

KNOWLEDGE OF TUMOR LYSIS SYNDROME MANAGEMENT AMONG NURSES AT A TERTIARY CARE HOSPITAL IN KARACHI

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Abstract

Tumor Lysis Syndrome (TLS) is a potentially life-threatening oncologic emergency characterized by severe metabolic disturbances resulting from the rapid destruction of malignant cells. Nurses play a pivotal role in the early identification, prevention, and management of TLS; therefore, adequate knowledge is essential for ensuring patient safety and improving clinical outcomes. This study aimed to assess the knowledge of Tumor Lysis Syndrome management among nurses working in a tertiary care hospital. A quantitative, descriptive cross-sectional research design was employed to achieve the study objective. The study was conducted among 33 registered nurses selected through a convenience sampling technique. Data were collected using a structured self-administered questionnaire consisting of demographic characteristics and knowledge-based questions related to the definition, risk factors, clinical manifestations, prevention, monitoring, and emergency management of TLS. The validity of the instrument was ensured through expert review, and ethical considerations were maintained throughout the study. Data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the findings. The results indicated that nurses possessed an overall satisfactory level of knowledge regarding Tumor Lysis Syndrome. Most participants correctly identified the definition of TLS, high-risk patients, the significance of hydration, laboratory monitoring, prevention of hyperuricemia, and the management of hyperkalemia-related complications. However, some knowledge gaps were observed in specific areas related to emergency nursing management and pharmacological interventions. The study concluded that while nurses demonstrated adequate knowledge of TLS management, continuous professional education is necessary to address identified deficiencies and maintain competency in managing oncologic emergencies. Based on the findings, it is recommended that healthcare institutions

implement regular in-service training programs, simulation-based learning activities, and evidence-based clinical guidelines to strengthen nurses' knowledge and enhance the quality and safety of patient care.

INTRODUCTION

Tumor Lysis Syndrome (TLS) is a severe oncologic emergency that develops following the rapid destruction of malignant cells, either spontaneously or after the initiation of anticancer therapy. Rapid lysis of the tumor cells releases intracellular potassium, phosphate and nucleic acids into the circulation and leads to metabolic derangements such as hyperkalemia, hyperphosphatemia, hypocalcemia and hyperuricemia. Such abnormalities can aggravate fast and can cause acute kidney injury, cardiac arrhythmias, seizures, multiple organ dysfunction, and death if preventive and therapeutic measures are not taken in a timely manner (Adeyinka & Bashir, 2024; Bociek & Lunning, 2025). TLS is more commonly associated with hematological malignancies including acute leukemia and high-grade lymphoma. However, recent reports suggest that TLS can also be a complication of patients with solid tumors, especially with high tumor burden or treatment with highly effective anti-cancer therapies.

TLS is clinically important because of its rapid onset and potential fatal consequences. In highly vulnerable patients, TLS can occur within hours to a few days after chemotherapy, immunotherapy, targeted therapy, radiotherapy or even invasive procedures. In some cases, spontaneous TLS can occur before treatment even starts, particularly in patients who have large tumors, high lactate dehydrogenase levels, poor kidney function, dehydration, or fast-growing cancers (Bociek & Lunning, 2025; Kumar et al., 2026). Because clinical signs of TLS can be nonspecific early in the course of the disorder (e.g., nausea, vomiting, weakness, muscle cramps, decreased urine output, restlessness, or altered cardiac rhythm), the ability of nurses to associate the patient's symptoms with laboratory abnormalities and risk factors is critical for early recognition.

Nurses working in tertiary care hospitals have a key role in the prevention, early recognition and management of TLS. Nurses, being frontline

healthcare providers, are constantly monitoring patients' vital signs, intake and output, lab reports, hydration status, cardiac rhythm, and response to chemotherapy or supportive medications. This knowledge is especially important because prevention of TLS begins before development of complications. Nursing roles include identifying high risk patients, ensuring adequate hydration, monitoring urine output, reporting abnormal levels of serum potassium, phosphate, calcium, uric acid, creatinine and lactate dehydrogenase and assisting in the timely administration of medications such as allopurinol or rasburicase when prescribed (British Society for Haematology, 2025; Ly et al., 2019). Thus, sufficient nursing knowledge is required not only for patient monitoring but also for timely communication and interdisciplinary coordination.

