maintained at 33.5°C for 72 hours and requires closed monitoring throughout cooling process (Faix et al., 2025).

Hypoxic ischemic encephalopathy occurs in 1.5/1000 live births (Faix et al., 2025). The incidence is relatively higher in developing countries with limited resources. HIE is estimated 23 % of all neonatal deaths worldwide and considered the fifth leading cause of death in children under the age of 5 years (Wudu et al., 2025)

A variety of mechanisms have been implicated in the effects of cooling therapy, including inhibition of cerebral metabolic rate reduction (Liu et al., 2025). and diminished release of excitotoxins and reactive oxygen species for neonates which emerged as the first treatment for severe HIE that provide neuroprotection for affected neonate (Wang et al., 2025).

Cooling therapy including two phases which are active cooling phase for the first 72 hours from the initiation of cooling, and rewarming phase for 12 hours of gradual rewarming time after completion of 72 hours of cooling (Zhang et al., 2025), Increase temperature by 0.5°C every 2 hours and progress notes

until $37^{\circ}\pm 0.2$. Monitor temperature frequently following rewarming to prevent rebound hyperthermia (Gao et al., 2024).

Side effects of cooling therapy including sinus bradycardia, hypotension with possible need for inotropes, mild thrombocytopenia, and persistent pulmonary hypertension with impaired oxygenation. Hypothermia can also prolong bleeding time (Arnautovic. et al., 2024). Neonates with HIE, whether they receive therapeutic hypothermia or not, are more prone to arrhythmias, anemia, leukopenia, hypoglycemia, hypokalemia, urinary retention and coagulopathy (Riccardi et al., 2024).

Nursing care in the neonatal units has become more detailed and complicated and considered a critical element in the neonate's chance for survival. (Amaguaya et al., 2024). However, highly skilled nurses should have power of observation and the ability to take accurate decisions, rapid management and to evaluate any complications to help for efficient and excellent neonatal outcomes (Brown et al., 2024).

Competency based programs refer to systems of instruction, assessment, grading and reporting that are based on demonstrating knowledge and skills that nurses are expected to learn. Competency based programs seek to reward nurses for their knowledge and help to ensure for gain skills that can be immediately used in their work, place environment (Roy et al., 2025).

SIGNIFICANCE OF THE STUDY

Cooling therapy is an essential treatment for neonates with HIE which is estimated to occur in about 1.5 per 1,000 live births (Faix et al., 2025). The incidence is relatively higher in developing countries with limited resources. HIE is estimated 23 % of all neonatal deaths worldwide and considered the fifth leading cause of death worldwide in children under 5 years of age, according to the World Health Organization (Wudu et al., 2025)

It is important to carry out this study to shed light on the effect of competency based educational program for improving performance of neonatal nurses regarding care of neonate undergoing cooling therapy particularly neonates with HIE that could be improved significantly with implementation of competency based educational program that consequently could promoting nursing care provided to neonates at the current studied Neonatal Intensive Care Units.

AIM OF THE STUDY

Our aim was to evaluate the effectiveness of implementing competency based educational program on improving of nurses' knowledge, practices, and attitudes regarding care of neonates undergoing cooling therapy through:

- Assessing nurses' knowledge, practices and attitude regarding care of neonates undergoing cooling therapy.
- Designing and implementing competency based program regarding care of neonates undergoing cooling therapy.
- Evaluating the nurses' performance after implementation of competency based program regarding care of neonates undergoing cooling therapy.
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RESEARCH HYPOTHESIS

Implementing the competency-based program would improve the studied nurses' performance regarding care of neonates undergoing cooling therapy.

METHODS

A quasi-experimental study design was conducted on a cohort of 50 nurses. The quasi-experimental design allowed for the assessment of the intervention's effects (pre/post) on a single group of nurses without the necessity of a control group. The study evaluated the effectiveness of competency-based program on nurses' knowledge, practices and attitude regarding care of neonates undergoing cooling therapy.

The included nurses were those from both sexes, have experience in neonatal intensive care for at least 1-year, provide direct care for neonates undergoing cooling therapy and working during the study period within neonatal intensive care units at Children's hospital and Maternity & Gynecological hospital affiliated to Ain Shams University Hospitals in Cairo, Egypt.

Nurses' supervisors, administrators and newly graduated nurses with experiences less than one year all were excluded from the study.

The neonatal intensive care units of Ain Shams University Hospitals served as the study's setting, which dedicated to providing specialized care for those neonates undergoing cooling therapy and requiring urgent medical attention.

