

Effect of Learning Program on Nurses' Knowledge and Performance about Glasgow Coma Scale

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Abstract

Background: The level of consciousness (LOC) of the patients has always been part of the validation and data in the nurses' observations. Usually used in the performance is still Glasgow Coma Scale (GCS). It was also noticeable that in different cases, although patients are awake, intubated, the response of verbal is immediately recorded as 1 which attributes to a GCS score is low compared to the poor prognosis. Also, the assessment of complex reactions which can be unnoticed necessitates a better assessment of the LOC. Subsequently, Although the GCS is broadly utilized in Egypt as in many countries over the world to evaluate the LOC of the patients, it has been notable that there is a lack of interest in using neurological assessments by nurses. **So the study was aimed** to evaluate the effect of the learning program on nurses' knowledge and performance about the Glasgow coma scale. **Design:** A quasi-experimental research design. **Setting:** The study was applied in a General Hospital (Al- Amery Hospital) in Port Said city. **Subjects:** This study covered thirty-six nurses working in an intensive care unit (ICU), an emergency care department, female and male internal medicine, and surgery departments of general Port Said hospital. **The data was collected using 2 tools;** the "Structured questionnaire sheet" which consisted of twenty questions related to socio-demographic characteristics, and knowledge about GCS, "observation checklist" was related to performance about GCS. **Results:** This study indicated that there are statistically significant improvements at p-value= (0.001) immediately after program implementation concerning nurses' knowledge and performance about GCS. Moreover, it was also found a statistically significant relationship between nurses' knowledge and performance, and there's no statistically significant association between the changes in their knowledge or performance scores and socio-demographic characteristics. **Conclusion:** It can be concluded from the results of the present study that the program had succeeded in inducing statistically significant improvements in nurses' knowledge and performance about GCS. Therefore, it can be concluded from the results of the present study that this learning program for nurses had a positive impact on their knowledge and performance. **Recommendation:** development and implementation of continuous learning program concerning GCS for nurses and physicians in all hospitals at Port Said City.

Keywords: Knowledge, Performance, Nurses, learning program, GCS.

Introduction

The Glasgow Coma Scale is a measure of neurological status that aims to provide an objective and reliable method for recording an individual's conscious state, and for initial assessment as well as a subsequent assessment. The patient is evaluated according to the criteria of the scale, the resulting score gives the patient a score between three (indicating deep unconsciousness), a seventh score indicating coma, and either fifteen or fourteen indicating full consciousness (Wiki, 2000, and Singh, 2004).

The score can be evaluated by (four) Best Eye Response - No eye-opening (one) Eye-opening to pain (two) Eye-opening to verbal command (three) Eyes open spontaneously (four), Best Verbal Response (five)- No verbal response (one) Incomprehensible sounds (two) Inappropriate words(three) Confused(four) Orientated(five), Best Motor Response (six)- No motor response (one) Extension to pain (two) Flexion to pain (three) Withdrawal from pain (four) Localizing pain (five) Obeys Commands (six) (Williams & Hopper, 2007, Nice, 2003,

and Alexander, 2006). The ultimate goal of using GCS is to identify those who need acute intervention as soon as possible and thus prevent secondary brain injury, thus reducing mortality among patients. From an educational and clinical point of view, all healthcare professionals working in emergency care must use evaluation of conscious level as easily as other routine vital signs observations (National institute for health and clinical excellence, 2013, Palmer, and Knight,2006).

However, several studies have stated that the GCS used in the clinical setting is inconsistent, and it is recognized that training and education are needed to ensure that the tool is used for patient status as a valid indicator (Fischer & Mathieson, 2001). Reports for nurses working in critical care units about interventions regarding continued education show support for different approaches of implementation, but they lack educational and theoretical considerations. In the clinical setting, the need for a learning intervention regarding the GCS scale has been expressed and the successful educational interventions of the lack of studies for nursing in

the critical care unit revealed the need for more studies (Ross & Crumpler, 2007, and Ann-Charlotte, 2015).

