

Assessment of Nurses' Knowledge and Clinical Practice Regarding the Care of Patients with Brain Tumors

Jennifer victor¹, Kousar Perveen², Sajida Batool³

¹ BSN, Superior University, College of Nursing, Lahore. Email: fahad_khanfk@yahoo.com

² Associate Professor Superior University College of Nursing, Lahore. Email: kous84@gmail.com

³ Assistant Professor Superior University College of Nursing, Lahore. Email: sajidabatool0@gmail.com

Corresponding Author: Jennifer victor

Abstract

Background: Brain tumors require complex nursing care because patients may develop neurological deterioration, seizures, raised intracranial pressure, cognitive changes, and treatment-related complications. Nurses play an essential role in early recognition, monitoring, supportive care, and timely intervention. Adequate knowledge and clinical practice are necessary to ensure safe and effective care.

Objective: To assess nurses' knowledge and clinical practice regarding the care of patients with brain tumors at Jinnah Hospital, Lahore.

Methods: A descriptive cross-sectional study was conducted among 218 registered nurses at Jinnah Hospital, Lahore. Participants were selected through simple random sampling. Data were collected using a structured questionnaire assessing demographic characteristics, knowledge, and clinical practice regarding brain-tumor care. Data were analyzed using SPSS version 27. Frequencies, percentages, means, and standard deviations were calculated. Chi-square tests and Pearson correlation were applied, with significance set at $p < 0.05$.

Results: Of 218 nurses, 51.8% demonstrated moderate knowledge, 30.3% good knowledge, and 17.9% poor knowledge. Clinical practice was moderate among 49.5%, good among 29.4%, and poor among 21.1%. Knowledge was positively correlated with clinical practice ($r = 0.62$, $p < 0.001$). Previous brain-tumor experience and neuro/neurosurgical training were significantly associated with better knowledge and practice.

Conclusion: Nurses demonstrated predominantly moderate knowledge and clinical practice. Regular specialized training and competency-based continuing education are recommended.

Keywords: Brain tumors; nurses; nursing knowledge; clinical practice; neurological nursing; Jinnah Hospital; Lahore.

Introduction

Cancer remains one of the most significant global public-health challenges, with its increasing incidence placing substantial demands on healthcare systems and professional nursing services. Global estimates indicate that cancer accounted for approximately 20 million new cases and 9.7 million deaths in 2022, while the burden is projected to increase further because of population growth, ageing, and changing exposure to risk factors (Bray et al., 2024). Brain and central nervous system (CNS) tumors represent a particularly complex category because their effects may involve cognition, consciousness, mobility, communication, behavior, and other neurological functions. Globally, approximately 321,000 new brain and CNS cancer cases and

248,000 deaths were estimated in 2022 (International Agency for Research on Cancer [IARC], 2024). Although brain tumors account for a smaller proportion of cancers than several other malignancies, their anatomical location and neurological consequences make their management clinically demanding. Consequently, competent nursing assessment and continuous monitoring are essential components of safe and effective brain-tumor care.

Brain and CNS tumors are especially relevant in Asia, where over half of the estimated world incidence and number of fatalities from these types of tumors occur. Cancer incidence is large in Asia, accounting for ~55% of new cases in 2022 (GLOBOCAN 2022) and there is also a difference in the extent of cancer diagnosis and cancer registration across the region (IARC, 2024). Geographical variation in reported incidence, however, should be treated with caution as reported estimates may be affected by variation in neuroimaging facilities and pathological diagnosis, cancer registration, and access to specialised services. These issues are exacerbated in South Asian countries due to inadequate specialist services, time to presentation and inequitable distribution of health care resources. These circumstances can result in more complex management of patients that reach tertiary centres with late stage disease or neurological complications. In view of the above, the need of a brain tumour in South Asia is not only epidemiological problem but also a challenge for health care professionals, especially nurses who evaluate the patient at the bedside continuously.

Brain tumors are a very heterogeneous group of primary and metastatic malignancies with significant differences in biological behaviour, anatomical location, prognosis and treatment needs. Modern neuro-oncology has transcended from the traditional histopathological classification to a combined molecular and pathological diagnosis, especially in the case of diffuse gliomas, which have developed more sophisticated treatment pathways (Weller et al., 2021). Neurosurgery, radiotherapy, chemotherapy, targeted therapy, corticosteroid therapy, anticonvulsant therapy, rehabilitation and palliative care will be needed depending on the type of tumor and clinical status. This complexity significantly adds to the knowledge and clinical judgment needed in the care of nurses who care for these patients. Nurses need to be aware of neurological changes, be vigilant about consciousness and pupil size, know what constitutes a seizure, be aware of signs and symptoms of raised ICP and be able to identify postoperative complications. Hence, brain-tumor nursing must involve knowledge of neurological, oncological, surgical, pharmacological and psychosocial aspects, in addition to general nursing competencies.

