Nanotechnology Perceptions
ISSN 1660-6795
www.nano-ntp.com

Effect of Educational Intervention on the Knowledge and Practice Level of Glasgow Coma Scale among Nurses at Tertiary Care Hospital KPK, Pakistan

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Background: The Glasgow Coma Scale (GCS) serves as a vital neurological assessment tool designed to evaluate the level of consciousness in patients with head injuries or other neurological disorders. Given the essential role that nurses play in the care of neurological patients and the importance of the GCS in their evaluations, it is crucial to assess and improve their knowledge through specific educational programs.
Objective: This study aims to assess the impact of an educational intervention on the knowledge and practice level of the Glasgow Coma Scale among nurses working in a tertiary care hospital.
Methods: A quasi-experimental design was utilized for this research at a tertiary care facility in Buner, Khyber Pakhtunkhwa, Pakistan. A sample of 150 nurses was selected through stratified sampling. Data were collected at two intervals, before and after the educational intervention, using structured questionnaires. Statistical analysis was conducted with SPSS, employing paired and independent t-tests, with a significance threshold set at $p < 0.05$ to evaluate differences between the intervention and control groups.
Results: The participant demographics revealed that 83.3% were male and 16.7% were female. The majority, 42.7%, worked in the Intensive Care Unit, followed by 24.7% in the Emergency Department. The majority, 42.7%, worked in the Intensive Care Unit, followed by 24.7% in the Emergency Department. Initially, knowledge scores were low, but post-intervention results indicated significant improvements, with knowledge scores increasing from a mean of 4.39 to 7.19 with ($p = 0.000$). similarly practice score was low, but post-intervention results indicated significant improvements, with practice score from 14.93 to 25.95 ($p = 0.000$).
Conclusion: The results suggest that the educational intervention successfully enhanced nurses' understanding of the Glasgow Coma Scale; however, notable deficiencies in practical application persist. Over 60% of nurses reported challenges in areas such as identifying motor responses, preparing for assessments, and documenting findings. These outcomes underscore the necessity for ongoing, targeted training initiatives to further develop nurses' proficiency with the GCS and foster reflective practice.

Keywords: Practice, Glasgow Coma Scale, Nurses, Tertiary Care Hospital.

1. Introduction

This study examines the impact of an educational intervention on nurses' understanding and use of the Glasgow Coma Scale (GCS) at a tertiary hospital in Buner, Pakistan. Accurate GCS application is vital for assessing neurological patients and guiding clinical decisions in complex care settings (1). Nurses play a pivotal role in these environments, as their ability to perform timely and accurate assessments can directly impact patient outcomes (2). The study aims to enhance nurses' GCS competency through education, improving clinical practice and team communication in resource-limited settings like Buner (3). This study highlights the potential of structured education to enhance GCS use, improving patient outcomes and guiding nursing education and training practices. (4). Enhancing nurses' competency in neurological assessments can elevate care standards, reduce diagnostic errors, and optimize resource use in high-pressure settings like tertiary hospitals (5).

The Glasgow Coma Scale (GCS) is a neurological assessment tool used to evaluate and quantify the level of consciousness in individuals who have suffered head injuries or other neurological conditions (6). It was first introduced in 1974 by Graham Teasdale and Bryan Jennett, both professors of neurosurgery at the University of Glasgow, hence the name (7). Since its inception, the GCS has become a cornerstone in clinical practice across various healthcare settings, including emergency medicine, intensive care units (ICUs), and trauma centers, due to its simplicity, reliability, and ability to provide a standardized, objective means of assessing neurological impairment (1).

The Glasgow Coma Scale (GCS) assesses neurological function through three components: Eye Opening (E), Verbal Response (V), and Motor Response (M), scored 1–4, 1–5, and 1–6, respectively. Higher scores indicate better responsiveness, while lower scores reflect severe neurological impairment. (8). The GCS, with scores ranging from 3 (severe impairment) to 15 (fully alert), offers a vital tool for assessing neurological status, guiding decisions, and tracking patient progress. (1).

The GCS is a valuable assessment tool but should complement a thorough neurological exam, acknowledging its limitations like subjective interpretation and reduced efficacy in specific populations (9). Therefore, the GCS is most effective when used in conjunction with other diagnostic tools and assessments to form a holistic view of the patient's neurological function (10). In complex tertiary care, nurses' proficiency with tools like the GCS is essential for accurate diagnosis, effective team communication, and timely interventions. (11). Studies reveal that nursing staff, as primary caregivers for neurological patients, often face challenges in consistently applying the GCS, impacting patient outcomes. (12). The GCS is essential for managing neurological patients in tertiary care, making it vital for nurses to have a strong understanding, with educational interventions proven to boost knowledge, confidence, and patient outcomes. (13).