The nurse has challenged quick recognition of the acute events, such as head injury, hemorrhage, post-surgery complications, or infection, and the recording and monitoring of neurological observations. Therefore, nursing staff, particularly those working in a critical care setting must be competent to monitor and record neurological observations and be equipped with clinical skills required that ensure high levels of quality care and patient safety. There are several tools used for assessing and monitoring the neurological status of clients in critical units. One such widely and universally accepted tool is the Glasgow Coma Scale, an assessment tool designed to note trends in client response to stimuli (Ahamed, and Dutta, 2016).

Nurses have a unique opportunity to help patients examine their lifestyle, learn about risks and potential areas for change, advise on a focused individual plan and facilitate the achievement of their goals (Grinspun & Coote, 2005). That can't be done without well-qualified thoroughly knowledgeable nurses, especially in a critical care setting as in the sample of our study (neuroscience nurses), since they ought to have an efficient evaluation and assessment skills to manage and deal with their patients especially those with the disturbing level of consciousness through the application of GCS (Nice, 2003). Therefore the need to develop a learning program for nurses about successful GCS will be suggested. Such programs are expected to improve nurses, knowledge, and performance about GCS. Therefore, this study aimed to evaluate the effect of a learning program on nurses' knowledge and performance on the Glasgow Coma Scale (GCS).

Significance of the Study:

The GCS remains the gold standard for assessment, continuous monitoring, prognosis, and clinical judgment about awareness in patients with brain trauma injuries and other acute neurological conditions. It is a tool designed for objectively measuring the severity of coma in all acute medical and trauma patients (Braine, & Cook, 2017). Insufficient knowledge in applying this tool that will always negatively affect the care of patients with altered level of consciousness or in emergency situations Circumstances, because the deterioration in the clinical condition may not be easily detected until the condition becomes worse or Irreversible (Emejulu, et.al. 2014).

Unfortunately, many studies that have been conducted to evaluate the knowledge of nurses and physicians about GCS have indicated that there is poor knowledge about the importance of a tool. In a study to evaluate the knowledge of Nigerian physicians About GCS, 30% of participants didn't even know the full meaning of GCS. In the same country, 33% of Nurses in a study to evaluate nurses' knowledge of GCS found that there is a weakness of knowledge. Similar studies conducted in Malaysia, Jordan, and Iraq also reported insufficient knowledge of GCS among nurses (Ehwarieme, & Anarado, 2016, and Al-Quraan, & AbuRuz, 2016). In the previous study in Vietnam, ninety percent of nurses were able to answer basic questions about GCS Correctly, 52.1% of studied nurses answered the questions incorrectly related to clinical scenarios that require the application of basic knowledge. This means that the nurses could not combine their theoretical knowledge of GCS with Clinical practice (Nguyen, et.al., 2011, and Jaddoua, et.al., 2013). Hence, the researcher carried out this study to evaluate the effect of the learning program on nurses' knowledge and performance about the Glasgow Coma Scale.

Aim of Study:

The study was aimed to evaluate the effect of a learning program on nurses' knowledge and performance about GCS.

Problem Statement:

There is an urgent need to evaluate the effect of the learning program on nurses' knowledge and performance about the Glasgow Coma Scale (GCS) due to the importance of education on providing high-quality GCS and thus improving survival rate and decrease mortality rate from Head injury (Leema, 2010).

Research questions:

How does a learning program on nurses' knowledge and performance about GCS improve nurses' knowledge and performance?

Is there a significant statistical relationship between the nurses' knowledge and performance and their sociodemographic data?

Does a learning program make positive improvements in nurses' knowledge and performance after attending a learning program about GCS?

Hypothesis Research:

H1: There will be positive effects of a learning program on nurses' knowledge and performance about GCS.

H2: There will be a relationship between the nurses' knowledge and performance and their sociodemographic data.

Material And Methods

Research Design:

A quasi-experimental design is used in conducting the study to evaluate the effect of the learning program on nurses' knowledge and performance about GCS.

