Impact of Implementing Nursing Care Protocol on Moderate Head Injured Patient's Outcome

Nagwa I. A. Ghoneim[1], Sanaa M. Alaa Elden[2], Mohammad E. Okab[3] and Om Ebrahiem A. E. Elsaay[1]

[1]Medical Surgical Nursing, Faculty of Nursing, Tanta University.
[2]Medical Surgical Nursing, Faculty of Nursing, Alexandria University.
[3]Anesthesia and critical care, Faculty of Medicine, Tanta University.
omebrahiem_ali@yahoo.com

Abstract: Traumatic head injury associated with polytrauma is common, with potentially devastating consequences. Cardiopulmonary, neurological, metabolic, gastrointestinal, urinary, and integumentary complications all remain potentially avoidable insults, which are associated with worse outcome after TBI. This study aimed to compare the impact of implementing nursing care protocol on moderate head injured patient's outcome. The study was carried out in Intensive Care Unit at Tanta Emergency Hospital. The subjects were divided into two groups 30 patients in each. Control group was treated according to the routine ICU management. Study group was received nursing care protocol for moderate head injury associated with polytrauma. Three tools were used for data collection. A tool 1 includes sociodemographic, and neurologic data assessment; it was developed by the researcher for data collection. Tool II was Trauma Scales and (APACHE II) checklist. It was used for assessing Injury severity score, trauma score, and APACHE II score. Tool III was Systemic Assessment Observational checklist tool. It comprised three parts: Part A was Airway, Part B was respiratory. Part C was cardiovascular, Part D was neurologic, Part E was gastrointestinal, Part F was urinary, and Part G was integumentary evaluation. Data were collected over a period of 14 months started from May 2009 to July 2010. **Result** revealed that 56.7% patients had died in control group compared with 26.7% patients in study group after two weeks from admission, while 43% of patients had referred to neurologic department in control group compared with 73% in study group. Also, the current study showed that a positive correlation between APACHE II score and expected death rate among control group in day 15th. **Conclusion** revealed that the implementing nursing care protocol for moderate head injured patients associated with polytrauma had best effect on minimize the incidence of all systemic complications, decrease morbidity as well as mortality rate. The study recommended that explained that the Critical care nurse managers should be responsible for planning educational programs for the critical care nurses.

[Nagwa I. A. Ghoneim, Sanaa M. Alaa Elden, Mohammad E. Okab and Om Ebrahiem A. E. Elsaay **Impact of Implementing Nursing Care Protocol on Moderate Head Injured Patient's Outcome***J Am Sci* 2012;8(7):649- 664]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 99

Key words:- Nursing Care Protocol , Moderate Head Injury**.**

1. Introduction:

Head injury is trauma that leads to injury of the scalp, skull, or brain. These injuries can range from a minor bump on the skull to serious brain injury. Trauma involving the central nervous system can be life threatening.(1) Injury, including traumatic brain injury (TBI), is a leading cause of death and disability worldwide that affects people regardless of their sex, age, income, race, or nationality. Centers for Disease Control and Prevention (CDC) had estimated that each year in the United States, at least 1.4 million persons sustain a TBI, 1.1 million of them are treated and released from Emergency departments (EDs), 235.000 are hospitalized, and 50.000 died. (2)

A study was conducted at the Neurosurgery Departments, Faculty of Medicine, Assiut University, Egypt concluded that the total number of head injured cases were 1331 out of 43,310 with an incidence of 3.07%. (3) Review of Tanta Main University Hospital Statistical Records has revealed that 1300 patients with head injury were admitted to Tanta Emergency Hospital (from May 2009 to June 2010). 800 patients had mild head injury, 385 patients had moderate head injury, 55 patients had moderate head injury associated with polytrauma and 60 patients had severe head injury.(4)

Death from immediate and early trauma is caused by primary brain injuries, or significant blood loss, while late mortality is caused by secondary brain injuries. The polytrauma had effect on physiologic changes of all body system. The trauma impact determines primary organ, or soft tissue, injuries, fractures, hypoxia and hypotension (first hit) with local tissue damage as well as an activation of the systemic inflammatory response. In addition, secondary endogenous and exogenous factors play a crucial role in the initiation and severity of post traumatic complications. Typical endogenous second hits are aspiration, respiratory distress, pneumonia, repeated cardiovascular instability, metabolic acidosis, ischemia/reperfusion, compartment syndromes, infections, intracranial haematoma, cerebral edema, increased intracranial pressure, epilepsy, induce a host **defense** response as well as mortality.(5,6)

Critical care nurses have a key role in preventing secondary brain injury. A person with

TBI will arrives in emergency department and the injury may be just one aspect of multiple traumas. The patient with multiple injuries requires an initial assessment which includes a primary survey and resuscitation. This followed by and secondary survey and definitive care. The management of traumatic head injury is consists of intubations, ventilation, resuscitation, thorough examination, imaging and decisions on treatment. [7,8] The nursing interventions for the patient with TBI associated with polytrauma are extensive and diverse; they include making nursing assessments, setting priorities for nursing interventions, anticipating needs and complications, and initiating rehabilitation.[9,10]

Traumatic brain injury is a leading cause of death and disability in trauma. Despite the publication and dissemination of TBI treatment guidelines in 1995, it has been documented that implementation of their guidelines is infrequent, with only 16% of 433 surveyed trauma centers in full compliance with the Guidelines.[11] A single-institution study documented that implementation of these Guidelines was associated with both improved patient outcomes and decreased hospital charges. These findings indicate the need to focus on changing practice to provide Guideline-compliant care and improve patient outcomes.[12] The holistic nursing protocol of care for moderate head injured patients associated with polytrauma should include cardiopulmonary, neurologic, gastrointestinal, metabolic, urinary, and integumentary system management.[13]

Aim of the study is to evaluate the impact of implementing nursing care protocol on moderate head injured patient's outcome.

Research hypothesis:

Study group who managed by using nursing protocol of care for traumatic brain injuries have better effect on

1. Minimizing cardiopulmonary complications? 2. Prevent early complications of head injury? 3. Minimizing the incidence of gastrointestinal problems and complications? 4. Prevent the incidence of urinary tract infection? 5. Decrease the death rate expected in 15th day of admission, and decrease the duration of intensive care unit stay?

2.Material and Methods

Materials

1. Research design: The study was quasi-experimental design.

2. Setting: The study was carried out in Intensive Care Unit at Tanta Emergency Hospital.

3. Subjects: A convenient sample of 60 adult patients were selected and assigned into two equal groups, 30 moderate head injured patients associated with polytrauma.

Control group: They treated according to the ICU routine management. **Study group:** They managed with implementing nursing care protocol.

- **Inclusion criteria:** Newly admitted adult patients within 24 hours and both sexes.

Diagnosed with traumatic head injury Glasgow coma scale at a range of (9-12) and may be associated with polytrauma. Patients on oxygen therapy or attached to mechanical ventilator in any mode.

- **Exclusion criteria:** Patients with cervical fracture, and co-morbid associated disorder as heart, renal, liver diseases were excluded from the study.

Tools: Three tools were used for data collection in this study.

Tool (I): Sociodemographic, and Neurologic Assessment Tool.

It includes patient code, age, sex, marital status, date of admission, diagnosis, Glasgow Coma Score, past surgical history, date of discharge and patient health status on discharge.

Tool (II *):* Trauma Scales and (APACHE II) checklist post implementing nursing care protocol.

It was adopted by El-Aziz M (2004) [14]. It includes three parts:

1. Trauma Score (TS): It considered a prognostic value with decreasing the chance of patient survival at 12 points or less. It consists of respiratory rate, respiratory effort, systolic blood pressure, capillary refill, and Glasgow Coma Score. The sum of them assigned in a numerical value ranged from 1 to 16. ***Respiratory rate*** (beat/ min);10-24c/ m score (4), 25-35c/m score (3), <35c/m score (2),<10c/m score (1), or 0 score (0). ***Respiratory effort***: normal score (1), or shallow or retractive score (0). ***Systolic blood pressure*** (mm:Hg); >90mm:Hg score (4), 70-90mm:Hg score (3), 60-70mm:Hg score (2), <60mmHg score (1), or 0 mm:Hg score (0). ***Capillary refill***; normal score (2), delayed score (1), or none score (0). ***Glasgow coma scale score*;** 14-15 score (5), 11-13 score (4), 8-10 score (3), 5-7 score (2), or 3-4 score (1).