Patients with brain tumors are susceptible to many neurological complications and complications relating to treatment, which could happen quickly and need to be addressed immediately. Patients' outcomes can be significantly affected by cerebral edema, seizures, intracranial hypertension, venous thromboembolism, neurological deterioration, treatment-related neurotoxicity, infection, and impaired mobility (Roth et al., 2021). Current clinical practice guidelines focus on early detection, proper follow-up, prevention and treatment of neuro- and vascular-related complications in primary and secondary brain tumors patients. Nurses are usually the first health care worker to see the tiniest changes in a patient's nervous system and are thus well placed to observe these changes. Deterioration can be missed, which could delay medical treatment and contribute to increased morbidity. As such, the ability of nurses to recognize signs, evaluate neurological status, administer medications, take precautions, and escalate care of patients with brain tumors is a crucial aspect of patient safety. For the purposes of this study, the definition of nurses' knowledge is their cognitive understanding of safe and evidence-based care for patients with brain tumors. This knowledge includes information about tumor symptoms, neurological assessment, ICP, seizures, postoperative monitoring, medication, infection prevention, nutrition, mobility, psychological care, patient education, and recognizing clinical deterioration. The professional competence of nurses in the field of cancer care is now described as multi-faceted, including, in addition to

clinical knowledge and hands-on skills, communication, education, leadership, and evidence-based decision-making (Thamm et al., 2025). Knowledge is thus not just a product of learning, but a key component to informed clinical decision making. This distinction is especially relevant for the treatment of neuro-oncology as the disease and treatment modalities are constantly evolving. This assessment can then be used to identify the areas in which the nurse needs further education and training, as well as to ascertain the cognitive underpinnings of the nurse to deliver specialty care for the brain tumour.

Clinical practice is the observable use of professional knowledge, technical skills, clinical judgment and evidence-based standards in patient care. Appropriate practice in brain-tumor nursing may involve systematic neurological assessment, monitoring of vital and neurological parameters, seizure precautions, observation after surgery, safe medication administration, preventing complications, nutritional and fluid management, infection prevention, psychological support, educating the patient, documenting, and timely communication with the multidisciplinary team. Importantly, knowledge should not be equated with practice as nurses can have good knowledge but have not translated it into practice consistently at the bedside. Low and middle income countries have found significant differences in oncology education, and little to no evidence that it leads to successful clinical practice (Karim et al., 2021). Thus, knowledge has to be assessed in conjunction with clinical practice in order to gain a better insight into nursing competence than just knowledge assessment.

Modern competency-based concepts of nursing highlight the linkage of knowledge, skills, professional judgment, communication, and lifelong learning, and can be used to understand the relationship between knowledge and practice. The clinical capability, education, leadership, professional development and evidence-based practice are considered as interrelated aspects of high-quality oncology nursing in cancer nursing competency frameworks (Thamm et al., 2025). This means that knowledge is the cognitive aspect, while clinical practice is the behavioral aspect of knowledge in the context of real clinical situations. Other factors that could impact on the competence of a nurse include education, clinical experience, exposure to a patient with a neuro-oncology diagnosis, continuing professional development, institutional protocols, and supervision. This conceptualization is important in brain-tumor nursing as the technologies and treatments for brain tumors continually evolve, necessitating the nurses to update their knowledge. So a study of knowledge plus practice may be valuable in determining the extent to which current educational preparation is reflected in clinical practice.

The growth of cancer services has led to growing demand for nurses with specialties in oncology at the global level, but the development of oncology nursing education has not been even across health services. There is evidence of low and middle income countries that opportunities for education and training for oncology remain underdeveloped with many focused mainly on the physician without necessarily addressing healthcare professionals, other than physicians, such as nurses (Karim et al., 2021). The authors of the article by Galassi et al. (2023) also highlighted that the specialized education is a necessity for modern oncology nursing, due to the complexity of cancer treatment and enhancing patient care. Structured oncology education has also been shown to have potential for the improvement of nurses' knowledge and clinical skills in resource-poor countries (Taj et al., 2022). The results indicate that competence cannot be taken for granted just because someone has a general nursing qualification or has been working for a number of years. The specialized knowledge and ongoing professional development are especially significant for nurses who care for patients with brain tumors as rapid neurological deterioration can occur and may necessitate urgent clinical decision-making.