Setting:

The study was carried out in an emergency care, an intensive care unit, an internal female medicine, and internal male medicine departments of a general hospital (Al- Amery Hospital) at Port Said City.

Subjects:

The population of this study consisted of all nurses (36) providing direct care to patients in the above-mentioned areas from the beginning of May to the end of October 2017.

Inclusion and exclusion criteria

All nurses were enrolled who were working during the study period. The ones inactive were excluded from the study.

Tools for data collection:

The tools consisted of two used in the study to collect data. The tool I "structured questionnaire sheet" had been developed and constructed by a researcher based on the review of relevant nursing literature to evaluate nurses' knowledge regarding GCS (Pre and post-knowledge questionnaire). It was composed of two parts.

Part I:

It involved items related to socio-demographic characteristics of the sample as a professional qualification, working area, age, years of experience, and attendance courses about GCS.

Part II:

It included questions associated with nurses' knowledge regarding GCS (importance, definition, indications, components, and its scores).

Tool II "An observation checklist" was developed by the researcher to evaluate nurses' performance related to GCS.

Method Of The Study

Validity of the tool:

The content validity of the tool was tested by a board of 7 experts in Medical-Surgical Nursing and professors specialized in neurological diseases in clinical settings to ensure that the

questions were clear, relevant, applicable, understandable, and complete and appropriate modification was done accordingly.

Reliability of the tools:

Test-retest reliability was used. The internal consistency of the tools was calculated using Cronbach's alpha coefficients. Study tools revealed reliability at Cronbach's alpha 0.87 for the tool (I), 0.90 for the tool (II).

Pilot study:

A pilot study was applied after the development of the tools. It was carried out with no fewer than 10 % nurses working in an intensive care unit (ICU), emergency care, male and female, and an internal medicine department to test the tools of the study's applicability and reliability. These nurses were excluded from the subject matter of the research work to ensure the stability of answers and performance.

Administrative design:

The official letters were obtained from the Dean of the faculty to the directors of each study setting to take cooperation and permission.

Ethical Considerations:

This research was approved by the faculty of nursing ethics committee, Permission to conduct the study was obtained from the responsible authorities after explaining its purpose. Data was obtained from every nurse prior to their inclusion in the study after explaining its importance and purpose. The researcher informed the nurses that the study was voluntary, they were allowed to refuse to participate and they had the right to withdraw from the study at any time, without giving any reason. The researcher presented himself to each nurse and obtained oral consent from each nurse. Moreover, nurses were assured that nurses' information would be confidential and utilized for research purposes only.

Data collection procedure:

The researcher used scientific books, papers, periodicals, and the internet to analyze current local and international related literature to gain a better understanding of the problem, create the study measures, and complete them. The actual fieldwork took place at the chosen setting from the beginning of May to the end of October 2017. In the previously described scenarios, the researcher presented himself to the medical and nursing staff. The researcher explained the study's nature and goal and requested cooperation.

Process of study

This study was conducted in four phases

Phase I (Assessment phase): to assess nurses' knowledge about GCS. The researcher interviewed the nurses on an individual basis. The researcher introduced the sheet (Tool I) to each nurse and asked them to complete it and each nurse was observed by the researcher during the procedure. Their performance was evaluated by using an observational checklist (Tool II).

Phase II (program planning): The learning program was developed based on the identified needs and demands of nurses gathered in phase I, and the light of the most recent pertinent literature.

Phase III (program implementation): The nurses were divided into three groups according to their working areas in the hospital. The learning program was implemented for each group of nurses. The learning sessions lasted for eight weeks, one session per week. The eight learning sessions were given for four hours, each session took about 30 minutes using participating lecture, data show, discussion, videotapes, and handout which was given to all nurses included in the study and demonstration and redemonstration GCS. The Arabic GCS handout was constructed and developed to be easily understood by all nurses. Researcher attended the previously mentioned settings 3 days per week (Sunday and Tuesday), from 9 am to 12 pm for learning sessions and data collection. Data Collection was within six months from the beginning of May to the end of October 2017.

