Effect of Designed Practice Guidelines on Nurses' Performance and Outcome of Children with Head Injuries

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ABSTRACT

Contexts Acute head injury resulting from a trauma to the head, leading to brain injury or bleeding within the brain, can cause edema and hypoxia. Head injury is the leading cause of death in the first four decades of life. Effective nursing management strategies for children with severe traumatic brain injury are still a remarkable issue and a difficult task for neurologists, neurosurgeons, and nurses.
Aim: To evaluate the effect of designed practice guidelines on nurses' performance regarding the care of children with head injuries.
Methods: A quasi-experimental research design was utilized to conduct the current study on pediatric neurosurgery departments of Benha University Hospital and Benha Teaching Hospital. A purposive sample of 72 children with head injuries and a convenient sample of all available nurses. They were 62 nurses who are working at the previously mentioned study settings. Four tools were used to collect data in this study. A structured interviewing questionnaire sheet was developed to assess the personal characteristic of the studied nurses and nurses' knowledge regarding head injuries. Child medical data record developed to assess children's personal and head injuries characteristics for them. Glasgow coma scale was adopted to assess the child's conscious level. Observational checklists to assess the actual nurses' practices regarding the care of children with head injuries.
Results: There was a statistically significant improvement in nurses' knowledge and practice regarding the care of children with head injuries before and after implementing designed practice guidelines ($p<0.001$). There was a statistically significant improvement regarding the occurrence of convulsion after the implementation of the program.
Conclusion: The study concluded that implementing designed practice guidelines for nurses improved their knowledge and practice and reduced the occurrence of frequency, duration, and timing of convulsion, which supports the current research hypotheses. The study emphasizes the importance of implementing designed practice guidelines for nurses caring for children with a head injury to reduce head injury complications, which is an effective and safe non-invasive intervention in neurosurgery and emergency departments as a standard of care for all head-injured children.

Keywords: Designed practice guidelines, nurses' performance, and head injuries, children, outcomes.

1. Introduction

Traumatic brain injury (TBI) is a disruption in the brain's normal function that can be caused by a bump, blow, or jolt to the head. This injury may include falls that lead to a head strike, including ground level. An acute injury should be evaluated within 24 hours of the traumatic event. TBI is the leading cause of death and acquired disability in children and adolescents. Children with TBI suffer from neurocognitive impairments and are at risk for derailed academic and social development *(Babikian & Asarnow, 2009; Anderson, Brown, Newitt, & Hoile, 2009).*

About 1.7 million cases of TBI occur in the US every year, and 5.3 million Americans live with a disability caused by TBI alone. Among children ages 14 and younger, TBI accounts for an estimated 2,685 deaths, 37,000 hospitalizations, and 435,000 emergency room visits. Additionally, in 2014, an estimated 812,000 children (age 17 or younger) were treated in US emergency departments for concussion or TBI, alone or in combination with other injuries. Also, over eight years (2006–2014), age-adjusted rates of TBI-related emergency departments visits increased by 54%; hospitalization rates decreased by 8%, and death rates decreased by 6% *(Centers for Disease Control and Prevention (CDC), 2004; Centers for Disease Control and Prevention (CDC), 2019).*

Worldwide, more than 400.000 children between infancy and 14 years of age are assessed in the emergency departments for assessment and treatment of traumatic head injury. Falls and motor vehicle accidents are the primary cause of traumatic head injury in this age group *(National Center for Injury Prevention and Control (NCIPC), 2018).*

Common causes of TBI include car or motorcycle crashes, falls, sports injuries, and assaults. Injuries can range from mild concussions to severe permanent brain damage. While treatment for mild TBI may include rest and medication, severe TBI may require intensive care and life-saving surgery. Those who survive a brain injury can face lasting effects on their physical and mental abilities, emotions, and personality. Most children who suffer

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moderate to severe TBI will need rehabilitation to recover and relearn skills *(Kochanek, Tasker, & Carney, 2019).*

Symptoms of a TBI can be mild, moderate, or severe, depending on the extent of brain damage. Some symptoms occur immediately, while others do not surface until several days or weeks after the injury. A child with a mild TBI may remain conscious or experience a loss of consciousness for a few seconds or minutes. The child may also feel dazed or not like himself for several days or weeks after the initial injury. Other symptoms of mild TBI include headache, confusion, lightheadedness, dizziness, blurred vision or tired eyes, ringing in the ears, bad taste in the mouth, fatigue or lethargy, a change in sleep patterns, behavioral or mood changes, and trouble with memory, concentration, attention, or thinking *(Kochanek et al., 2019).*

The complications that occur immediately following TBI are considered distinct medical problems that arise due to the head injury. The risk increases with the severity of the trauma. Complications of head injury include immediate seizures, hydrocephalus (or post-traumatic ventricular enlargement), cerebrospinal fluid leaks, infections, vascular injuries, cranial nerve injuries, multiple organ system failures in unconscious child, and polytrauma (trauma of other parts of the body in addition to the brain) *(Watson, Shepherd, Rhodes, & Andrews, 2018).*

