

## **Effect of Guidelines Regarding Care of Intracranial Hypertension Patients on Critical Care Nurses' Knowledge and Practices**

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### **Abstract**

**Background:** Enhancing competency in the care of patients with intercranial hypertension is recommended to maintain nursing knowledge base and practice levels. Ongoing nursing education regarding management of those patients is required for nurses to provide optimal care and improve patients' outcomes. **Aim of the study:** Evaluate the effect of guidelines regarding care of intracranial hypertension patients on critical care nurses' knowledge and practices. **Design:** A quasi-experimental design was utilized to conduct the current study. **Setting:** This study was conducted at the critical care units (Intensive Care Unit and Neuro-Critical Care Unit) in Suez Canal University Hospitals. **Sample:** A purposive sample of **80** nurse was enrolled in this study from 1<sup>st</sup> of December 2021 to the end of May 2022. **Tool of data collection:** two tools were used, tool (I): a Self-administered knowledge questionnaire to assess demographic characteristic and level of nurses' knowledge about care of intracranial hypertension patients and tool (II) an observational checklist to assess nurses' practices related to caring of patients with Intracranial hypertension. **Results:** There was a statistically significance differences between pre/ post & follow up educational program implementation regarding knowledge and practices of the studied nurses caring for patients with intracranial hypertension. **Conclusions:** Educational nursing guidelines were effective in the improvement of knowledge and practice levels of the nurses' caring for patients with intracranial hypertension. **Recommendations:** Implementing orientation and periodic in-service training program for nurses regarding care of patients with intracranial hypertension.

**Keywords:** Critical care, Guidelines, Intracranial hypertension, Knowledge, Nurses, Practice

### **1. Introduction**

Intercranial hypertension (IH) is a neurological emergency that can be fatal, thus rapidly identifying and treating the underlying cause can help to avoid major morbidity and even death (Nam et al., 2020). There are

many causes of IH as trauma, intracranial bleeding, mass lesions, cerebral edema, increased cerebrospinal fluid (CSF) production, and impaired CSF absorption. If IH not treated promptly, it can lead to brain herniation and death (Kochanek et al., 2019).

The normal ICP ranges from 3-15 mmHg. Sustained increases of 20 mm Hg for 5 minutes should almost certainly necessitate therapy **(Pedersen et al., 2020)**. The pressure inside the cranial vault is measured in (mmHg), and it's usually less than 20 mmHg **(Choucha et al., 2021)**. Elevated intercranial pressure ICP caused by agitation, discomfort, and patient-ventilator asynchrony. The ICP inside the skull and increased cranial vault volume might cause a reduction in cerebral blood flow or herniation of the brain. It can also result in disability and a higher mortality rate **(Mollan et al., 2021)**.

Aside from headache, nausea and vomiting, blurred vision, and papilledema are some of the clinical signs of IH. Computed Tomography (CT) outcomes express IH or reduced intracranial compliance reserve include midline shift, obliteration of the basal cisterns, loss of sulci, ventricular effacement (or enlarged ventricles in the event of hydrocephalus or ventricular trapping) Also, edema appears on a CT scan as a region of hypodensity and the basal cisterns look on CT as a dark halo about the upper end of the brainstem **(Poignant et al., 2022)**.

The goal of treating IH is to reduce pressure on the brain and stop secondary damage brought on by insufficient blood flow **(Moss et al., 2021)**. The first step of treatment

for IH focuses on maximizing the partial pressure of oxygen reaching brain tissue and the cerebral perfusion pressure. Decompressive craniotomy surgery, barbiturate infusions, late hypothermia management, induced hyperventilation, and hyperosmolar treatments are all included in the second level of therapy **(Wesley et al., 2022)**.

Neurologists, neurosurgeons, neuro nurses, and intensive care nurses still face extraordinary challenges when it comes to developing effective nursing management techniques for individuals with IH. The justifications for the nursing management of these patients are always being added to a set of guidelines. Therefore, education and training are crucial for nursing staff members to enhance the standard of healthcare and learn new information. The process of helping nurses achieve their ideal level of educational development is known as educational guidelines **(Poignant et al., 2022)**.

The purpose of educational guidelines regarding care of intracranial hypertension patients is to give nurses the theoretical and technical knowledge they need to learn new skills and continuously enhance their nursing practice related to patients with intercranial hypertension. A well-trained nurse is the

foundation of a well-organized department, and educational guidelines regarding care of intracranial hypertension patients assist nurses in accepting responsibility for their professional development (**Sunderland et al., 2021**).

Nursing staff education is a crucial component in managing patients with ICP; all nurses involved in any element of their care and management must have completed the necessary training and be competent in their field. The process of encouraging each nurse to achieve their highest level of educational development is known as educational guidelines.