2. Injury Severity Score (ISS) It was provided an overall score for patients with multiple injuries, each injury is assigned an abbreviated injury scale (AIS) and is allocated to one of six regions (Head, Face, Chest, Abdomen, Extremities including pelvis and External). The highest AIS score in each body region is used. The ISS is the sum of the squares of the highest AIS scores from the 3 most severely injured body regions. The three most severity injured body regions have their score squared and added to produce the ISS score. In case of a level 6 injury, the ISS is automatically set to 75. Thus the ISS ranges from 0 to 75, increasing with severity.

3. Acute physiology and chronic health evaluation scoring (APACHE II score): It consisted of 3 parts acute physiologic score (APS), age, and chronic health evaluation. The following

acute physiological parameters of APACHE II score were assessed and recorded at the time of admission: Temperature (°C), Mean arterial pressure (mm Hg), Heart rate, Respiratory rate (non-ventilated), Oxygenation (PaO_2 in mmHg with FiO_2<O.5 record PaO_2), Arterial pH, Serum Sodium (mmol/l), Serum potassium (mmol/l), Serum creatinine (mg/dl) , Haematocrit (%), White blood count, and Glasgow Coma Scale. These values integer score from 0 to 71 were scored in accordance to the APACHE II chart scoring for abnormally high or low range. **Tool (III): Systemic Assessment Observation Check List Tool post implementing nursing care protocol.** It was developed by the researcher based on literature review. [5,8,9,12,13] It divided into 7 categories' air way, respiratory, cardiovascular, neurological, urinary, and integumentary system evaluation. Each category represented a qualitative data that assessed patient's abnormal response and complications, while the quantitative data included patient's values. It includes the following:

A. Air way evaluation: It includes Date of endotracheal tube insertion, oral, and tracheal secretions, and endotracheal tube problems if attached to ventilator.[5,8,9,13]

B. Respiratory evaluation: This includes method of oxygen therapy, ventilator mode, standard setting, arterial blood gases, chest wall movement, respiratory pattern and sound, skin and nails color, and respiratory complications. [5,8,9,13]

C. Cardiovascular evaluation: Which includes heart rate, blood pressure, central venous pressure, mean arterial pressure, capillary, and refill limb edema. [5,8,9,12,13]

D. Neurological evaluation: This includes oculomotor papillary response, incision of the eye, Pupils gauge, cranial nerves, swallowing and gag reflexes, best motor strength upper and lower extremities, signs of increase intracranial pressure, and early complications of head injury. [5,8,9,12,13]

E. Gastrointestinal tract evaluation: This includes oral mucosa, lips, tongue, breath odor, bowel sound, anthropometrics measurement, routes of nutrition, serum electrolytes test, blood glucose, liver function test, complete blood count, bowel movement, and gastrointestinal complications. [5,8,9,12,13]

F. Urinary evaluation: This includes urinary output, total intake and output ratio, and urinary tract complications. [5,8,9,12,13]

G. Integumentary evaluation: This includes skin condition, sites and degree of bed sores if present. [5,8,9,12,13]

Methods

1. Hospital permission was obtained before conducting this study through official letters from faculty of nursing clarifying the purpose of the study.

2. Three tools were designed and used in the study. Tool (I) was developed by researcher. Tool (II) was adopted and modified by El-Aziz [14], and tool (III) was developed by researcher after extensive review of the update references. [5,8,9,12,13]

3. The implemented of nursing care protocol for moderate head injured patient's associated with polytrauma was developed by researcher after review of the relevant literature. [5,8,9,12,13]

4. The protocol of nursing care was reviewed by a 9 jury for content validity to assess clear, comprehensive, and relevant of protocol.

5. The moderate head injury associated with polytrauma protocol of care validity test was 99.8%, and reliability test was 0.928.

6. Informed consent was obtained from the patient if he/she was conscious and from the family if the patient was unconscious after explaining the purpose of the study.

7. Confidentialit of patient was ascertained.

8. from intensive care unit to test the different items of the tool and to verify the applicability, feasibility and clarity of the study.

9. Assessment tool was done for both groups to collect base line data within 24 hours of patient admission and continued throughout period of study using Tools (I), (II) and (III).

10. Sociodemographic, and neurologic data assessment was done for all groups to collect base line data within 42 hours of admission using Tool (I).

11. Trauma Score (TS): Tool (II) part (1) was observed daily until first week, and every two days until the second week for both groups.

12. Injury Severity Score (ISS): Tool (II) part (2) was obtained within 24 hours of admission for both groups.

13. Acute physiology and chronic health evaluation scoring (APACHE score): Tool (II) part (3) was observed daily until first week, and groups**.**

14. Systemic Assessment Observation Check List post implementing nursing care protocol: Tool (III). Air way, respiratory, cardiovascular, neurological, gastrointestinal, urinary, and integumentary evaluation. It observed daily until first week of admission, and every two days until the second week of admission for both groups.

15. Nursing care protocol (primary and secondary trauma phase) was prepared based on related literature. [5,8,9,13] **It implemented by researcher for moderate head injured patients associated with polytrauma. The general objective of nursing care protocol was minimizing the cardiopulmonary, neurological, gastrointestinal, urinary, and integumentary compromise. Decrease length of ICU stay, morbidity as well as mortality rate. The protocol of care was done by researcher daily from time of admission until two week during morning, and afternoon shift, while night shift the register**

nurse perform the protocol of care. The patient's response and other complications were monitored through observational check list developed by researcher and patient records. The protocol of care started as follows:

1. Air way management.

✓ Appropriate catheter size (maximum external diameter of the catheter should be half the size of the internal diameter of the ET tube).

✓ Adjust suction pressure (80–120 mm: Hg).
✓ Depth of catheter insertion (inserts the catheter to the carina and then retracted 1-2 cm before suction is performed).
✓ Continuous versus intermittent suction pressure.
✓ Duration of procedure (no more than 10 seconds per catheter insertion and 15 seconds for the entire procedure).
✓ Hyper oxygenate and hyperinflation before and after each suction pass (3-6 ventilation with 100% oxygen).
✓ Sedate patient before the endotracheal suction to blunt increases in ICP as order.

B. Respiratory management.

✓ Perform active and passive range of motion exercise every shift.
✓ Use manual hyperinflation before and after suction.
✓ High levels of positive end-expiratory pressure are avoided.
✓ **The laboratory studies were done weekly until two weeks for both group:**
✓ The daily caloric, protein, and water requirements were estimated for 15 consecutive days from date of enteral formulas initiation by using Harrise and Benedict's equation.
✓ Administer daily stool softeners as ordered.
✓ Enema each other day as prescribed.
✓ Administer stress ulcer prophylaxis as order.

F. Maintain skin integrity

✓ Assess all body surfaces and document skin integrity at least every 8 hours.
✓ Turn and reposition the patient every 2 hours.
✓ Provide skin care every 4 hours.
✓ Consider use of specialty mattresses based on skin and risk factor assessments.

G. Eye management

✓ Eye care with sterile normal saline every 4 hours.
✓ Artificial tears every 4 hours.
✓ Cold compresses may be prescribed.

H. Urinary management.

✓ Use Foley catheter to monitor urine output every hour.
✓ Bladder training program.
✓ Perform chest percussion and vibration for intubated and non intubated patients every 4 hours.

C. Cardiovascular management.

✓ Administer anticoagulant therapy if not contraindicated.
✓ Prevent DVT with the use of antiembolic stockings and remove it once every shift for 20-30 minute, pneumatic compression applied for about two hours in the morning, and two hours at night and subcutaneous low molecular weight heparin as prescribed.

D. Neurological management.

✓ Make neurological checks every shift.
✓ Maintain normothermia.
✓ Administer O_2 therapy to maintain PaO_2 > 60 mm Hg.
✓ Provide sedation as necessary and as prescribed.
✓ Administer prophylactic antiepileptic agents as prescribed to prevent seizure activity as prescribed.

E. Gastrointestinal management.

✓ Provide meticulous oral hygiene every 4 hours.
✓ Provide early enteral nutrition according to resolving gastroparesis and positive test feeding.
✓ Confirm tube placement before starting feeding.
✓ Arrange dietary/nutrition consult.
✓ Perform nutritional assessment parameters at patient admission and every two days throughout period of hospitalization.