Evidence-based management of TLS is based on risk assessment, early prophylaxis, laboratory monitoring, hydration, correction of electrolyte imbalance, uric-acid-lowering therapy and renal support when needed. The updated guidance from the British Society for Haematology notes that delayed or omitted treatment, including delays in rasburicase administration, can be associated with patient harm and that a lack of staff knowledge can contribute to such delays (British Society for Haematology, 2025). The finding is particularly relevant for nurses as oncology care requires rapid clinical judgment and coordinated response. Poor awareness of the risk factors, laboratory criteria and emergency management of TLS may lead to delayed escalation of care and increased morbidity and mortality in cancer patients.

The worldwide burden of cancer has increased the demand for safe and competent oncology nursing practice. Cancer is still one of the major public health problem in Pakistan with increasing number of patients requiring diagnosis, chemotherapy, radiotherapy and supportive oncology care. Tertiary care hospitals generally manage complicated oncology cases and critically

ill patients who are at higher risk of treatment-related emergencies. In such settings, nurses are expected to provide specialized care, monitor high risk patients and respond appropriately to complications. However, in many low- and middle-income countries, oncology nursing education and continuous professional development may not be available in a uniform manner, and nurses' knowledge and clinical preparedness may vary. Evaluating knowledge is a crucial step in improving nursing practices. Quantitative descriptive research design is appropriate when the purpose of a study is to evaluate the existing knowledge level among specified participants. Such a design can help to determine whether nurses have adequate knowledge about causes, risk factors, clinical manifestations, laboratory abnormalities, prevention and management strategies in the context of TLS. The findings may also identify specific educational needs and provide evidence for planning in-service education, clinical protocols, and competency-based oncology nursing education. The hypothesis of the present study is that nurses working in a tertiary care hospital have adequate knowledge regarding the management of Tumor Lysis Syndrome. Testing this hypothesis is important because nurses' knowledge directly affects early recognition, timely reporting, preventive care, and patient safety. The study assessing nurses' knowledge on TLS management may help to strengthen the oncology nursing practice and improve patient outcomes in tertiary care settings.

PROBLEM STATEMENT

Tumor Lysis Syndrome (TLS) is a life-threatening oncologic emergency that requires early recognition, accurate interpretation of laboratory data, and prompt intervention. The recent literature continues to emphasize that delayed prevention and treatment of TLS can lead to severe metabolic disturbances, acute kidney injury, cardiac dysrhythmias, seizures, and mortality (Bociek & Lunning, 2025; Molyneux et al., 2025). The updated guidance from the British Society for Haematology also identifies patient-safety issues among healthcare professionals, including nurses, as delayed or non-delivery of critical TLS

medication, and lack of staff knowledge (British Society for Haematology, 2025). Based on clinical observations in the setting of tertiary care, it is suggested that some nurses may not be able to consistently recognize high risk patients, understand laboratory abnormalities or identify early signs and complications of TLS. These gaps may delay escalation of care and contribute to adverse outcomes in oncology patients.

Despite increasing cancer burden and complexity of oncology care in Pakistan, there is limited local evidence on nurses' knowledge of TLS management. Recent evidence from Pakistan has shown that TLS can be observed spontaneously in patients with testicular germ cell tumors, thus demonstrating the relevance of TLS within local oncology practice (Kumar et al., 2026). Furthermore, recent case-based and review literature shows that TLS can occur not only after chemotherapy but also in high-burden solid tumors and after diagnostic or therapeutic procedures, thereby highlighting the importance of nurses' knowledge in the field of oncology, emergency, and critical care units (Mao et al., 2025). Hence, nurses' knowledge of management of TLS needs to be assessed to identify educational gaps, improve clinical preparedness and support evidence-based nursing practice in tertiary care hospitals. The purpose of this study is to assess the adequacy of knowledge of nurses working at tertiary care hospital on the management of Tumor Lysis Syndrome.