**Significance of the study:**

Intracranial hypertension carries a mortality rate of around 20% estimated by (**Mahday & Hessien, 2016**). Routine nursing interventions may positively or negatively affect physiological variables, leading to good prognosis or bad prognosis in patient with (IH). Thus, all nursing staff should involve with any aspect of care and management of IH patients and must have appropriate training to demonstrate competence, achieve professional practice, reduce the risk of complications. and enhance patients' recovery (**El-Gawad, Hala, Taha, Othman, & Zatton, 2019**).

Education of the nursing staff is an integral part for managing patients with IH, all nursing staff involved with any aspect of care and management of those patients must have received the appropriate training and be able to demonstrate competence. Educational guidelines for nurses care patient with IH are a process of assisting the individual nurses to reach optimum educational development. The nurses must have the necessary knowledge, skills, attitudes, values and/or abilities to be deemed competent in caring for patients with IH. Also, ongoing development and maintenance of competency is their responsibility to achieve professional practice, So, the nurse must be trained and have been assessed as competent care for patients with IH (**Aboelezz, Alseraty, & Farag, 2019**).

**The aim of the study:**

The purpose of this study was to ascertain how critical care nurses' knowledge and practices were affected by guidelines for treating patients with intracranial hypertension.

**Objectives:**

- 1- Assess nurses' knowledge regarding care of -intracranial hypertension patients.
- 2- Assess nurses' practices regarding care of intracranial hypertension patients.
- 3- Design intracranial hypertension management guidelines.

- 4- Apply guidelines intracranial hypertension patients' management.
- 5- Evaluate the effect of the guidelines regarding care of intracranial hypertension patients on critical care nurses' knowledge and practices.

**Hypotheses:**

H1: The educational guidelines regarding care of patients with intracranial hypertension will improve studied nurses' knowledge.

H2: The educational guidelines regarding care of patients with intracranial hypertension will improve studied nurses' practices.

**2. Subject and Methods**

**Study design:** Quasi-experimental research was used in the study's design.

**Study setting:** The study was carried out in Egypt's Suez Canal university hospitals' critical care units, including the intensive care unit (ICU) and the neurocritical care unit (NCCU).

**Subjects:**

The population for this study consisted of 95 nurses working in Intensive Care Units (87) and Neuro-critical care unit (8) at Suez Canal University Hospital in 2021.

**Sample size :**

According to a statistical formula, a convenience sample of nurses was selected without using inclusion or exclusion criteria. The sample size was calculated using a statistical formula to be 80 nurses out of the total 95 nurses working in the intensive care units and neurocritical care unit at Suez Canal University Hospital (Yamane 1967) to be 80 nurses. ( $n=N/1+Ne$ )

Where:

n=sample size

N= population size

e=margin error

Unit	Total number	Sample taken
Intensive Care Unit	87	72
Neuro-critical care unit	8	8
<b>Total</b>	<b>95</b>	<b>80</b>

Table (A) Number of nurses in Suez Canal university hospital (Intensive Care Unit and neuro-critical care unit)

Eighty nurses participated in the study. seventy-two nurses working in Intensive Care Units and eight nurses working in Neuro-critical care unit.

**Tools of data collection:**

In this study, two instruments were utilized to gather data, including:

**Tool I: Self-administered Questionnaire:** It was developed by (Mahday & Hessien, 2016 , Hinkle & Cheever, 2018), It was modified by the researcher in Arabic language after reviewing the related literatures to assess nurses' knowledge regarding care of patients with intracranial hypertension and divided into two parts: **Part 1:** Sociodemographic and work-related data - **Part 2:** Knowledge regarding intracranial hypertension.

**Part 1: Sociodemographic and work-related data:** It included seven questions regarding nurses' demographic and work-related data e.g., age, gender, level of education, working unite, total years of experience, years of experience at ICU, and attending training programs on management of patient with intercranial hypertension. This part needed 5 minutes to be completed .

**Part 2: Knowledge regarding ICH:** It was designed to assess nurses' knowledge regarding care of patients with intracranial hypertension and involved 53 questions in Arabic language was composed of seven parts covering the following areas- :

Anatomy of brain, which include 4 question (1,2, 3 and 36), causes of intracranial hypertension, which include 5 questions (4,5,6,7and 45), sign and symptoms of intracranial hypertension, which include 6 questions (8,9,10,11, 40 and 41), diagnosis of intracranial hypertension, which include 4 questions (12, 13 ,14 and 15), prognosis of intracranial hypertension, which include 4 questions (16,17,18 and 19), risk factors of intracranial hypertension, which include 2 questions (38 and 46) and guidelines of caring patients with intracranial hypertension, which include 28 questions (from 20:53). This part needed from 15 to 20 minutes to be completed.

**Tool II: Observational Checklist:** It was used to assess Nurses' practices for caring of patients with intracranial hypertension according to the guidelines of care referenced from (Mahday & Hessien, 2016), which include seven main parts.

Patient Assessment (which included diagnosis, patient history and Physical examination) (18 items), maintaining a patent airway (6 items), achieving an adequate breathing pattern (4 items), optimizing cerebral tissue perfusion (which included: proper positioning, bowel and bladder regimen & minimizing environmental

stimuli) (16 items), maintaining negative fluid balance (13 items), preventing infection (20 items) and monitoring for more increase in ICP and potential complications (12 items).

