

Effect of Training Program on Nurses' Knowledge and Practice toward Care of Children with Coma at Pediatric Intensive Care Unit

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Abstract: Coma is a relatively common condition in critical pediatric care nurses need to acquire a wide range of theoretical and practical knowledge in order to provide the appropriate level of care for pediatric patients. Aim of the study: The aim of the study was to evaluate the effect of training program on nurses' knowledge and practice toward care of children with coma at Pediatric Intensive Care Unit (PICU). Research design: A quasi-experimental design was used. Setting: This study was conducted at the Pediatric Intensive Care Unit in Benha Specialized Pediatric Hospital. Sample: A Convenient sample of nurses (n=43) and purposive sample of comatose children (n=80) were included from the above mentioned setting. Those children were divided equally into two groups (study and control). Tools of data collection: Two tools were used namely; a structured interviewing questionnaire format, nurses' knowledge and practice regarding care of children with coma. Results: Revealed that, there was significant improvement in nurses' knowledge and practice toward care for children with coma as well as after program implementation, Moreover, Most children in the study group was improvement feeding and scores of Glasgow scale coma rather than the control group. Conclusion: The study was concluded that, the theoretical and practical an educational intervention had a positive effect in improving nurses' knowledge and practice toward care for children with coma at PICU. There was also a positive correlation between levels of nurses' knowledge as regards their practice. Recommendation: Nurse's educators should develop educational intervention provided to all nurses caring for unconscious pediatric patient to improve and update their knowledge and practice.

Keywords: Coma, critically ill children, pediatric intensive care unit, training program, nurses' knowledge and practice.

1. INTRODUCTION

Coma is a medical and neurological emergency, requiring immediate consideration of key issues including immediate life support, identification of causes and institution of specific therapy. The evaluation (clinical as well as investigations) and treatment have to proceed simultaneously (Tripathi et al., 2015).

Coma is emergency and accounts for high morbidity and mortality defined as a state of prolonged unconsciousness in pediatric age group. Coma in children is categorized into traumatic and non-traumatic (NTC) categories, the incidence of non-traumatic coma (NTC) which the pediatric patient cannot be aroused even with coma was five times greater in children under 16 years of painful stimuli. Coma is an alteration of consciousness age than in the healthy children with a notably higher that represents the final pathway of various incidences in the first year of life. The most common pathophysiological processes in disease states (trauma, causes of NTC are infections, toxins, status epileptic's, neoplastic, seizures) ultimately leading to derangement in cardiac or brain abnormalities, hypoxia or ischemia and cerebral function manifested as decreased arousal and awareness (Slusher et al., 2016).

Coma is a relatively common condition in the pediatric intensive care unit. Although the principles of diagnosis and management are basically the same for both children and adults, there are some age-specific aspects related to infants and children less than 16 years of age that influences the pediatric intensive care practitioner's conduct. Several aspects regarding neuroplasticity raised intracranial pressure and epileptogenesis in the immature brain are considered. Several differences in the physiology of immature brains can affect clinical and neurophysiologic expression in a disorder of consciousness and may need special proceedings for its management (**Reith et al., 2016**).

Pediatric Glasgow Coma Score (PGCS) is the equivalent of the Glasgow Coma Scale (GCS) used to assess the level of consciousness of child patients. As many of the assessments for an adult patient would not be appropriate for infants, the Glasgow Coma Scale was modified slightly to form the PGCS. As with the GCS, the PGCS comprises three tests: eye, verbal and motor responses. The three values separately as well as their sum are considered. The lowest possible PGCS (the sum) is 3 (deep coma or death) whilst the highest is 15 (fully awake and aware person). The pediatric GCS is commonly used in emergency medical services (**Klinetil and Haut, 2016**).

The GCS is divided in three assessment parameters: Firstly, eye opening (score 1 to 4): spontaneous eye opening when standing next to the child patient's bed or even during procedures receives a score of 4. Eye opening by verbal stimulus using the simple commands such as "open your eyes", sometimes-continuous verbal stimulus is needed, and the score given is 3. Eye opening with painful stimulus, applied by the examiner, in regions as nail bed and by supraorbital pressure, the score given is 2. No eye opening even after application of all previous described stimuli, the score given is 1 (**Carter and Cumming, 2014**).

Second, verbal response (score 1 to 5): Pediatric patient is oriented in time, space and aware of the self, is able to answer accordingly simple questions, the score given is 5. Pediatric patient can answer questions, but incoherently, is disoriented and confused, the score given is 4. A score of 3 is given for patients who answer do not match questions. The need of painful stimulus that answers is incomprehensible songs, *e.g.*, moaning, groaning, the score given is 2. No response even after application of all previous described stimuli, the score given is 1 (**Hamza and Mohamad, 2016**).

Third, motor response (score 1 to 6): Score of 6 is given for pediatric patient when obey simple commands, such as "raise arm or leg", "Move feet or hands" with adequate motor response. After a painful stimulus, pediatric patient find the origin and try to remove what is causing the pain, the score given is 5. After a painful stimulus, the pediatric patient is able to find the pain and move the limb by flexion, however, is not able to remove the source of pain, the score given is 4. A score of 3 is given for the pediatric patient who motor response is by flexion movement, evidenced by decortication response, therefore, presenting arms flexed, or bent inward on the chest, hands clenched into fists, and legs extended and feet turned inward. A score 2 is given for pediatric patients that motor response is by extensor movement and decelerate posture in which neck is extended, arms are rigid extended close to elbows, legs are extended on knees level, and feet in plantar flexion. A score 1 is given for patient who does not present no motor response even after application of all previous described stimuli (**Ghelichkhani et al., 2018**).

Stabilization As in any emergency, initial steps should be directed to ensuring adequacy of airway, breathing and circulatory function. Airway management is of paramount importance in children with altered states of consciousness, as protective reflexes are obtunded and they are more prone to aspiration. Children with Glasgow Coma Score less than 8 should preferably be intubated; mechanical ventilation should be provided in case the breathing efforts are not adequate. Appropriate oxygenation should be ensured (**Mattar et al., 2015**).