The scenario becomes all the more pertinent in Pakistan where cancer registration is weak, diagnostic facilities are limited, cancer specialists are not available in every part of the country and people have to travel long distances to get the benefit of advanced treatment. According to

the Pakistan Brain Tumour Epidemiology Study, there were 2,750 cases of brain tumors reported from 2019 from the main centers which included gliomas as the highest category of reported tumours (Pakistan Society of Neuro-Oncology, 2022). It also revealed the lack of national cancer registration and the need for improvement of the cancer-care system as well as the implementation of uniform treatment methodologies. For this reason, nurses in the public sector tertiary hospitals are often involved in the provision of care to patients with complex neurological and oncological issues in resource limited settings. The situation makes it more important to have effective nursing skills in assessment, monitoring, education, and supportive care. However, there is a dearth of specific evidence pertaining to knowledge and clinical actions of nurses in the context of brain tumor care in Pakistan.

The issue is examined in the context of an important setting – Jinnah Hospital, Lahore – a large tertiary teaching hospital specialized in neurosurgical services and serving a large patient population, mostly from the public sector. The hospital provides treatment for patients who need complex neurosurgical procedures, such as patients with intracranial lesions and brain tumors, so that nurses are expected to make continuous monitors of neurological functions and conduct postoperative follow-up care. Advanced neurosurgical procedures have been proven to be effective in diagnosing and managing intracranial lesions at Jinnah Hospital, and bleeding and cerebral edema are still significant postoperative complications (Kamboh et al., 2023). Nurses must be able to detect early signs of neurological changes and to alert their doctors of the deterioration in a timely manner. But the presence of advanced neurosurgical techniques does not necessarily imply the same level of nursing skills. It can then be used to measure the knowledge and the practice of nurses at this institution, which can be locally meaningful evidence of the quality and preparedness of nursing care.

Although there is growing evidence on the epidemiology, neurosurgical management and oncology nursing of brain tumors, there is still a significant lack of information about nurses' knowledge and clinical practice with patients having brain tumors in Pakistan. Previous studies in Pakistan have shown that education of structured interventions can enhance nurses' practices in the care of patients with neurological disease; for instance, Zafar et al. (2022) found that implementing nursing guidelines led to an improvement in nurses' practices for patients with traumatic brain injury in a tertiary hospital in Lahore. Traumatic brain injury and brain tumors are different clinical settings, however, and have different knowledge about things like disease progression, treatment, complications and long-term care. The literature also reflects differences in the oncology nurses' knowledge and clinical skills across the world and highlights the need for context-specific evaluation (Phothikul & Seven, 2023). Therefore, no empirical evidence is available to conclude that the brain-tumor patients nursing in tertiary hospitals of Pakistan have sufficient knowledge about the disease and they follow the right treatment consistently.

Therefore, the proposed study is justified as it falls under the influence of increasing burden of cancer, clinical complexity of brain tumors, growing demands of oncology nursing and lack of evidence regarding brain tumour competencies of nursing in Pakistan. Patients with brain tumor can develop neurological, physical, cognitive, psychological and functional impairment that needs ongoing and customized assessment by nurses. Recent evidence demonstrates that supportive and rehabilitative treatment by multiple specialists can have a positive impact on quality of life and psychological functioning in people with brain tumors. Effective supportive care hinges, however, on the ability of the nurse to detect patient need, take action as necessary, provide patient and family education and recognize complications quickly. A study of the knowledge and clinical practice of nurses at Jinnah Hospital Lahore will therefore help to establish an empirical basis to address gaps in competency and to provide impetus to specific continuing education, clinical guidelines, supervision, and quality improvement programs.

Results of the study could eventually lead to further evidence-based practice in neuro-oncology nursing and better patient safety and quality of care.

Methods

Study Design and Setting

A descriptive cross-sectional research design was used to assess nurses' knowledge and clinical practice regarding the care of patients with brain tumors at Jinnah Hospital, Lahore. The design was appropriate for assessing existing knowledge and clinical practices at a specific point in time without manipulating the study variables. The study was conducted at Jinnah Hospital, Lahore, Punjab, Pakistan, a public tertiary-care teaching hospital providing specialized medical, surgical, neurological, and neurosurgical services. Nurses working in these clinical areas are involved in neurological assessment, monitoring of vital signs and level of consciousness, seizure monitoring, recognition of raised intracranial pressure, medication administration, postoperative care, prevention of complications, and patient education.

Population and Sampling

The study population consisted of registered nurses working at Jinnah Hospital, Lahore, who were involved in direct patient care and had the potential to care for patients with brain tumors. The accessible population consisted of 500 eligible nurses. The sample size was calculated using the Raosoft sample size calculator with a 95% confidence level, 5% margin of error, and 50% response distribution. The required sample size was 218 nurses. Probability simple random sampling was used, with eligible nurses selected randomly from a sampling frame until the required sample size was achieved.

Data Collection Procedure

Following ethical approval and administrative permission, the researcher coordinated with nursing administration and relevant clinical departments to identify eligible participants. Selected nurses were approached at appropriate times, and the purpose, procedures, voluntary participation, and confidentiality of the study were explained. Written informed consent was obtained before questionnaire administration. Participants independently completed a structured questionnaire assessing demographic and professional characteristics, knowledge, and clinical practice regarding brain-tumor care. Completed questionnaires were checked for completeness, assigned identification codes, organized, coded, and entered into SPSS Version 27.

