

ORIGINAL ARTICLE

IMPACT OF EDUCATIONAL TRAINING ON NEUROLOGICAL ASSESSMENT SKILLS OF FEMALE NURSES IN EVALUATING TRAUMATIC BRAIN INJURY PATIENTS THROUGH GLASGOW COMA SCALE IN LAHORE GENERAL HOSPITAL, LAHORE, PAKISTAN

Nazia Yousef, Kabir Ozigi Abdullahi, Kousar Perveen, Sadia Khan

Department of Nursing, Lahore School of Nursing, Faculty of Allied Health & Sciences, The University of Lahore, Lahore, Pakistan

ABSTRACT

Background: Traumatic Brain Injury (TBI) is a leading cause of death and disability worldwide. The objective of this study was to determine the impact of educational training on neurological assessment skill of female nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale in Lahore General Hospital, Lahore, Pakistan.

Material & Methods: This quasi-experimental one group pre-posttest design study was conducted at Lahore School of Nursing, Faculty of Allied Health & Sciences, The University of Lahore, Lahore, Pakistan from April 3, 2021 to May 15, 2021. Pre-test neurological assessment skill of 70 nurses was noted by an observer, two weeks educational training was given and four weeks later on, post-test score was noted. For neurological assessment skill, a 20 items observatory checklist was used. Age groups, marital status, job experience, work experience in recent department and work place were four demographic, while neurological assessment skill score was one research variable. Paired sample t test was used for hypothesis testing.

Results: Out 70 nurses, 26 (37.1%) were in age group 25-30 years, 18 (25.7%) in 31-35, 16 (22.9%) in 36-40, six (8.6%) in 41-45 and four (5.7%) in 46-50 years. Marital status was; 36 (51.4%) single, 27 (38.6%) married, three (4.3%) divorced and four (5.7%) widow. Job experience was; eight (11.4%) had <2 years, 33 (47.1%) 2-5 years, 25 (35.7%) 6-10 years and four (5.7%) had >10 years. Work experience in recent department was; 16 (22.9%) had <1 year, 39 (55.7%) 1-3 years, 13 (18.6%) 4-5 years and two (2.9%) had >5 years. Work place was Trauma Unit in 12 (17.1%), neurosurgery ICUs in 38 (54.3%) and surgical units in 20 (28.6%) cases. Mean 16.89 ± 2.52 posttest skills score was significantly higher than mean 12.56 ± 2.67 pretest skills score ($p = <.0001$).

Conclusion: Our study confirmed that the effect of educational training was significant in improving neurological assessment skills of nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale in Lahore General Hospital, Lahore, Pakistan. Further studies are suggested with increased sample size and multiple research settings.

KEY WORDS: Traumatic Brain Injury; Head Injuries; Brain Injuries; Neurological Assessment; Glasgow Coma Scale; Nursing Assessment, Skills; Nurses, Pakistan.

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Corresponding Author:

Nazia Yousef
Post-graduate Scholar
Lahore School of Nursing
Faculty of Allied Health & Sciences
The University of Lahore, Lahore, Pakistan
E-mail: naziayousif19@gmail.com

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1. INTRODUCTION

1.1 Background: Traumatic Brain Injury (TBI) is defined as contuse to the cerebrum. The National Center for Injury Prevention and Control characterizes a TBI as “a blow or shock to the head that disturbs the typical capacity of mind”. There are several ways of TBIs but the commonest are engine vehicle collision, injury to head and assault. Assessment of traumatic brain injury in emergency department should be multidimensional. This will help in making early and

accurate diagnoses. It also helps in making decision about CT imaging.¹

This aids in reduction of cost in needless testing and reduce the hospital stay. Sequential assessment gears in emergency can help in making appropriate clinical diagnosis. It provides objectivity and quantify. TBI is a leading cause of death and disability worldwide. Yearly, about 1.5 million people die from TBI and those several millions that survive receive emergency treatment. Neurological injuries affect 1.4 million people per year in Pakistan.²

In Finland, 101 to 221 per 100,000 population is the incidence rate yearly for TBI. In Pakistan, according to road traffic injury surveillance study ($n > 100,000$), one third of patients had a TBI and 10% of them had moderate to severe brain injury. Regardless of recorded burden, no accurate data is present related to emergency treatment for TBI.

The usual reception of TBI patients to the emergency department (ED) is with altered level of consciousness that needs urgent and efficient assessment. The Glasgow Coma Scale (GCS) provides objective assessment of level of consciousness in all types of medical and surgical patients during neurological assessment.^{3,4}

The GCS has 3 main domains of assessment of level of consciousness, namely; eye opening (E), verbal response (V), and motor response (M). The highest score is 15 and lowest 3.