The outcome of coma depends on the etiology, depth and duration of impaired consciousness. Prolonged coma after a hypoxic-ischemic insult carries a poor prognosis. Most children surviving infectious encephalopathies have comparatively better outcomes, often surviving with mild or moderate difficulties only. Outcome has been shown to be worse for patients who were younger, had a lower GCS score on presentation, or had absent brainstem reflexes, worse motor responses, hypothermia, or hypotension. These children should be followed up for early identification of developmental disabilities, learning and behavior problems, as well as other neurological sequelae such as motor, visual or hearing deficit and seizure disorder (**Pankaj et al., 2014**).

Nursing is a dynamic and evolving profession, in which knowledge is central to its accountability. Nurses need to aquire a wide range of theoretical and practical knowledge in order to provide the appropriate level of care for pediatric patients.

Nurses are responsible to continuously assess pediatric patients. One of the major challenging that nurses find during assessment is the neurological dysfunctions; especially in pediatric patients with coma. The most important assessment of neurological examination the clinical setting is assessing level of consciousness (LoC) which is considered the first step, Nurses not only need to know how to assess LOC by GCS, but also they need to know how to interpret these numerical values (Jaddoua et al. 2013).

Significance of the Study

Coma is a relatively common condition in critical pediatric care. Epidemiological studies generally divide studies by traumatic and nontraumatic causes. In a population-based study in the Northern region of the UK, the incidence of nontraumatic coma was five-times greater in children under 16 years of age than in the general children (30.8 per 100,000 vs 6.0 per 100,000 per year, respectively), with a notably higher incidence in the first year of life (160 per 100,000 children per year (Bragatti, 2014).

Provision of such knowledge and practices related to the coma nursing management would be beneficial for nurses in different ways. It could have a direct positive reflection upon the quality of pediatric patient care and could support the important role of the nurse related to coma nursing management. In addition, it might generate an attention and motivation for further researches into this area. This improved pediatric patient's outcomes and shorten length stay of children at Pediatric Intensive Care Unit (PICU). Therefore, the current study was carried out to evaluate the pediatric intensive care unit nurses' performance regarding children with coma at PICU.

Aim of the study:

The aim of this study was to evaluate the effect of training program on nurses' knowledge and practice toward care of children with coma at Pediatric Intensive Care Unit, through:

- 1-Assessing nurses' knowledge toward care of children with coma.
- 2- Assessing nurses' practice toward care of children with coma.
- 3-Designing and implementing a training program based on nurses' actual needs toward care of children with coma.
- 4- Evaluating the effect of the training program on nurses' knowledge and practice toward care of children with coma.

Research Hypotheses:

- 1-The level of nurses' knowledge and practice toward care of children with coma will be improved significantly after implementing training program.
2. There will be a statistically significant correlation between nurses' knowledge and practice scores after training program.
3. Children with coma in study group who receive care after implementing training program will have increase Glasgow scale come score, improvement feeding and not having complication related to coma than those in control group who receive a routine hospital care.

2. SUBJECTS AND METHODS

Technical Design:

Research Design: A quasi-experimental design was utilized to achieve the aim of this study.

Research Setting: This study was conducted in Pediatric Intensive Care Unit (PICU) at Benha Specialized Pediatric Hospital affiliated to the ministry of health and population, it is found in the third floor and consisted of (3) rooms, first room contain (8) beds, second room contain (4) beds and the third room contain (1) bed named isolation room.

N.B The researcher doesn't conduct this study at Benha University hospital because the PICU in this hospital had some renovations and repairs during data collection time.

Subjects: The study subjects consisted of two groups:

First group: - A Convenient sample of all available nurses (n=43) working at the previously mentioned setting in morning and afternoon shifts regardless their personal characteristics.

Second group: - A purposive sample of children with coma (n=80) were included from the previously mentioned setting. Those children were divided equally into 2 constructed groups; study group (n=40) who receive care after implementing training program and control group (n=40) who receive a routine hospital care.

The inclusion criteria:

- Children with coma.
- Age: 6-18 years.

The exclusion criteria:

- Children less than 6 years.
- Children who had congenital anomalies.

NB: the researcher excluded children under 6 years because children who assessed before with another Glasgow scale coma scale.

Tools of data collection

Tool I: A structured interviewing questionnaire format: It was designed by the researcher after reviewing of the related literatures, it was written in an Arabic language. It comprised three main parts which are:

Part I: Personal characteristics of the studied nurses such as; age, gender, academic qualification, years of experience, attendance of training courses related to care of children with coma, which included (6) questions.

Part II: Personal characteristics of the studied children with coma such as; age, gender, diagnosis, length of hospital stay at PICU and previous coma for them, which included (5) questions.

Part III: Nurses' knowledge regarding care of children with coma: It was adapted from **Piyush et al., (2017)** to assess nurses' knowledge regarding care of children with coma. It consists 21 multiple choice questions, this includes: Definition of coma, causes, complication, complication related to respiratory system, complication related to skin, complication related to musculoskeletal system, complication related to gastrointestinal system, complication related to urinary system, definition of Glasgow coma scale, component of Glasgow coma scale, component of eye response, component of verbal response, component of motor response, nursing care for children with coma, warning symptoms that children needs for the cardio pulmonary resuscitation, diagnostic tests made to children with coma, vital signs, suction, nursing care for children on ventilator, analysis of blood gases and infection control in Pediatric Intensive Care Unit. **Scoring system for knowledge:** Nurses' knowledge were evaluated upon completion of the interview questionnaire as the studied nurses' knowledge was checked with a model key answer and accordingly, the complete correct answer was given two scores, the incomplete correct answer was given one score and zero for incorrect or don't know answers. The total score was ranged from 0-42. Then, their total knowledge were categorized as score of 80% and more was considered good, a score between 60% to less than 80% was considered average, while a score below 60% was considered poor.