**Scoring systems:** Each correct step received a score of 1, and each incorrect step received a score of 0. The item scores were added up for each practice area, and the total score was then divided by the number of items. A percent score was created from these scores. According to (Mahday & Hessian, 2016), it was unacceptable for nurses working in these critical areas to have a practice level of less than 85%, so the overall nursing practices were deemed competent if the percent score was 85% or more, and incompetent if less than 85%.

#### **The preparatory phase.**

In order to develop the instruments for data collecting, the researcher studied the relevant literature utilizing national and international books, periodicals, and journals. By legal letter presented from the Faculty of Nursing, Suez Canal University, approval was officially given from the authorized authoritative staff at Suez Canal University Hospital to start data collection.

#### **Content validity of the tool:**

A panel of experts from various academic staff categories of the medical-surgical nursing at the nursing faculty (3), the neurosurgery department (1), and the medical staff at the intensive care unit (1) reviewed the validity of the tools to see if the included items are comprehensive, understandable, applicable, clear, and suitable to achieve the study's objective.

#### **Reliability:**

In this study, the alpha Cronbach's coefficient was used, and its values for the practice tools (I) Self-administered Questionnaire and (II) Observational Checklist were (0.65) and (0.78) respectively.

#### **Pilot study:**

A pilot study was conducted to evaluate the tools' viability, understandability, and time requirements for filling them out. It was done on 8 nurses who were not included in the sample size, or 10% of the study sample. Each nurse in the pilot study received a brief description of the study's objectives before receiving a copy of the tools, albeit tool II was filled out by the researcher. The filling

of the tools took between 25 and 40 minutes to each tool.

### **Fieldwork:**

The study's data were gathered over a six-month period, starting on December 1 and ending on May 31, 2022. The four phases of assessment, planning, implementation, and evaluation were used to collect the data.

#### **I. Assessment phase:**

The studied nurses who agreed to participate in the study before data collection were simply informed of its purpose. Using an observation checklist (appendix II), it was possible to evaluate how critical care nurses handled patients with IH while at work. Using a knowledge questionnaire (appendix I), critical care nurses' understanding of the standards for caring for patients with IH was evaluated.

#### **II. Planning phase:**

The educational program was created based on the demands and needs of the nurses as identified during the pre-assessment phase, as well as the most recent recommendations for treating patients with IH (**Chesnut et al., 2020a**). The course covers both the theoretical and practical knowledge necessary to provide patients with IH with the care they need in

critical care units. For the benefit of the nurses, a booklet with the program's content was created by the researcher, written in plain Arabic, and accompanied by images and pictures.

#### **Aim of the program:**

The program aimed to improve nurses' knowledge and practice regarding care patient with IH in critical care units.

**Booklet content:** the booklet contained two parts (theoretical and practical). **The theoretical part included:** The anatomy of the brain, the physiology of the brain, definition of intercranial pressure, definition of intercranial pressure, causes of intercranial hypertension, factors affecting intercranial hypertension, symptoms of intercranial hypertension, diagnosis of intercranial hypertension, treatment of intercranial hypertension and prevention of intercranial hypertension.

**The Practical part include:** Steps for measuring intercranial pressure with external ventricular drain (EVD). Guidelines regarding care of patients with intracranial hypertension these practices include (maintain airway open, improve the breathing, improve blood supply to the brain, prevent problems associated with increased intercranial pressure, decrease

intracranial hypertension and measure of intercranial pressure. Nursing care for patients with intercranial hypertension.

### **III-The Implementation phase:**

From the first of December 2021 to the last day of May 2022, data for the current study were gathered. The program was designed after its goals were determined. To improve incentive for sharing in this study, a structurally structured study program was used in the form of session reinforcement and motivation.

The total number of sessions was five divided as: three sessions for theoretical part and two sessions for practical part. The total groups' number was 10 group each group contained 8 nurses. The teaching session time was determined and modified according to the nurses' free time. The teaching hour was one hour/day for three days/week. 2 months were spent to perform pre- test, 4 months for program implementation, and immediate post-test and 3 months for follow-up.

For theoretical part, three teaching sessions were performed for each group (8 nurses). Communication channel was kept open between the researcher and the study subjects. The follow-up knowledge test was

performed three months post program implementation .

For the practical content, each nurse's practice regarding the pre- determined procedures was assessed before any obtained information (pre-test) utilizing tool (II). Then the participants were divided into small groups (4 nurses in each), demonstration and redemonstration were carried out on 2 sessions for each nurse. Continuous feedback was given through the data collection period, then post-test (immediate) and follow-up were carried out after 3 months.

The teaching methods for theoretical part, were lecture and discussion However, demonstrations and redemonstration were used in practical teaching methods as regards to media used; they were booklet, posters and video. The tools were administered to the study subjects three times before program implementation(pre-test); immediately after program implementation; and follow up after 3 months of program to evaluate the effect of designed program.