These interventions are particularly relevant in tertiary hospitals, where nurses are often required to manage complex neurological cases and collaborate closely with other healthcare professionals (14). Understanding the nuances of the GCS becomes essential, as it empowers nurses to contribute significantly to the multidisciplinary approach required in tertiary healthcare settings (15). This study assesses the impact of an educational intervention on nurses' practice level in tertiary hospitals to enhance clinical competencies and patient

outcomes.(10). Educational initiatives help bridge knowledge gaps, ensuring nurses can confidently and accurately apply the GCS in various clinical scenarios. (9). The findings of this study could inform future educational strategies, ensuring that nurses are equipped with the necessary skills to provide high-quality neurological assessments and contribute meaningfully to the multidisciplinary approach to patient care.

2. Material and Method:

This study used a parallel group quasi-experimental pre-post design to assess the impact of an educational intervention on nurses' knowledge and practice of the Glasgow Coma Scale (GCS) at a tertiary care hospital in Buner, Khyber Pakhtunkhwa, Pakistan. Registered nurses from various wards participated, selected through stratified random sampling to ensure representation across different knowledge and experience levels. The study included 150 nurses, with 75 in each of the intervention and control groups, and excluded those absent, on leave, or previously trained in GCS assessment. Data collection followed ethical approval from the Institutional Review Board and relevant hospital authorities, with participants providing written consent. The data were analyzed using SPSS version 25 and MS Excel, employing descriptive statistics (frequency distributions and cross-tabulations) and inferential statistics (normality tests, parametric and non-parametric tests, including paired t-tests and Mann-Whitney U tests) to assess the impact of the intervention on GCS knowledge and practice. Statistical significance was determined at a level of less than 0.05.

3. Results:

Table No 01: Demographic Variables of the study Participants

		Frequency	Percent
Gender of the Participants	Male	125	83.3
	Female	25	16.7
	Total	150	100.0
Working area of the Participants	CCU	14	9.3
	ENT	2	1.3
	ER	37	24.7
	HDU	5	3.3
	ICU	64	42.7
	MW	2	1.3
	Neuro	19	12.7
	NICU	1	0.7
	Neuro	2	1.3
	OT	1	0.7
	Peads	3	2.0
	Total	150	100.0

Analyzed by frequency ‘n’ and Percentage ‘%’

The study sample of 150 participants was predominantly male (83.3%, n=125), with females making up 16.7% (n=25). Most participants worked in critical care units, with 42.7% (n=64) in the ICU and 24.7% (n=37) in the ER. Smaller proportions worked in departments such as the CCU (9.3%, n=14), Neuro (12.7%, n=19), and others. The demographic analysis indicated a focus on male nurses working in high-intensity settings like the ICU and ER.

Table No 2: Interventional group Knowledge and Practice level of nurses regarding the Glasgow Coma Scale assessment in the region of Buner, Pakistan.

Variables	Pre-Score		Post Score		P-Value
	Mean	S.D	Mean	S.D	
Knowledge level	4.39	1.866	7.19	1.171	0.000

Analyzed by paired t test with a p less than 0.05

The knowledge and practice levels of nurses in the interventional group regarding the Glasgow Coma Scale assessment in Buner, Pakistan, were analyzed using paired t-tests, with statistical significance set at a p-value of less than 0.05. The results showed a significant improvement in both knowledge and practice levels after the intervention. The mean pre-intervention knowledge score was 4.39 (S.D. = 1.866), which increased to 7.19 (S.D. = 1.171) post-intervention, with a p-value of 0.000.