Data Analysis Procedure

Data were analyzed using SPSS Version 27. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were used for continuous variables and knowledge and practice scores. Chi-square tests were used to examine associations between categorized knowledge or practice levels and selected characteristics. Pearson or Spearman correlation was used, as appropriate, to assess the relationship between knowledge and clinical practice scores. Statistical significance was set at $p < 0.05$ with a 95% confidence level.

Results

Demographic Analysis

Table 4.1 presents the demographic characteristics of the 218 participating nurses. The findings showed that the largest proportion of nurses (44.0%) were aged 25–34 years, followed by 28.0% who were 35–44 years, while 14.7% were younger than 25 years and 13.3% were aged 45 years or above. Regarding gender, females constituted the majority of participants (66.1%), whereas males represented 33.9%. In terms of educational qualification, most nurses (57.8%) held a BSN degree, followed by Post-RN BSN (19.3%), diploma/general nursing (17.4%), and MSN or above (5.5%). Regarding professional experience, 33.0% had 5–9 years of experience, 26.6% had less than 5 years, 24.8% had 10–14 years, and 15.6% had 15 years or more. Overall, the sample represented nurses with diverse demographic and professional backgrounds.

Table 4.1**Distribution of Nurses According to Demographic Characteristics (N = 218)**

Demographic characteristic	Category	f	%
Age	<25 years	32	14.7
	25–34 years	96	44.0
	35–44 years	61	28.0
	≥45 years	29	13.3
Gender	Male	74	33.9
	Female	144	66.1
Educational qualification	Diploma/General Nursing	38	17.4
	BSN	126	57.8
	Post-RN BSN	42	19.3
	MSN or above	12	5.5
Nursing experience	<5 years	58	26.6
	5–9 years	72	33.0
	10–14 years	54	24.8
	≥15 years	34	15.6

Table 4.2 describes the professional characteristics of nurses related to brain-tumor care. The findings indicated that 70.6% of nurses had previous experience caring for patients with brain tumors, whereas 29.4% had no such experience. However, only 37.6% reported having received previous neurological or neurosurgical training, while 62.4% had not received such training. Regarding experience in neurological or neurosurgical care, 47.2% had 1–5 years of experience, 30.8% had more than 5 years, and 22.0% had less than one year. Approximately one-third of nurses (33.5%) frequently cared for patients with brain tumors, while 41.7% did so sometimes and 24.8% rarely. Notably, only 34.9% had received specific training related to brain-tumor care, suggesting a potential need for structured continuing education and specialized nursing training.

Table 4.2**Professional Characteristics of Nurses Related to Brain-Tumor Care (N = 218)**

Professional characteristic	Category	f	%
Experience caring for brain-tumor patients	Yes	154	70.6
	No	64	29.4
Previous neurological/neurosurgical training	Yes	82	37.6
	No	136	62.4
Experience in neurological/neurosurgical care	<1 year	48	22.0
	1–5 years	103	47.2
	>5 years	67	30.8
Frequency of caring for brain-tumor patients	Rarely	54	24.8
	Sometimes	91	41.7
	Frequently	73	33.5
Previous brain-tumor care training	Yes	76	34.9
	No	142	65.1

Figure 1 demonstrates the overall level of nurses' knowledge regarding the care of patients with brain tumors. The findings showed that more than half of the participants (51.8%) had a

moderate level of knowledge, while 30.3% demonstrated good knowledge and 17.9% demonstrated poor knowledge. These findings indicate that although a considerable proportion of nurses possessed adequate knowledge, the majority did not achieve the highest knowledge category. The presence of poor knowledge among nearly one-fifth of participants may represent an important educational gap, particularly because brain-tumor patients require timely neurological assessment, recognition of complications, appropriate postoperative care, and continuous monitoring. Therefore, the findings suggest a need for targeted educational interventions to strengthen nurses' knowledge and improve the consistency of evidence-based brain-tumor care.