Special considerations were given regarding the care of these neonates, the selection of study setting was purposed. This setting allowed a more focused evaluation for the effectiveness of competency-based program on nurses' knowledge, attitudes and performance.

TOOLS OF DATA COLLECTION

Three tools were used to collect the data as follows:

Tool I: A predesigned questionnaire format

It presented in Arabic language to assess characteristics of the participated nurses, including their age, gender, educational level, years of experience, prior attendance of competency-based training, knowledge related care of neonates undergoing cooling therapy consisted of 26 closed ended multiple-choice questions including care of cooling therapy (14 questions), mechanical ventilation and care of endotracheal tube (7 questions), developmental care (3 questions) and prevention of prevention of VAP (2 questions). The complete correct answer was scored 2 points, incomplete correct answer was scored 1-point and incorrect answer scored zero point. The total scores were calculated and converted into a percent score. The total knowledge score was classified into 2 categories: Satisfactory knowledge if score $\geq 90\%$, and unsatisfactory knowledge if score $< 90\%$ (Ibrani and Molacavage, 2018; Weng et al., 2021; Gamage and Fraser 2021; Seitz et al., 2021)

Tool II: Attitude rating scale

It was adopted from **DeLis et al. (2005)** and translated into simple Arabic language. It consisted of 22 statements: Care of cooling therapy (9 statements), infection control measures (3 statements), care of cooling devices (5 statements), family care (3 statements), and palliative and developmental care (2 statements). A 3-point Likert scale ranging from 1 (agree), 2 (neutral) and 3 (disagree). The total attitude scores were calculated and converted into a percentage score. It was classified into 3 categories: Positive attitude if score $> 60\%$, neutral attitude when the total score is $60 - < 75\%$, and negative attitude if score $< 60\%$

Tool III: Observational checklist.

It was adopted from **Ibrani and Molacavage (2018)**, as follow: Preparation for cooling (6 step), care of active cooling (8 steps), care of rewarming (8 steps), administration of oxygen therapy (12 steps), care of nasal CPAP (13 steps), care of mechanical ventilation (12 steps), endotracheal suctioning (20 steps), and drawing of capillary blood gases (18 steps).

Each step was evaluated as "correctly done" its score = one and "incorrectly or not done" its score = zero. The total scores were calculated and converted into a percentage score. It was classified into 2 categories: competent if score $\geq 90\%$; incompetent if score $< 90\%$.

PROCEDURE

The preparatory phase aimed to develop data collection and assessment tools. Five nurses were included in pilot study before the data collection phase began. Their knowledge and attitudes were assessed by using a printed questionnaire format. Their practices were observed while providing direct care for neonates undergoing cooling therapy. The applicability and clarity of the research tools were tested and validated. Content validity was ascertained by a panel of 5 neonatal nursing and medicine experts. The format, layout, consistency, accuracy, and comprehensiveness of the developed tools were validated. Reliability was tested by Cronbach's alpha yielding a value of 0.76 for knowledge, 0.86 for attitude scale, and 0.83 for observational checklists.

The fieldwork of the research was carried out according to the systematic sequence of assessment planning, implementation and evaluation phases.

Ethical considerations:

Each nurse gave a written informed consent before participating in the training program. The program and research proposal were approved by the ethics and research committee in the Faculty of Nursing, Ain Shams University, Egypt.

Assessment phase

During the assessment phase, the researchers interviewed each participating neonatal nurse in the study setting and obtained their informed consent. Baseline data and actual needs assessment were collected included an assessment of nurses' knowledge, practices and attitude regarding care of neonates

undergoing cooling therapy. The actual fieldwork took place over two months, beginning in January 2024. The researchers were available between 9:00 a.m. and 2:00 p.m. four days a week (Sunday, Monday, Tuesday, and Thursday).

Planning and Implementation phase

The competency-based program was designed according to the actual needs assessment of neonatal nurses in terms of knowledge and practices related competency-based program. The program included 9 sessions 40–45 min each, four sessions for theoretical part, three sessions for practice and two for attitude that covered the following:

The first session included program objectives, a brief introduction to the competency-based program, competency domains, components, categories of competencies, and the role of the clinical preceptor.

The second session discussed the definition of cooling therapy, goals, indications, types, methods, contraindications, and complications.

The third session covered care of neonates on mechanical ventilation, care of endotracheal tube and prevention of ventilation-associated pneumonia.