Tool II: Observational Checklist for nurses' practices:

It was adopted from **Bowden and Green-berg, (2016)** to assess nurses' practice regarding care of children with coma. It included; Hand washing, Vital Signs, IV therapy, arterial blood gases, collection of blood sample, nasogastric feeding, endotracheal suction(ET), care for child on ventilator prevent nosocomial infection and apply a septic technique, communicate effectively with parents throughout length of hospital stay and at discharge. The total practices were (9)practices. **Scoring system** for each item of nurses' practice: Scoring system for nurses' performances will be as follows: Done correctly and competent will score (1) and done incorrect or incompetent will score (0). Total scores converted into percent scores, where the score of $\geq 80\%$ considered competent level of practice and a score $< 80\%$ considered an incompetent level of practice.

Tool validity and reliability:

The data collection tools were revised by a panel of five experts including; three professors of pediatric nursing from the Faculty of Nursing, Benha University, and two professors in PICU medicine from the Faculty of Medicine, Benha University, to test the content validity. Modification of the study tools were done according to the panel judgment on clarity of sentences, appropriateness of content and sequence of items. The reliability and internal consistency reliability of all items of the tools was assessed by using coefficient alpha. It was 0.79 for knowledge and 0.88 for practice.

International Journal of Novel Research in Healthcare and Nursing

Vol. 6, Issue 3, pp: (762-777), Month: September - December 2019, Available at: www.noveltyjournals.com

Method:

Exploratory phase:

Pilot Study: The pilot study was carried out on 4 nurses and 10 children with coma (5 for study and 5 for control groups) representing 10.0% of the study subjects this phase took about of one month. The purpose was to ascertain the feasibility of the study, the clarity, and applicability of the tools. It also helped to estimate the time needed for filling out the forms. Based on the results of the pilot, the necessary modifications on the study tools were done and pilot study subjects were included in the study sample.

Ethical Considerations and human rights: A permission to carry out the study was obtained from the hospital manager and the supervisor of Pediatric Intensive Care Unit in the previously mentioned study setting through submission of an official letter issued from the Dean of Faculty of Nursing, Benha University. All participants were assured that participation in the study was voluntary; each nurse was informed about the purpose, procedure, benefits and nature of the study and each nurse had the right to withdraw from the study at any time without any rationale, then oral consent obtained from them. Confidentiality and anonymity of each subject was assured through coding of all data and all information has taken was protected.

Field work:

1-An official permission for data collection was obtained from the hospital manager through submission of official letter issued from the Dean of Benha Faculty of Nursing.

2-Data were collected from the beginning of September 2018 to the end of May 2019. Immediately after the ethical approval was obtained.

3-The researcher then started to interview each nurse individually and this took about 20-25 minutes for assessing knowledge. Then an evaluation of care provided by nurses was done during their actual work for each child (routine care) and this took about 40-45 minutes for assessing practice. The researcher was available at the previously mentioned setting two days/week (Monday, Tuesday) in the Pediatric Intensive Care Unit in the morning shift to collect data by using the previous tool, this phase took about two months.

4-Determine was done for the area of weakness in nurses' knowledge and practice of care in the hospital.

5- The training program was designed by the researcher after an extensive review of related literatures and the needs identified in the assessment phase. An Arabic booklet nursing care for children with coma at PICU was prepared and given to nurses. .

6- The training program was implemented in about four months. It was carried out in 6 sessions (2 sessions for theory and 4 sessions for practice). A time schedule suitable for nurses was developed to conduct the program that includes; date, place, topic, time and duration of each session. The training program consisted of two parts; the theoretical part and the practical part cover the items of care for children with coma. It was difficult to take all nurses at the same time; thus they were divided into 8 groups of about 5-6 nurses in every session (five groups each group include five nurses and three groups each group include six nurses). The duration of theory sessions 30-35 minutes for each session and practical sessions ranged between 45 to 60 minutes for each session for two days/week. .

7-Reassessment for nurses' knowledge and their practice for nursing care for children with coma were evaluated immediately after implementing training program, the post tests were administered by using same pretest tools, this phase took about two months.

8-An assessment of children with coma outcomes using children medical outcomes assessment sheet.

Administrative design:

An official permission for data collection was obtained from the hospital manager through submission of official letter issued from the Dean of Benha Faculty of Nursing. The title, objectives and outcomes of the study were illustrated as well as the main data items to be covered, and the study was carried out after gaining the necessary permission

Statistical analysis of data

The collected data were categorized, analyzed and tabulated using the SPSS computer program Version 21. Numerical data were expressed as the mean and standard deviation. Qualitative data were expressed as frequency and percentage. A comparison between qualitative variables carried out by using a parametric Chi-square test. Correlation among variables was done using Pearson

correlation coefficient. A highly statistically significant difference was considered at $p\text{-value} \leq 0.001$, a statistically significant difference was considered at $p\text{-value} < 0.05$, and no statistically significant difference was considered at $p\text{-value} > 0.05$.

3. RESULTS

Table (1): Shows that, the nurses' personal data; it was observed that, the mean age of the studied nurse's was 28.95 ± 4.93 years. In relation to nurses' education level more than one third (34.9%) of them had technical institute of nursing. Additionally, it was noticed that, more than two fifth (41.9%) of nurses had an experience ≥ 10 years.

Figure (1): Illustrates that, the majority (86.0%) of the studied nurses females, while the minority of them (14.0%) males.

Figure (2): Illustrates that, more than two thirds (69.8%) of the studied nurses not attended any previous training courses regarding nursing care for children with coma.

Table (2): Shows that, children's characteristics, it was observed that, the mean age of the studied children was 9.60 ± 3.00 & 9.62 ± 3.11 years, while the mean length of hospitalization was 13.30 ± 8.49 and 21.67 ± 6.99 days in study group and control group.

Figure (3): Reveals that, more than half (55.0%) of the studied children group males, while more than half (52.5%) for control children group females.