Also, children with a severe head injury, if they recover consciousness, suffer from cognitive disabilities, including the loss of many higher levels of mental skills. The most common cognitive impairment among severely head-injured children is memory loss, characterized by some loss of specific memories and the partial inability to form or store new ones. Some of these children may experience post-traumatic amnesia *(American Academy of Pediatrics, 2015).*

The nurses have a significant and serious role in caring for a child with a head injury. The nurse is one member of the health care team who can use assessment and observation, education, supportive skills, and evaluation to the child with a head injury. They expected to measure vital signs and observe the level of consciousness according to the Glasgow coma scale. So, observe abnormal breathing, severe wound or fracture in the head, and bleeding or clear fluid from the nose or ear and mouth. Also, nurses should observe disturbance speech or vision, pupils of unequal size, weakness or paralysis, dizziness, convulsion, neck pain or stiffness, convulsion, vomiting more than two or three times, and loss of bladder or bowel control *(Campbell & Alson 2018).*

Effective nursing management strategies for children with severe traumatic brain injury are still a remarkable issue and a difficult task for neurologists, neurosurgeons, and nurses. A list of justified indications and scientific rationale for nursing management of these children is continuously evolving. Nurses are the health professionals who see the full impact of TBI and have the skills that can alter the course of a child's recovery; nurses must have a valuable resource with evidence-based recommendations on nursing practice to help them achieve the most significant possible outcomes. Nurses require knowledge and skills to provide quality care to those children with TBI *(Varghese, Chakrabarty, & Menon, 2017).*

2. Significance of the study

Head injuries are a leading cause of morbidity and mortality in children. It is responsible for a significant proportion of acquired disability, communication, language difficulties, attention disorders, and learning difficulties. In Egypt, epidemiological data and updated statistical records for pediatric traumatic head injuries are often lacking and difficult to extract from routinely collected data *(Halawa, Barakat, Ibrahim & Moawad, 2015).* This study helps to upgrade nurses' knowledge and improve their practice regarding care of children with head injuries, decrease the duration of hospital stay that consequently decreases cost, increases the quality of provided care, and decreases infection. Additionally, it decreases the occurrence of complications for children with a head injury.

3. Aim of the study

This study aimed to evaluate the effect of designed practice guidelines on nurses' performance regarding the care of children with head injuries through:

- Assessing nurses' current knowledge and practice regarding head injuries.
- Designing and implementing practice guidelines based on nurses' actual needs assessment about head injuries and best-evidenced practice.
- Evaluating the effect of designed practice guidelines on nurses' knowledge and practice toward the care of children with head injuries.

3.1. Research hypotheses

- Nurses who are exposed to the practice guidelines will exhibit better knowledge compared to their pre-intervention level.
- Nurses who are exposed to the practice guidelines will exhibit improved practice compared to their pre-intervention level.
- Children with head injuries who are cared for by the trained nurses will exhibit better outcomes than their preintervention level.

3.2. Operational definition

Practice guidelines

It is the practice based on evidence that directs nurses to provide quality care to patients under care.

Children outcomes

It meant in this study post-traumatic brain injury as; onset of children complains, signs and symptoms, the occurrence of convulsion and vomiting during head injuries (frequency, duration, and time during the day) as it is the most common acute complications in children with TBI.

4. Subjects & Methods

4.1. Research design

A quasi-experimental (pre/post-test) design was used to conduct this study. Quasi-experimental studies have been

widely accepted and used in the social sciences for several decades. Quasi-experimental research shares similarities with the traditional experimental design or randomized controlled trial, but it specifically lacks the element of random assignment to treatment or control *(Bärnighausen et al., 2017).*

4.2. Research setting

The study was carried out on pediatric neurosurgery departments of Benha University Hospital and Benha Teaching Hospital. The neurosurgery department in Benha University Hospital is located on the second floor in the surgery building and consisted of a dressing room and three big rooms; each room contains six beds. The neurosurgery department in Benha Teaching Hospital is located on the third and consists of one big room that contains eight beds.

4.3. Subjects

A convenient sample of all available (62) nurses working as full-time nursing providers at the previously mentioned study settings was taken.

A purposive sample of children with head injuries included in the study from the previously mentioned study settings; the total number was 72. They were taken according to the following inclusion criteria:

Inclusion criteria

- Diagnosed with head injuries include all classes of injuries.
- From both genders.
- Ages ranged from 1 to 15 years.
- Free from any other medical condition.

Sample size was calculated utilizing the following formula

Yamane, (1967);

$$n = \frac{N}{1 + N(e)2}$$

Where:

n=sample size

N=total population

e=margin error (0.05)

4.4. Tools of the study

The following tools were utilized to collect data for the current study. The researchers developed them after reviewing related literature, periodicals, and scientific websites. These tools consisted of the following:

4.4.1. A Structured Interviewing Questionnaire

It was prepared in the Arabic language to assess the nurses' knowledge regarding head injuries (*Kinyanjui, 2016).* Each nurse interviewed individually to answer the structured interviewing questionnaire sheet. It included two main parts, which are:

Part I is concerned with personal characteristics of the studied nurses as; age, gender, place of work, years of experience, academic qualifications, job position, and attendance of training courses regarding head injuries.