Phase IV (Evaluation phase) The program outcomes were assessed by using tools one and two. Two times; first preprogram, second immediately after the implementation of the program.

Scoring system

The total score of nurses' knowledge against the six basic items was calculated to fifteen. The respondent was given one point for every correct answer and (0) for an incorrect one. For every part, the item scores were summed up. These scores were turned into a percent score. The total score of 75% and more was considered satisfactory in knowledge while scores below 75% were considered unsatisfactory.

Whereas the performance total scores were calculated to 15 steps. The possible choice for each item was done or not done. Each nurse was given one degree for each step done correctly,

and zero for that was not done. For each category of the performance, the scores of the items were summed-up and the total divided by the number of items, giving a mean score for the part. These scores were converted into a percent score, and means and standard deviation were computed. The total score of 75% and more was considered satisfactory in performance while scores below 75% were considered unsatisfactory.

Statistical Analysis

After data were collected, they were coded and transformed into a specially designed format suitable for computer feeding. All data were verified after entering data for any errors. Data were analyzed using a statistical package for social sciences (SPSS) windows 21.0 version and were presented in tables.

Data were presented utilizing descriptive statistics in the form of frequencies and percentages for qualitative variables, ranges means, and standard deviations. Qualitative variables were compared utilizing the Z test. For quantitative variables, mean and standard deviation was calculated the difference between the two methods was made using student test (t). The difference in the right ratio of the items of knowledge and performance before and post-learning program tested with Wilcoxon site rank test (z&p). For multiple group comparisons of quantitative data, a one-way analysis of variance test (ANOVA) was used. Pearson's link coefficient (r) was calculated for the numerical variables. When one or two ordinal variables are ordinal, the Spearman variable is the (rho) test. The level of importance was adopted at $p < 0.05$.

Results

Table (1) showed the socio-demographic characteristics of studied nurses. About a third of the nurses (37.5%) worked in the ICU, 25.0% were in the emergency room, 19.4% were in male internal medicine departments and male internal medicine departments respectively. Regarding age, about half of the nurses (50.0%) were 30 years old and less than 40 years old. As regards their qualification about two-third of studied nurses graduated from secondary nursing school. About half of the studied nurses (50.0%) had 10 to less than 20 years of experience, and 30.6% of them had more than 20 years of experience. All of the studied nurses did not attend any course about GCS.

From **Table (2)**, differences in nurses' knowledge regarding GCS were observed during the program intervention. The results indicated

statistically significant improvements in knowledge of the nurses in different aspects of indications, definition, components, importance of GCS, and scores of GCS ($p < 0.001$). The most prominent improvement was in the knowledge scores about components, and the definition of GCS reaching 100.0%, 97.2% respectively in the immediate post-test. Their levels were significantly higher than the pre-program levels.

Table (3): Demonstrated the differences in nurses' performance concerning GCS throughout the program intervention. The results indicated improvements in nurses' performance in various areas of GCS. These improvements were statistically significant ($p < 0.001$). The most prominent improvements were in the scores of performance about steps of (observe if patient opens eye spontaneously, calls and commands patient and observes if patient opens the eyes, and apply pressure on the limb and observe the patient response to pain). They reached 100.0% in the immediate post-test. The nurses' performance levels were significantly higher than the preprogrammed level (pretest).

Table (4): showed a comparison of mean nurses' knowledge total score concerning GCS throughout the program intervention. The highest percentages of improvement were in nurses' knowledge between the immediate post-test and the pre-program level (56.94 ± 11.79) where $t = 39.094$ at $p\text{-value} = (0.001)$.

Table (5): illustrated a comparison of mean nurses' performance total score concerning GCS throughout the program intervention. The highest percentages of improvement were in nurses' performance between the immediate post-test and the pre-program level (98.41 ± 7.76) where $t = 70.145$ at $p\text{-value} = (0.001)$.