The fourth session included the aim of developmental care, types, and reducing environmental stressors.

The fifth session included practices preparing for cooling, care of active cooling, and rewarming.

The six-session covered practice for administration of oxygen therapy, Nasal CPAP and care of mechanical ventilation.

The seventh session included practice for oropharyngeal and endotracheal suctioning and drawing of capillary blood gases.

The eighth session included attitude toward devices and alarms.

The ninth session included attitude family and developmental care.

The 50 nurses were divided into five small groups; each group consisted of 10 nurses. The teaching methods used were group discussion, brainstorming, presentations, videos, demonstration and to retain what they had learned.

Each group of nurses was subdivided into 2 groups. The instructors demonstrated the steps of each procedure first by using a mannequin training model, then each nurse performed the procedure in front of the instructor's till reaching the required scores of competency levels prior to the on-the-job training.

Evaluation Phase

The effectiveness of the competency-based program was evaluated post implementation of the program gauged by using the same pretest knowledge, and attitudes questionnaires, and observational checklists, after one month of the program implementation. As part of inducement, the researchers had given feedback to each nurse individually on his/her overall performance.

Statistical analysis

Data was coded and analyzed by using The Statistical Package for Social Science (IBM SPSS) version 26. Data were presented using descriptive statistics in the form of number and percentage. The Chi-square test and t-test were to compare questionnaires, checklist and attitudes scores. Parsons's coefficient correlations were performed to examine correlations between nurses' knowledge, attitudes and practices.

RESULTS

Table (1) The demographic characteristics of the 50 nurses enrolled. Their mean age $\pm$ SD were 28.7 ± 1.05 years. They were (74.0%) females, and (26%) males. Out of the 50 nurses (42%) aged between 25 to < 30, (22%) aged from 30 to <35 years, and (16%) 35 or more years old. Their qualifications were (18%) Diploma, (56%) Technical Nursing Institutes, (22%) Bachelor, and only (4%) postgraduates. The years nursing experience in NICU were (28%) nurses <5 years, (28%) nurses 5–10 years, (24%) nurses 10 < 15, and (20%) nurses >15 years. The employment status was (78%) were full-time, and (22%) were part-time. Only (18%) of them received training programs regarding nursing care for neonates undergoing cooling therapy, among those who received (77.8%) received one training program, and only (22.2%) received two programs.

Table (2) depicts the distribution of nurses' knowledge regarding care of neonates undergoing cooling therapy across phases of competency-based program. The table shows marked improvement in knowledge gain of cooling therapy, mechanical ventilation, developmental supportive care and prevention of VAP pre and post implementation, with statistically significant differences for all knowledge items, $p = 0.00$.

Table (3): reveals the distribution of nurses' attitudes regarding care of neonates undergoing cooling therapy across phases of competency-based program. The table shows a considerable improvement in all

aspects of attitudes, toward care of cooling therapy, $p = 0.00$; infection control, $p = 0.00$; devices, $p = 0.00$; family care, $p = 0.00$; and palliative and developmental care, $p = 0.00$; post implementation compared to pre-implementation of the program.

Nurses' practices for care of neonates undergoing cooling therapy were significantly improved for the 50 nurses. Preparation for cooling improved post implementation, compared to baseline, $p = 0.00$. care of active cooling, $p = 0.00$; care of rewarming, $p = 0.00$; administration of oxygen therapy, $p = 0.00$; care of nasal CPAP, $p = 0.00$; care of mechanical ventilation, $p = 0.00$; endotracheal suctioning, $p = 0.00$; drawing capillary blood gases, $p = 0.00$; all previous practices improved in post implementation, compared to pre implementation of competency based program (Table 4).

Pre-implementation total knowledge score recorded was satisfactory in (42%) of the nurses, (58%) had unsatisfactory score. Pre-implementation total attitude score was positive in (38%), and negative in (32%). Pre-implementation total practice score was competent in (58%), and incompetent in (42%). Post-implementation knowledge, attitudes, and practice were significantly improved for the 50 nurses. The total knowledge score improved in post-implementation, compared to pre-pre-implementation, $p = 0.00$. The total attitude score improved in post-implementation, compared to pre-pre-implementation, $p = 0.00$. The total practice score improved in post-implementation, compared to pre-pre-implementation, $p = 0.00$. (Table 5).