Two important factors of neurological evaluation are level of consciousness and motor response upon painful stimuli. GCS scoring is very helpful in evaluating trend of neurological functioning over the period of time. Quick and appropriate assessment, diagnosis and early treatment can reduce chances of many complications of brain trauma. In the extent of critical care, regardless of advancement in technology, neurological assessment plays a crucial part in the diagnosis and management of TBI patients.⁵

Sound knowledge and efficient skill performance of nurses may be helpful to deal with complexities of neurological assessment of such patients.

Assessment is the basic component of nursing process that helps in finding diagnoses and ruling out problems. Right after proper physical examination nurse organizes, analysis, and synthesizes collected data in a manner to figure out the patient's health care needs.⁶

Efficient nursing assessment was found associated with early patients recovery in neurosurgery and general surgery departments.⁷ A study reported that nurses, working in neurosurgery department have poor knowledge and practices about GCS assessment of TBI patients.

About 40% of all patients who admit in hospitals with traumatic brain injuries, rather to recover, their conditions get more worsen due to improper assessment

and poor management.⁸

It is concluded from the above cited literature that the neurological competency of nurse can influence the prognosis of neurological clients. It has been observed many times that nurses are deficit in knowledge, skills and clinical confidence regarding neurology. Earlier studies reported that in service training can be very helpful in this regard. In service short courses are need of the hour for nurses to enhance the knowledge and competency related to neurology. This not only boasts the early recovery of patient but also reduce the financial burden of government.

Thus, to improve the ongoing traditional practices, there is huge need of changing the learning intervention to enhance the knowledge and skill for ultimately best patients' outcome that is the utmost objective of nursing practices. To the best of investigator awareness, formerly no study was published from Lahore, Pakistan on impact of educational intervention in improving the practices of nurses regarding neurological assessment of TBI patients on GCS.

1.2 Research Objective (RO): To determine the impact of educational training on neurological assessment skill of female nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale in Lahore General Hospital, Lahore, Pakistan.

1.3 Research (H_0) Hypothesis (RH): There is no statistically significant impact of educational training on neurological assessment skill of female nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale in Lahore General Hospital, Lahore, Pakistan.

2. MATERIAL & METHODS

2.1 Design, duration, setting & ethical considerations: This quasi-experimental one group pre-posttest design study was conducted in the Lahore School of Nursing, Faculty of Allied Health & Sciences, The University of Lahore, Lahore, Pakistan from April 3, 2021 to May 15, 2021. Study was conducted according to the guidelines of declaration of Helsinki. Ethical and research committee approval was taken vide Notification No. IRB-UOL-FAHS/830-III/2021 from The University of Lahore. Written informed consent was taken from study subjects.

2.2 Population, sample size, sampling technique & sample selection: The population of our study comprised 1,387 registered nurses of Lahore General Hospital. The sample size was calculated by using the following WHO formula. Software used 80% power and $Z_{\alpha/2} = 1.96$. After adding up 20% drop off rate, the sample size was selected as 70.⁹ Mean and standard deviation values were used from previously published studies.

$$n = \frac{\sigma_d^2 (Z_\beta + Z_{\alpha/2})^2}{\text{difference}^2}$$

$$\sigma_d = 2.56 \quad Z_\beta = 1.28$$

$$\mu_d = 52.87 \quad Z_{\alpha/2} = 1.96^9$$

All the diploma holder female nurses were eligible. There was no male nurse working in our hospital at this time. Degree holders and those having specialization in neurosciences were excluded as they have sufficient skill due to their higher studies. Age group >50 years was excluded as they this group has sufficient skill due to their longer experience. Convenience sampling was used by choosing only morning nursing staff and purposive sampling was used to choose nurses from Accident & Emergency Unit and three neurosurgical ICUs and three surgical units as these units receive almost all patients with TBI.

2.3 Conduct of procedure, intervention & data collection checklist: In pre-assessment, the clinical assessor assessed the participants for skill competences at their original working place by maintaining anonymity through an "Observatory Checklist for

Neurological Assessment Skill (NAS)" of nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale. One week educational training was given by specialized nursing instructor. In included one hour activity daily. The first three days included 30 minutes power point lecture and 10 minutes videos regarding GCS. The next three days included demonstration and skill performance at simulated live adult standardized patient regarding neurological assessment of traumatic brain injury (TBI) patients through GCS.