I. Musculoskeletal management.

✓ Use of splints or foam boots aids in the prevention of foot drop.
✓ The arms should be in abduction, the fingers lightly flexed, and the hands in slight supination.
✓ Active and Passive range of motion exercise every shift.
✓ Isometric muscle contractions are also contraindicated

16. Evaluation was done for both groups to compare the impact of the two management modalities in relation to the Trauma Scale and APACH II Score tool (II), that represented a quantitative data, and the incidence of airway, respiratory, cardiovascular, neurological, gastrointestinal, urinary, integumentary system complications that represented a qualitative data included patients' abnormal response and quantitative data included patients' value tool (III). It was observed and monitoring daily in the first week of admission and then every two days throughout period of the study through assessment check list and patient records by using tools (II), and tool (III).

Limitation of the study:

- Moderate head injured patients associated with polytrauma ranged from 5-7 patients per month, so the data need long time to be collected.
- Type of patients needs much effort on implementing nursing care protocol and communication.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS software statistical computer package version 13. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison between two groups and more was done using Chi-square test (X^2). For comparison between two means, Univariate parametric and non-parametric tests (t-test and Mann-Whitney U tests) were used. Correlation between variables was evaluated using Pearson's correlation coefficient. Significance was adopted at $p<0.05$ for interpretation of results of tests of significance.

3.Results

Table (1): Distribution of the studied patients according to age, sex, and duration of hospital stay among the studied, and control groups. Regarding age, it was observed that the mean of age was (31.60±8.34 years) in study group, while the mean of age was (28.73±9.68 years) in control group. In relation to sex, most studied groups, and control groups were male (76.7%), and (73.3%) respectively. Concerning marital status, it was observes that (56.7%), and (50%) approximately an equal percentage of both study and control groups were married respectively. In relation to length of hospital stay, it was revealed that the mean length of hospital stay were (21.90±5.20) in study group, while the mean length of hospital stay was (19.87±3.96) in control group respectively. Also, no significant difference was found among studied and control group regarding to age, sex, marital status, and length of hospital stay, where *P*=(≥0.05).

Table (2): Impact of nursing protocol for polytrauma moderate head injured patients on injury severity score (ISS), and trauma score (TS) among the studied, and control groups up to 15th days. Regarding injury severity score on admission, it was observed that the mean score was (28.60±8.92) in control group and (23.83±8.95) in study group respectively with a significant difference between them, where *P* =(0.043*). The table also showed that the mean trauma scale in first week of admission was (13.37±1.038) in control group and (14.152±0.69) in study group respectively with a significant difference between both groups, where *P*= (0.002*). On second week of admission, the mean trauma scale was (12.87±1.85) in control group and (14.44±0.64) in study group respectively with a significant difference among both groups, where *P*= (0.0004*).

Table (3): The impact of nursing protocol for moderate polytrauma head injury patients on methods of oxygen therapy and modes of mechanical ventilator among the studied, and control groups up to 15th days.

In relation to methods of o_2 and modes of mechanical ventilator, it was observed that there is was a non significant difference in 1st , and 2nd week in relation to patient attached to simple o_2 mask, T-piece tube, and control mandatory ventilator, assist control, synchronized intermittent mandatory ventilator modes of mechanical ventilator, where *P* =(≥0.05).

Regarding modes of mechanical ventilator in 1st week, it was observed that (3.3%) of control group had attached to continuous positive air way pressure compared with (10.0%) of study group respectively with a non significant difference between them, where *P*=(≥0.05). On other hand in 2nd week, it was found that (3.3%) in control group had attached to continuous positive air way pressure compared with (30.0%) of study group respectively with a significant difference in both groups, where *P*=(≥0.015*).

Table (4): The impact of nursing protocol for moderate polytrauma head injury patients on changes in standard setting of mechanical ventilator among the studied, and control groups up to 15th days.

It was observed that the mean fraction inspired oxygen Fio_2 in 1st week and 2nd week, results showed a significant difference among both groups, where *P*=(0.0001*, 0.0003*).

It was found that the mean preset respiratory rate per minute RR/min in 1st week and 2nd week, results reported a significant difference between both groups, where *P*=(0.010*, 0.002*).

In relation to the mean preset tidal volume vT L/Kg in 1st week and 2nd week, it was found that a significant difference between both groups, where *P*=(0.024*, 0.002*).

Regarding mean of current tidal volume in 1st week, it was reported that a significant difference between both groups, where *P*=(0.0001*).

It was found that the mean peak inspiratory flow PIF in 2nd week with a significant difference between both groups, where *P*=(0.039*).

It was report that the mean cmH_2o in 1st week and 2nd week with a significant difference among both groups, where *P*=(0.002*, 0.003*).

In relation to the mean positive end expiratory pressure PEEP in 1st week and 2nd week, it was found that a significant difference between both groups, where *P*=(0.026*, 0.004*).

Regarding mean of sensitivity in 2nd week, it was reported a significant difference between both groups, where *P*=(0.014*).

Table (5): The impact of nursing protocol for moderate polytrauma head injury patients on changes in arterial blood gases among the studied, and control groups up to 15th days.

Concerning the mean ph in 1st week, it can be seen that (7.44±0.06) in control group compared with (7.39±0.04) in study group respectively with a significant difference among both groups, where *P*=(0.0003*).

Regarding mean of Pao_2 in 2nd week, results showed that (77.83±12.13) in control group compared with (96.31±3.13) in study group respectively with a significant difference among both groups, where *P*=(0.0001*).

In relation to oxygen saturation in 1st week, it was reported (91.32±7.23) in control group compared with (94.2±2.88) in study group while in 2nd week, it was showed (93.62±4.66) in control group compared with (95.93±2.39) in study group respectively with a significant difference among both groups, where *P*=(0.042*, 0.036*).

Figure (1): Relationship between right and left best motor strength of the upper extremities among the studied, and control groups up to 15th days.

Regarding best motor strength of upper right extremity in 2nd week, it was observed that (63.3%) had drift in control group compared with (90.0%) in study group respectively with a significant difference between both groups, where *P*= (0.033*).

Figure (2): Relationship between right and left best motor strength of the lower extremities among the studied, and control groups up to 15th days.

In relation to best motor strength of lower extremity in 1st week, it was reported that (40%) had raises right leg off bed in control group compared with (70.0%) in study group while in 2nd week, it was observes that (53.3%) in control group compared with (83.3%) in study group respectively with a significant difference between both groups, where *P*=(0.038*,0.026*). Also, it was observed in 1st week that (23.3%) had raises left leg off bed in control group compared with (66.6%) in study group while in 2nd week, it was observes that (30.0%) in control group compared with (80.0%) in study group respectively with a significant difference between both groups, where *P*=(0.002*, 0.0003*).

On other hand in 1st week, it was noticed that (20.0%) had drags left heel on bed and left knee in control group compared with no patient in study group while in 2nd week, it was reported (23.3%) in control group compare with no patient in study group respectively with a significant difference between both groups, where *P*= (0.031*, 0.016*).

Figure (3): The percentages of the studied patients on changes in anthropometric measurements among the studied, and control groups during the first and second weeks. In relation to % of body weight in 1st week, it was observed that the majority of patients (76.7%) had mild, (10.0%) had moderate weight loss, and (13.3%) had severe weight loss in control group compared with (23.3%) had mild weight loss, (66.7%) had moderate weight loss, and (10.0%) had severe weight loss in study group respectively. Also, in 2nd week it was revealed that (20.0%) had mild weight loss, (46.7%) had moderate weight loss, and (33.3%) had severe weight loss in control group compared with (43.3%) had mild weight loss, (56.7%) had moderate weight loss, and no evidence of patient had severe weight loss in study group respectively with a significant difference between both groups, where *P*=(0.0001*, 0.002*). Regarding percentage of upper arm muscle area in 2nd week, it was reported that the majority (90.0%) had wasted muscle, (6.7%) had average size, (3.3%) had above average, and no patient had a high muscle compared with (43.3%) had wasted, (13.3%) had average size, (40.0%) hade above average, and (3.3%) had a high muscle in study group respectively with a significant difference between both groups, where *P*=(0.001*).