Table (6) Furthermore, a significant correlation was observed between total knowledge and total attitude ($r = 0.634$, $p = 0.001$), indicating that nurses with greater knowledge exhibited more positive attitudes toward neonatal care and cooling therapy. Additionally, total practice and total attitude showed an even stronger positive correlation ($r = 0.754$, $p < 0.001$), suggesting that nurses who improved their practical skills were also more likely to develop positive attitudes post implementation of the program.

Table (1): Demographic characteristics of nurses

Characteristics of nurses	N	%
Age (Year).		
20 < 25	10	20.0
25 < 30	21	42.0
30 < 35	11	22.0
≥ 35	8	16.0
$X \pm S.D$	28.7 $\pm$ 1.05	
Gender.		
Male.	13	26.0
Female.	37	74.0
Academic qualification.		
Diploma of Nursing.	9	18.0
Nursing Technical Institute	28	56.0
Bachelor of Nursing.	11	22.0
Postgraduate.	2	4.0
Years of experience.		
< 5	14	28.0
5 < 10	14	28.0
10 < 15	12	24.0
≥ 15	10	20.0
$X \pm S.D$	9.08 $\pm$ 0.96	
Number of working hours.		
Full time	39	78.0
Part time	11	22.0
Received training program regarding nursing care for neonates undergoing cooling therapy		
Yes	9	18.0
No	41	82.0
Number of attending training courses(n=9) *		
1	7	77.8
2	2	22.2

*Number isn't exclusive

Table (2): Comparison between nurses' knowledge through competency-based program phases (n = 50).

Knowledge Items	Pre-implementation		Post- implementation		χ^2 p-value
	N	(%)	N	(%)	
Cooling therapy					
Satisfactory	17	34.0	36	72.0	17.293
Unsatisfactory	33	66.0	14	28.0	.000
Mechanical ventilation					
Satisfactory	16	32.0	34	68.0	18.18
Unsatisfactory	34	68.0	16	32.0	.000
Developmental supportive care					
Satisfactory	20	40	37	74	16.302
Unsatisfactory	30	60	13	26	.000
Prevention of VAP					
Satisfactory	23	46.0	44	88.0	18.990
Unsatisfactory	27	54.0	6	12.0	.000

Table (3): Comparison between nurses' attitudes through competency-based program phases (n = 50).

Attitudes Items	Pre-implementation		Post- implementation		χ^2 p-value
	N	%	N	%	
Attitude toward care	18	36	4	8	17.897
Positive					.002**
Neutral	18	36	11	22	
Negative	14	28	35	70	
Attitude toward infection control					
Positive	21	42.0	38	76.0	
Neutral	17	34.0	9	18.0	21.300
Negative	12	24.0	3	6.0	0.000
Attitudes toward device					
Positive	18	36.0	34	68.0	
Neutral	17	34.0	11	22.0	20.528
Negative	15	30.0	5	10.0	0.000
Attitudes toward family care					
Positive	16	32.0	35	70.0	
Neutral	14	28.0	12	24.0	19.001
Negative	20	40.0	3	6.0	0.000
Attitudes toward palliative and developmental care					
Positive	14	28.0	36	72.0	
Neutral	13	26.0	8	16.0	16.443
Negative	23	46.0	6	12.0	0.000

** : Highly statistically significant

Table (4): Comparison between nurses' practices regarding care of neonates undergoing cooling through competency-based program phases (n = 50).

Practices Items	Pre-implementation		Post- implementation		χ^2 p-value
	N	%	N	%	
Preparation for cooling					
Competent	15	30.0	36	72.0	18.024
Incompetent	35	70.0	14	28.0	0.000
Care of active cooling					
Competent	13	26.0	35	70.0	17.133
Incompetent	37	74.0	15	30.0	0.000

Care of rewarming					
Competent	17	34.0	42	84.0	16.900
Incompetent	33	66.0	8	16.0	0.000
Administration of oxygen therapy					
Competent	32	64.0	45	90.0	17.243
Incompetent	18	36.0	5	10.0	0.000
Care of Nasal CPAP					
Competent	28	56.0	38	76.0	15.113
Incompetent	22	44.0	12	24.0	0.000
Care of mechanical ventilator					
Competent	24	48.0	41	82.0	14.770
Incompetent	26	52.0	9	18.0	0.000
Endotracheal suctioning					
Competent	18	36.0	34	68.0	15.433
Incompetent	32	64.0	16	32.0	0.000
Drawing capillary blood gases					
Competent	19	38.0	36	72.0	19.1,14
Incompetent	31	62.0	14	28.0	0.000

Table (5): Comparison between nurses' total knowledge, total attitudes, and total practices pre and post implementation of competency-based program (n = 50).