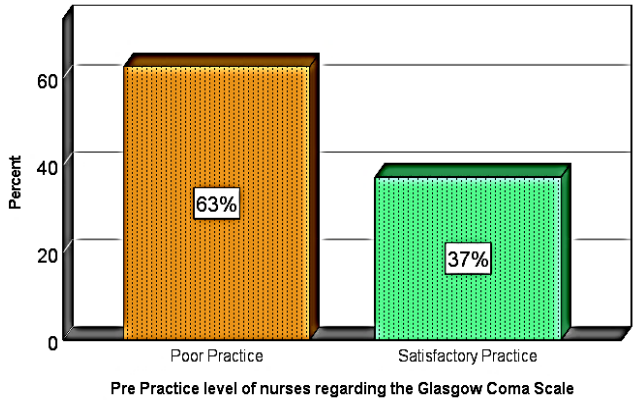

Figure 1: Interventional group pre practice level of nurses regarding Glasgow Coma Scale

This graph 1 illustrates that 63% of participants demonstrated poor practice, while 37% exhibited satisfactory practice. The high percentage of poor practice raises concerns about the effectiveness of prior training or interventions, suggesting many participants lack the necessary skills or knowledge. The 37% showing satisfactory practice represents a valuable group that could mentor peers, sharing best practices to foster improvement. The significant gap between the two groups indicates a need for a thorough analysis of factors contributing to poor performance, such as training content, guideline clarity, and potential barriers like insufficient resources or external stressors. To address these challenges, targeted interventions could include additional training sessions, practical workshops, and peer support systems to encourage collaboration. Establishing regular feedback mechanisms would help assess practice levels and empower participants in their development. While the data reveals a concerning level of poor practice, it also highlights opportunities for growth. By understanding underlying causes and leveraging the strengths of those demonstrating satisfactory practice, stakeholders can develop strategies to enhance overall practice quality and improve patient

care outcomes.

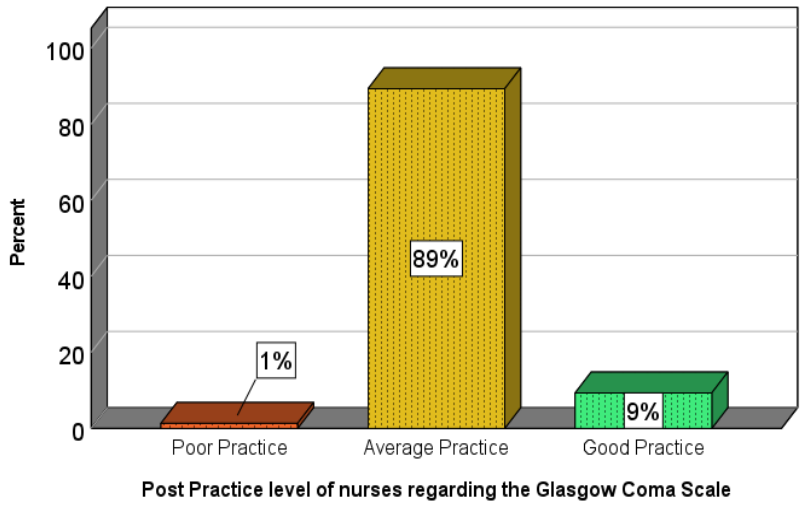

Figure 2: Interventional group post practice level of nurses regarding Glasgow Coma Scale

Post-intervention results show 89% moderate practice, 9% good practice, and 1% poor practice, indicating the intervention's effectiveness with room for growth. Moderate practice forms a solid foundation, but ongoing development is needed to elevate more participants to good practice. The 9% achieving good practice highlights potential success with further support. The 1% poor practice warrants investigation into underlying issues, addressed through targeted training and mentorship. Continuous evaluation and refinement of strategies can drive excellence and improve overall practice quality.

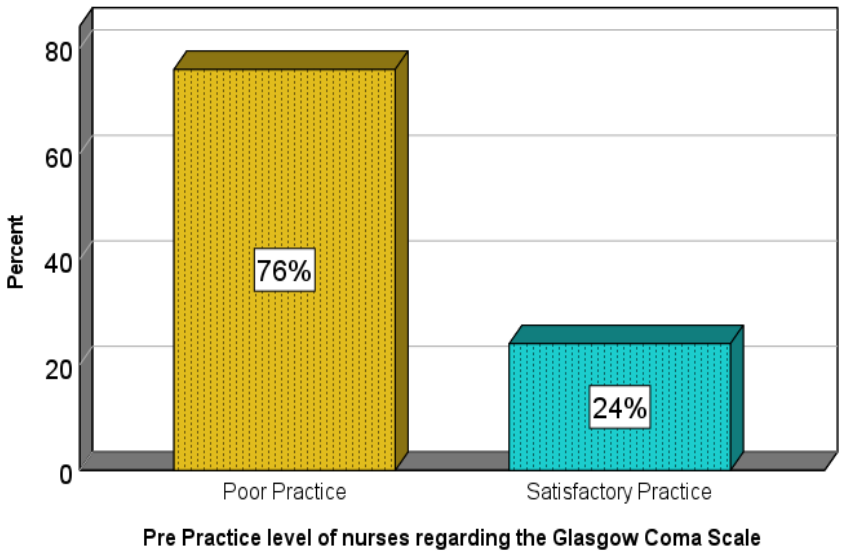

Figure 3: Control Group pre practice level of nurses regarding the Glasgow Coma Scale