Figure (4): Reveals that, the majority (80.0%) of the studied children in study group and three quarter (75.0%) in control group had no previous coma.

Table (3): Shows that, nurses' knowledge regarding coma in children. the majority (86.1, 88.5, 93.0%) of them have unknown answer regarding, causes, complication of coma and complication related to musculoskeletal system pre training program compared with (93.0, 83.8, 81.5%) of them had correct complete answer post training program, there was a highly statistically significant pre and post training program implementation.

Table (4): Reveals that, nurses' knowledge regarding Glasgow Coma Scale, the majority (86.1, 95.2 %) of them have unknown answer regarding definition and component of Glasgow coma scale pre training program compared with (81.4, 83.8%) of them had correct complete answer post training program, there was a highly statistically significant pre and post training program implementation.

Table (5): Illustrates that, nurses' knowledge regarding nursing care for children with coma. the majority (83.8%) of them have unknown answer regarding nursing care for children on ventilator pre training program compared with (90.5%) of them had correct complete answer post training program, there was a highly statistically significant pre and post training program implementation.

Table (6): Shows that, nurses' practice regarding nursing management of children with coma, there was a statistically significant difference pre and post training program implementation.

Table (7): Indicated that, percentage distribution of total knowledge and practice scores of the studied nurses about coma in children. As nearly three quarters (74.4%) of them had poor knowledge pre training program implementation compared with (81.4%) of them had good knowledge pre training program implementation. While more than two thirds of them (72.1%) had incompetent practice pre training program implementation compared with (83.7%) had competent practice post training program implementation.

Table (8): Demonstrates that, there is apposite correlation between nurses' knowledge and practice score in pre and post training program implementation ($P < 0.001$).

Table (9): Clarifies that, distribution of the studied children with coma regarding effect of training program on their condition. Whereas, three quarter (75.0%) of them had improvement Glasgow coma scale scores after implementation of program compared with the pre implementation of program. On the other hand, increased feeding improvement, majority the studied children (80.0%) before implementation of program compared with post program.

Table (10): Shows that, highly statistical significance relations between the studied nurses' knowledge and their academic qualification, years of experiences and training courses regarding nursing care for children with coma in pre and post training program implementation ($P < 0.001$).

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Vol. 6, Issue 3, pp: (762-777), Month: September - December 2019, Available at: www.noveltyjournals.com

Table (11): Shows that, highly statistical significance relations between the studied nurses' practice and their academic qualification, years of experiences and training courses regarding nursing care for children with coma in pre and post training program implementation (P<0.001).

Table (1): Distribution of the studied nurses according to their personal characteristics (n=43).

Items	Number (43)	%
Age in years		
20<25	10	23.2
25<30	15	34.9
30<35	14	32.6
≥35	4	9.3
Mean ±S.D 28.95±4.93		
Gender		
Male	6	14.0
Female	37	86.0
Academic qualification		
Diploma of secondary technical nursing school	14	32.6
Diploma of technical institute of nursing	1	2.3
Technical institute of nursing	15	34.9
Bachelor of nursing science	9	20.9
Post graduate	4	9.3
Years of experience		
one year< 5 years	13	30.2
5 years<10 years	12	27.9
≥10 years	18	41.9
Mean ±S.D 7.95±4.16		

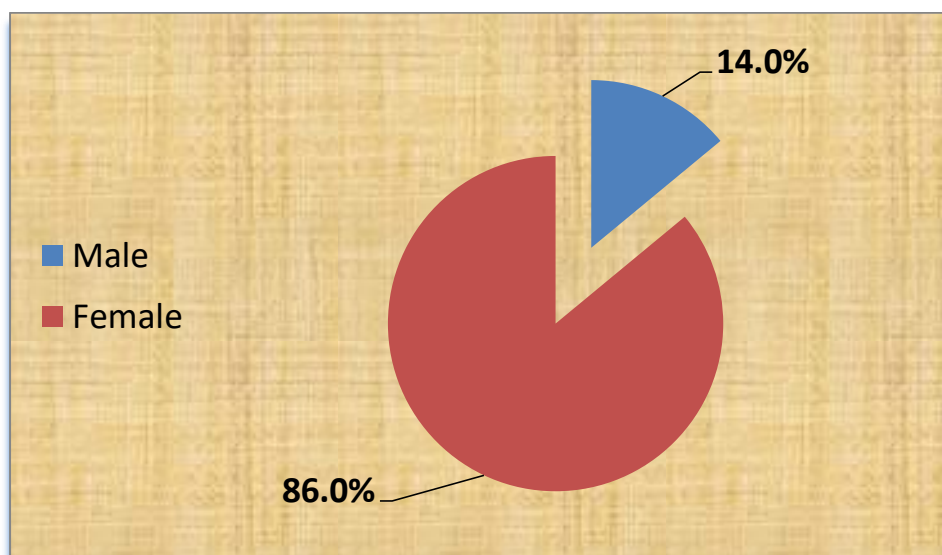


Figure (1): Distribution of the studied nurses according to their gender (n=43)

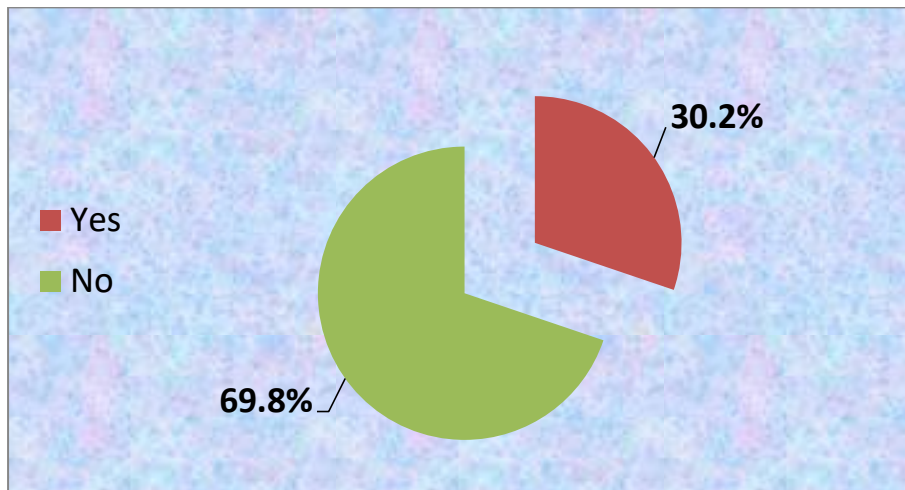


Figure (2): Distribution of the studied nurses according to their training courses regarding nursing care for children with coma (n=43)

Table (2): Distribution of the studied children according their personal characteristics (n=80).