Figure 1

Level of Nurses' Knowledge Regarding the Care of Patients with Brain Tumors (N = 218)

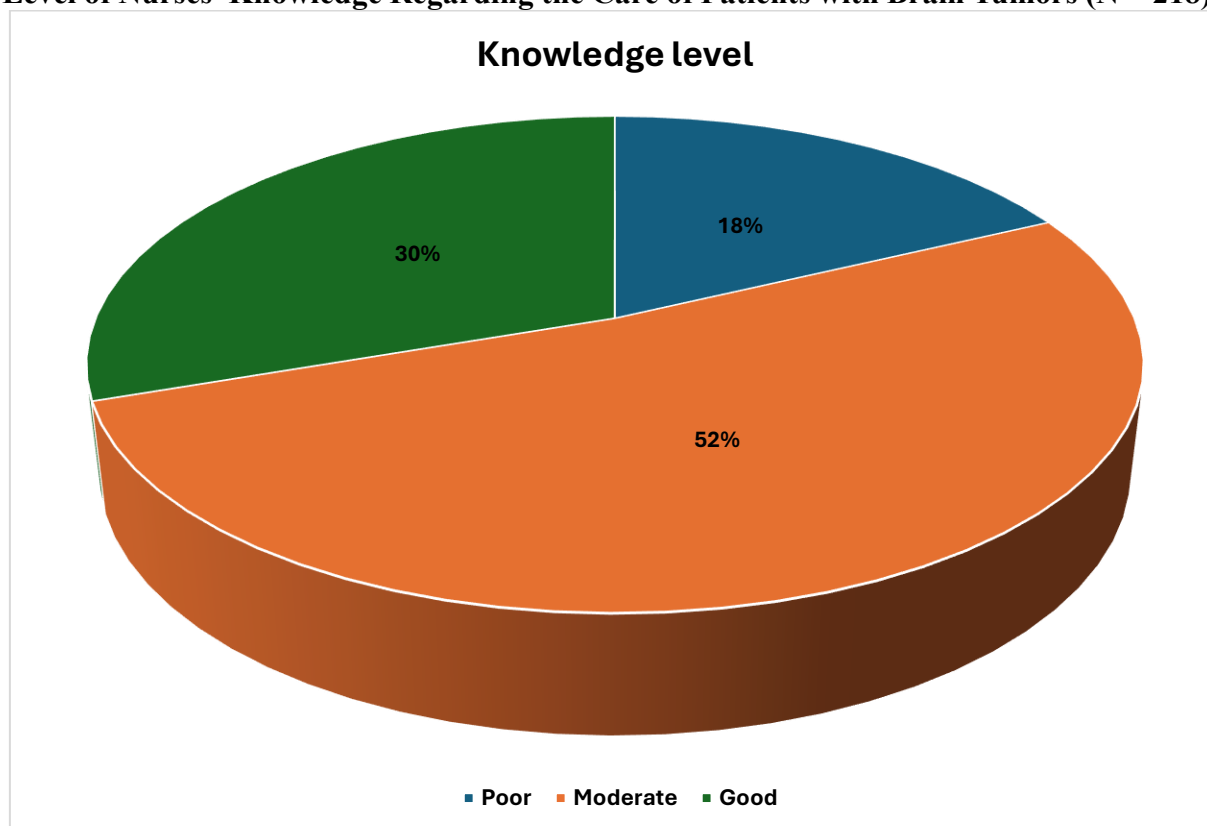


Table 3 presents the descriptive statistics for nurses' knowledge regarding brain-tumor care. The mean knowledge score was 20.84 ± 4.21 out of a possible 30 points, with individual scores ranging from 9 to 29. The mean score indicates that, overall, participants demonstrated a moderate level of knowledge regarding the care of patients with brain tumors. The standard deviation of 4.21 indicates a noticeable variation in knowledge levels among participants, suggesting that nurses did not have a uniform understanding of brain-tumor care. The relatively wide range between the minimum and maximum scores further demonstrates differences in individual knowledge. These findings highlight the importance of identifying specific knowledge deficiencies and providing continuing professional education focused on neurological assessment, increased intracranial pressure, seizure management, postoperative care, and recognition of clinical deterioration.

Table 4.4

Descriptive Statistics of Nurses' Knowledge Regarding Brain-Tumor Care (N = 218)