Part II is concerned with the assessment of nurses' knowledge about head injuries. It consisted of 10 multiple choice questions and two close-ended questions covering issues related to; definition, causes, signs, and symptoms for mild, moderate, and severe head injuries, types of head injuries, risky signs of head injuries, complications, diet restriction, prevention, and nursing management.

Additionally, nurses' knowledge regarding head injuries inducing factors as; psychological, environmental, playing, and associated mental diseases and the relation between them and head injuries occurrence. It includes 12 multiple-choice questions.

Scoring system

The MCQ is corrected against the model answer as (1 mark) for correct answer and (0) for incorrect answer. The scoring of closed-ended questions gave a score (1) for the correct and complete answers, (0) for incomplete answers, incorrect answers, or do not know answers. The total score ranged from 0-12. Then, the total knowledge was categorized as a score of 80%, and more were considered satisfactory; a score of less than 80% was considered unsatisfactory.

4.4.2. Child Medical Data Record

It developed by the researchers and included two parts as follow;

Part 1 is concerned with the children's characteristics. It included; age, gender, birth order, and school stage.

Part 2 is concerned with the assessment of head injuries characteristics. It included the onset of child complain, signs and symptoms, the occurrence of convulsion and vomiting during head injuries, blood or CSF leakage, the effect of head injuries on child health, level of consciousness, and motor disabilities.

4.4.3. Glasgow Coma Scale (GCS)

It was adopted from *Teasdale & Jennett (1974)* and revised *(Teasdale & Jennett, 1976)* then modified by *Teasdale & Jennett (2008)*. It is used to assess the child's level of consciousness. It is the most commonly accepted assessment tool for documenting the neurologic status of head-injured children. It can be used for pediatric populations with an age-appropriate assessment. It composed of three subscales as follows; eye-opening (4 items), verbal response (5 items), and best motor response (6 items).

Scoring system for Glasgow Coma Scale

- 13-15 considered mild head injuries
- 9-12 considered moderate head injuries
- < 8 severe head injuries
- The maximum score is 15, and the minimum score is 3.

4.4.4. Nursing Practice Observation Checklist

It was adopted from *(Hockenberry & Wilson (2015)* and modified by the researchers. It is used to assess the actual nurses' practices regarding the care of children with head injuries. It included assessment of admission care, putting the child in a suitable position during injury, measuring vital signs, measuring the level of consciousness (Glasgow coma scale) (24 items), keeping the child to take

balanced diet, providing complete relaxation and bed rest (11 items), and maintain antiseptic technique, exercise, and physiotherapy (11 items), wound care (9 items), mouth care (5 items), medication administration (20 items), and range of motion exercises for upper and lower extremities (10 items).

Scoring system

Total practice scores were (90 items). Each nurse observed during each procedure three different times using nurses' observational checklists. The mean of the three observations calculated, and the mean was taken. Each correctly done step gave the score of (1) and (0) for each incorrectly done step or not done. The total scoring for practice classified as follows:

- Competent practice level: Equal to or more than 80%.
- Incompetent practice level: Less than 80%.

4.5. Procedures

The researchers reviewed the past, current regional, and international related literature covering all aspects of the study using textbooks, journals, articles, websites, and periodicals. This review helped the researchers be acquainted with the research problem and guided them in developing the data collection tools. The researchers assure that items of the tools adequate presented what is supposed to be measured by a jury of five experts, including; one neuro-surgeon professor, one pediatric medicine assistant professor, and three assistant professors of the pediatric nursing from the Faculty of Nursing Ain Shams and Benha Universities, to test the tool and guidelines' content validity.

Modifications are made according to the experts' judgment on the clarity of sentences, appropriateness of the content, and sequence of items. The experts' agreed on the contents but recommended minor language changes that would make the information clearer and more precise. The suggested changes were made. The internal consistency reliability of all items of the tools assessed using coefficient alpha. It was 0.87 for structured interviewed questionnaires and was 0.83 for nurses' practices observational checklists.

Ethical considerations and human rights: Official permissions to conduct the study were obtained from the hospital managers and heads of emergency and neurosurgery departments at the previously mentioned study settings by submitting official letters issued from the dean of Benha faculty of nursing. The study's title, objectives, and outcomes are explained and the main data items to be covered, and the study is carried out after gaining the necessary permission.

Participation in the current study was voluntary; each nurse informed about the nature of the study, the purpose, procedures, benefits, and all the information has taken was confidential. Each nurse had the right to withdraw from the study at any time without any rationale, and then oral/written consent was obtained from them. Subjects informed that obtained data would not be included in any job evaluation.

A pilot study was carried out for 10% of studied subjects (7 head-injured children and six nurses) during May 2018 to assess the feasibility of the research process, clarity, objectivity, applicability, and time needed for the data collection tools. Accordingly, the necessary modifications were made in the form of adding or omission of some questions. The pilot study subjects were excluded from the actual study sample.