### **IV-Evaluation phase :**

The evaluation of the nurses' knowledge and practice were implemented through comparison between knowledge and practice levels pre/ post implementation of program



and at follow up phase using tools (I) and (II). The evaluation was implemented through three months from June 2022 to August 2022.

### **Ethical considerations:**

The Suez Canal University's nursing faculty received approval from the ethical committee (with number 115/7-2021). Before beginning, the researcher made sure that all of the study's nurses participants understood its purpose and goals. The nurses were made aware of their ability to participate or not in the study and their right to withdraw at any time. Safety for the nurse was guaranteed, as well as confidentiality and anonymity. Prior to study participation, each nurse was required to provide written consent following a brief explanation of the study's purpose and anticipated results. Each nurse also understood the significance of his or her contribution.

### **Statistical Analysis:**

Statistical Package for the Social Sciences (SPSS version 20) was used to code, input, and analyze the data obtained from the self-administered questionnaire and observation checklist. The associations between various variables were examined using correlations. For descriptive data, statistical methods such as percentage, mean score degree (X<sup>2</sup>)

standard deviation SD, paired T test, one way ANOVA test, repeated measured ANOVA test, R test, confidence interval, and proportion probability of error (P-value) were used.

Results significance: A statistically significant difference exists when P 0.05, and a very statistically significant difference exists when P 0.01.

### **3.Results**

**Table (1)** demonstrated that (41.25%) of the nurses under study were between the ages of 20 and 25. The majority (51.3%) of the nurses in the study were female. The technical institute had the highest percentage of graduates (57.5%), and 32.5% of the nurses who had studied nursing had experience ranging from 6 to 9 years. 90% of the nurses in the study worked in intensive care units; 10% worked in neurological intensive care units. Nearly half of the nurses in the study (46.3%) had less than three years' experience in ICUs; 28.8% had three to six years' experience; 18.8% had less than ten years' experience; and 6.3% had more than nine years' experience. The study also revealed that 73.8% of the nurses hadn't attended any training sessions regarding intercranial pressure.

**Figure (1):** Distribution of studied nurses' level of total knowledge regarding

patients with intercranial hypertension throughout the study phases, demonstrated that before the program's implementation, all of the nurses in the study had inadequate knowledge of intercranial hypertension, which increased to 78.8% in the post-program phase then falling to 50% in the follow-up phase.

**Figure (2):** Distribution of studied nurses' satisfactory level of total practice regarding patients with intercranial hypertension throughout the study, prior to the implementation of the program, 91.2% of the nurses who participated in the study practiced intercranial hypertension in an unsatisfactory manner; this number increased to 95% after the program's implementation and 52.5% during the follow-up period. Additionally, the total nurses' practice regarding the pre-, post-, and follow-up care of patients with intercranial hypertension showed a statistically significant difference at 0.001.

**Table 2:** Found no statistically significant correlation between nurses' knowledge and overall practice in the study.

**Table 3:** Showed no statistically significant relationship between studied nurses' knowledge of caring for patients with intercranial hypertension in the phases following program implementation and their

work experience in intensive care units at a p value of (.05), but there was a significant relationship at a p value of (.009) when gender was compared to nurses' knowledge of caring for patients with intercranial hypertension in the follow-up phase.

Additionally, there was no statistically significant correlation between the study nurses' knowledge of post-program implementation phase patient care for those with intercranial hypertension and their age, education, and course attendance.

**Table 4:** Showed a statistically significant relationship between the gender of the study nurses and their practice of caring for patients with intercranial hypertension in the post-program implementation phase, with a p value of (.045), and a significant relationship between their level of education and their knowledge related caring for patients with intercranial hypertension in the post-implementation phase, with a p value of (.038). Additionally, there was no statistically significant correlation between the study nurses' post-program practice of caring for patients with intercranial hypertension and their course attendance, age, or ICU experience.

#### **4. Discussion**

Intercranial hypertension is an abnormal condition with important nursing implications

for patient with the concomitant condition. As a result, caring for patients with neurological problems is a tremendous task for the nursing staff, needing specialized and continuing care for IH patient. The causes of IH are several. The major goal of treatment for these patients is to avoid further brain injury. The treatment of these patient is based on the principles of early stabilization and targeted management of IH (Pedersen et al., 2020).

- **Socio demographic characteristics**

In terms of demographics, the current study revealed that more than half of the nurses were female and that less than half of them were between the ages of tweeny and twenty-five. This result could be explained by the fact that women make up the majority of nurses in Egypt and that, up until ten years ago, they still outnumbered men in nursing areas. Additionally, the trend in key sectors is to hire young nurses who can handle the workload in these locations.

Regarding to demographic characteristics, the present study showed that, about less than half of the studied nurses' ages range from tweeny to twenty-five years, and more than half of them were females. This finding could be interpreted in the light of the fact that majority of nurses in Egypt are females and their number are still greater than

males in nursing fields till ten years ago. Also, the critical areas trend to hire young nurses to be able to bear the lead of work at these critical areas.