Further four weeks were given for improving neurological assessment skills. Then participants were reassessed for the same skills in a way as for pre-assessment.

For measuring NAS score, a 20 items observational checklist was used. Correctly performed skill step was marked as "achieved" and was scored as "1" and wrong or missed one step was marked as "not achieved" and scored as "0".^{10,11} The correct/achieved items were added to give a final score of 0-20. The Cronbach's alpha for this check list was 0.723 and intra-rater reliability of the tool was reported as 0.86.¹² (Table 1)

Table 1: Observatory Checklist for Neurological Assessment Skill (NAS) of nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale

No.	Competency checklist Items	Achieved Yes(1)/No (0)
1	Performed hand washing	
2	Correctly verified patient identification	
3	Obtained consent about the procedure from patient or attendant	
4	Maintain patient privacy during the procedure	
5	Observe if eye open spontaneously	
6	If patient is not opening his eyes; call patient's name twice	
7	Pressing the lateral part of the nail bed to apply peripheral pain stimulus	
8	Ask about time, place and person to check patient's orientation	
9	Check for confusion	
10	Check for inappropriate words	
11	Check for incomprehensible sounds	
12	Check for none response	
13	Check patient if he obeys commands by instructing; squeezing your hand, close/open eyes	
14	Apply the central pain stimulus (trapezius squeeze); If a patient is not obeying command	
15	Observe if patient reacts to pain; localizing, withdrawing, abnormal flexion and extension	
16	Have nurse pen light or a torch for patient assessment of pupillary reaction. Check pupil size before the reaction to light and able to differentiate pupil reactions; brisk, sluggish or fixed	
17	Correctly perform assessment of limb movements and able to differentiate; normal power/mild weakness/ severe weakness/no movement/abnormal posture (extension/flexion)	
18	Summarize, interpret and report abnormal results of the GCS	
19	Performed score aggregation	
20	Categorize the scores	

2.4 Data collection plan: Data was collected for four categorical demographic variables (attributes); age groups (25-30/ 31-35/ 36-40/ 40-50, 46-50 years), marital status (married/ unmarried, divorced/ widow), job experience (<2/ 2-5/ 6-10/ >10 years) and work experience in recent department (<1/ 1-3/ 4-5/ >5 years).

There was one research variable on ratio scale; Neurological Assessment Skill (NAS) score.

2.5 Data analysis plan: The four demographic variables were analyzed by count and percentage. NAS score was analyzed by mean, minimum, maximum, range and SD with 95%CI for mean. Hypothesis was verified by paired samples t test. Mean & SD of the two observations, difference of means, 95% CI of difference of means, t value, degree of freedom & significance (p-value) are given at alpha .05. IBM SPSS version v.20 (IBM Inc., Armonk, NY) was used for statistical analysis.

3. RESULTS

3.1 Sample description by demographic variables:

Out of a sample of 70 nurses, 26 (37.1%) were in age group 25-30 years, 18 (25.7%) in 31-35 years, 16 (22.9%) in 36-40 years, six (8.6%) in 41-45 years and four (5.7%) in 46-50 years. Marital status was; 36 (51.4%) single, 27 (38.6%) married, three (4.3%) divorced and four (5.7%) widow.

Job experience of nurses was; eight (11.4%) had <2 years, 33 (47.1%) 2-5 years, 25 (35.7%) 6-10 years and four (5.7%) had >10 years. Work experience in recent department was; 16 (22.9%) had <1 year, 39 (55.7%) 1-3 years, 13 (18.6%) 4-5 years and two (2.9%) had >5 years. Work place was Accident & Emergency Unit in 12 (17.1%), neurosurgery ICUs in 38 (54.3%) and surgical units in 20 (28.6%) cases.

3.2 Sample statistics and population parameters:

Table 3.2 shows statistics for the sample and esti-

mated parameters for the population for the research variable NAS score.

3.3 Hypothesis Testing: Paired t test showed p-value <.0001, rejecting the H_0 and thus confirming that the difference between the pretest and posttest skill score is statistically significant. Hence the educational intervention was effective in improving neurological assessment skill of nurses. (Table 3.3)

4. DISCUSSION

Neurological assessment in emergency and intensive care units is the basic skill for nurses. It is recommended that effectiveness of practices could be enhanced through evidence based practices. Hence the present study aimed to investigate the impact of educational training in improving the practices of registered nurses.