Items	Pre-implementation		Post- implementation		χ^2 p-value
	N	(%)	N	(%)	
Total knowledge score					
Satisfactory	21	42.0	39	78.0	21.032
Unsatisfactory	29	58.0	11	22.0	0.000
Total attitude score					
Positive	19	38.0	36	72.0	25.346
					0.000**
Neutral	15	30.0	10	20.0	
Negative	16	32.0	4	8.0	
Total practice score					
Competent	29	58.0	41	82.0	25.346
Incompetent	21	42.0	9	18.0	0.000**

** : Highly statistically significant

Table (6): Correlation Matrix between studied variables pre and post implementation of the program

		Pre- implementation			Post-implementation		
		1	2	3	1	2	3
1) Total knowledge	r				r		
	p				p		
2) Total practice	r	.763			r	.721	
	p				p		

	p	.000**			p	.000**	
	r	.695	.634		r	.634	.754
3) Total attitude	p	.001**	.001**		p	.001**	.000**

****:** Highly statistically significant

DISCUSSION

In the current study, results prove significant improvement in care of neonates undergoing cooling therapy knowledge, attitudes, and practices of the 50-nurses after implementation of competency-based program. Selection of the competency method of training is essential. In a way to improve nurses' performance, numerous studies recommended application of competency-based training program for care of neonate undergoing cooling therapy (Holtmoen, Aagaard & Solevåg, 2023; Yang et al. 2025). Competency-based programs offered a comprehensive, effective and ethical way of teaching skills, special in neonatal care (Dudding et al., 2022).

As regards nurses' characteristics, the findings of the present study revealed that the majority of the participating nurses were young adults, with a mean age of 28.7 ± 1.05 years, and more than one thirds fell within the 25 to <30-year age range. Nearly three quarters of nurses were females, more than half of nurses held diplomas from Nursing Technical Institutes, while only 4% pursued postgraduate education, Table (1). Similarly, **Sallam, et al (2023)** conducted study on "Nurses' Performance regarding Care of Infant Suffering from Hypoxic Ischemic Encephalopathy" showed that less than half of nurses were aged 25 to <30 years, (43.0%). with mean age (30.00 ± 9.69) years. Less than two thirds (61.7%) of nurses were female, more than half (56.7%) of them have Nursing Technical Institute. from the researcher point of view, increase percent of females may be attributed to the increase of numbers of females who studied in Faculty of Nursing than males. And the most of them were young ($20 < 25$ years) may could be due to hospital administration prefer this age and may reflect high nurses' turnover. Low experience might be due to the absence of mandatory training policies, staffing shortages leading to employment of less experienced nurses.

On investigating nurses' knowledge level about cooling therapy, the current study results showed that less than half of nurses had poor level of knowledge preprogram implementation. This could be due to the lack of nurses' desire to enhance or at least refresh their knowledge whether new or old graduated nurses are due to the work overload. These results were supported by **Sayed et al., (2024)**. Who conducted study about "Caregivers, Awareness of Neonatal Hypoxic Ischemic Encephalopathy and Subsequent Infant Development" and illustrates that, less than half of the studied nurses (46.7%) have poor level of knowledge pre- program implementation. On the other hand, majority (80.0%) of them have good level of knowledge post program implementation. Table (2) Figure (1) significant improvements were observed post-intervention ($p < 0.001$), these results underscore the effectiveness of the competency-based program intervention in improving multidimensional clinical knowledge. Moreover, the mean total knowledge score improved from 0.42 ± 0.49 to 0.78 ± 0.41 , with a significant T-test result of $t = 5.25$ ($p < 0.001$). This quantitative evidence highlights the powerful impact of structured, focused training on enhancing nurses' theoretical knowledge regarding neonatal care practices.

There is significant improvement in total practice of studied nurses (χ^2 , 18.024, 17.133 and 16.900 at $p < .000$) regarding preparing for cooling and rewarming, of neonates undergoing cooling therapy post-implementation of the competency-based program. The highest improvement was seen in Rewarming. Before the intervention, only third of studied nurses demonstrated competent total practice, However, post-implementation, a significant increase was observed, with Most of nurses achieving competency, and incompetency rates dropping to fifth at ($p < 0.000$). (Table 3)

Similarly, **Said et al. (2024)** conducted an study "Effect of On-the- Job Training on Neonatal Nurses' Performance related to Cooling Therapy for Hypoxic Ischemic Encephalopathy" Indicates that pre-intervention, 42.6% and 46.8% of the surveyed neonatal nurses demonstrated competent practices regarding the protocol for active cooling and general care support. Post-intervention, these percentages significantly increased to 93.6% and 95.7%, respectively.