This graph shows 76% of nurses demonstrating poor practice and 24% satisfactory practice, highlighting concerns about care quality. Insufficient training, outdated guidelines, and inadequate support may contribute to poor performance, requiring targeted interventions. Professional development, mentorship, and regular evaluations can help improve competencies and adherence to best practices. These findings urge healthcare leaders to invest in training and resources to foster continuous improvement and better patient outcomes. Ongoing monitoring will be crucial to assess and sustain progress.

Figure 04 shows 84% of the control group had poor practice post-intervention, with only 16% satisfactory, indicating the intervention's ineffectiveness. This suggests insufficient training, unclear guidelines, or inadequate support hindered improvements. The low satisfactory rate highlights the need to investigate barriers and develop targeted interventions. Addressing these challenges is crucial for enhancing practice standards. Future research should assess similar trends in other settings to inform broader improvement strategies.

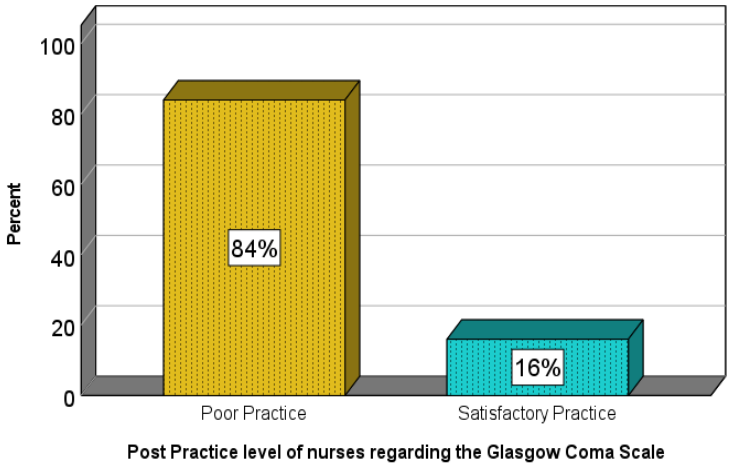

Figure 4: Control Group post practice level of nurses regarding the Glasgow Coma Scale

Table No 2: Nurses' practice level in utilizing the Glasgow Coma Scale for patient Assessment.

		n	%
Preparation: Demonstrates knowledge of the components of the Glasgow Coma Scale. Gathers necessary equipment (e.g., penlight, pain stimulus). Ensures a quiet and appropriate environment for assessment.	Not attempt	9	6.0
	Poor	93	62.0
	Satisfactory	48	32.0
Introduction and Consent: Introduces oneself to the patient. Explains the purpose of the GCS assessment. Obtains verbal consent from the patient or caregiver.	Not attempt	10	6.7
	Poor	93	62.0
	Satisfactory	47	31.3
	Not attempt	7	4.7
	Poor	60	40.0

Eye Opening (E): Assesses the patient's eye-opening response accurately. Differentiates between spontaneous, response to verbal stimuli, and response to pain stimuli. Records the appropriate score for the eye-opening component.	Satisfactory	32	21.3
	Good	51	34.0
Analyzed by frequency 'n' and percentage '%'			

Table 2 highlights nurses' practice levels in using the Glasgow Coma Scale (GCS) for patient assessment. For preparation, 6.0% did not attempt, 62.0% performed poorly, and 32.0% were satisfactory. In the introduction and consent process, 6.7% did not attempt, 62.0% were poor, and 31.3% were satisfactory. For the eye-opening response assessment, 4.7% did not attempt, 40.0% were poor, 21.3% satisfactory, and 34.0% showed good practice. Analysis was based on frequency and percentage.