Table (6): declared a comparison between nurses' knowledge & performance total score concerning GCS throughout the program intervention. There is no statistically significant correlation between nurses' knowledge & performance total scores concerning GCS throughout the program intervention.

Table (7): showed a correlation between nurses' knowledge and performance concerning GCS and their socio-demographic throughout the program intervention. There is a statistically insignificant relationship between knowledge and performance regarding GCS and their socio-demographic throughout the program intervention where $p\text{-value} > 0.05$.

Table (8): demonstrated the Correlation between nurses' and performance concerning GCS throughout the program intervention according to their working area. There is a statistically insignificant relationship between knowledge and performance regarding GCS and their working area throughout the program intervention where $p > 0.05$.

Table 1 Socio-demographic characteristics of nurses.

Items	N n= (36)	%
Working areas:		
- Intensive care unit	13	36.1%
- Emergency room	9	25.0%
- Male internal medicine	7	19.4%
- Female internal medicine	7	19.4%
Age:		
<20 years	0	0.0%
20-<30 years	7	19.4%
30-<40 years	18	50.0%
40-<50 years	9	25.0%
50+ years	2	5.6%
Qualification:		
- Secondary nursing school	23	63.9%
- Nursing technical institute	13	36.1%
Years of Experience:		
<1 years	0	0.0%
1-<5 years	2	5.6%
5-<10 years	5	13.8%
10-<20 years	18	50.0%
20+ years	11	30.6%
Attendance course about GCS:		
Yes	36	100.0
No	0	0.0

Table 2 Differences in nurses' knowledge regarding GCS throughout the program intervention period .

Nurses' knowledge about GCS	Time				Z	P-value
	Pre test		Immediate post test			
	N	%	N	%		
- Definition	4	1.4%	35	97.2%	9.866	0.001
- Indications	2	0.7%	33	91.7%	10.057	0.001
-Importance	1	0.36%	34	94.4%	10.294	0.001
-Components	8	2.9%	36	100.0%	10.149	0.001
-Scores of GCS	6	2.2%	33	91.7%	10.002	0.001

Table 3 Differences in nurses' performance regarding GCS throughout the program intervention period

		Time					
		Pre test		Immediate post test		Z	P-value
		N	%	N	%		
Eye opening	-Observe if patient opens eye spontaneously	20	55.6%	36	100.0%	9.487	0.001*
	-Calls and commands patient and observes if patient opens the eyes	12	33.3%	36	100.0%	10.100	0.001*
	-Apply pressure on the limb and observe patient response to pain	9	25%	36	100.0%	10.000	0.001*
	-apply pressure on the supraorbital area and observe patient response	2	5.6%	35	97.2%	10.198	0.001*
Verbal response	-talk with patient and observe if the patient is oriented or not	11	30.5%	34	94.4%	9.652	0.001*
	-observe if patient is not oriented and Confused and talks inappropriate and understandable words.	11	30.5%	34	94.4%	9.652	0.001*
	-observe if patient talks incomprehensible sounds	0	0.0%	34	94.4%	10.440	0.001*
	-observe if there is no verbalization of any type	10	27.7%	35	97.2%	9.655	0.001*
Motor response	-gives patient simple command and observes if the patient responds.	12	33.3%	34	94.4%	9.600	0.001*
	-gives painful stimuli and observes if patient uses arms and attempts to remove stimuli /pressure.	8	22.2%	34	94.4%	10.050	0.001*
	-observes if patient's arm withdraws to pain	7	19.4%	32	88.9%	10.002	0.001*
	-observes if there is flexion of arm to the body in response to pain	1	2.7%	34	94.4%	10.294	0.001*
	- observes if there is flexion of arm away from body in response to pain	0	0.0%	25	70.3%	7.926	0.001*
	- observes that patient is flaccid and no response to pain flexion of arm to the body in response to pain	0	0.0%	21	60.4%	6.932	0.001*

Table 4 Comparisons of mean nurses' knowledge total score regarding GCS throughout the program intervention period.