OBJECTIVES OF THE STUDY

To assess the knowledge of Tumor Lysis Syndrome management among nurses at a tertiary care hospital.

RESEARCH QUESTION

What is the level of knowledge regarding Tumor Lysis Syndrome management among nurses working at a tertiary care hospital?

RESEARCH HYPOTHESES

Alternative Hypothesis (H_1)

Nurses working at a tertiary care hospital possess adequate knowledge regarding the management of Tumor Lysis Syndrome.

Null Hypothesis (H_0)

Nurses working at a tertiary care hospital do not possess adequate knowledge regarding the management of Tumor Lysis Syndrome.

LITERATURE REVIEW

Tumor Lysis Syndrome is considered to be one of the most serious metabolic emergencies in oncology. It is due to rapid lysis of malignant cells with release of intracellular substances into the circulation. The characteristic biochemical abnormalities are Hypouricemia, hyperkalemia, hyperphosphatemia and hypocalcemia. If these changes are not treated in time, they can lead to renal impairment, cardiac arrhythmias, seizures, and sudden death (Adeyinka & Bashir, 2024; Bociek & Lunning, 2025). The Cairo-Bishop classification remains the most commonly used system to define laboratory and clinical TLS, however recent reviews highlight that clinical judgement is just as important as patient risk may quickly change during cancer treatment (Molyneux et al., 2025).

Risk assessment is an integral part of TLS prevention. Patients with hematological malignancies, including acute leukemia, Burkitt lymphoma, and aggressive non-Hodgkin lymphoma, are frequently considered to be at high risk. However, recent evidence suggests that TLS might also develop in solid tumors, especially in the context of a high tumor burden, extensive metastatic disease, impaired renal function, or rapid tumor response to therapy (Mao et al., 2025). In a case series from a cancer center in Lahore, Kumar et al. (2026) reported spontaneous tumor lysis in patients with testicular germ cell tumors (Kumar et al., 2026). The study highlighted that TLS is clinically relevant in Pakistan and may occur even before the onset of anticancer treatment (Kumar et al., 2026). This widening of the risk profile emphasizes the importance of nursing vigilance in oncology and tertiary care settings. Prevention and management of TLS require prompt interdisciplinary care. Evidence-based management includes risk identification, hydration initiation, fluid balance monitoring, regular laboratory evaluation, correcting electrolyte abnormalities, uric-acid-

lowering therapy, and escalation of care in case renal replacement therapy is required (British Society for Haematology, 2025; Bociek & Lunning, 2025). The British Society for Haematology guideline update was performed to address patient-safety concerns, including delayed administration of rasburicase and lack of staff knowledge of the criticality of TLS treatment. This suggests that TLS management is a medical, systems, and education issue, where nursing preparedness can impact patient safety.

Nurses are closely involved in the prevention and early detection of TLS. Nurses are responsible for constant monitoring of patient condition, providing prescribed therapies, keeping track of intake and output, reviewing laboratory results and reporting clinical deterioration. Oncology nurses are expected to understand the significance of elevated potassium, phosphate, uric acid, creatinine, and lactate dehydrogenase levels and decreased calcium levels in suspected TLS (Ly et al., 2019; Oncology Nursing Society, 2018). Early symptoms that should be reported and intervened timely include nausea, vomiting, weakness, muscle cramps, decrease in urine output, confusion and cardiac irregularities. Lack of knowledge may therefore result in delayed recognition and poor clinical outcome. The literature also indicates that continuing education for nurses is necessary as oncology care is rapidly evolving. Novel therapies, targeted treatments, immunotherapies, and aggressive treatment protocols may change the risk and timing of TLS (Bociek & Lunning, 2025). In tertiary care hospitals, nurses may be caring for patients with complex malignancies, multiple comorbidities, and high risk treatment plans. In such settings, knowledge gaps may arise if nurses are not provided with regular updates, simulation-based training or access to institutional TLS protocols. This is especially true in low- and middle-income countries where the provision of specialized training for oncology nursing may vary from institution to institution.