Table (6): The impact of nursing protocol for moderate polytrauma head injury patients on incidence of early systemic complications among the studied, and control groups up to 15th days. Regarding incidence of respiratory complications in 1st , and 2nd week, it was reported that a no significant difference in relation to pneumonia, and respiratory arrest between both groups, where *P*=(≥0.05).In relation to incidence of early complication of moderate head injury in 2nd week, it was observed that (30.0%) had a confusion in control group compared with no patient in study group, while (36.6%) had a headache in control group compared with no patient in study group, and (20.0%) had a seizures in control group compared with no patient in study group respectively with a significant difference between both groups, where *P*=(0.004*, 0.001*, and 0.031*). In relation to incidence of gastrointestinal problems and complications in 1st week, it showed that the majority (90.0%) had constipation in control group compared with (46.6%) in study group while in 2nd week, it observed that (63.3%) had constipation in control group compared with (10.0%) in study group respectively with a significant difference between both groups, where *P*= (0.0009*, 0.0001*). Also, it was observed that there were no significant difference in relation to diarrhea ,gastrointestinal bleeding, paralytic illeus, and Cushing's ulcer between both groups, where *P*=(≥0.05). In relation to incidence of urinary tract infection in 2nd week, it was reported that (33.3%) had a urinary tract infection in control group compared with no patient in study group respectively with a significant difference between both groups, where *P*=(0.002*).

Table (7): Distribution of the studied patients according to status at discharge and APACHE II death rate expected in 1st day and day 15 among the studied, and control groups. In relation to status at discharge, it was reported that (56.7%) had die in control group compared with (26.7%) in study group while (43.3%) had referred in control group compared with (73.3%) in study group respectively with a significant difference between both groups, where *P*=(0.018*). Regarding death rate expected in 15th days, it was reported that the mean were 19.37±10.08 in control group compared with 15.23±8.07 in study group respectively with a significant difference between both groups, where *P*=(0.085*).

Table (8): Correlation between total acute physiology and chronic health evaluation (APACE) scores and prognosis of the study subjects (study and control group). It was observed that there were a significant difference among the both group regarding death rate expected at 1st day, where *P*=(0.0001*). Also, it was observed that there were a significant difference among the both group regarding death rate expected at 15st day, where *P*=(0.0001*).

Figure (4): Correlation between duration of hospital stay and the expected death rate at the 15th day among the study group (n=30).This figure showed that a significant difference regarding duration of hospital stay and the expected death rate at the 15th day among study group, where *P*=(0.033*).

Figure (5): Correlation between duration of hospital stay and the expected death rate at the 15th day among the control group (n=30).This figure showed that a no significant difference regarding duration of hospital stay and the expected death rate at the 15th day among control group, where *P*=(0.491).

Table (1): Distribution of the studied patients according to age, sex, and duration of hospital stay among the studied, and control groups.

Variables	Control group (n=30)		Study group (n=30)		X^2	*P*
	n	%	n	%		
Age:						
Range	18-48		18-45			
Mean±SD	28.73±9.68		31.60±8.34			
t-test	1.228					
P	0.171					
Sex:						
Females	8	26.7	7	23.3	0.089	0.766
Males	22	73.3	23	76.7		
Marital status:						
Single	15	50.0	13	43.3	0.268	**0.605**
Married	15	50.0	17	56.7		
Duration of hospital stay (days):						
Range	15-25		17-40			
Mean±SD	19.87±3.96		21.90±5.20			
t-test	1.703					
P	0.084					

Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.
***Significant (*P*<0.05)**

Table (2): Impact of nursing protocol for polytrauma moderate head injured patients on injury severity score (ISS), and trauma score (TS) among the studied, and control groups up to 15th days.

Injury severity score (ISS), and Trauma score (TS).	Control group (n=30)	Study group (n=30)	t-test	*P*
	Range Mean±SD	Range Mean±SD		
Injury severity score (ISS) on admission	13-56 28.60±8.92	13-41 23.83±8.95	2.066	0.043*
Trauma scale (TS): 1st week	9-16 13.37±1.038	12-15 14.152±0.69	3.436	0.002*
2nd week	8-16 12.87±1.85	13-15 14.44±0.64	4.393	0.0004*

Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.
***Significant (*P*<0.05)**

Table (3): The impact of nursing protocol for moderate polytrauma head injury patients on methods of oxygen therapy and modes of mechanical ventilator among the studied, and control groups up to 15th days.

Methods of O_2 therapy& modes of mechanical ventilator		Control group (n=30)		Study group (n=30)		X^2	*P*
		n	%	n	%		
Methods of oxygen therapy:							
Simple O_2 mask	**1st week**	2	6.6	6	20.0	1.30	0.254
	2nd week	9	30.0	11	36.6	0.08	0.784
T-piece tube	**1st week**	0.0	0.0	0.0	0.0	-	-
	2nd week	1	3.3	0.0	0.0	0.00	1.000
Modes of mechanical ventilator:							
(C M V)	**1st week**	9	30.0	6	20.0	0.36	0.551
	2nd week	5	16.7	1	3.3	1.67	0.196
Assist control	**1st week**	7	23.3	4	13.3	0.45	0.504
	2nd week	1	3.3	0.0	0.0	0.00	1.000
SIMV	**1st week**	11	36.6	11	36.6	-	-
	2nd week	13	43.3	9	30.0	0.65	0.421
CPAP	**1st week**	1	3.3	3	10.0	0.27	0.605
	2nd week	1	3.3	9	30.0	5.88	0.015*

***Significant (*P*<0.05)**

Study group=Moderate head injured patients receiving researcher nursing care protocol.

Control group=Moderate head injured patients receiving routine ICU care.

Table (4): The impact of nursing protocol for moderate polytrauma head injury patients on changes in standard setting of mechanical ventilator among the studied, and control groups up to 15th days.

Standard setting of mechanical ventilator		Control group (n=30)	Study group (n=30)	Mann-Whitney U test	
		Range Mean±SD	Range Mean±SD	Z	*P*
(FiO_2%)	**1st week**	21-100 67.37±13.78	21-100 51.54±11.30	4.865	0.0001*
	2nd week	21-100 46.2±22.32	0-100 29.76±14.70	3.369	0.0003*
Preset. (RR).C/M	**1st week**	0-12 9.75±2.30	0-12 7.75±3.22	2.768	0.010*
	2nd week	0-12 6.96±4.96	0-12 3.41±4.53	2.895	0.002*
Current RR. C/M	**1st week**	10-38 17.6±4.6	10-25 17.2±3.16	0.392	0.238
	2nd week	10-35 19.51±5.19	12-24 18.31±3.34	1.065	0.123
Preset vT.L/kg	**1st week**	0-640 463.76±116.83	0-650 369.52±183.11	2.376	0.024*
	2nd week	0-580 352.16±233.74	0-550 189.16±248.43	2.617	0.002*
Current vT.L/Kg	**1st week**	0-152.99 313.37±135.28	0-940 456.2±79.79	4.981	0.0001*
	2nd week	0-560 454±117.3	0-640 499±52.32	1.919	0.103
PIF.L/min	**1st week**	0-50 34.24±10.12	0-50 27.87±14.64	1.960	0.114
	2nd week	0-48 25.11±17.72	0-60 14.70±19.59	2.158	0.039*
CmH_2o	**1st week**	0-62 18.52±8.79	0-22 12.17±6.47	3.187	0.002*
	2nd week	0-40 16.4±12.37	0-24 6.81±9.14	3.415	0.003*
PEEP. CmH_2o	**1st week**	0-15 3.72±2.86	0-5 2.16±2.31	2.324	0.026*
	2nd week	0-15 4.0±3.96	0-5 1.39±2.22	3.149	0.004*
Sensitivity	**1st week**	0-2 0.62±0.43	0-5 0.43±0.53	1.525	0.234
	2nd week	0-2.40 0.78±0.71	0-1.50 0.34±0.49	2.794	0.014*

Fraction inspired O_2 (FiO_2%)

Respiratory rate (RR)

Tidal volume (vT)

Peak inspiratory flow (PIF)

Pressure limit (Cm $H_2$0)

Positive end expiratory pressure (PEEP)

***Significant (*P*<0.05)**

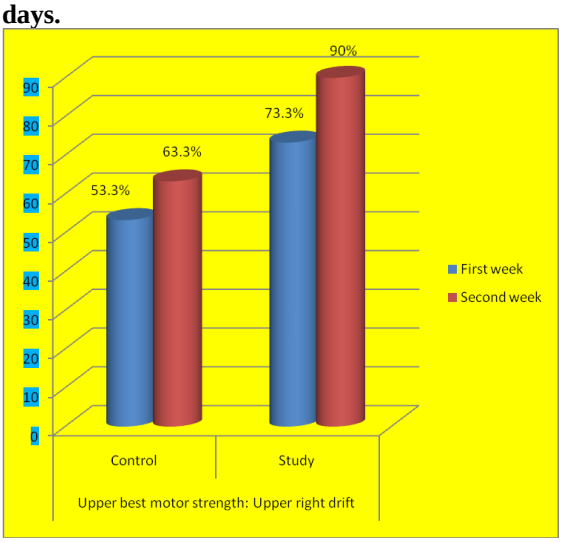
Table (5): The impact of nursing protocol for moderate polytrauma head injury patients on changes in arterial blood gases among the studied, and control groups up to 15th days.