Variables	Mean	±SD	t	p
Knowledge pre learning program	4.07	±.923	-----	-----
Knowledge immediately post learning program	56.94	±11.79	39.094	0.001

Table 5 Comparison of mean nurses' performance total score regarding GCS throughout the program intervention period.

Variables	Mean	±SD	t	p
Performance pre learning program	7.09	±8.43	-----	-----
Performance immediately post learning program	98.41	±7.76	70.145	0.001

Table 6 Relationship between nurses' knowledge & performance total score regarding GCS throughout the program intervention period.

Total performance score	Total knowledge score	
	r	p
Performance pre learning program	0.111	0.245
Performance immediately post learning program	-0.028	-0.770

Table 7 Relationship between nurses' knowledge and performance in relation to GCS and sociodemographics throughout the program intervention period.

Variables	Age		Educational level		Year of experiences	
	rho	p	rho	p	rho	p
Knowledge pre learning program	0.203	0.033	-0.233	0.014	-0.219	0.021
Knowledge immediately post learning program	-0.224	0.018	-0.108	0.261	-0.68	0.480
Performance pre learning program	0.181	0.057	0.005	0.960	-0.005	0.959
Performance immediately post learning program	0.007	0.939	-0.167	0.079	-0.080	0.407

Table 8 Relationship between nurses' and performance in relation to GCS throughout the program intervention **consistent with** their working area.

Variables	Working areas				ANOVA (F)	P-value
	Intensive care MEAN± SD	Emergency Room MEAN± SD	Male Internal medicine MEAN± SD	Female Internal medicine MEAN± SD		
Knowledge pre learning program	11.7+58.7	12.8+61.4	10.7+53.6	11.7+56.0	1.235	0.294
Knowledge immediately post learning program	9.7+80.2	8.2+81.3	15.7+70.1	11.6+78.9	2.447	0.068
Performance pre learning program	11.5+8.0	6.2+5.7	5.5+6.4	8.3+7.2	0.229	0.876
Performance immediately post learning program	1.0+99.7	8.9+97.6	1.0+99.7	9.2+98.08	0.386	0.764

Discussion

GCS is a reliable and valid tool to measure the level of consciousness. Nursing professionals are responsible for ongoing monitoring and identification of altered consciousness level in patients. Hence it is critical for nurses to acquire accuracy knowledge and skills in using GCS (Nguyen & Sun-Mi, 2011). Results of the several studies indicated that all items related to nurses' knowledge and performance concerning the Glasgow Coma Scale were inadequate and the authors of those studies recommended that it is a crucial need to educate the nurse and to employ more qualified and knowledgeable and skilled nurses with competencies geared towards high standards for progression through neurological assessment and especially the Glasgow Coma Scale in neurosurgery wards. So the aim of the study was to evaluate the effect of the learning program on nurses' knowledge and performance about GCS (Nguyen & Sun-Mi, 2011, and Batool, et.al., 2013):

The results of the present study revealed that the majority of studied nurses were at the age group 30 years and less than 40 years, and The results of the present study revealed that most of them graduated from secondary nursing schools all studied nurses were secondary nursing schools graduates, had an experience from 10 to less than 20 years, and all studied nurse didn't attend any course about GCS. This result was in agreement with Nihatolla, et al. (2005) who reported that (95%) of the nurse staff did not take a postgraduate course on GCS, while this result was inconsistent with the result obtained

from the study by Batool, et. al.(2013) who found that most of the nurses (19.0%) were of age group (28-32) years old, 44.0% of them graduated from Nursing Institute, 34.0% of them had experiences from 1 to less than 5 years, and 27.0% of them had one trained. Assessment of nurses' knowledge and performance with respect to GCS prior to program implementation showed that, in the current study, almost all nurses studied lacked basic knowledge and performance about GCS.