The available literature supports the need for assessment of nurses' knowledge of TLS management. The quantitative descriptive study can provide measurable data on the nurses' understanding of TLS definition, risk factors,

clinical signs, laboratory findings, prevention and management. This evidence can assist hospital administrators, educators of nurses and oncology departments in developing targeted educational programs. The study may help identify knowledge gaps that could lead to safer oncology care, better emergency preparedness and improved patient outcomes in tertiary care hospitals.

RESEARCH METHODOLOGY

Research Design

The study was a quantitative descriptive cross-sectional study design. This design was appropriate as the study sought to find out the level of knowledge of registered staff nurses about the management of Tumor Lysis Syndrome at a particular point in time. A descriptive design was used to describe the knowledge of nurses about risk factors, clinical manifestations, laboratory findings, prevention, complications and management of Tumor Lysis Syndrome without manipulation of any variables. The cross-sectional design helped to collect information from the participants in a specific period making it an appropriate measurement of the present knowledge of nurses working in oncology units of a tertiary care hospital.## How the Sample Was Selected

Sampling Technique:

The study participants were selected using a non-probability convenience sampling technique. This technique was deemed appropriate because the participants were selected based on their availability, accessibility and willingness to participate during the data collection period. The study population comprised of registered staff nurses working in the oncology units of a tertiary care hospital that provides oncology and hematology services. Thirty staff nurses participated in the study. Registered staff nurses working in oncology units and willing to participate were the inclusion criteria. Nurses on leave during the data collection period, nursing students, interns and nurses who were unwilling to participate were excluded from the study.## Data Collection Instrument

Data Collection Tool:

Data were collected using pre-tested structured self-administered questionnaire developed based on the study objectives and review of relevant literature on Tumor Lysis Syndrome. The questionnaire was divided in two parts. A Section included demographic information including age, gender, professional qualification, years of clinical experience and experience in oncology units. Section B included knowledge-based questions on Tumor Lysis Syndrome (TLS) covering definition, risk factors, signs and symptoms, laboratory abnormalities, complications, prevention, and management. The questionnaire was administered to the participants during their duty hours and they completed it independently. Content validity of the tool was established by review from experts in nursing research and oncology. Reliability was measured using Cronbach's Alpha coefficient on a pilot study of 10% of the sample. A reliability coefficient value of 0.70 and above was considered acceptable (Polit & Beck, 2021).## Ethical considerations

Ethical Consideration:

Ethical approval was taken from the concerned institutional review board or ethical review committee before data collection. Formal approval was also taken from the hospital management and concerned nursing authorities. All participants were clearly explained the purpose of the study and informed consent was obtained before distributing the questionnaire. Participation in the study was voluntary and participants were told that they could withdraw from the study at any stage without any penalty. Confidentiality and anonymity were guaranteed by not writing down participants' names on the questionnaire. All data collected were stored securely and used only for research purposes. The study did not cause any physical, psychological or professional harm to the participants.

DATA ANALYSIS:

Data was analyzed using IBM SPSS version 27. The descriptive statistics was run to test the level of knowledge of nurses regarding management of Tumor Lysis Syndrome.