Arterial blood gases		Control group (n=30)	Study group (n=30)	Mann-Whitney U test	
		Range Mean±SD	Range Mean±SD	Z	*P*
Ph	1st week	7.20-7.56 7.44±0.06	7.24-5.51 7.39±0.04	3.798	0.0003*
	2nd week	7.23-7.56 7.36±3.60	7.14-7.49 7.39±5.63	0.024	0.897
PaO_2,mm Hg	1st week	42.10-336 96.8±41.0	27.70-336 101.16±25.42	0.495	0.795
	2nd week	52-140 77.83±12.13	92-99.40 96.31±3.13	8.080	0.0001*
$PacO_2$,mm Hg	1st week	19-55 37.40±6.17	25.10-98.40 37.93±11.86	0.767	0.621
	2nd week	21.90-50.50 36.47±6.49	26.30-98.40 36.28±12.02	0.076	0.841
O_2 Saturation %	1st week	49-99.20 91.32±7.23	48-99 94.2±2.88	2.027	0.042*
	2nd week	60-99 93.62±4.66	80-99 95.93±2.39	2.416	0.036*

***Significant (*P*<0.05)**

Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.

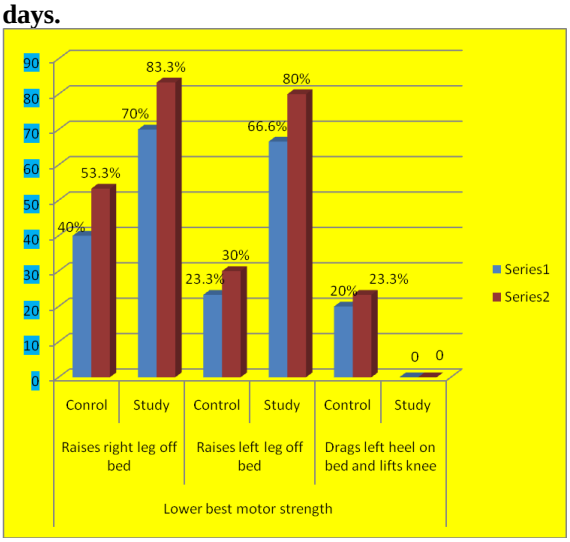
Figure (1): Relationship between right and left best motor strength of the upper extremities among the studied, and control groups up to 15th days.



***Significant (*P*<0.05)**

Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.

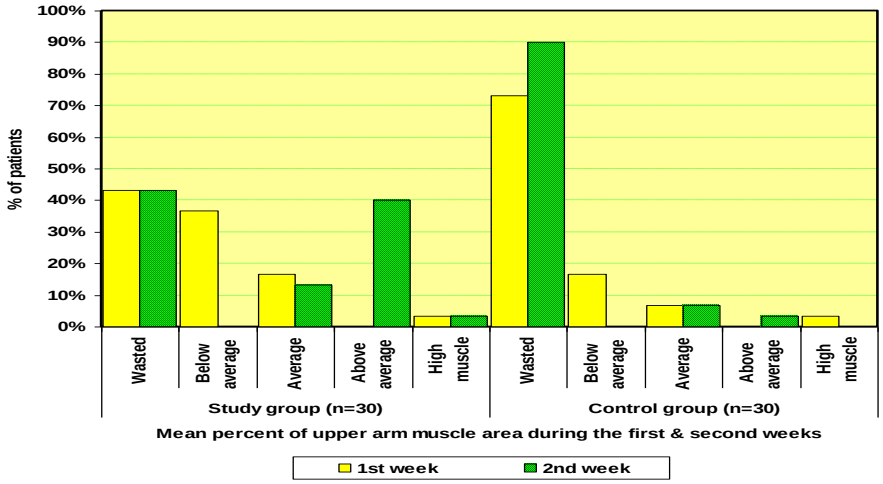
Figure (2): Relationship between right and left best motor strength of the lower extremities among the studied, and control groups up to 15th days.



***Significant (*P*<0.05)**

Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.

Figure (3): Percent of upper arm muscle area among the study subjects (study and control group) during the first and second weeks.



Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.

Table (6): The impact of nursing protocol for moderate polytrauma head injury patients on the incidence of early systemic complications among the studied, and control groups up to 15th days.

Early systemic complications		Control group (n=30)		Study group (n=30)		X^2	*P*
		N	%	n	%		
Respiratory complications							
Pneumonia	1st week	0.0	0.0	0.0	0.0	-	-
	2nd week	1	3.3	0.0	0.0	0.00	1.00
Respiratory arrest	1st week	1	3.3	0.0	0.0	0.00	1.00
	2nd week	2	6.6	0.0	0.0	0.52	0.472
Early head injury complications							
Brain edema by CT scan	1st week	9	30.0	8	26.6	0.00	1.000
	2nd week	9	30.0	4	13.3	1.57	0.210
Confusion	1st week	7	23.3	5	16.6	0.10	0.747
	2nd week	9	30.0	0.0	0.0	8.37	0.004*
Headache	1st week	7	23.3	2	6.6	2.09	0.148
	2nd week	11	36.6	0.0	0.0	11.13	0.001*
Seizures(tonic and clonic).	1st week	6	20.0	1	3.3	2.59	0.108
	2nd week	6	20.0	0.0	0.0	4.63	0.031*
Gastrointestinal tract problems and complications							
Constipation	1st week	27	90.0	14	46.6	11.09	0.0009*
	2nd week	19	63.3	3	10.0	16.15	0.0001*
Diarrhea	1st week	0.0	0.0	0.0	0.0	-	-
	2nd week	4	13.3	0.0	0.0	2.41	0.120
GIT hemorrhage	1st week	0.0	0.0	0.0	0.0	-	-
	2nd week	1	3.3	0.0	0.0	0.00	1.00
Paralytic illeus	1st week	0.0	0.0	0.0	0.0	-	-
	2nd week	2	6.6	0.0	0.0	0.52	0.472
Cushing's ulcer	1st week	0.0	0.0	0.0	0.0	-	-
	2nd week	1	3.3	0.0	0.0	0.00	1.00
Urinary tract infection							
	1st week	3	10.0	0.0	0.0	1.40	0.236
	2nd week	10	33.3	0.0	0.0	9.72	0.002*

***Significant (*P*<0.05)**

Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.

Table (7): Distribution of the studied patients according to status at discharge and APACHE II death rate expected in 1st day and day 15 among the studied, and control groups.

Status at discharge and APACHE II death rate expected	Control group (n=30)		Study group (n=30)		X^2	*P*
	n	%	n	%		
Status at discharge:						
Die	17	56.7	8	26.7	5.554	0.018*
Referred	13	43.3	22	73.3		
Death rate expected first day:						
Range	4-40		8-40			
Mean±SD	19.37±10.08		15.23±8.07			
t-test	1.753					
P	0.085					
Death rate expected 15 day:						
Range	8-40		8-25			
Mean±SD	24.03±10.38		16.13±6.57			
t-test	3.521					
P	0.001*					

Table (8): Correlation between total acute physiology and chronic health evaluation (APACE) scores and prognosis of the study subjects (study and control group).

Expected death rate	Correlation between total APACE scores & expected rate of death of the study patients			
	Control group (n=30)		Study group (n=30)	
	r	*P*	r	*P*
Death rate expected at 1st day	0.743	0.0001*	0.952	0.0001*
Death rate expected 15th day	0.565	0.001*	0.903	0.0001*

Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.
***Significant (*P*<0.05)** **r=Correlation coefficient**

Figure (4): Correlation between duration of hospital stay and the expected death rate at the 15th day among the study group (n=30).