Our study revealed mean pretest skill score of 12.56 ± 2.67 and mean posttest score of 16.89 ± 2.52 , with mean difference of -4.33 after educational intervention. This difference was statistically significant (<.0001) with calculated t value of -11.90, proving that the intervention has significant impact on enhancing nurses skill score.

All the four following studies favor our finding.

Devi, et al.¹³ from Pokhara, Nepal reported in 2018 (on scale of 0-20 score) mean pretest knowledge score of 10.58 ± 3.57 (n=35) and mean posttest knowledge score of 16.32 ± 1.79 (n=31), with mean difference of -5.74 after educational intervention. This difference was statistically significant with calculated t value of -8.913 ($t_{(30)} = 2.042$), proving that the intervention has significant impact on enhancing nurses knowledge score. Skill score was tested on scale of 0-12 score. The mean pretest skill score was 5.42 ± 2.159 and mean posttest skill score was 9.38 ± 1.94 , with mean difference of -3.96 after educational intervention. This difference was statistically

Table 3.2: Pre and post educational training scores of Neurological Assessment Skill of nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale in Lahore General Hospital, Lahore, Pakistan (n=70)

Observation	Mean	Minimum	Maximum	Range	S.D	95% CI for mean	
						Lower	Upper
Pretest Skill Score	12.56	6	18	12	2.67	11.92	13.19
Posttest Skill Score	16.89	13	20	7	2.52	16.28	17.48

Table 3.3: Comparison of pre and post educational training scores of Neurological Assessment Skill of nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale in Lahore General Hospital, Lahore, Pakistan (n=70)

Variable	Mean	S.D	Paired differences				t-value	p-value
			Mean	SD	95%CI Lower	95%CI Upper		
Pretest skills score	12.56	2.67	-4.33	3.04	-5.05	-3.60	-11.90	<.0001
Posttest skills score	16.89	2.52					d.f.=69	

significant with calculated t value of -9.36 ($t_{(30)} = 2.042$), proving that the intervention has significant impact on enhancing nurses skill score.

Kumar, et al.¹⁴ from Abhipur, Mohali, Punjab, India has reported in 2015 the effect of self-instruction module (SIM) on level of knowledge of 50 nurses regarding medical and surgical management of patients with head injuries. Pre-test knowledge score was 13.16 ± 2.33 and post-test score was 24.04 ± 2.65 , with significant increase in score with SIM ($p < .001$).

Kamothi¹⁵ from Ahmedabad, India reported in 2016 the effect of Planned Teaching Programme (PTP) on knowledge and practice of 40 nurses on Glasgow Coma Scale (GCS) of head injuries patients in ICUs. Knowledge and practice were assessed on structured knowledge questionnaire and structured observational check list respectively. Pre-test knowledge score was 14.225 and post-test was 28.25, with significant difference after PTP. Pre-test practice score was 1.37 and post-test was 5.2, with significant difference after PTP.

Teles, et al.¹⁶ from Belgaum, India reported in 2013 the effect of SIM on knowledge and practice of 55 nurses working in critical care units regarding GCS in neurological assessment of patients. There was significant increase in mean knowledge score from 12.84 ± 4.24 pre-test score to 25.78 ± 2.39 post-test score. The increase in skill score was also significant from 7.64 ± 2.79 pre-test score to 11.45 ± 2.21 post-test score.

Enriquez, et al.¹⁷ selected 90 nurses, collected data on a pre-survey questionnaire, followed by 90 minutes educational intervention on GCS and then had a post-survey questionnaire. They concluded that standardized educational program has significantly improved the knowledge of nurses regarding GCS.

Jones from Murray, Utah, United States ($n=31$) have shown significant increase in overall post-survey scores (88.6 ± 13.3) vs. pre-survey scores (77.2 ± 16.7) ($p=0.001$). Here a 40 minutes neurological assessment power point educational module was presented in lecture format in five different sessions to 31 nurses at Intermountain Medical Center (IMC) in Murray, Utah. The pre and post assessment was done by 17 items questionnaire on Likert scale.

5. CONCLUSION

Our study confirmed that the effect of educational training was significant in improving neurological assessment skills of nurses in evaluating traumatic brain injury patients through Glasgow Coma Scale in General Hospital, Lahore, Pakistan. The findings of current study support the need for ongoing education of nurses for neurological assessments to increase skill and confidence in assessment of neurological injuries, which ultimately could

increase the patient survival rate. Further studies are suggested with increased sample size and multiple research settings.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	NY, KOA
Acquisition, Analysis or Interpretation of Data:	NY, KOA, KP, SK
Manuscript Writing & Approval:	NY, KOA, KP, SK

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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