Children Characteristics	Study group (No=40)		Control group (No=40)	
	No	%	No	%
Age in years				
6<9	20	50.0	19	47.5
9 <12	12	30.0	10	25.0
12<15	6	15.0	5	12.5
15≥18	2	5.0	6	15.0
Mean ±SD	9.60±3.00		9.62±3.11	
Length of hospital stay in days				
10-	15	37.5	2	5.0
20-	15	37.5	3	7.5
≥30	10	25.0	35	87.5
Mean ±SD	13.30±8.49		21.67±6.99	
Diagnosis				
Status Epileptic	10	25.0	8	20.0
Meningitis	10	25.0	13	32.5
Diabetic ketoacidosis	4	10.0	6	15.0
Poly trauma	16	40.0	13	32.5

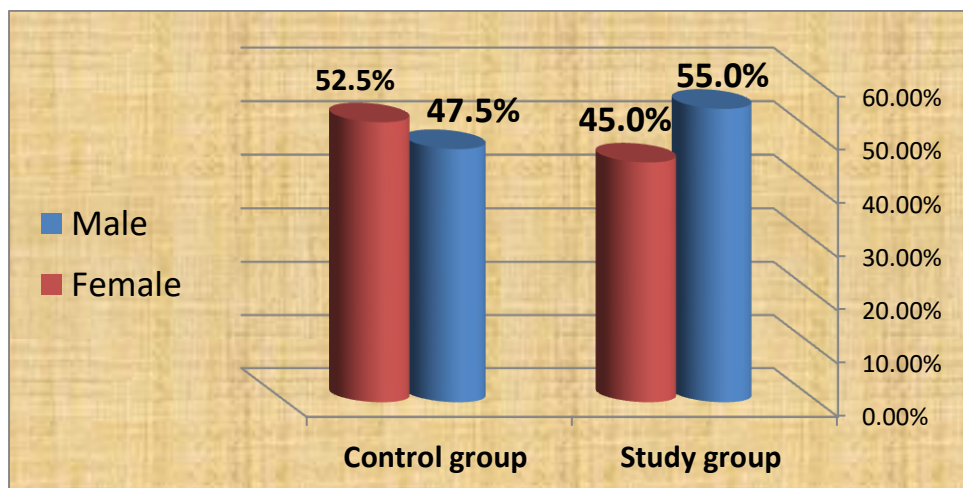


Figure (3): Distribution of the studied children according their gender (n=80).

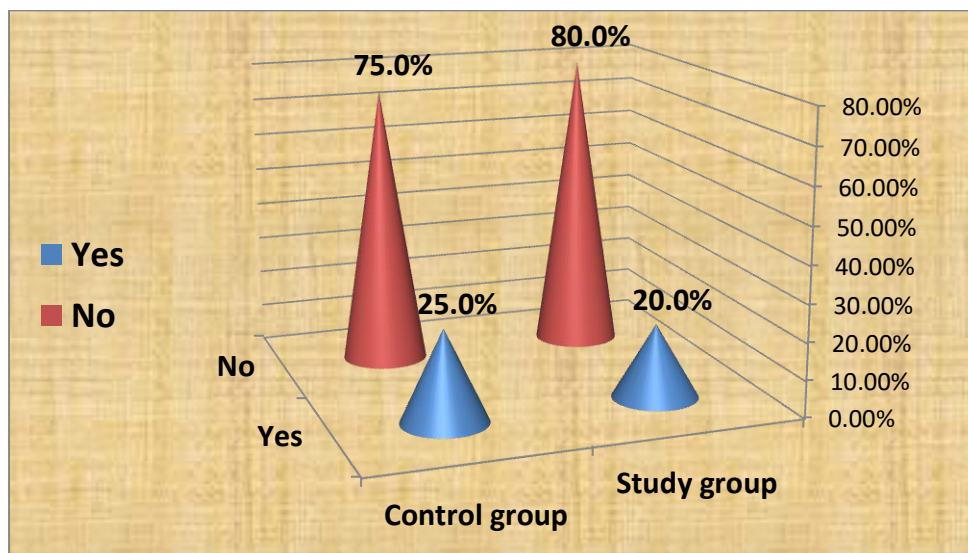


Figure (4): Distribution of the studied children according to their previous coma (n=80).

Table (3): Distribution of the studied nurses according to their knowledge regarding coma in children (n=43).

Nurses' knowledge	Pre- program implementation(No=43)						Post- program implementation(No=43)						X ²	P value
	Correct complete		Correct in complete		Don't know		Correct complete		Correct incomplete		Don't know			
	No	%	No	%	No	%	No	%	No	%	No	%		
Definition of coma	4	9.3	4	9.3	35	81.4	26	60.7	4	9.3	3	6.9	93.4	<0.001
Causes of coma	5	11.5	1	2.4	37	86.1	40	93.0	2	4.6	1	2.4	132.3	<0.001
Complication of coma	3	6.9	2	4.6	38	88.5	36	83.8	4	9.3	3	6.9	10.6.7	<0.001
Complication related to respiratory system	4	9.3	2	4.6	37	86.1	40	93.0	1	2.4	2	4.6	121.9	<0.001
Complication related to skin	8	18.6	3	6.9	32	74.5	41	95.2	1	2.4	1	2.4	108.5	<0.001
Complication related to musculoskeletal system	2	4.6	1	2.4	40	93.0	35	81.5	5	11.6	3	6.9	112.8	<0.001
Complication related to gastrointestinal system	5	11.5	6	13.9	32	74.6	38	88.5	3	6.9	2	4.6	107.4	<0.001
Complication related to urinary system	6	13.9	2	4.6	35	81.5	40	93.0	1	2.4	2	4.6	100.6	<0.001

Table (4): Distribution of the studied nurses according to their knowledge regarding Glasgow coma scale (n=43).