Regarding to educational level, the present study showed that, more than half of study nurses were graduated from nursing institute, and the majority of them didn't attend training course. This result may be due to most of nurses under study are newly graduated and there are mandatory period after graduation and many of them after receiving years of experience tends to travel to work abroad.

This outcome is comparable to Hussein's (2018) research at Zagazig University on "Nurses' performance regarding caring patients with head injury: An educational intervention," which found that more than three-quarters of the study nurses were female and that less than half of them ranged in age from 18 to 25. According to Taha (2014), who investigated the "Effect of training guidelines on nurses' performance for caring for patients with traumatic brain injury" in Egypt, more than three-quarters of the studied nurses were female, and the majority of them were between the ages of 18 and 30. These findings were similar to those of Taha.

**Maarouf (2012)**, who investigated the "Nurses' performance for patients with traumatic head injury during golden hour" at Ain Shams University, disagreed with this finding. Who claimed that the majority of nurses were between the ages of 20 and 25.

More than half of the nurses in the current study had less than six years of experience working in an intensive care unit, according to the study. This finding might be explained by the fact that the majority of the study's nurses had just graduated, the majority of them were younger than 25 years old, and that work stress, the severity of the patients' conditions, the number of hours they had to work, as well as any occupational hazards they faced in the intensive care unit, all of which discouraged them from continuing to work as critical care nurses.

This result was consistent with the findings of Shehab, Ibrahim, and **Abd-Elkader (2018)**, who reported that roughly half of the nurses in the study had less than six years of experience in the intensive care unit and had not taken any training courses. Their study was titled "Impact of an educational guidelines on nurses' knowledge and practice regarding care of traumatic brain injury patients at intensive care unit" and was conducted at Suez Canal University Hospital.

Regarding training programs, the current study revealed that the majority of the nurses under investigation had never taken any prior classes on how to care for patients with IH. The lack of staff, workload, and lack of time in the ICU may be to blame, or it may be that the staff nurses are not aware of the value of training sessions that will enhance their performance and have a positive impact on the standard of care and the prevention of complications from head injuries. This outcome is comparable to that reported by (Hussein, 2018; Shehab, Ibrahim & Abd-Elkader, 2018), who found that the majority of nurses did not attend training sessions on head injuries.

In all areas of nurses' pre/post and follow-up phase knowledge of patients with intracranial hypertension, the current study found a statistically significant difference. In this respect, Hussein et al., (2017), who studied "The ABCs of managing increased intracranial pressure", emphasized that ICU nurses must have a thorough understanding of brain content and physiology and how it varies as patients worsen or recover.

This might be connected to the development of nursing educational standards. In addition to the guidelines' content, was developed in response to nurses'

requests for additional training and improvement in their ability to care for patients with IH, as well as the guidelines' positive effects on ICU nurses. In this context, Bratton et al. (2017), who studied the "Guidelines for the management of severe traumatic brain injury" added that high control of IH can result in positive neurological consequences. Nurses' practices were also affected by the fact that they were unaware of their responsibilities and that medical directions were unclear. So, the nurses need training guidelines.

The current study showed is a statistically significant difference between pre/post and follow-up guidelines implementation regarding all items of nurses' knowledge regarding nursing care for patients with increased intracranial pressure. Similarly, McNett & Gianekis (2010) who studied "Nursing interventions for critically ill traumatic brain injury patients" and Slazinski et al. (2011) who studied "Care of the patient undergoing intracranial pressure monitoring/external ventricular drainage or lumbar drainage" mentioned that the quality of nursing care is influenced by the knowledge, judgment, skills, and values of those providing care for patients as well as the nurses' cognitive abilities.

The present study revealed no statistically significant correlation between level of nurses' practice and knowledge pre/post and follow-up guidelines implementation. This is not agreed with by (McNett, Doheny, Sedlak & Ludwick, 2010), who investigated "Risk of brain secondary injuries and proved that a thorough review of information related to intracranial pressure and an updated review of potential treatment strategies can prepare the nurse for new treatment modalities for caring for the neurosurgical patient with IH.

Concerning correlation between the studied nurses' knowledge and practice regarding care of patients with IH pre/post and follow-up guideline intervention, the study results showed that, there was no statistically significant differences. According to one interpretation of this finding, a high level of understanding would boost nurses' motivation and confidence to provide better care for those patients more frequently. It might also increase the critical care staff's empowerment in decision-making, raising the standard of care and ultimately improving patient outcomes.

This agree with Shahin et al. (2012); Taha, (2014) and Seliman et al. (2014) who stated that a highly statistical significant

correlation between participants' scores of care of intracranial hypertension patients on critical care nurses' knowledge and practice. But this study was contradicted by the study of **Maarouf, (2012)** who stated that no statistically significant correlation between nurses' knowledge and practice.