The fieldwork was performed from the beginning of July 2018 to December 2018 to collect data by the researchers. The researchers were available three days per week (Saturday, Monday, and Wednesday) in the morning and afternoon shifts by rotation in the previously mentioned study settings. The average number of nurses who were assessed and taking designed practice guidelines per week ranged from 6-9 nurses. The nurses filled out the structured interviewing questionnaire, and the researcher collected observation checklists. The average time required for completion of each tool was around 15-30 minutes.

Preparation phase concerned with designing and testing different data collection tools besides the administrative arrangements to carry out the study and conducting the pilot study. In the beginning, the researchers introduce themselves to the studied nurses. Nurses who agreed to participate in the study individually interviewed the researchers to explain the nature, aim, and desired outcomes of the study and oral consent obtained from these nurses.

Steps of designed practice guidelines construction:

A. General Objectives

This guideline aimed to upgrade studied nurses' knowledge and improve their practice regarding the care of children with head injuries.

B. Specific Objectives;

By the end of the implementation of the designed practice guidelines, each studied nurse should be able to:

(According to the given handout and questionnaire)

- Define head injuries.
- Determine the classification of head injuries.
- Mention inducing factors for head injuries.
- Enumerate symptoms of head injuries.
- Identify symptoms that refer to worsen head injuries.
- Identify the Glasgow coma scale and how to apply it.
- Determine lines of treatment regarding head injuries.
- Discuss methods that should be followed to avoid head injuries.
- Perform breathing exercises and wound care for the child.
- Perform hygienic care for the child with head injuries.
- Apply interventions for caring for the child during head injuries.

Implementing phase: The researchers clarified and answered any related questions. Then, each nurse observed during their practice on morning and afternoon shifts using the same researcher's observational checklists. The time needed for each observation for each nurse was 20-30 minutes three times during nursing care provided for children with head injuries. The same researcher was observing the nurses' practice for the same specified nurse. The mean of the three observations calculates after that the mean was taken.

Designed practice guidelines construction, implementation, and evaluation: The designed practice guidelines were designed based on the nurses' actual needs assessment and best evidence published for caring for children with head injury *(Kochanek et al., 2019).* Then designed, implemented, and evaluated. This guideline aimed to upgrade nurses' knowledge and improve their practice regarding care provided for children with head injuries. The implementation of the designed practice guidelines carried out in the previously mentioned study settings. The designed guidelines were distributed and implemented with the studied nurses.

In contrast, the researchers explained the contents of the designed practice guidelines and how to use them as a personal reference later on. Training of nurses conducted using a laptop with MS PowerPoint presentations 2010 provided all guiding booklet contents. According to working circumstances, the designed practice guidelines were implemented for a group of nurses that entail (6-9) their mental and physical readiness (12 groups of studied nurses).

The designed practice guidelines were implemented over three weeks, in addition to one week for pre and post-test. A schedule appropriate for nurses developed to conduct the designed practice guidelines included; date, topic, place, time, and duration of each session. The total numbers of sessions were nine sessions for theory and practice (6 for practice and 3 for theory) in each setting. Each session took about 45 to 60 minutes, including periods of open discussion during their training and one session for pre-test and another for post-test.

At the beginning of the first session, the researchers provide an overview of the designed practice guidelines. Also, feedback about the previous session made and the objectives of the new topic explained. Simple Arabic words are used to suit the nurses' level of understanding. At the end of each session, nurses' questions were discussed to correct any misunderstanding and re-demonstration for practical procedures.

Different teaching strategies used to implement the designed practice guidelines were lectures, small group discussions, brainstorming, role play, demonstration, and re-demonstration using real objects. Suitable teaching aids as a booklet, colored posters, mannequins, and real objects were prepared especially for practice. Nurses were motivated to cooperate and participate actively in different stages of the study.

Evaluation: Upon completing the designed practice guidelines, the post-test was done for the studied nurses to evaluate the outcomes of the implemented guidelines using the same tools for the pre-test.

4.6. Data analysis

The collected data were revised, organized, tabulated, and analyzed using SPSS (Statistical Package for the Social Science Software) statistical package version 20 on IBM compatible computer. Numerical data (Quantitative data) presented in tables by using Mean, Standard deviation ($\overline{X} \pm$ SD) and analyzed by applying t-test for normally distributed variables, while qualitative data expressed as frequency and percentage and chi-square used, t-test was used as a parametric test of significance for comparison between two samples means. Pearson correlation (r) is used to measure the correlation between quantitative variables. p-value at 0.05 used to determine significance regarding:

- P-value > 0.05 to be statistically insignificant.
- P-value ≤ 0.05 to be statistically significant.
- P-value ≤ 0.001 to be highly statistically significant.

5. Results

Table 1 describes the characteristics of the studied nurses, where their mean age is 32±2.7 years. The majority of nurses were females (95.2%) and 59.7% working at Benha University Hospital. Regarding years of experience, about half of them (51.6 %) of their years of experience ranged from 1 to less than ten years. More than three-quarters of nurses' education (79.0%) had a secondary school diploma in nursing, while 11.3% of them had a bachelor's degree in nursing. Also, 90.3% of them not attended any previous training courses regarding head injuries for children.