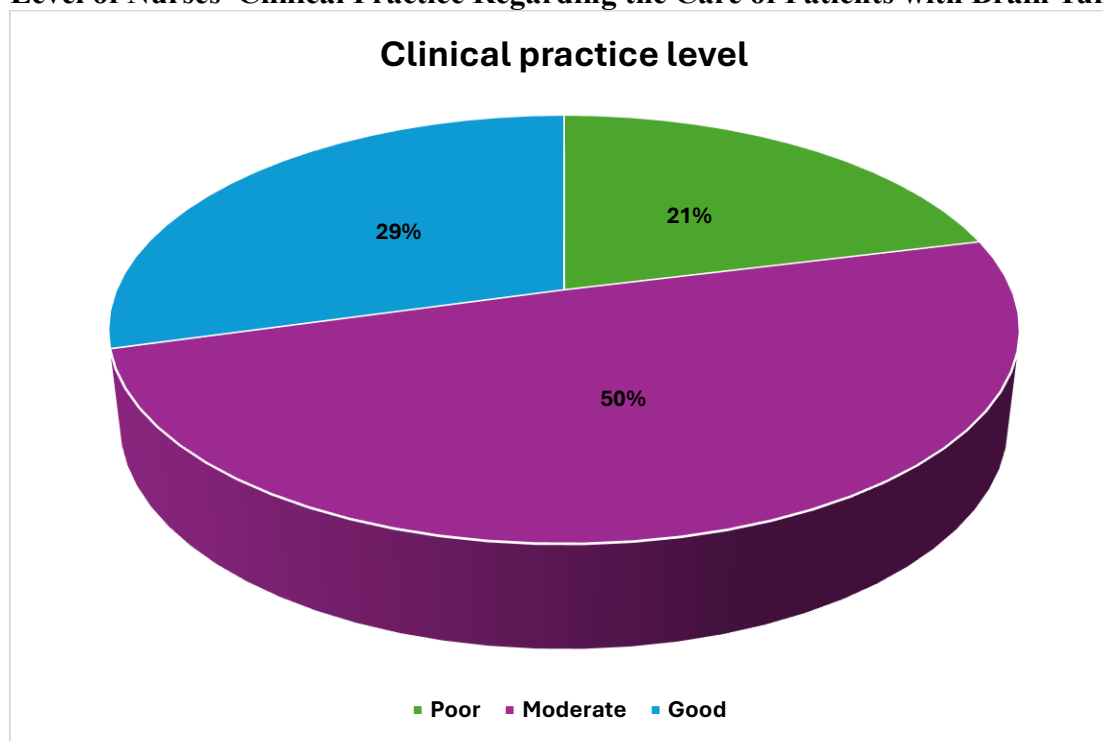
Variable	Possible score	Mean	SD	Minimum	Maximum
Knowledge score	0–30	20.84	4.21	9	29

Figure 2 presents the level of nurses' clinical practice regarding the care of patients with brain tumors. The findings indicated that 49.5% of nurses demonstrated a moderate level of clinical

practice, while 29.4% demonstrated good practice and 21.1% demonstrated poor practice. Thus, nearly half of the participants were categorized as having moderate clinical practice, whereas approximately one-fifth demonstrated poor practice. These findings suggest that although some nurses may consistently perform appropriate brain-tumor care activities, considerable variation exists in the implementation of recommended clinical practices. The proportion of nurses with poor practice is particularly important because inadequate neurological monitoring, delayed recognition of complications, inappropriate postoperative care, or insufficient patient education may negatively affect patient safety. Strengthening clinical supervision, competency-based training, and adherence to standardized protocols may therefore be beneficial.

Figure 2

Level of Nurses' Clinical Practice Regarding the Care of Patients with Brain Tumors



Table

4.6 Table 4. presents the association between nurses' knowledge and selected professional characteristics. The findings showed a statistically significant association between previous experience caring for brain-tumor patients and knowledge level ($\chi^2 = 8.42$, $p = .015$). Similarly, previous neurological or neurosurgical training was significantly associated with knowledge ($\chi^2 = 18.76$, $p < .001$), with trained nurses demonstrating a greater proportion of good knowledge. Nursing experience was also significantly associated with knowledge level ($\chi^2 = 10.31$, $p = .036$), as the proportion of nurses with good knowledge increased among those with greater professional experience. These findings suggest that both formal specialized training and accumulated clinical exposure may contribute to improved knowledge regarding brain-tumor care.

Table 4.

Association Between Nurses' Knowledge and Selected Professional Characteristics

Variable	Category	Poor (%)	n	Moderate (%)	n	Good (%)	n	χ^2	p
Previous brain-tumor experience	Yes	20 (13.0)	78	50.6	56	36.4		8.42	.015
	No	19 (29.7)	35	54.7	10	15.6			
Neurological training	Yes	7 (8.5)	38	46.3	37	45.2		18.76	<.001
	No	32 (23.5)	75	55.1	29	21.4			

Nursing experience	<5 years	16 (27.6)	31 (53.4)	11 (19.0)	10.31	.036
	5–9 years	13 (18.1)	39 (54.2)	20 (27.7)		
	≥10 years	10 (11.4)	43 (48.9)	35 (39.8)		

Note. χ^2 = Chi-square; $p < .05$ indicates statistical significance.

Table 4.8 demonstrates the association between nurses' clinical practice and selected professional characteristics. Previous experience caring for brain-tumor patients was significantly associated with clinical practice ($\chi^2 = 9.67$, $p = .008$), indicating that nurses with direct experience were more likely to demonstrate good practice. Previous neurological or neurosurgical training also showed a statistically significant association with practice ($\chi^2 = 14.52$, $p = .001$), with 41.5% of trained nurses demonstrating good practice compared with 22.1% among those without training. Nursing experience was similarly associated with clinical practice ($\chi^2 = 11.74$, $p = .019$), with good practice more frequently observed among nurses with 10 or more years of experience. These findings indicate that both specialized training and practical clinical exposure may play important roles in strengthening nurses' performance in brain-tumor care.