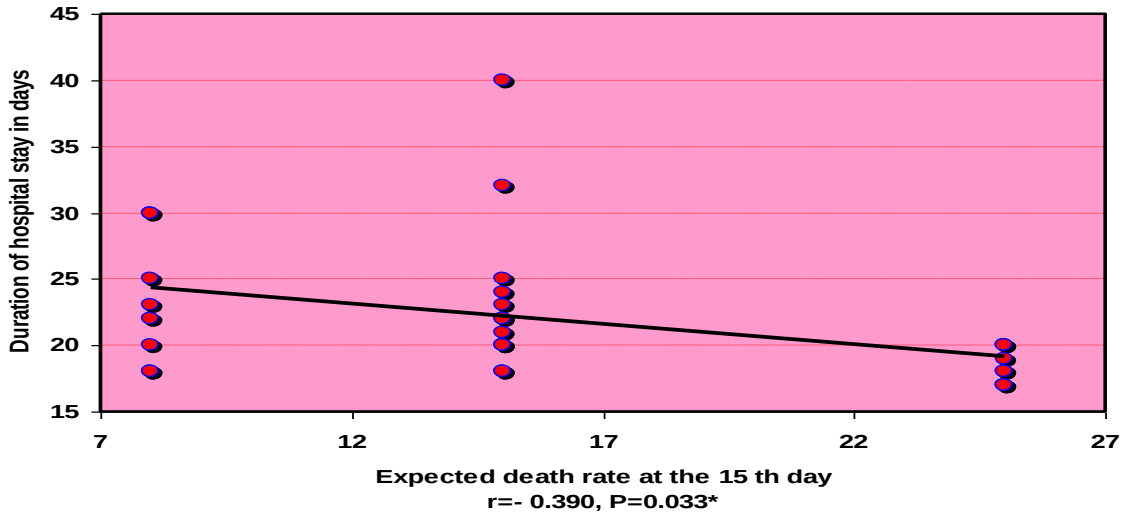
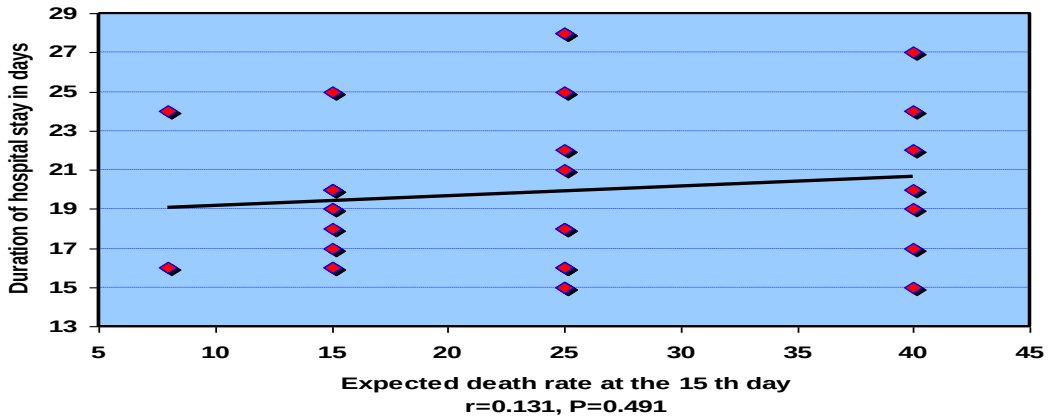


Figure (5): Correlation between duration of hospital stay and the expected death rate at the 15th day among the control group (n=30).



Study group=Moderate head injured patients receiving researcher nursing care protocol.
Control group=Moderate head injured patients receiving routine ICU care.

4. Discussion

Patients with traumatic brain injury or polytrauma develop many pathologic alterations. These include airway compromise, impaired oxygenation and gas exchange, hemodynamic instability, increase intracranial pressure and neurologic compromise, fluid and electrolyte disturbances, malnutrition, urinary tract infection, and impaired skin integrity. [15] This study aimed to evaluate the impact of implementing nursing care protocol on moderate head injured patient's outcome.

Regarding biosociodemographic characteristics, and neurologic data, the finding of the present study revealed that the mean age in study group (31.60±8.34 years), and (28.73±9.68 years) in control group. This finding was in line with **Faul** [16] who mentioned that the children and older adolescents are most likely to sustain a traumatic brain injury. On the other hand **Ronald, and Savage** [17] reported that traumatic brain injury is a leading cause of death and disability in children, adolescents and young adults around the world.

Regarding to sex, the present study showed that the majority of the patients in both groups were male. This finding was in accordance with **Abd Elsalam** [18] who stated that males were commonly affected with TBI than females with a ratio 3.5 – 1. Also **El Sawaf** [19] add that the females than male are less exposure to trauma as they live a rather protected indoor life.

In relation to length of hospital stay, it was founded that increase in length of ICU stay on study group than control group with no significant difference among both groups. This finding was agreement with **Clayton *et al.,*** [20] reported that the introduction of an evidenced –based protocol to guide the ICU management of patients with severe head injury has been associated with a significant reduction in ICU mortality with length of hospital stay remained constant over the study period . This result was contradicting with **Jose *et al.,*** [21] who discovered that a significant reduced in hospital mortality and length of stay without changes in readmission rate or long term mortality.

Regarding to injury severity score (ISS) on admission, the current study showed that an increase in ISS among control group than study group with a significant difference among control group. Also it concluded that the most prominent increase in injury severity score associated with the significant increase in mortality rate. This result was similar to **Groris** [22] who demonstrated that death rates increased in the presence of injuries in a second or third body area of abbreviated injury scale (AIS), even when the additional injuries would not in themselves be life threatening. On the other hand, **Samer *et al.,*** [23] reported that the mean injury severity score for all patients was 42.4. Also, he noted that the three groups did not differ significantly on injury severity score.

The findings of the present study revealed that patients in study group had a significant improvement in trauma scale than control group in first and second week of admission. Similarly **EL-Aziz** [14] who reported that increase in trauma score among conventional group than total parentral group. In this respect **Kondoy *et al.,*** [24] who stated that simple trauma scoring system , strongly determine the mortality rate in hospitalized patients . In addition **Jennings** [25] emphasized that a predictive instrument , the revised trauma score has been shown to have a moderate to high a ability to accurately predict survival .

In relation to respiratory system evaluation, the present study revealed that the majority of patients in study group were attached to CPAP mode as a method of weaning from

mechanical ventilator than control group in the second week, while the most control group was showed attachment to SIMV as a mode of mechanical ventilator. This could be attributed to the pulmonary care was used in the study group as nursing modalities to improve ventilation and oxygenation. This include elevating head of the bed, turning the patient and repositioning, limb exercises, chest physiotherapy, and airway management. In this regard **Boles *et al.,*** [26] who reported that the CPAP applied during spontaneous breathing in patients with acute respiratory insufficiency reduces mean intrathoracic pressure, has beneficial effects on right and left ventricular performance, and improves oxygenation. Also **Topp *et al.,*** [27] stated that physiotherapy treatment when started early helps prevent weaning delayed, limited mobility and total dependency on the ventilator.

In relation to changes in mechanical ventilator standard, a significant increase in Fio_2, preset respiratory rate, preset tidal volume, airway resistance (cmH_2o), positive end expiratory pressure (PEEP) was founded in 1st and 2nd week, while peak inspiratory flow and sensitivity increased in 2nd week among control group. This could be due to impaired oxygenation and lung compliance in control group, while perform chest physiotherapy, and intermittent manual lung hyperinflation among study group. This result was consistent with **Sprangers *et al.,*** [28] who showed that intermittent manual lung hyperinflation in patients with mechanical ventilator has a significantly increased the tidal volume. Furthermore, **Safar** [29] reported that partial airway obstruction (increased airway resistance cmH_2o) may result in increased fluctuations of intrathoracic pressure, hypoventilation with hypoxia and hypercarpia, cerebral congestion and edema. Also, he noted that the majority of control group had increase in Fio_2, preset respiratory rate, preset tidal volume, cmH_2o, peak inspiratory flow, and sensitivity. In this regard **Groldstone** [30] concluded that the level of external PEEP increased the ability of the patients to achieve gas flow reduced until the optimum balance of internal and external PEEP was reached.

In relation to changes in arterial blood gases, the findings of the present study revealed a significant improvement in pH in first week, Pao_2 in second week and o_2 saturation in first and second week among study group. This could be due perform chest physiotherapy, and intermittent manual lung hyperinflation among study group. The same finding was indicated by **Olson *et al.,*** [31] who reported that chest physiotherapy is performed to open blocked alveoli and increase the surface area of the lung, there by promoting gas exchange at the cellular level. On the other hand **Stiller *et al.,*** [32] demonstrated that a chest physiotherapy offer improvements in arterial blood gases values, lung compliance and intrapulmonary shunt.