Table 2 shows a highly statistically significant difference between the studied nurses' knowledge pre- and post-intervention.

Figure 1 shows that 93.6% of the studied nurses have satisfactory knowledge regarding head injury post-intervention compared to 4.8% of them pre-intervention.

Table 3 demonstrates a highly statistically significant difference between pre- and post-program implementation regarding the studied nurses' knowledge of head injury triggering factors, where the mean score before the program was 1.13±0.51 compared to 1.88±0.26 after program implementation (P <0.001, T = 13.92).

Table 4 clarifies an improvement in nurses' practices related to the care of children with a head injury after program implementation as compared to pre-program mean scores with a highly statistically significant (P<0.001) difference between them.

Table 5 clarifies the personal characteristics of the studied children, where the mean age of them is 8.31±1.74 years, 56.9% of them were males. Regarding birth order, more than two-fifth (43.1%) of children are the first child in the family, and 6.9% of children are the fourth and more. Also, 83.3% of them are in primary school, and 2.8% are in preparatory school.

Table 6 illustrates head injury symptoms, more than half (55.6%) of children complaints of convulsion and headache. While 33.3% of them got vomiting, and 8.3%, 2.8% of these children are having the appearance of drowsy and blood or CSF leakage from nose or mouth or ear, respectively. Regarding the time of child complaints from a head injury, it was found that 55.6% of children their onset of head injury complaints was higher between children four years and more. Regarding the effect of head injury on a child, this table reflects that all studied children's health is affected by head injury where precisely

one-third (33.3%) of children have to challenge concentrating on schoolwork. Also, (11.1%, 13.9%, 13.9%, and 19.5%) of these children complain from limitation in usual physical activities, sleeping interruption during the night, emotional hypersensitivity, and missing school days, respectively. Moreover, 8.3 % only of them suffer from disrupted social interaction and interpersonal relationships.

Table 7 clarifies an improvement regarding the occurrence of convulsion after implementation of the program, where 69.4% of children have one attack of convulsion per day compared with 27.8% before the intervention. Meanwhile, the lowest percentage (1.4%) of them have three times of convulsion per day compared to 6.9% before the intervention. Regarding the average length and daytime of attack occurrence, this table reveals that 70.8% of children their attack lasts for less than 5 minutes. Meanwhile, 55.6% of attacks occurred during the day compared to 73.6% during the day and night before the intervention.

Table (1): Frequency and percentage distribution of the studied nurses' demographic characteristics (N= 62).

Demographic characteristics	Study group (N= 62)	
	No	%
Age in years		
<20	0	0.0
20-<25	21	33.9
25-<30	37	59.7
≥30	4	6.4
Mean±SD	32±2.7 years	
Gender		
Male	3	4.8
Female	59	95.2
Place of work		
Benha University Hospital	37	59.7
Benha Teaching Hospital	25	40.3
Experience (years):		
<1	9	14.5
1-<10	32	51.6
≥10	21	33.9
Academic Qualifications		
Diploma (Secondary School)	49	79.0
Technical Institute of Nursing	6	9.7
Bachelor of Nursing	7	11.3
Job position		
Nurse	55	88.7
Head nurse	7	11.3
Attendance of previous training courses		
Yes	6	9.7
No	56	90.3

Table (2): Comparison of studied nurses' knowledge of head injuries before and after the intervention (no. 62).

Items of knowledge	Pre-intervention				Post-intervention				x^2	P-value
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory			
	No	%	No	%	No	%	No	%		
Definition of head injury	5	8.0	57	92.0	60	96.8	2	3.2	33.41	0.001
Causes of head injury	3	4.8	59	95.2	58	93.6	4	6.4	40.11	0.001
Mild symptoms of head injury	5	8.0	57	92.0	58	93.6	4	6.4	38.04	0.001
Moderate symptoms of head injury	1	1.6	61	98.4	62	100.0	0	0.0	38.19	0.000
Severe symptoms of head injury	0	0.0	62	100.0	59	95.2	3	4.8	36.08	0.001
Types of head injuries	0	0.0	62	100.0	58	93.6	4	6.4	32.74	0.001
Classification	0	0.0	62	100.0	62	100.0	0	0.0	42.16	0.00
Risk signs of head injuries	7	11.3	55	88.7	60	96.8	2	3.2	31.55	0.001
Complications of head injury	5	8.0	57	92.0	58	93.6	4	6.4	38.04	0.001
Diet restriction	3	4.8	59	95.2	58	93.6	4	6.4	40.11	0.001
Prevention	3	4.8	59	95.2	58	93.6	4	6.4	40.11	0.001
Nursing management	1	1.6	61	98.4	60	96.8	2	3.2	38.19	0.000
Total	3	4.8	59	95.2	58	93.6	4	6.4	21.47	0.001