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Gender	33	1	2	1.18	.392
Education	33	1	4	2.39	1.116
Experience	33	1	4	2.76	1.226
Workplace	33	1	4	1.18	.727
Workshop	33	1	2	1.36	.489
Tumor Lysis Syndrome (TLS) is best defined as	33	1	3	1.97	.305
Which laboratory marker may indicate a high tumor burden and increased TLS risk	33	1	5	3.09	.678
TLS most commonly occurs in patients with	33	1	4	2.91	.579
Which patient is at the highest risk of developing TLS	33	1	2	1.97	.174
Hyperuricemia in TLS results from	32	1	5	2.97	.647
The organ most commonly affected by TLS is	32	1	3	2.91	.390
Why is hydration important in TLS	33	1	2	1.97	.174
Which medication is commonly used to prevent hyperuricemia in TLS	33	1	2	1.97	.174
According to TLS management guidelines nurses should closely monitor	33	1	3	2.88	.485
Severe hyperkalemia may cause	33	1	3	2.94	.348
Why is insulin administered in TLS related hyperkalemia	33	1	3	2.79	.600
What is the primary role of calcium gluconate in TLS related hyperkalemia	33	1	3	2.70	.728
Which statement regarding calcium gluconate is correct	33	1	5	2.00	.661
Sodium bicarbonate may be administered in TLS related hyperkalemia because it	33	1	4	2.03	.467

The nurse's most important role in TLS management is	32	1	4	3.00	.440
Which cardiac complication is most commonly associated with severe hyperkalemia in Tumor Lysis Syndrome	33	1	5	2.94	.747
A patient with TLS develops hyperkalemia and ECG changes. What should be the nurse's priority action	33	1	3	2.73	.674
A patient with Tumor Lysis Syndrome develops severe hyperkalemia with ECG changes. Which medication should be administered first to protect the heart	33	2	5	2.94	.609
Which outcome indicates effective management of Tumor Lysis Syndrome	33	1	5	2.88	.893
The primary goal of nursing emergency management in TLS is to:	33	1	5	2.18	.769
Valid N (listwise)	31				

Descriptive statistics were calculated for 33 nurses who took part in the study. The demographic characteristics showed that the participants were mostly a homogeneous group as there was a low standard deviation for Gender ($M = 1.18$, $SD = 0.392$). Participants' education levels were moderately varied ($M = 2.39$, $SD = 1.116$) and professional experience was more varied ($M = 2.76$, $SD = 1.226$). Most participants were in similar workplace environments ($M=1.18$, $SD=0.727$) and a significant number had attended relevant workshops or training sessions ($M=1.36$, $SD=0.489$). These results indicate that the sample was varied in terms of educational background and clinical experience and this may account for different levels of knowledge about Tumor Lysis Syndrome (TLS) and its management.

Knowledge related variables analysis revealed that respondents had generally good understanding of TLS. Questions on the definition of TLS ($M=1.97$, $SD=0.305$), identification of high-risk patients ($M=1.97$, $SD=0.174$), importance of hydration

($M=1.97$, $SD=0.174$), prevention of hyperuricemia ($M=1.97$, $SD=0.174$) and monitoring requirements in accordance with TLS management guidelines ($M=2.88$, $SD=0.485$) showed high mean scores. Participants also had a good knowledge of the complications of hyperkalemia, including severe cardiac manifestations ($M = 2.94$, $SD = 0.348$) and appropriate emergency interventions ($M = 2.73$, $SD = 0.674$). In addition, respondents were aware of the role of calcium gluconate ($M = 2.70$, $SD = 0.728$) and insulin administration in TLS-related hyperkalemia ($M = 2.79$, $SD = 0.600$). The mean score of nursing emergency management in TLS's main goal was relatively lower ($M = 2.18$, $SD = 0.769$), indicating potential gaps in some aspects of emergency care. In conclusion, the results support that nurses had adequate knowledge of TLS pathophysiology, risk factors, prevention strategies, and emergency management, but targeted educational interventions may further improve understanding in specific clinical areas.

Discussion:

A study was conducted to evaluate the knowledge of management of Tumor Lysis Syndrome (TLS) among nurses working in tertiary care hospital. The results indicated a good knowledge level among the participants regarding the fundamental concepts, risk factors, prevention strategies, and emergency management of TLS. The majority of the nurses correctly recognized the definition of TLS, high-risk patient populations, hydration and the use of medications such as allopurinol to prevent hyperuricemia. These results are encouraging because TLS is still a life-threatening oncologic emergency that requires prompt recognition and intervention to prevent acute kidney injury, cardiac arrhythmias and mortality. Recent evidence suggests that continuous monitoring of laboratory parameters, fluid balance and cardiac status, emphasizing the need of adequate knowledge in oncology and critical care settings, are important for early identification of TLS (Mathew & Bourgeois, 2025; Molyneux et al., 2025).