Table No 3: Nurses' practice level in utilizing the Glasgow Coma Scale for patient Assessment.

		n	%
Professionalism: Maintains a professional demeanor throughout the assessment. Respects the patient's dignity and privacy during the evaluation.	Not attempt	9	6.0
	Poor	66	44.0
	Satisfactory	29	19.3
	Good	46	30.7
Documentation: Records the GCS score accurately in the patient's chart or documentation. Documents any relevant observations or additional information	Not attempt	16	10.7
	Poor	97	64.7
	Satisfactory	37	24.7
Feedback and Reflection: Accepts feedback from instructors or preceptors. Reflects on the assessment, identifying strengths and areas for improvement.	Not attempt	9	6.0
	Poor	101	67.3
	Satisfactory	40	26.7
Analyzed by frequency 'n' and percentage '%'			

Table 3 examines nurses' practice in using the GCS, focusing on professionalism, documentation, and feedback. For professionalism, 6.0% did not attempt, 44.0% were poor, 19.3% satisfactory, and 30.7% good. In documentation, 10.7% did not attempt, 64.7% were poor, and 24.7% satisfactory. For feedback/reflection, 6.0% did not attempt, 67.3% were poor, and 26.7% satisfactory. Analysis was based on frequency and percentage.

Table No 4: Interventional group Practice level of nurses regarding the Glasgow Coma Scale assessment in the region of Buner, Pakistan.

Variables	Pre-Score		Post Score		P-Value
	Mean	S. D	Mean	S.D	
Practice Level	14.93	3.185	25.95	2.880	0.000
Analyzed by paired t test with a p less than 0.05					

The analysis of nurses in Buner, Pakistan, showed significant improvements in knowledge and practice regarding the Glasgow Coma Scale after the intervention ($p < 0.05$). The mean knowledge score rose from 4.39 (S.D. = 1.866) to 7.19 (S.D. = 1.171), and the practice score increased from 14.93 (S.D. = 3.185) to 25.95 (S.D. = 2.880), both with $p = 0.000$. These results

confirm the intervention's effectiveness in enhancing nurses' skills and knowledge.

Table No 5: Control group Knowledge and Practice level of nurses regarding the Glasgow Coma Scale assessment in the region of Buner, Pakistan.

Variables	Pre-Score		Post Score		P-Value
	Mean	S.D	Mean	S.D	
Practice Level	13.89	3.253	13.92	3.287	0.418

Analyzed by paired t test with a p less than 0.05

The analysis of the control group in Buner, Pakistan, showed no significant improvements in knowledge or practice regarding the Glasgow Coma Scale ($p > 0.05$). The mean knowledge score increased slightly from 3.89 (S.D. = 1.956) to 4.39 (S.D. = 1.866), with a p-value of 0.147. The practice score changed minimally from 13.89 (S.D. = 3.253) to 13.92 (S.D. = 3.287), with a p-value of 0.418. These results indicate the intervention was ineffective in improving the control group's skills and knowledge.

Table No 06: Effect of the educational intervention on nurses' practice level in utilizing the Glasgow Coma Scale for patient assessment.

		Interventional		Control		
Variables	N	X	S.D	X	S.D	P-Value
Pre-Practice Score	75	14.93	3.185	13.89	3.253	0.627
Post-Practice Score	75	25.95	2.880	13.92	3.287	0.000

Analyzed by Independent t test with p less than 0.05

The educational intervention significantly improved nurses' practice levels in utilizing the Glasgow Coma Scale. Pre-intervention scores were similar between groups: 14.93 (S.D. = 3.185) for the interventional group and 13.89 (S.D. = 3.253) for the control group ($p = 0.627$). Post-intervention, the interventional group showed a significant increase to 25.95 (S.D. = 2.880) compared to 13.92 (S.D. = 3.287) in the control group ($p = 0.000$). These results highlight the intervention's effectiveness.

4. Discussion:

This study examines the effect of an educational intervention on nurses' practice levels in utilizing the Glasgow Coma Scale (GCS) at a tertiary care hospital in KPK, Pakistan, highlighting both the challenges and improvements in practice. Prior to the intervention, substantial gaps were identified, with many nurses struggling in key areas such as preparation, obtaining consent, and documentation. For instance, 62.0% performed poorly in preparation, and 64.7% demonstrated inadequate documentation of GCS scores. These deficiencies are consistent with findings from other studies, such as those by Adnan (2023) and Hussain & Rasheed (2021), which reported similar issues in GCS practice due to insufficient training, lack of resources, and work overload. (16).