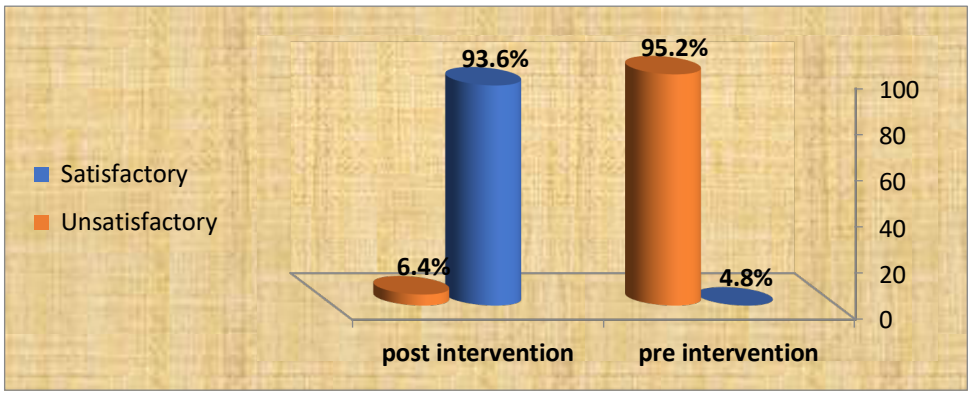

Figure (1): Percentage distribution of the studied nurses according to their total knowledge about head injury pre and post-intervention (no. 62)

Table (3): Comparison of studied nurses' knowledge regarding the triggering factors of head injuries pre and post-intervention (no. 62).

Head injury triggering factors	Pre-program				Post-program			
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory	
	No	%	No	%	No	%	No	%
Falls	19	135	43	69.4	53	85.5	9	14.5
Child abused	5		57	92.0	56	90.3	6	9.7
Sporting accident	9	14.5	53	85.5	57	92.0	5	8.0
Home accident	13	21.0	49	79.0	57	92.0	5	8.0
Pedal cycle Accident	14	22.6	48	77.4	58	93.5	4	6.5
Emotional stress	19	30.6	43	69.4	58	93.5	4	6.5
Child neglect	30	48.4	32	51.6	57	92.0	5	8.0
Total mean ± SD	1.13 ± 0.51				1.88 ± 0.26			
	Paired T-test = 13.92				P < 0.001			

Table (4): Comparison of nursing performance regarding caring for children with a head injury before and after the intervention (N=62).

Practice	Pre-program Mean±SD	post-program Mean±SD	T-test	P-value
Admission care	1.74± 0.44	1.93±0.72	4.27	<0.001
Putting the child in a suitable position during injury	1.11± 0.31	1.96±0.19	21.15	<0.001
Measuring vital signs	1.26±0.44	1.93± 0.26	12.45	<0.001
Measuring level of consciousness (Glasgow Coma Scale)	1.03±0.19	2.00±0.00	45.03	<0.001
Keeping child to take balanced diet	1.51±0.50	1.90±0.37	55.50	<0.001
Providing complete relaxation and bed rest	1.47±0.50	1.28±0.45	4.27	<0.001
maintain antiseptic technique	1.02±0.16	2.00±0.00	34.61	<0.001
Exercise and physiotherapy	1.01±0.11	2.00±0.00	79.00	<0.001
Care of wound and maintain antiseptic technique	1.02±0.15	1.80±0.38	46.02	<0.001
Mouth care for the child during injury	1.33±0.47	1.85±0.36	9.11	<0.001
Medication administration	1.05±0.21	1.67±0.74	11.84	<0.001
Range of motion exercises for upper and lower extremities	1.07±0.26	2.00±0.00	15.92	<0.001

Table (5): Frequency and percentage distribution of the studied children regarding their characteristics.

Characteristics of children	No (N=72)	% (100.0)
Age (in years)		
1 < 5	17	23.6
5< 8	22	30.5
8-15	33	45.9
Mean±SD	8.31±1.74	
Gender		
Male	41	56.9
Female	31	43.1
Birth Order		
The first	31	43.1
The second	25	34.7
The third	11	15.3
The fourth & more	5	6.9
School Stage		
Nursery school	10	13.9
Primary school	60	83.3
Preparatory school	2	2.8

Table (6): Frequency and percentage distribution of children regarding their present history of head injury (N=72).

Head injury Characteristics	No.	%
Symptoms		
Headache, convulsion.	40	55.6
Vomiting.	24	33.3
Drowsy.	6	8.3
Blood or CSF leakage from nose or mouth, or ear.	2	2.8
The onset of head injury complaints		
2 years -<3 years	8	11.1
3 years -<4 years	24	33.3
≥ 4 years	40	55.6
Effect of head injury on the child		
Limitation in usual physical activities	8	11.1
Sleep interruption due to nighttime injury symptoms	10	13.9
Difficult to concentrate on schoolwork	24	33.3
Missing school days	14	19.5
Emotional hypersensitivity	10	13.9
Disrupt social interaction and interpersonal relationships	6	8.3

Table (7): Comparison of occurrence of convulsion between pre- and post-intervention.