Concerning right and left best motor strength, the present study revealed that a significant improvement was observed in relation to upper right drift in second week and raises of right and left leg off bed in first and second week among the majority study group than control group. Also, a significant difference was observed in relation to drags left heel on bed and lifts knee in first and second week among study group than control group. This could be due to reduced intracranial pressure, and improve neurological outcome. In this regard **Walker and Pickett** [33] reported that the degree to which specific therapeutic interventions might improve these deficits or related functional deficits. In addition, **Haaland *et al.,*** [34] emphasized that the head injured group demonstrated deficits on tasks one month after injury, but only finger tapping was impaired one year post injury while, grip strength differentially improved in the head injured group from one month to one year.

Concerning anthropometric measurements, the current study revealed that a significant improvement in percent of body weight in the first and second weeks among study group than control group. This result would positively foster the role of early nutrition and its impact upon the patient's overall health status. This in the same line with **Nour** [35] revealed that a significant weight loss > 10% of usual body weight was experienced by nearly half of the control group while; significant improvement showed in percent of body weight in the experimental group.

In the current study, change in percentage of the upper arm muscle area in study group was showed a significant improvement in the second week. This result was supported by **El-Yazied** [36] who revealed that a decreased percentage of upper arm muscle area in the first week, followed by improvement in the second week among the enteral combined with parentral " early fed group" while in enteral only "delayed fed" group were showed increase in the percentage of the upper arm muscle area at third week after start of nutritional support in critically ill patients.

Regarding the incidence of early systemic complications, the findings of the present study revealed a significant difference in relation to early head injury confusion, headache, and seizures in the second week among the majority of control group than study group. This could be due to improve neurological outcome. In this respect **Feske** [37] mentioned that the primary complication of increased intracranial pressure is altered level of consciousness, brain edema, and brain herniation resulting in death. Also, **Lee** [38] pointed that the head injured patient sometimes develops impaired of information storage and integration, which leads

to headache, confusion and disorientation and can last hours to weeks. Also, he noted that Seizures occur after head injury at a rate more than 12 times that of the general population. It can happen immediately after the traumatic event or up to year later.

Concerning constipation, the current study showed a significant difference in the first and second week among control group, while the majority of study group had normal bowel movement. This can be attributed to many factors as, negligence of nursing staff with preventive measures of constipation, and performance of physical examination, priorities of nursing care of the vital body system as cardiac and respiratory systems, poor documentation of bowel movement, used muscle relaxant, nothing per mouth, immobility, and absence of bowel care guidelines in the intensive care unit. Similarly, **Abd-Elkader** [39] reported that the incidence of constipation in the control is 80% and it was suggested to the important of setting a constant defecation time for patient with diminished cognitive and functional ability because they at high risk to delayed defecation. This is in the same line with **Rolando *et al.,*** [40] they mentioned that the use of opioids and muscle relaxant can have significant deterious effect on nutrition. In addition **Kompan *et al.,*** [41] reported that the presence of food in the gut stimulates peristalsis, and induces the gastro colic reflux and thereby helps to promote colon motility. This result was contradicting with **Mahgoub** [42] who discovered that diarrhea is a common complication associated to enteral feeding, its incidence ranges from 2% to 63%.

Concerning urinary tract infection, the current study revealed a significant difference in the second week among the most of control group than study group. This could be attributed to urinary catheterization. This result was similar to **Khalil** [43] reported that the urinary tract is the commonest source of nosocomial infection, particularly when the bladder is catheterized. Also, **Marklew** [44] pointed that the skill and knowledge necessary to ensure safe and effective nursing care of catheterized patients are complex. Also, he showed that a well informed planned strategy must taken precedence over crisis management in order that the effects of catheter associated complications are minimized and the resources available are used most effectively.

Concerning status at discharge, the current study findings that the majority of the control group were died after 2 weeks, as a result of sepsis or multiple organ failure; brain anoxia, multiple trauma, air way obstruction, and respiratory failure, while the majority of study group had referred to neurological department. This finding was agreement with **Salem** [45] who reported that multiple organ dysfunction syndrome can be initiated by any severe injury or disease process that activates a systemic inflammatory response syndrome. Also, he noted that the multisystem failure has 75% to 90% mortality rate when associated with surgical sepsis. This findings was in line with **El-Sawaf** [19] who reported that the mortality rate in adults with head injury raised from 30% to 50% when there were multiple traumas. In this regard **El-Refaei** [46] reported that the polytraumatic head injury patients with Glasgow Coma Scale 8-13 had a mortality rate 20% as 5 patients exposed to more than 10 episodes of hypotension in intensive care unit. Also, he revealed that there was direct relationship between the low initial Glasgow Coma Scale and the frequency of hypertensive event during intensive care unit stay.

In relation to total APACH II score death rate in day 15, the current study revealed a significant increase in APACHE II score and death rate expectance among control group than study group. This finding was in agreement with **Ting *et al.,*** [47] revealed that both Glasgow coma scale and APACHE II score are good predictor power for the mortality of neurological patients.

Concerning total APACHE II and patient prognosis, the current findings revealed a positive correlation between total APACHE II score and expected death rate in day 1, and day 15 among control group than study group. This finding was in line with **David *et al.,*** [48] who stated that the both APACHE II and Trauma- injury severity scores (TRISS) were shown to accurately predict group mortality in intensive care unit trauma patients. APACHE II and TRISS may be utilized for quality assurance in intensive care unit trauma patients. However, neither APACH II nor TRISS provides sufficient confidential for prediction of outcome of individual patients. On the other hand, **Escorce and Kelley**[49] revealed that the APACHE II dose not measure illness severity accurately in all patients who admitted intensive care units. Also, he reported that improving predictions of hospital death rates among patients who are in medical intensive care unites may require the inclusion of new types of information in the classification system. Also, the findings of the current study showed a positive correlation between the duration of hospital stay and the expected death rate in the day 15 among both groups. This finding was in line with **Civett *et al.,*** [50] they reported that the patients with a high initial APACHE II score have a higher survival rate with increase duration of ICU stay. However if care is not provided immediately it seems very likely that an early death will result.

Conclusion

Post implementing nursing care protocol for moderate head injured patients associated with polytrauma, the current study revealed a

significant improvement in relation to air way patency, respiratory function, and arterial blood gas; hemodynamic status, and capillary refill; neurologic function; gastrointestinal motility, anthropometrics measurements, hemoglobin, and liver function tests; urinary output; skin and mucous membrane integrity, and normothermic body temperature among study group. Also, in the light of incidence of complications, the current study revealed that a significant difference in relation to confusion, headache, seizures; constipation; urinary tract infection among the control group.

Concerning APACHE II, and expected death rate, the current study showed that a positive correlation between APACHE II score and expected death rate among control group in day 15th. Also, there was no significant differences were found between study and control group in relation to sociodemographic characteristics, duration of ICU stay, past medical history, method of oxygen therapy, pneumonia, and respiratory arrest.

Recommendations

- All traumatic brain injury associated with polytrauma should be considered at risk of cardiopulmonary, neurological, gastrointestinal, urinary, and integumentary complications.
- Continuous monitoring for ventilatory setting, neurologic system, nutritional parameters, fluid and electrolyte status, skin and mucous membrane status should be done for traumatic head injured patients for early detection of complications.
- Critical care nurse managers should be responsible for planning educational programs for the critical care nurses. These programs should be organized and supervised by the critical care nursing and the critical care nursing experts at the hospital.
- A simple illustrated booklet includes the nursing care protocol for traumatic head injured patients associated with polytrauma should be given to all critical care nurse's in ICU.