Nurses' knowledge	Pre- program implementation(No=43)						Post- program implementation(No=43)						X ²	P value
	Correct complete		Correct in complete		Don't know		Correct complete		Correct incomplete		Don't know			
	No	%	No	%	No	%	No	%	No	%	No	%		
Definition of Glasgow coma scale	2	4.6	4	9.3	37	86.1	35	81.4	4	9.3	4	9.3	97.6	<0.001

Component of Glasgow coma scale	1	2.4	1	2.4	41	95.2	36	83.8	4	9.3	3	6.9	123.4	<0.001
Component of eye response	1	2.4	1	2.4	41	95.4	35	81.5	2	4.6	6	13.9	106.4	<0.001
Component of verbal response	2	4.6	3	6.9	38	88.5	40	93.0	1	2.4	2	4.6	126.9	<0.001
Component of motor response	7	16.3	3	6.9	33	76.8	36	83.8	3	6.9	4	9.3	86.6	<0.001

Table (5): Distribution of the studied nurses according their knowledge regarding nursing care for children with coma (n=43).

Nurses' knowledge	Pre- program implementation(No=43)						Post- program implementation(No=43)						X ²	P value
	Correct complete		Correct in complete		Don't know		Correct complete		Correct incomplete		Don't know			
	No	%	No	%	No	%	No	%	No	%	No	%		
Nursing care for children with coma	5	11.6	5	11.6	33	76.8	37	86.1	4	9.3	2	4.6	89.9	<0.001
Warning symptoms that children needs for the cardio pulmonary resuscitation.	6	13.9	7	16.3	30	69.8	40	93.0	2	4.6	1	2.4	93.7	<0.001
Diagnostic tests made to children with coma	11	25.6	4	9.3	28	65.1	35	81.5	5	11.6	3	6.9	65.8	<0.001
Vital Signs	43	100.0	0	0.0	0	0.0	43	100.0	0	0.0	0	0.0	-	-
Suction	10	23.3	3	6.9	30	69.8	40	93.0	2	4.6	1	2.4	95.9	<0.001
Nursing care for children on ventilator	5	11.6	2	4.6	36	83.8	39	90.5	3	6.9	2	4.6	107.4	<0.001
Analysis of blood gases	15	34.9	5	11.6	23	53.5	41	95.4	2	4.6	0	0.0	44.6	<0.001
Infection control in pediatric Intensive Care Unit	12	28.0	3	6.9	28	65.1	36	83.8	4	9.3	3	6.9	61.7	<0.001

Tables (6): Distribution of the studied nurses according to their practice regarding nursing management for children with coma (n=43).

Nurses' practice	Pre- program Implementation(No=43)				Post -program implementation(No=43)				X ²	P-value
	Correct and competent		Incorrect and Incompetent		Correct and competent		Incorrect and Incompetent			
	No	%	No	%	No	%	No	%		
Hand washing	8	18.6	35	81.4	38	88.3	5	11.6	89.73	<0.001
Monitoring the vital signs parameters	18	41.8	25	58.2	36	83.7	7	16.3	26.32	<0.001
IV therapy	12	27.9	31	72.1	37	86.0	6	14.0	32.88	<0.001
Arterial blood gases	6	14.0	37	86.0	34	79.1	9	20.9	41.32	<0.001

Collection of blood sample	5	11.6	38	88.3	33	76.7	10	23.3	80.83	<0.001
Nasogastric feeding	11	25.6	32	74.4	35	81.4	8	18.6	75.66	<0.001
Endotracheal suction	14	32.6	29	67.4	36	83.7	7	16.3	45.29	<0.001
Care for child on ventilator	9	20.9	34	79.1	30	69.7	13	30.3	36.32	<0.001
Prevent nosocomial infection and apply a septic technique	7	16.3	36	83.7	31	72.1	12	27.9	43.83	<0.001
Communicate effectively with parents throughout length of hospital stay and at discharge	17	39.5	26	60.5	33	76.7	10	23.3	32.69	<0.001

Table (7): Distribution of the studied nurses according to their total knowledge and practice pre and post bundle implementation (n=43)

Items	Pre intervention (No=43)		Post intervention (No=43)		X ²	P value
	No	%	No	%		
Total knowledge level						
Good (80-≤100%)	5	11.6	35	81.4	76.89	P <0.000**
Average (60-≤80%)	6	14.0	4	9.3		
Poor (0-<60%)	32	74.4	4	9.3		
Total practice level						
Competent (80-≤100%)	12	27.9	36	83.7	55.19	P <0.000**
Incompetent (<80%)	31	72.1	7	16.3		

Table (8): Correlation between total knowledge and total practice scores of the studied nurses pre and post intervention (n=43).

Variables	Pearson correlation coefficient			
	Total knowledge score			
	Pre intervention (No=43)		Post intervention (No=43)	
	R	P	r	P
Total practice score	0.274	0.000**	0.244	0.000**

Table (9): Percentage distribution of the studied children regarding effect of training program on their condition (n=80).