Occurrence of convulsions	Pre-program		post-program		t-test	P-value
	No	%	No	%		
The average frequency of convulsion during a day						
One time.	20	27.8	50	69. 4		
Two times.	46	63.9	21	29.2		
Three times.	5	6.9	1	1.4		
Four times and more.	1	1.4	0	0.0		
The average length of convulsion						
Less than five minutes.	22	30.6	51	70.8	17.04	0.000
From five to ten minutes.	45	62.5	20	27.8		
More than ten minutes	5	6.9	1	1.4		
The daytime that injury occurs						
At the day.	5	6.9	40	55.6		
During the night.	14	19.5	8	11.1		
During day and night.	53	73.6	24	33.3		

6. Discussion

Traumatic brain injury (TBI) remains one of the most complex diseases that continue to be a significant public health problem globally. It is portrayed by high levels of mortality, disability, and undue financial burden on governments and individuals in terms of treatment costs and lost workforce *(Kinyanjui, 2016).*

This study was conducted to evaluate the effect of designed practice guidelines on nurses' performance regarding the care of children with head injuries. It was conducted in neurosurgical departments at Benha University Hospital and Benha Teaching Hospital in Benha city from the beginning of July 2018 to the end of December 2018

Regarding the personal characteristics of the studied nurses, the findings of the present study revealed that their mean age was 32±2.7 years. This finding is also supported by *Mohammed, Khamis, and Sabry (2018)* in a study about "Effect of preterm neonates' developmental supportive care program on nurses' performance." Regarding nurses' age, they found that less than half of the studied nurses were between 30 to less than 40 years, and 4% of them were 50 years or more. This finding also agreed with *Mohammed, El-Sharkawy, Abdelsadek, and Said (2019*) in a study about "Intervention program for nurses about the care of preterm neonates undergoing continuous positive airway pressure." They found that the mean age of the studied nurses was 26.02±5.10 years.

These results in contrast with *Allahi (2013)* in a study about "Assessment of pediatric nurses' performance regarding oxygen administration therapy," who found that all of the nurses whose age ranging from 20 to less than 25 years are the most capable group for understanding and applying what they have been taught as compared with nurses whose age from 25 to less than 30 years.

Regarding the gender of the studied nurses, the current study results demonstrated that the highest percentage of them were females. This result may be due to the study of nursing in Egypt exclusively for females until a few years ago. Thus, the profession of nursing in Egypt was mostly feminine. Majority of them having a diploma in nursing degree. *Shahin, Mohammed, and Sayed (2012)* support this finding in a study about " Nurses' knowledge and practices regarding enteral nutrition at the critical care department of Al-Manial University Hospital in Egypt: Impact of a designed instructional program." The study reported that the highest percentage of them are females and having a diploma in nursing.

Regarding years of experience for the studied nurses, the present study revealed that slightly more than half of the studied nurses had one to less than ten years of experience. The finding of the present study was in contrast with *Aziz and Mansi (2018)* in a study about "Assessment quality of nursing care provided to neonates with respiratory distress syndrome at an intensive care unit in Al- Nasiriyah City Hospitals," who showed that half of the studied nurses had less than two years of experience in neonatal care unit and pediatric nursing filed. Moreover, the study finding also supported by *Abd-Elbaky, Mohamed, and Nagib (2018)* in a study about the "Impact of a simulated education program on nurses' performance of invasive procedure at intensive care units," which showed that the majority of the studied nurses had less than five years of experience.

Regarding knowledge of studied nurses′ about head injury, the result of the present study showed that the majority of the studied nurses had total unsatisfactory knowledge pre-intervention compared with the minority of them had unsatisfactory knowledge post-intervention with a statistically significant difference regarding all knowledge dimension and the total between the two program phases. The improvement of total nurses' knowledge indicated that the program implementation was a successful method for increasing their knowledge regarding head injuries for children.

Regarding knowledge of studied nurses′ about triggering factors of head injuries pre and post-intervention, the present study showed a highly statistically significant difference between pre and post-program implementation. *Ramadan, Darwish, Maati supported this finding, and Said (2011)*, in a study about the "Discharge guide program for mothers of children with a head injury," reported that there were improvements in mothers' post-program mean scores knowledge as compared to pre-program mean scores regarding triggering factors.

This finding is supported by *Mohamed et al. (2019)*, who reflected that most studied nurses had correct answers post-program implementation compared with the minority of them who had complete answers pre-program implementation. This result was also in agreement with *Bakhshi, Montaseri, Edraki, Razavi, and Haghpanah (2018)*, who showed a significant improvement in the knowledge scores of nurses about nursing care of premature infants undergoing CPAP after program implementation. This finding also supported by *Said, Abd El-Sadik, & Mahmoud (2017)* in a study about "Integrated clinical pathway regarding the care of children with typhoid fever," who reported a highly statistically significant difference in nurses' knowledge ($p<0.001$) before and after the intervention where the majority of nurses had satisfactory knowledge after the intervention. These findings are supporting the first research hypothesis.