This is in the same line with Mahday et al. (2016) who proved that a comprehensive review of intracranial pressure related information and an updated review of possible treatment guidelines can prepare the nurse for new treatment modalities for caring the neurosurgical patient with increased ICP.

The current study demonstrated that while there was no statistically significant relationship between total knowledge level and course attendance, age, or degree of the studied nurses, there was a statistically significant relationship between experience in an ICU and post-guideline knowledge. This finding is consistent with that of Abd El-Aziz (2014), who conducted a study on the "Effect of Educational Guidelines on Nursing, Knowledge and Skills about Oral Care for Traumatized Patients" and reported that; regarding the relationships between nurses' knowledge and skills and their years of experience in nursing, they found statistically significant relation between diploma and bachelor's degree, the older nurses with more

years of experience and increase of years of experience showed increasing levels of knowledge and skills. Also, found that, high education nurses had more knowledge and skills than nurses with diploma in all items of oral care procedure.

The results were in line with the findings of a study by Meherali, Parpio, Ali & Javed (2012) titled "Care of the Patient Undergoing Intracranial Pressure Monitoring/External Ventricular Drainage or Lumbar Drainage," which demonstrated that CCU nurses' knowledge is higher in those with more experience and who have a specialized degree in CCUs. Relation between education level and knowledge level with increasing the education level the proportion of cases with satisfactory knowledge increase.

These results were supported by Mahday et al. (2016) who mentioned that the nurse must have knowledge and experience to work efficiently to promote optimal patient outcome, and the nurse must achieve and maintain an up-to date knowledge base of critical care nursing. This result disagrees with Shehab, Ibrahim & Abd-Elkader, (2018) whom reported that there is no significant relation between total knowledge and demographic characteristics (age, level of education, years of experience).

There were statistically significant differences in nurses' mean knowledge and practice of IH on pre/post and follow-up phase by results of the present study. The nurses in this study revealed that the total mean knowledge and skills increased at the post and follow-up phase of educational nursing guidelines implementation rather than pre implementation phase. Unsatisfactory nurses' knowledge and practice about IH pre-phase may be traced back to the fact that the majority of nurses have only a diploma, in addition to a lack of training educational guidelines for staff nurses about IH. Concerning enhancing nurses' knowledge and practice about caring for patients with IH in the post and follow-up phase, this demonstrates nurses' preparedness and interest to learn more and, as a result, enhance the care delivered to patient in ICU and NCCU. This demonstrated the promising impact of the training guidelines on nurses since it improved their knowledge and practice helped them reach the current study's goal.

This was in the same line with Hussein (2018), who stated that post and follow up-phase completing a guideline, the total score of knowledge and practice improved. Also, Oyesanya & Snedden, (2018) indicated that there was a highly statistically significant

difference in nurses' total knowledge and practice scores for the nursing caring of IH pre/post and follow-up the guideline's implementation. The current study found a statistically significant difference in all aspects of nurses' knowledge and practice about patient with IH pre/post and follow-up phase.

In summary, the result of this study revealed that, there is a need to focus on development of nursing staff knowledge and practice, so effort should be directed toward enhancing creativity among nurses. Nurses must have access to update information, learning resources and continuous educational opportunities.

## **5. Conclusion:**

According to the study's findings, nurses' knowledge and skill levels regarding the care of patients with intracranial hypertension improved statistically significantly in the post- and follow-up phases as compared to the implementation of educational guidelines. There was no statistically significant association between nurses' knowledge and overall practice in the study.

In post-program implementation stages, there was a statistically significant relationship between the study nurses' knowledge of how to care for patients with intercranial hypertension and their prior experience working in intensive care units.

There was a statistically significant relationship between the gender of the nurses and the care they provided for patients with intercranial hypertension after the program's introduction.

## 6. Recommendations:

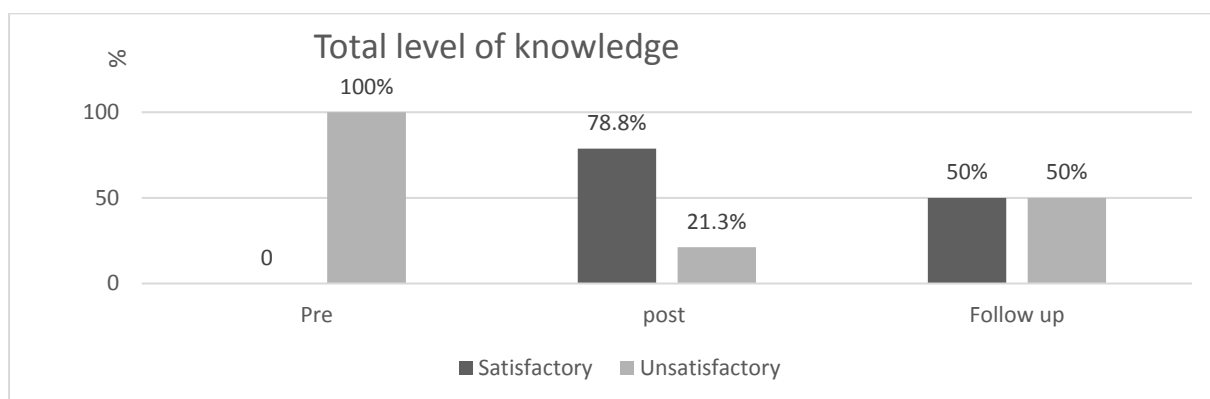
Based on the nurses' demands to enhance their knowledge and practice in relation to intracranial hypertension and EVD measurement, the current study advocated providing upgrading courses with evidence-based guidelines.