Discussion

In the present study, 66.1% of the nurses were females, 57.8% were BSN qualified and the largest age group (44.0%) of the nurses was between 25 and 34 years old. The largest professional group of nurses were those with 5–9 years of experience (33.0%). The results suggest that the sample consisted mainly of relatively younger, working nurses and having only undergraduate training. The demographic pattern is significant for brain-tumor nursing because clinical experiences and educational training could affect the ability of nurses to identify neurocognitive changes and provide specialized nursing care. Another study on nurses caring for patients with glioma in 2025 also found that age, duration of employment, educational level and job position were associated with differences in the level of nursing knowledge, attitudes and practices (Weng et al., 2025).

Seventy percent and 37.6% of nurses had previous experience with brain-tumor patients, respectively, and received no neurological and neurosurgical training. Given the relatively high volume of clinical exposure and limited specialized training, nurses might be expected to gain extensive knowledge of brain-tumor care in the course of their typical clinical experiences without formal training. Weng et al. (2025) found that there were significant differences in the levels of knowledge, attitudes and practices of nurses in relation to professional and educational characteristics of nurses caring for patients with glioma. The finding is in line with the concern discovered by Tokunaga et al. (2025) that insufficient nursing knowledge and skills is an ongoing challenge in brain-tumor rehabilitation nursing.

In conclusion, the present study revealed that 51.8% of the nurses had moderate level of knowledge on brain-tumor care, 30.3% had good knowledge and 17.9% had poor knowledge. The overall level of knowledge was also moderate as reflected in the mean knowledge score of 20.84 ± 4.21 . The discovery indicated that the majority of nurses had a general knowledge about the treatment of brain tumors and were not consistently highly competent. Another key limitation in brain-tumor rehabilitation care identified by Tokunaga et al. (2025) was the lack of knowledge and skills among nurses. The similarity supports the interpretation that specialized brain tumor nursing will require skills and abilities that go beyond basic nursing training, including the assessment skills of the neurological nurse, the ability to prevent complications, the skills to promote rehabilitation, and the skills to provide multi-disciplinary care.

Based on the moderate knowledge in the present study, continuous nursing assessment is needed because brain-tumor patients might get together with complex neurological, functional, psychological and treatment related problems. Any changes in consciousness, neurological

status, seizures, functional ability, and other complications should be recognised by the nurse and communicated in a timely manner; if clinically significant. Tokunaga et al. (2025) determined that nursing duties in brain-tumor rehabilitation involved information gathering, secondary complications prevention and management, family support and coordination with other healthcare providers. The present findings indicate that moderate knowledge can be a starting point for the above-mentioned responsibilities but it may not be enough to consistently provide highly specialized care.

The level of clinical practice was also high, with higher percentage of the nurses showing moderate clinical practice (49.5%), good clinical practice (29.4%) and poor clinical practice (21.1%). The mean practice score was 27.36 ± 5.63 . The findings that knowledge and practice were both moderate indicate that the clinical performance of nurses may be influenced by a lack of knowledge and specific training. Weng et al (2025) analyzed the knowledge, attitude, and practice of nurses who treat individuals with gliomas and particularly the need to turn evidence-based nursing knowledge into clinical practice. The present results highlight the importance of investigation of not only knowing the interventions but their actual application in clinical practice.

There was a significant correlation between previous brain-tumour care experience and nurses' knowledge ($\chi^2 = 8.42$, $p = .015$). A higher percentage of good knowledge was shown by nurses with prior experience than by those without. There was also a significant correlation between neurological/neurosurgical training and knowledge ($\chi^2 = 18.76$, $p < .001$). The study by Weng et al. (2025) was congruent with the findings of the current study as they found that age, length of time working in the profession, education and professional characteristics had a significant impact on nursing knowledge, suggesting that the factors that could affect competency, such as professional exposure and preparation, can impact nursing knowledge. The present findings suggest that clinical exposure can be a part of knowledge development; however, formal neurological training might be more structured in developing specialized knowledge.

In the current study clinical practice was significantly associated with previous brain tumor care experience ($\chi^2 = 9.67$, $p = .008$) and neurological or neurosurgical training ($\chi^2 = 14.52$, $p = .001$). The proportion of good practice was higher for nurses with neurological training compared to those without this training. This study reinforces the idea that focused education and frequent exposure to a clinical setting can have a positive effect on the skill of the nurse to transfer the theoretical information into patient care activities. Tokunaga et al. (2025) concluded that nurses play a crucial role in prevention and management of secondary complications, patient support, and the coordination of multidisciplinary professionals, and that insufficient knowledge and skills are obstacles to the effective rehabilitation nursing.