Regarding the studied nurses' practice about the care of the children with head injury pre/post-program implementation. The current study's findings showed that the mean scores of the studied nurses' practice before program implementation were generally deficient and significantly improved after the intervention. This finding may be due to a lack of continuous training programs to improve their practice. This result may reflect the importance of providing a training program for upgrading nurses' practice.

These findings supported by *Shinnor (2007)* in a study about "Impact of knowledge on head injury management," which illustrated that improved knowledge about a head injury could improve the management skills for the head injury, which was associated with better compliance with the traumatic therapy, better injury management behaviors

and to some extent better health outcomes. Klimo also supports *these results; Ragel, Jones, and McCafferty (2015),* in a study about "Severe pediatric head injury during the Iraq and Afghanistan conflicts," illustrated that continuous training programs improve knowledge and practices for the health care provider. These findings support the second research hypothesis.

Regarding the personal characteristics of the studied children, the results of the current study revealed that the mean age was 8.31±1.74 years, about three-thirds were males, and the majority were in primary school. This result was consistent with the *National Center for Health Statistics (2007)*, which reported that the prevalence rate of head injury is higher among children through the first 12 years of age. It is significantly more prevalent among males from 10 through 15 years of age. On the other hand, *style (2008)*, in a study about "Head trauma in a young man," illustrated that the difference in head injury prevalence between boys and girls might be due to the over activities and bicycle riding in boys.

This study, also supported by *Finkelsteine (2006)*, illustrated gender differences seen in head injury, as males are more affected by head injury before adolescence and more females during adolescence and adulthood. As the sex predominance of males in pediatric head injury may be due to male-female differences in behavior patterns, susceptibility to traumatic injury among boys, and sex differences in exposure to environmental risk factors. *El-Menyar et al. (2017)* reported in a study about " Pediatric Traumatic Brain Injury: a 5-year descriptive study from the National Trauma Center in Qatar," that 17.7% of the population with a head injury was ≤18 years old with a mean age of them was 10.6±5.9 years, and 81% were males.

Regarding the birth order of children, the current study found that the first child was profoundly affected by head injury occurrence by more than two-fifths of the studied children. Also, the minority of the studied children ranked as the fourth or more. This finding may be due to a lack of mothers' knowledge and experience related to protecting their children from head injury occurrence. This finding was in agreement with *Pena (2003)*, in a study about "The effect of danger's plays on traumatic brain injury among school-aged children," who found that 34% of experimental and 39% of control groups were the majority of the study sample ranked as the first child in the family.

According to children's head injury characteristics, the present study showed that the onset of head injury complaints was higher between children four years and more. These findings are supported by *Traumatic Brain Injury Statistics (2006); Centers for Disease Control and Prevention (2019)*, which found that children aged 0 to 4 years, older adolescents aged 15 to 19 years, and adults aged 65 years and older are most likely to sustain a TBI. Almost half a million (473.947) emergency department visits for TBI are made annually by children aged 0 to 14 years.

Regarding symptoms that occur for the child during a head injury, the present study showed that more than half of the studied children complained about convulsion and headache. Meanwhile, the minority complained of blood or CSF leakage from the nose or mouth or ear. This result is supported by *Abo Salem (2006)* in a study about "The use of self-management skills in improving pediatric neuro outcomes, who reported that the most frequent trauma complaints among head injury for children were vomiting, drowsiness, headache, restlessness, and irritability.

Regarding the occurrence of convulsion for children after the head injury, there was an improvement after implementing the practice guidelines. About two-thirds of them have one attack on convulsion per day than about two-thirds who had two attacks a day before the intervention. Their attack lasts from less than 5 minutes in about three-fourths of TBI children compared to one-third before intervention. *Ramadan et al., (2011)* supported this result, who reported that convulsion for children after head injury improved after implementation of the discharge guide program.

These findings were also in agreement with the *National Institute of Neurological Disorders and Stroke (2011),* which reported that about 25% of patients with brain contusions or hematomas and about 50% of those with penetrating head injuries would develop immediate seizures. These seizures occur within the first 24 hours of the injury. These immediate seizures increase the risk of early seizures but do not seem to be linked to the development of post-traumatic epilepsy. Generally, medical professionals use anticonvulsant medications to treat seizures in TBI patients only if the seizures persist. These findings are supporting the third research hypothesis.

7. Conclusion

Based on the result of the present study, it can be concluded that the research hypotheses are accepted, the implementation of designed practice guidelines for nurses improves their knowledge and practice as well as reduced occurrence of convulsion frequency and duration.

8. Recommendations

Based on the results of the present study, the following recommendations can be suggested.

- Conducting periodical orientation programs for nurses with continuous regular updating of knowledge and practice regarding head injury for children.
- Emphasizing the importance of implementing designed practice guidelines for nurses caring for children with a head injury reduces the occurrence of head injury complications, which is an effective and safe non-invasive intervention in all neurosurgery and emergency departments as a standard of care for all head-injured children.
- Further studies regarding the implementation of practice guidelines for different health statuses.

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