Children Condition	Study group (No=40)				Control group (No=40)				X ²	P-value
	Before		After		Before		After			
	No	%	No	%	No	%	No	%		
Score of Glasgow coma scale										
Severe (3 - 8)	23	57.5	3	7.5	32	80.0	28	70.0	75.50	<0.001
Moderate (9 - 12)	10	25.0	7	17.5	4	10.0	10	25.0		
Mild (13 -15)	7	17.5	30	75.0	4	10.0	2	5.0		
Feeding improvement										
Normal	5	12.5	32	80.0	2	5.0	4	10.0	37.34	<0.001
Hypoactive	35	87.5	8	20.0	38	95.0	36	90.0		
Complication related of coma										
Yes	28	70.0	3	7.5	20	50.0	33	82.5	23.55	<0.05
No	12	30.0	37	92.5	20	50.0	7	17.5		

Table (10): Relation between studied nurses' knowledge and their characteristics (n=43).

Nurses' characteristics	Nurses' knowledge												X ²	P value	
	Pre- program implementation(No=43)						Post- program implementation(No=43)								
	Good		Average		Poor		Good		Average		Poor				
	No	%	No	%	No	%	No	%	No	%	No	%			
Age in years														38.95	<0.001
20 <25	2	4.7	2	4.7	6	13.9	7	16.2	2	4.7	1	2.3			
25 <30	1	2.3	1	2.3	13	30.2	13	30.2	1	2.3	1	2.3			
30 <35	1	2.3	2	4.7	11	25.5	12	27.9	1	2.3	1	2.3			
≥35	1	2.3	1	2.3	2	4.7	3	6.9	0	0.0	1	2.3			
Educational qualification														41.46	<0.001
Diploma of secondary technical nursing school	0	0.0	1	2.3	13	30.2	11	25.5	1	2.3	2	4.7			
Diploma of technical institute of nursing	0	0.0	1	2.3	0	0.0	1	2.3	0	0.0	0	0.0			
Technical institute of nursing	1	2.3	1	2.3	12	27.9	12	27.9	1	2.3	2	4.7			
Bachelor of nursing science	2	4.7	1	2.3	6	13.9	7	16.2	2	4.7	0	0.0			
Post graduate	2	4.7	2	4.7	0	0.0	4	9.3	0	0.0	0	0.0			
Years of experience														49.75	<0.001
1 < 5	1	2.3	1	2.3	11	25.5	9	20.9	2	4.7	2	4.7			
5 <10	2	4.7	2	4.7	8	18.7	9	20.9	1	2.3	2	4.7			
≥10	2	4.7	3	6.9	13	30.2	17	39.5	1	2.3	0	0.0			
Training courses regarding care of children with coma														38.65	<0.001
Yes	3	6.9	4	9.3	6	13.9	12	27.9	1	2.3	0	0.0			
No	2	4.7	2	4.7	26	60.4	23	53.4	3	6.9	4	9.3			

Table (11): Relation between studied nurses' practice and their characteristics (n=43).

Nurses' characteristics	Nurses' practice								X ²	P-value		
	Pre- program implementation(No=43)				Post- program implementation(No=43)							
	Competent		Incompetent		Competent		Incompetent					
	No	%	No	%	No	%	No	%				
Age in years											25.55	<0.001
20<25	2	4.7	8	18.7	8	18.7	2	4.7				
25<30	3	6.9	12	27.9	13	30.2	2	4.7				
30<35	4	9.3	10	23.2	12	27.9	2	4.7				
≥35	3	6.9	1	2.3	3	6.9	1	2.3				
Educational qualification											44.39	<0.001
Diploma of secondary technical nursing school	2	4.7	12	27.9	10	23.2	4	9.3				
Diploma of technical institute of nursing	1	2.3	0	0.0	1	2.3	0	0.0				
Technical institute of nursing	4	9.3	11	25.5	13	30.2	2	4.7				
Bachelor of nursing science	3	6.9	6	13.9	8	18.7	1	2.3				
Post graduate	2	4.7	2	4.7	4	9.3	0	0.0				

Years of experience									36.46	<0.001
1-< 5	7	16.2	5	11.6	9	20.9	4	9.3		
5 -<10	3	6.9	9	20.9	10	23.2	2	4.7		
≥10	2	4.7	16	37.2	17	39.5	1	2.3		
Training courses regarding care of children with coma									33.7	<0.001
Yes	4	9.3	9	20.9	11	25.5	2	4.7		
No	8	18.7	22	51.1	25	58.2	5	11.6		

4. DISCUSSION

Coma is a medical emergency which presents diagnostic as well as therapeutic challenges. The potential causes of coma are numerous, and the critical window for diagnosis and effective intervention (not only to ensure survival but also to prevent long-term sequelae) is short. Pediatricians in the emergency services and intensive care units (ICU) have to frequently manage comatose children patients. Central nervous system (CNS) infections are the most common cause of non-traumatic coma in children (Marsha et al., 2017).

Concerning the personal data of the studied nurses, it was noted that the slightly more than one third of them had age between twenty five and thirty years and the majority of them was females. In relation to nurses' education qualification more than one third of them had technical institute of nursing. This agrees with the results of Mohammed et al., (2013) who conducted a study of "Assessment Of Nurse's Knowledge Concerning Glasgow Coma Scale In Neuro Surgical Wards" who found that nearly of one quarter of nurses had age between twenty eight and thirty two years, more than half of them had technical institute of nursing.

Regarding distribution of the studied nurses according to their gender the most of them have females; also, more than two thirds of them had not attended training programs related to caring children with coma. This agrees with the results of (Elsayed, 2018). Who conducted a study of "Intensive Care Unit Nurses' Performance Regarding Caring Patients With Head Injury: An Educational Intervention" who found that nearly two thirds of studied nurses have females and nearly to three quarters of them had not attended training programs related to PICU.

Regarding distribution of the studied nurses in relation to their knowledge regarding coma in children. It was found that, there was a highly statistically significant pre and post intervention implementation. The result of current study is in congruence with what was reported by (Hussein, 2015) Who conducted a study of "Effect of Instructional Guidelines about Coma and Pediatric Glasgow Coma Scale on Knowledge and Skills of Pediatric Intensive Care Nurses" who found that nurses' knowledge about coma and PGCS in pretest was unsatisfactory but their knowledge was improved after provision of instructional guidelines in posttest and there was a statistically significant difference between mean scores of nurses' knowledge in pretest and posttest.