Post-intervention, the results demonstrated a significant improvement in both knowledge and

practice. The mean knowledge scores increased from 4.39 to 7.19, and practice scores rose from 14.93 to 25.95, both with p-values of 0.000, indicating highly significant outcomes. These findings align with studies by Ibrahim (2018), Al-Sinan & Mansour (2020), and Ehwarieme et al. (2024), which show that targeted interventions are effective in addressing knowledge and practice gaps in critical care settings (17).. For instance, Ibrahim (2018) observed improvements in nurses' understanding of GCS components and scoring, while Al-Sinan & Mansour (2020) highlighted a correlation between enhanced knowledge and better practices.(4). Comparative studies further emphasize the broader applicability of these findings. For example, Loutfy et al. (2023) demonstrated that educational programs not only improved GCS knowledge and practice but also boosted nurses' confidence, suggesting that interventions can have a holistic impact on professional growth (17). Similarly, the study by Abd Elrazek & Shalaby (2021) advocated for the integration of structured training sessions and manuals to enhance critical care nurses' performance and reliability in coma assessments (18).

According to the Hussain and Rasheed 2021 study shows that 41.5% of study participants had adequate knowledge about GCS. Only 38.3% had good knowledge about functions, indicators and monitoring skills of GCS. The study cleared that there were 20.2% nurses having poor GCS knowledge (5). In same way the Kimboka's 2017 study found that just 13.3% of participants had a high level of knowledge about the Glasgow Coma Scale (GCS). More than half were unaware of the lowest score, and 47.6% had not received any GCS training. Challenges to GCS assessment included inadequate knowledge (19.6%), work overload (19.6%), lack of resources (14.6%), insufficient skills (5.7%), and lack of training (5.1%) (19).

According to Ehwarieme study conducted in 2021 showed that most of the respondents had poor knowledge (79.71%) of the GCS, and demonstrated a poor level of skills (96.69%) with no significant differences between institutions in knowledge and skills p greater than 0.05 (20). The studies across various regions consistently demonstrate significant improvements in nurses' knowledge and practice of the Glasgow Coma Scale (GCS) following targeted interventions. For instance, research in Buner, Pakistan, showed substantial gains in both knowledge and practice post-intervention, with statistical significance. Ibrahim's 2018 study and Al-Sinan & Mansour (2020) similarly highlighted notable enhancements in GCS knowledge and practice, with higher knowledge correlating with better practices. Conversely, Hussain & Rasheed (2021) and Kimboka (2017) revealed gaps in GCS knowledge and training among nurses, indicating a need for further education and resources (21). Ehwarieme (2021) also found poor GCS knowledge and skills among respondents, underscoring ongoing challenges in GCS training and implementation (22).

Overall, these studies emphasize the critical need for improved GCS training and education to enhance nursing practice and patient care. The study assessed knowledge gain among nurses after an educational intervention using an independent t-test. Pre-intervention scores were similar between the groups, with no significant difference ($p = 0.557$). However, post-intervention, the interventional group showed a significant increase in knowledge (mean score 7.19) compared to the control group (mean score 4.39), with a highly significant p-value of 0.000.

Similarly, Abd Elrazek and Shalaby's 2021 study found that training sessions significantly

improved critical care nurses' performance and their preference for the four scale over the GCS (23).. The four-scale showed higher inter-rater reliability (Cohen's kappa 0.92 vs. 0.81), with 83% of nurses favoring it for assessing coma depth. The study recommends ongoing training and distributing manuals to all critical care nurses for assessing patients' level of consciousness. (24). Overall, the findings from this study and the literature underscore the critical importance of educational interventions in bridging knowledge and practice gaps in GCS utilization. While the intervention yielded significant improvements, addressing systemic challenges such as resource limitations and workload pressures is crucial for sustaining these gains. Continuous education, coupled with organizational support and resource allocation, can help nurses achieve and maintain proficiency in GCS application, ultimately leading to better patient outcomes.

5. Conclusion:

This study highlights a significant improvement in nurses' knowledge and practice of the Glasgow Coma Scale (GCS) after an educational intervention in Buner, Pakistan. Participants, primarily from critical care settings (42.7% ICU, 24.7% ER), showed substantial increases in knowledge (mean score: 4.39 to 7.19) and practice (mean score: 14.93 to 25.95, $p = 0.000$). Despite these gains, gaps persisted in practical application, including challenges in motor response identification, documentation, and reflective practices, with over 60% of nurses underperforming in key areas. The findings underscore the need for ongoing, targeted training to enhance GCS proficiency.

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