**Table (1): Percentage distribution of the studied nurses according to their sociodemographic characteristics (n=80)**

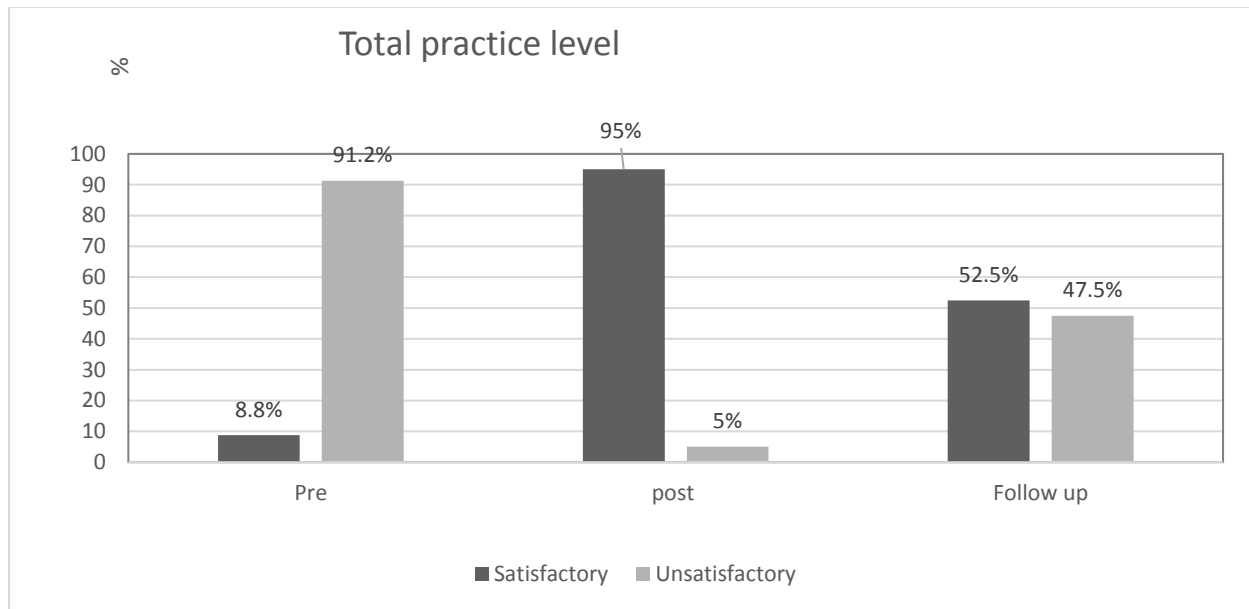
Demographic characteristics	Total Sample (n=80)	
	N	%
<b>Age (Years)</b>		
20: < 25	33	41.25
25: < 30	31	38.75
30:<35	12	15.0
≥35	4	5.0
<b>Gender</b>		
Male	39	48.8
Female	41	51.3
<b>Education</b>		
Bachelor's degree	16	20.0
Technical Institute of nursing	46	57.5
Diploma	18	22.5



<b>General experience in nursing (years)</b>		
<3	24	30.0
3:<6	23	28.8
6:<9	<b>26</b>	<b>32.5</b>
≥9	7	8.8
<b>Working Department</b>		
Intensive care unit ICU	72	90
Neurological intensive care unit CCU	8	10
<b>Working years of experience in ICU</b>		
< 3 yrs.	37	46.3
3 < 6 yrs.	23	28.8
6<9 yrs.	15	18.8
> 9 yrs	5	6.3
<b>Training course attendance</b>		
Nurses attended training courses	21	26.3
Nurses hadn't attended training courses	59	73.8



**Figure (1): Distribution of studied nurses' level of total knowledge regarding intercranial hypertension throughout the study phases (n= 80).**



**Figure (2):** Distribution of studied nurses' satisfactory level of total practice regarding intercranial hypertension throughout the study (n= 80).