This result may be due to the fact that most of the studied nurses were diploma graduates, working since 10 years ago, poor theoretical knowledge and demonstrated willingness and motivation for courses on GCS, and their knowledge during school study years might be insufficient for such a specialized service or forgotten. Moreover, there's a lack of supervision and evaluation system for nurses during their working. These points to an area of deficient continuing nursing education. These results were supported by Nguyen & Sun-Mi (2011) who found that the results of the study indicate the gap between theoretical knowledge and performance of GCS in Vietnamese nurses. Although most nurses have suitable theoretical knowledge of the GCS, they cannot be able to assess the clinical patient condition and their level of consciousness. Furthermore, their basic knowledge of GCS was not sufficient to ensure accurate performance of GCS scoring. Hence, The study suggested that a well-developed GCS practice program should be delivered to nurses to contain the accuracy of assessing the score of the consciousness level using GCS, ultimately improving the quality of nursing care. In addition to Ahamed and Dutta (2016) who stated that more

than two-thirds of the sample, exactly 44 out of 60 participants, didn't have a satisfactory level of knowledge.

Regarding the impact of the intervention programme, The findings of the present study have shown statistically significant improvements in nurses' knowledge and performance regarding GCS. This was observed immediately after the implementation of the program compared to the preliminary test. This improvement may be due to the in-service training program which not only emphasized the acquisition of knowledge of GCS but also the practical training of obtaining information and changing work performance with appropriate courses or sessions, increased for the training program, all nurses participated have taken booklet, pamphlets and handouts for the program objectives and content as well as sufficient materials and supplies were provided for the training and not provided at the actual work situation.

These results are congruent with **Ahamed and Dutta (2016)** who reported that knowledge and performance level of nurses significantly improved after the teaching program as evident from the obtained 't' value (knowledge $p < 0.20$, performance $p < 0.001$). Thus it can be depicted that there is an obvious role of continuing professional development of nurses which have ultimate reflection in better client care outcome. To produce competent and knowledgeable nurses, emphasis should be made on in-service education programs and frequent evaluation of nurse's performances which will help in proper assessment and management of clients through monitoring and formulating early diagnosis. Nursing supervisors and in-charges should take the initiation to continue staff development program in the unit. **Nguyen & Sun-Mi (2011)** also ensured the importance of effective education or training for nurses about GCS.

Continuing education for using GCS was emphasized in the study of **Waterhouse (2005)**, who found that the more education the medical staff received regarding GCS knowledge, the more accurately they would perform. Performance training sessions by experts are highly effective because they provide standardized methods for measuring GCS to improve accuracy in using it.

As for the comparison between nurses' knowledge & performance total score regarding GCS throughout the program intervention. There is no statistically significant correlation between nurses' knowledge & performance total score regarding GCS throughout the program intervention. This result was supported by **Ahamed and Dutta (2016)** who stated that there was no significant relationship between pretest knowledge and performance of staff nurses regarding monitoring Glasgow Coma Scale ('t' 0.03, $p > 0.05$). The results of the current study showed that there is a non-statistically significant relationship between knowledge and Performance in relation to GCS and sociodemographics during the program intervention where p -value > 0.05 .

This finding points to the successful effect of the learning program about GCS to all nurses, irrespective of their age, experiences, level of education, and work areas. This result is supported by **Batool, et. al (2013)** who revealed that there wasn't a significant relationship where p -value > 0.05 . between knowledge of nurses and their socio demographic characteristics.

Conclusion:

The results of the present study revealed that there are statistically significant improvements immediately after program implementation and regarding nurses' knowledge and performance about GCS. Furthermore, it was also found that there is a significant relationship between nurses' knowledge and performance, and there are no statistically significant associations between changes in knowledge scores, performance, and socio-demographic characteristics.

Recommendations:

- ❖ Designing and implementing regular continuous educational programs about GCS for enhancing nurses' knowledge and performance to achieve high quality care.
- ❖ Periodic refreshing courses about GCS should be planned and implemented for nurses every six months to one year.
- ❖ Upgrading nurses' knowledge and performance concerning GCS .
- ❖ Replication of the current study with a larger sample of nurses in different settings is required for generalizing the results.

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