From the researcher point of view, these finding could be due Well-designed program, Nurses may have been more engaged due to the practical relevance and interactive format of the training.

Total Nurses' Practices Pre and Post Comparison reveals a highly statistically significant improvement in the overall practice of nurses after the implementation of the competency-based educational program. The proportion of nurses classified as competent increased from two third pre-intervention to nearly all of them post-intervention, while the percentage of incompetent nurses declined from less than half to

fifth, The Chi-square value was 25.346 ($p < 0.000$), and the mean total practice score increased from 0.58 ± 0.49 to 0.82 ± 0.38 , with a significant T-test value of 3.93 ($p < 0.001$). Table (4) and Figure (2) Similarly, **Sallam, et al (2023)** Demonstrates that, less than one third (28.3 %) of the studied nurses have incompetent practices level pre-program implementation. While, the majority (93.3%) of them have competent practices level post program implementation.

This significant improvement reflects the success of the competency-based approach in enhancing both the quality and consistency of neonatal nursing practice, particularly for procedures involving cooling therapy and respiratory support.

Comparable results were reported **Abd allah et al. (2022)** conducted an study "Effect of Low Fidelity Simulation Training Program on Knowledge and Practices of Pediatric Nursing Students regarding Intravenous Cannulation" Indicates that more than two fifths (41%) of pediatric nursing students had incompetent level of total practices score in the pre- training program implementation phase, while the majority (85%) of them had competent level of total practices score in post training program implementation phase..

Regarding nurses' attitudes about cooling therapy, the present study showed that, a statistically significant improvement in the overall attitudes of nurses following the implementation of the competency-based program the mean total attitude score improved has been made from one-third to three-quarters. Supported by a T-test = 5.02 and Chi-square = 25.346 ($p < 0.001$). Table (5): and Figure (3)

This result was agreed with **Kim et al., (2020)** who found that, more than two thirds of the studied nurses had positive attitudes after implementation of the program.

The current study findings revealed that, there was a statistical significant positive correlation between total nurses' knowledge and total practices scores pre-program implementation. While, there was a highly statistical significant positive correlation between total nurses' practice, total knowledge and total attitude scores post program implementation. Knowledge and Practice: $r = 0.763$, $p < 0.001$, Knowledge and Attitude: $r = 0.695$, $p = 0.001$, Practice and Attitude: $r = 0.634$, $p = 0.001$. Table (6)

This could be due to the knowledge and practice of nurses was improved after implementation the program and this reflects positively on nurses' attitude. These results were consistent with **Zhu et al (2023)** who conduct a study " application effect analysis of clinical nursing pathway in the care of neonatal Hypoxic Ischemic encephalopathy" and found that there was a highly statistical significant positive correlation between nurses' total practice, total knowledge and total attitude scores in both pre and post program implementation ($p=0.001$).

CONCLUSION

The findings of this study affirm that implementing a competency-based educational program significantly improved nurses' performance regarding care of neonates undergoing cooling therapy. Notable enhancements were observed across knowledge, clinical practice, and professional attitudes. Pre-intervention data revealed knowledge and skill gaps, especially in high-risk areas such as endotracheal suctioning and rewarming procedures.

Importantly, the study also identified strong positive correlations between knowledge, practice, and attitude—indicating that gains in one domain were associated with improvements in others. These findings highlight the value of structured, skill-focused education in equipping NICU nurses with the competencies required to deliver high-quality, evidence-based neonatal care.

Overall, the results support the integration of competency-based training models in neonatal intensive care units to enhance clinical outcomes and reduce preventable complications during caring of neonates with cooling therapy.

RECOMMENDATIONS

Based on the study findings, the following recommendations are proposed:

1. Integrate competency-based training in NICU orientation programs to improve nurses' preparedness in managing neonates with HIE undergoing cooling therapy.
2. Develop and distribute simplified Arabic educational booklets covering key aspects of cooling therapy, HIE care, and emergency preparedness.
3. Conduct similar studies on a larger sample across multiple hospitals to validate the results and support generalization.

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