**Table (2):** Correlation between total studied nurses' knowledge and practice (Pre-Post-Follow up) (n=80).

Nurses' knowledge	Timing	Nurses 'practice	
		Pearson Correlation (r test)	Sig. (2-tailed)
	Pre- test	-.043	.703
	Post- test	-.209	.063
	Follow up- test	-.002	.784

**Table (3): Relation between sociodemographic characteristics and nurses' level of knowledge (pre/post and follow up).**

Sociodemographic characteristics	Level of knowledge											
	Pre				Post				Follow			
	Unsat		Sat		Unsat		Sat		Unsat		Sat	
	N	%	N	%	N	%	N	%	N	%	N	%
<b>Age (Years)</b>												
20: < 25	30	93.8	2	6.3	0	0	32	100	2	6.3	30	93.8
25: < 30	31	96.9	1	3.1	2	6.3	30	93.8	3	9.4	29	90.6
30:<35	12	100	0	0	0	0	12	100	1	8.3	11	91.7
≥35	4	100	0	0	0	0	4	100	0	0	1	100
P value	1.21(.851) <sup>MC</sup>				3.08(.434) <sup>MC</sup>				.571(1.00) <sup>MC</sup>			
<b>Gender</b>												
Male	37	94.9	2	5.1	1	2.6	38	97.4	6	15.4	33	84.6
Female	40	97.6	1	2.4	1	2.4	40	97.6	0	0	41	100
P value	.400(.527) <sup>S</sup>				.001(.971) <sup>S</sup>				<b>6.81(.009*)<sup>S</sup></b>			
<b>Qualification</b>												
Bachelor	15	93.8	1	6.3	0	0	16	100	0	0	16	100
Technical	44	95.7	2	4.3	2	4.3	44	95.7	6	13	40	87
Diploma	18	100	0	0	0	0	18	100	0	0	18	100
P value	1.24(.611) <sup>MC</sup>				1.52(.498) <sup>MC</sup>				4.79(.083) <sup>MC</sup>			
<b>Experience in ICU</b>												
<3	34	91.9	3	8.1	0	0	37	100	3	8.1	34	91.9

3:<6	33	100	0	0	0	0	23	100	0	0	23	100
6:<9	15	100	0	0	2	13.3	13	86.7	3	20	12	80
≥9	5	100	0	0	0	0	5	100	0	0	5	100
P value	3.62(.375) <sup>MC</sup>				8.88(.05*) <sup>MC</sup>				5.67(.113) <sup>MC</sup>			
<b>Training course about IH</b>												
Yes	21	100	0	0	0	0	21	100	2	9.5	19	90.5
No	56	94.9	3	5.1	2	3.4	57	96.6	4	6.8	55	93.2
P value	1.11(.292) <sup>s</sup>				.730(.393) <sup>s</sup>				.168(.682)			

<sup>s</sup> is fisher exact test test, <sup>MC</sup> is Monte Carlo for Chi square test; P value is significant <.05

**Table (4): Relation between sociodemographic characteristics and level of practice (pre/post and follow up)**

Sociodemographic characteristics	Level of practice											
	Pre				Post				Follow			
	Unsat		Sat		Unsat		Sat		Unsat		Sat	
	N	%	N	%	N	%	N	%	N	%	N	%
<b>Age (Years)</b>												
20: < 25	30	93.8	2	6.3	1	3.1	31	96.9	15	46.9	17	53.1
25: < 30	29	90.6	3	9.4	2	6.3	30	93.8	16	50	16	50
30:<35	11	91.7	1	8.3	0	0	12	100	7	58.3	5	41.7
≥35	3	75	1	25	1	25	3	75	0	0	4	100
P value	1.59(.776) <sup>MC</sup>				4.34(.252) <sup>MC</sup>				4.27(.269) <sup>MC</sup>			
<b>Gender</b>												
Male	35	89.7	4	10.3	0	0	39	100	21	53.8	18	46.2

Female	38	92.7	3	7.3	4	9.8	37	90.2	17	41.5	24	58.5
P value	.216(.709) <sup>s</sup>				4.00(.045*) <sup>s</sup>				1.23(.371) <sup>s</sup>			
<b>Qualification</b>												
Bachelor	14	87.5	2	12.5	1	6.3	15	93.8	6	37.5	10	62.5
Technical	43	93.5	3	6.5	0	0	46	100	26	56.5	20	43.5
Diploma	16	88.9	2	11.1	3	16.7	15	83.3	6	33.3	12	66.7
P value	.694(.638) <sup>MC</sup>				7.63(.038*) <sup>MC</sup>				3.59(.206) <sup>MC</sup>			
<b>Experience in ICU</b>												
<3	35	94.6	2	5.4	1	2.7	36	97.3	19	51.4	18	48.6
3:<6	20	87	3	13	2	8.7	21	91.3	12	52.2	11	47.8
6:<9	13	86.7	2	13.3	0	0	15	100	5	33.3	10	66.7
≥9	5	100	0	0	1	20	4	80	2	40	3	60
P value	1.92(.610) <sup>MC</sup>				4.23(.252) <sup>MC</sup>				1.74(.683) <sup>MC</sup>			
<b>Training course about IH</b>												
Yes	19	90.5	2	9.5	0	0	21	100	9	42.9	12	57.1
No	54	91.5	5	8.5	4	6.8	55	93.2	29	49.2	30	50.8
P value	.021(1.00) <sup>s</sup>				1.49(.568) <sup>s</sup>				.246(.620)			

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