Corresponding author
Om Ebrahiem A. E. Elsaay
Medical Surgical Nursing, Faculty of Nursing, Tanta University.
omebrahiem_ali@yahoo.com

References

1. Heegaard WG, and Biros MH., 2009. Rosen's Emergency Medicine: *Concepts and clinical practice*. Louis. Mosby Com.:38.
2. Jallo Y, and Loftus C.,2009. *Neurotrauma and critical care of the brain*. USA. Thieme Com.; 15:8-9.
3. Farghaly A, El-Khayat R, Awad W , And George S.,2005. Forensic Medicine and Clinical Toxicology, and Neurosurgery Departments, Faculty of Medicine, Assiut University, Assiut, Egypt..
4. Statistical Analysis Records. Tanta Main University Hospital.
5. Keel M.,2005. *Pathophysiology of polytrauma.* International J of the Care of the Injured.;36 (6):691-709.
6. Moppet I.,2007. *Traumatic brain injury: assessment, resuscitation, and early management*. Br J Anaes.;99:18-31.
7. John F, and Kennedy B., 2005. *Critical Care: The sequesties in anesthesiology.* Philadelphia. Elsever Mosby.;20:214-233.
8. Branson R, Johannigman J, and Shutter L. ,2004. *Respiratory care of the neurologic patient*. Society of Crit Care Med.;3:1-16.
9. Adam S and Osborne S., 2005. *Critical care nursing science and practice*. 2nd ed. London, UK, New York. Oxford University Press Com.;13:299.
10. Chang L, Horng F, and Hsieh Y. ,2006. *Prognostic accuracy of acute physiology and chronic health evaluation II score in critically ill patients*. American J of Critical Care.;15:47-53.
11. Hesdorffer DC, Ghajar J, and Jacono L. ,2002. *Predictors of compliance with the evidence based guidelines for traumatic brain injury care: A survey of United States Trauma Center.* Trauma J.;52:1202-209.
12. Fakhry SM, Trask AL, and Waller MA. ,2004. *Neurotrauma task force : Management of brain injured patients by evidence based medicine protocol improves outcomes and decreases hospital charges*. Trauma J. 56:492-499. (www.braintrauma.org).
13. Giankis M., 2010. *Nursing interventions for critically ill traumatic brain injury patients.* J Neuroscience Nursing.;42(2):71-77.
14. El_Azize M., 2004. *Evaluation of parenteral nutrition on immune system in patients with polytrauma* . Doctoral Degree in Medical Surgical Nursing. Faculty of Nursing. Alexandria University..
15. Brunner and Suddarth's., 2008. *Text book of medical Surgical N*ursing. 11ed. Philadelphia. Lippincott Williams and Wilkins.;63:1834-1937.
16. Faul M, Xu L, Wald MM, and Caronado VG. ,2010. *Traumatic brain injury in the United States: emergency department visits, hospitalization, and deaths.* Atlantes: Centres for Injury Prevention and Control..
17. Ronald C, and Savage D.,2009. *The developing Brain after TBI: predicting long term deficits and services for children, adolescents, and young adults.* North American Injury Society.:4.
18. Abd-Elsalam A.,1992. *Traumatic epidural hematoma: clinical radiological and operative study.* Master Degree in neurosurgical department. Faculty of Medicine. Tanta University..
19. El- Sawaf Y., 1995.*Management of traumatic intracranial haemorrhage.* Master Degree in neurosurgical department. Faculty of Medicine. Tanta University.
20. Clayton TJ, Nelson RJ, and Manara AR. , 2004. *Reduction in mortality from severe head injury following introduction of a protocol for IC management.* British J of Anaesthesia.;93(6):761-66.

21. Jose S, Osman Z, Muhammad F, Eliahu S, Gwendolyn L, Hickman J, Alexandros G, and Selman W., 2004. *Length of stay and mortality in neurocritically ill patients: impact of a specialized neurocritical care team.* Critical Care Med.; 23(11):2311-17.

22. Goris MD., 2004. *The injury severity score.* World Surg.; 7:12-18.

23. Samer M, Fakhry MD, Arthur L, Maureen, Waller RN, and Dorraine D. , 2004. *Management of brain injury patients by an evidence based medicine protocol improves outcomes and decrease hospital charges.* J of Trauma.;56:3.

24. Kondo Y, Abe T, Kohshi K, Tokuda Y, and Kukita I., 2011. *Revised trauma scoring system to predict in hospital mortality in the emergency department: Glasgow Coma Scale, age, and systolic blood pressure score.* Critical Care Med.;15:10-11.

25. Jennings P., 2004. *A critical appraisal trauma score.* J of Emergency Primary Health Care.;2:1-2.

26. Boles JN, Bion J, Connors A, Herridge M, Marsh B, Melot C, Pearl R, Silver man H, Stanchina M, and Baron V., 2007. *Weaning from mechanical ventilation.* European and respiratory Journal.; 29:1033-1056.

27. Topp R, Ditmyer M, King K, Doherti K, and Hornyak J., 2002. *The off bed rest and potential of rehabilitation on patients in the intensive care unit.* AACN Clinical issues.;13:263-76.

28. Sprangers F, Jellema W, Lopuhaa C, Endert E, Ackermans M, and Sauerwein R., 2002. *Effect of dopamine versus norepinphrine on cardiac output and myocardial oxygen supply and demand in patients with septic shock.* J of Laboratory and Clinical Medicine.;51:57-64.

29. Safar P., 2008. *Recognition and management of airway obstruction.* J of the American Medical Association.;208(6):1008-1011.

30. Goldstone J., 2002. *The pulmonary physician in critical care: Difficult weaning.* Thorax.;57:986-991.

31. Olson D, Thoyre S, Bennett S, and Graffagnino J. , 2009. *Effect of mechanical chest percussion on intracranial pressure: A pilot study.* American J of Crit Care.;18:330-335.

32. Stiller K, Jenkins S, and Grant R. ,2002*Acute. labor atelectasis: A comparison of five physiotherapy regimens.* Physiother Pract.; 12: 197- 209.

33. Walker W, and Pickett T., 2007. *Motor impairment after severe traumatic brain injury: A longitudinal multicenter study.* J of Rehabilitation Research and Development.;44(7):975-982.

34. Haaland K, Temkin N, and Randahl G. ,2008. *Recovery of simple motor skill, after head injury.* Pub Med.;448-456.

35. Nour W., 2003. *Effect of nutritional regimen for moderate burn patients on graft taken.* Doctoral Degree in Adult Nursing. Faculty of Nursing. Alexandria University..

36. El-Yazied D., 2006. *Comparative study between combined enteral and parenteral nutrition versus enteral nutrition in critically ill patients.* Master Degree in anaesthesia. Faculty of Medicine. Tanta University..

37. Feske S. ,1998. *Neurologic emergencies.* Neurologic Clinics.;16:237.

38. Lee E. ,1998. *Factors influencing the functional outcome of patients with acute epidural hematomas: Analysis of 200 patients undergoing surgery.* Trauma J.;45:946.

39. Abd-Elkader F. 2008. *Effect of implementing nursing practice guidelines for bowel care on occurrence of* constipation for critically ill patients. Master Degree in Critical Care Nursing. Faculty of nursing. Mansoura University. Rolando H, Dispin G, and Doglas W. *Evidence based nutrition support.* Crit Care Nutr Suppo. ACS Surg on line.2006;18:282-96.

40. Kompan I, Vidmar G, and Spinler A., 2004. *Is early enteral nutrition a risk factor for gastric intolerance and pneumonia.* Clin Nutr J.; 23:527-32.

41. Mahgoub A. ,2009. *Factors associated with the occurrence of diarrhea among critically ill patients.* Master Degree in Critical Care Nursing. Faculty of Nursing. Assuit University..

42. Khalil S.,2008. *Nosocomial infection in intensive care units.* Master Degree in anaesthesia. Faculty of Medicine. Tanta University.

43. Marklew A., 2004. *Urinary catheter care in the intensive care unit.* British Association of Critical Care Nurses: Nursing in Critical Care.;9:1.

44. Salem M., 2005. *Multiple organ dysfunction syndrome.* Review article in Adult Nursing Department. Faculty of Nursing. Alexandria University.

45. El-Refaei S., 2001. *Management of head injured patients in emergency department.* Master Degree in neurosurgical department. Faculty of Medicine. Tanta University.

46. Ting H, Chen M, Hsieh Y, and Chan C. ,2010. *Good mortality prediction by GCS for neurosurgical patients.* J Chin Med Assoc.; 73:8.

47. David W, Sall L, Manuel G, and Robert B. ,1995. *Evaluation of predictive ability of APACHE II system and hospital outcome in Canadian intensive care unit patients.* Crit Care Med.; 23:1177-83.

48. Escarce J, and Kelley M., 1990. *Admission source to the medical intensive care unit predicts hospital death independent of APACHE II score.* JAMA.;264(18):2389-94.

49. Civett AJ, Judith A, and Weclson L. , 1990. *Evaluation of APACHE II for cost containment and quality assurance.* Ann Surg.; 121(3):266-274.