Unsatisfactory nurses' knowledge about coma and PGCS from point of view of research investigator may be return to that the majority of nurses their level of education only diploma in addition and though, the students are exposed to pediatric critical care nursing in their studying curriculum, but they are not prepared or knowledgeable enough to provide care for children in PICUs, besides that lack of training educational programs for staff nurses about appropriate care for PICUs patients in general and PGCS specifically, its benefits and applicability and also reflects the lack of responsibility of nursing director and management staff in providing such training programs for staff nurses in PICUs.

Regarding to increasing nurses' knowledge regarding care of children with coma in posttest, this reflects nurses' readiness and interest toward increase their knowledge and consequently improve care provided to PICUs children. This proved the positive effect of training program upon nurses as increased their knowledge and achieved aim of current study.

Regarding distribution of the studied nurses in relation to their knowledge regarding Glasgow coma scale. It was found that, there was a highly statistically significant pre and post intervention implementation. In agreement with the present results Mohammed et al., (2013) who found that the nurses ' have inadequate Knowledge in all items concerning (GCS).

These results are supported in the literature in different studies. Hamza and Mohamad (2016) conducted a similar study in Jordan and showed that the nurses have inadequate knowledge concerning all items related to GCS. The recommendation of this study was a critical need to educate the nurses about the GCS. Similarly, a study in Vietnam showed that the nurses were lacking the necessary knowledge about GCS especially when it comes to the clinical setting.

From point of view of researcher, the nurses lack the basic knowledge about the Pediatric GCS and recommended different training and teaching programs to be done. It is very important to have a high knowledge about the Pediatric GCS and its application because the scores will affect the decisions and the treatment of the pediatric patients.

A competent nurse in a globalized world, which increasingly demands the professional to be capable of autonomous thought and critical thinking, creative, educated, and knowledgeable is one of the major challenges in nowadays health care systems. Nurses have a unique opportunity to help clients examine their lifestyle, recognize risks and potential areas for change, advice on a focused individualized plan and facilitate the accomplishment of their goals. That can't be done without a well-qualified thoroughly knowledgeable nurses, especially in critical care settings as (nurses at pediatric intensive care unit), since they ought to have efficient assessment and evaluation skills to deal and manage their patient particularly those with disturbed level of consciousness through the application of GCS (**Beatriz et al., 2009**).

The researcher used statistical tests to identify the direction of differences in practice scores, it was clear that the significant difference was between the pre and all post program scores. The improvement of nurses' practices as a result of implementing a training program was well recognized and supported by (**Elsayed, 2018**). Who found that the unsatisfactory nursing practices regarding head injury nursing care in the intended PICU. At the pre-intervention phase these findings are agreed with this may be due to shortage of nursing staff to provide high quality nursing care for head injury pediatric patients.

Pediatric Intensive care unit (PICU) nurses are responsible for the continuous monitoring and maintenance of physiological values associated with coma. Therefore, nurses as health care team members are the best positioned to detect and prevent complication related to coma. However, nurses vary in their practice, and little is known about how PICU nurses manage children with coma. Evidence-based guidelines for care of comatose children have been established, but the extent to which these guidelines influence nursing practice in the management of children with coma (**Seliman et al., 2014**).

From point of view of research investigator this indicates to readiness of nurses to learn more and their interest in learning new skills for improving their skills regarding care of children patients with coma and also reflects the positive effect of training program in improving skills of PICUs nurses regarding application of PGCS.

The frequency of neurological assessments depends on the severity of the children patient's illness and underlying condition and can range from every 15 minutes to every four to eight hours. The registered nurses (RN) should use clinical judgment to determine the need for an increase in the frequency of neurological observations and whether observations should be expanded to include other assessment parameters. A MRP (most responsible provider) order is not necessary for the RN to increase the frequency of neurological assessments, which are within their scope of practice (**Hopkins et al., 2018**).

The correlation between nurses' total knowledge score and total practice score. Findings of the present study reported that there is a positive correlation between nurses' knowledge and practice. Findings of the present study reported that there is a positive correlation between nurses' knowledge and practice. This agree with (**Elsayed, 2018**).and (**Hussein,2015**) Who stated that a highly statistical significant correlation between nurses' scores of knowledge and practice in pre-program, post program, 1 month and 2 months following the instructional program.

Regarding distribution of the studied nurses in relation between total knowledge and their characteristics. It was found that, there was a highly statistically significant relation between nurses age, years of experiences academic qualification and their total knowledge score in pre and post intervention implementation. In agreement with the present results **Metwally, (2017)** Who conducted a study of (Effect of Preventive Guidelines on Nurses' knowledge and Compliance Towards Ventilator Associated Pneumonia in PICU) who found that, statistically significant relation between nurses age, years of experiences, academic qualification and their total knowledge score in pre and post intervention

Finally, before the program, the majority of nurses unsatisfactory and less of total score knowledge and practice related to care of children with coma while the majority of them had satisfactory of total knowledge and practice after training program. This explained by the fact that most of studied nurses attended any training courses in caring of children with coma. Also, reflect positive effect of the program on nurses' knowledge practice and importance of their application

5. CONCLUSION

In the light of the present study, it was concluded that, the theoretical and practical a training program had a positive effect in improving nurses' knowledge and practice regarding care for children with coma at PICU. There was also a positive correlation between levels of nurses' knowledge as regards their practice.

6. RECOMMENDATIONS

1-The study recommended continuous educational programs should be planned on regular basis to nurses' caring of children with coma at PICU for enhancing nurses' knowledge and practice to achieve high quality of care of children with coma.

2-Nurse's educators should develop training program provided to all nurses caring for unconscious patient children to improve and update their knowledge and practice.

3- Designing and distributing a manual procedure book to all nurses who were working in PICU including standard of techniques that must be applied.

4- The current nursing textbooks and handbooks need to be updated and each unit's policy and standards of care need evidence based resources with current recommendations from current research.

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