The results also demonstrated good knowledge in the recognition and management of electrolyte disturbances related to TLS, particularly hyperkalemia. Participants correctly identified the cardiac complications of severe hyperkalaemia and recognized the role of insulin and calcium gluconate in emergency treatment. These findings are consistent with current recommendations for the management of TLS, which acknowledge hyperkalemia as the most immediate life-threatening complication because of its association with fatal dysrhythmias. The current literature highlights the importance of nurses promptly identifying electrocardiographic changes, monitoring serum potassium levels, and taking appropriate interventions to stabilize patients prior to definitive treatment (Adeyinka et al., 2024; Mathew & Bourgeois, 2025). Additionally, recent reviews have emphasized the importance of nursing vigilance and timely interventions in reducing TLS-related morbidity and mortality through early detection of metabolic abnormalities and timely escalation of care (Molyneux et al., 2025; StatPearls, 2024).

The results were generally favourable but some areas of concern were identified with regard to the primary objectives of emergency nursing management and specific pharmacological interventions, as reflected by the lower mean scores for these items. This lack of knowledge may indicate the need for structured continuing education programs and periodic competency-based training in oncologic emergencies. Nursing research has recently shown that focused educational interventions significantly enhance nurses' knowledge, confidence and clinical performance in the management of complex oncology-related conditions (Saker et al., 2026). Furthermore, advances in nursing decision-support systems and evidence-based clinical education have been found to improve clinical judgment and compliance with management guidelines leading to better patient outcomes (Abi Khalil et al., 2025; Shady et al., 2025). Regular in-service training, simulation based learning and evidence-based TLS management protocols are therefore likely to further enhance nurses' preparedness in dealing with this potentially fatal condition. Overall, findings indicate that nurses in this study had adequate knowledge of TLS management; however, continued education efforts are needed to maintain optimal patient safety and quality oncology care.

Conclusion:

The study was aimed at assessing the knowledge of nurses working in a tertiary care hospital in the management of Tumor Lysis Syndrome (TLS). The results showed that the nurses had adequate knowledge regarding the definition, risk factors, clinical manifestations, prevention strategies and management of TLS. Participants demonstrated good understanding of the importance of hydration, monitoring of lab parameters, identifying high risk patients and management of life threatening complications such as hyperkalemia. These findings underscore the proactive role of nurse practitioners in the early detection and management of TLS, a critical aspect of averting severe complications and enhancing patient outcomes. Although the knowledge level was generally adequate, some gaps

were identified in specific aspects related to emergency nursing management and pharmacological interventions. The findings underscore the importance of continued professional development and periodic educational refreshers to help nurses remain current with evidence-based practices and clinical guidelines. Ongoing educational opportunities can enhance nurses' knowledge and skills to improve the quality of oncology care, ensure patient safety, and better manage oncologic emergencies such as Tumor Lysis Syndrome.

Recommendations:

- Regular in-service education and training programs should be conducted to enhance nurses' knowledge and clinical competencies regarding the prevention, recognition, and management of Tumor Lysis Syndrome.
- Simulation-based learning sessions and emergency response drills should be incorporated into continuing nursing education to improve practical skills in managing TLS-related complications, particularly severe hyperkalemia and cardiac emergencies.
- Standardized evidence-based protocols and clinical guidelines for TLS management should be made readily available in oncology and critical care units to support timely and appropriate nursing interventions.
- Future research should involve larger sample sizes and multiple healthcare institutions to provide a broader understanding of nurses' knowledge, practices, and educational needs related to Tumor Lysis Syndrome management.

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