A significant positive correlation between knowledge and clinical practice was found in the present study ($r = 0.62$, $p < .001$). There was a positive correlation between knowledge scores and the nurses' perceptions of clinical practice, and those who had higher knowledge scores were more likely to perceive higher clinical practice, suggesting that knowledge may be an important element in competent brain-tumor nursing care. This result confirms the previous finding from the 2025 glioma nursing study conducted by Weng et al. that reviewed the relationship between knowledge, attitudes and practice and highlighted the implementation of evidence-based nursing knowledge into clinical practice. In the present study, the strength of the association does not imply causation because the cross sectional design does not allow for temporality to be determined. Other factors that can also affect practice are: clinical experience, training, staffing, clinical protocols, supervision and resources.

Moderate knowledge and clinical practice found in this study has implications for long-term supportive care and rehabilitation. Brain-tumor nursing involves more than just alertness to acute neurological changes; it also involves working to prevent secondary complications, assisting with functioning, educating patients, involving families, and coordinating with

rehabilitation specialists. Tokunaga et al. (2025) discussed the importance of nursing roles that include information management, continuation of rehabilitation, prevention of secondary complications, family support and multidisciplinary collaboration. O'Donovan et al. (2025) also found that rehabilitation interventions for adults with brain tumors can have positive effects and highlighted a lack of consistent evidence use in practice and guidelines. The present findings may help indicate the types of support that emphasizing nurses' knowledge and clinical skills could provide to help in the more regular and uniform application of these more comprehensive care responsibilities.

The overall findings show that there is a gap between routine and specific competence in brain-tumor nursing in Jinnah Hospital, Lahore. Although most nurses had taken care of brain tumor patients, fewer than two-fifths were trained in neurological/neurosurgical care, and knowledge and practice were still largely moderate. There is a strong link between professional experience, specialised training, knowledge and practice and this could be used to further enhance the importance of continuous professional development. Tokunaga et al. (2025) found that brain-tumor rehabilitation nursing is still in its early stages and that more evidence and expertise need to be gained. The present study is the first to bring a tertiary-care Pakistani perspective to the nursing workforce and contributes to the creation of structured education, competency-based assessment, clinical protocols, and periodic training of nurses involved in the care of patients with brain tumors.

Conclusion:

The present study aimed to evaluate the knowledge and clinical practice of the nurses about the management of patients with brain tumor in Jinnah Hospital, Lahore. The results showed that majority of nurses had moderate knowledge (51.8%) and moderate level of clinical practice (49.5%) while 17.9% had poor knowledge and 21.1% had poor clinical practice. The mean of the knowledge score was 20.84 ± 4.21 and the mean of clinical practice score was 27.36 ± 5.63 . Knowledge and clinical practice correlated well with previous experience of care of brain tumors and neurological/neurosurgical training. The other statistically significant positive correlation was between knowledge and clinical practice ($r = 0.62$; $p < .001$). The results indicated that nurses have a good basis for care and support of patients with brain tumours, but also that there are significant areas of gap in their specialised knowledge and clinical competence. To reinforce nursing practice and enhance patient safety and outcomes, there is a requirement for structured neurological/neurosurgical education, regular competency evaluations, evidence based clinical guidelines and ongoing professional development

Recommendations

The following recommendations are suggested based on the results obtained from the study:

1. Continuous educational activities should be set up for the nurses regarding extensive brain-tumor nursing care, especially neurological assessment, seizure management, increased ICP, postoperative care, and neurological deterioration.
2. Nurses who work in departments where patients with brain tumors are often admitted should receive specialized neurological and/or neurosurgical training.
3. The hospital should establish common evidence-based nursing procedures and standards to evaluate and manage brain tumour patients.
4. Nurses should be assessed periodically to determine their proficiency in a competency-based manner in the following areas: Practical skills in neurological assessment, monitoring, medication administration, seizure precautions, postoperative care, and prevention of complications.
5. Advances in brain-tumor treatment and brain-tumor nursing management should be the regular continuing professional development (CPD) sessions for nurses.

6. Nursing administrators should reinforce clinical supervision and mentorship, especially for nurses who do not have extensive experience in neurological and neurosurgical care.
7. There needs to be more focus on patient/family education, disease education, medication adherence, warning signs, seizure precautions, rehabilitation, and follow-up care.
8. Cooperation should be enhanced between different groups of healthcare providers, especially between nurse, neurosurgeon, neurologist, oncologist, rehabilitators, psychologists and others.
9. The study should be replicated with a larger sample and more hospitals to find greater generalizability of the results for nurses in the care of patients with brain tumors in Pakistan.
10. Observational assessment of clinical practice should be taken into consideration in future studies instead of just the self-reported practice to get a better objective assessment of nursing competency.

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