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Clinical Profile and Outcomes of Oncology Patients Requiring Critical Care Admission–A Single Center Tertiary Care Experience

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ABSTRACT

Background: Oncology patients often require critical care admission due to acute complications related to cancer or its treatment. Understanding their clinical profile and outcomes is crucial for optimizing care strategies and improving patient survival rates.

Methods: This retrospective observational study analyzed the clinical profiles and outcomes of oncology patients admitted to a tertiary care hospital's Intensive Care Unit (ICU). Data were collected from electronic health records of adult oncology patients admitted to the ICU during the study period. Descriptive statistics, comparative analysis using chi-square tests and ANOVA, and predictive analysis through logistic regression were performed to identify associations and predictors of patient outcomes.

Results: The study included 101 oncology patients (mean age: 56.5 years), predominantly male (63.4%) and from rural areas (71.3%). Cardiovascular disease was the most common comorbidity (41.6%). ICU admissions were primarily due to respiratory failure (34.7%) and sepsis (27.7%). Laboratory abnormalities included hemoglobin, TLC, PT/INR, bilirubin, and albumin levels. Antibiotics were administered to 90.1% of patients, and 11.9% required mechanical ventilation. Outcomes: 41.6% discharged, 26.7% deceased, and 31.7% left against medical advice. Significant predictors of mortality included low GCS scores, elevated bilirubin, and mechanical ventilation.

Conclusion: This study provides valuable insights into oncology patients' clinical profiles and outcomes requiring critical care admission. The findings underscore the complexity of managing these patients and highlight the importance of early identification and targeted interventions to improve patient outcomes. Further research is warranted to validate these findings and develop personalized care approaches for critically ill oncology patients.

Key-words: Oncology patients, Critical care, Clinical profile, Patient outcomes, Tertiary care

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INTRODUCTION

The clinical profile and outcomes of oncology patients requiring critical care admission have garnered increasing attention in recent years due to the complex interplay between cancer-related complications, comorbidities, and critical illness [1]. As the incidence of cancer continues to rise globally, so does the likelihood of oncology patients require ICU admission for management of acute medical conditions, treatment-

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related complications, or end-of-life care [2]. Understanding the unique clinical characteristics and prognostic factors associated with critical illness in this patient population is essential for optimizing care delivery and improving patient outcomes [3].

Oncology patients presenting to the ICU often exhibit distinct clinical profiles characterized by a high burden of comorbidities, compromised immune function, and susceptibility to treatment-related toxicities [4]. Common indications for critical care admission include sepsis, respiratory failure, neutropenic fever, and acute organ dysfunction, reflecting the diverse spectrum of medical emergencies encountered in this population [5]. Additionally, the presence of advanced-stage cancer, performance status, and the extent of organ dysfunction are important prognostic determinants that influence clinical decision-making and treatment outcomes [6].

The management of critically ill oncology patients poses unique challenges due to the need for tailored treatment approaches that balance the risks of cancer progression, treatment-related toxicities, and ICU-associated complications [7]. Multidisciplinary collaboration between oncologists, intensivists, palliative care specialists, and allied healthcare professionals is essential for developing personalized care plans that address the complex needs of these patients [8]. Furthermore, advanced supportive care measures, such as early goal-directed therapy, antimicrobial stewardship, and symptom management, are crucial in optimizing outcomes and enhancing quality of life [9].

Despite advances in cancer treatment and critical care medicine, oncology patients requiring ICU admission continue to experience high rates of morbidity and mortality [10]. Prognostication in this population is challenging due to the heterogeneity of cancer types, disease trajectories, and treatment responses [11]. Predictive models incorporating clinical, laboratory, and imaging parameters have been developed to assist clinicians in risk stratification and treatment decision-making [12]. However, further research is needed to validate these models and identify novel prognostic markers that can accurately predict outcomes in critically ill oncology patients [12].

Overall, oncology patients' clinical profiles and outcomes requiring critical care admission represent a complex and evolving field of study. By gaining insights into the unique challenges and prognostic factors associated with critical illness in this population, healthcare providers can develop targeted interventions and personalized care plans that improve outcomes and enhance quality of life. Through ongoing research and multidisciplinary collaboration, we can continue to advance our understanding of critical care in oncology and optimize care delivery for these vulnerable patients.

MATERIALS AND METHODS

Study Design- The study was designed as a retrospective, observational analysis, focusing on evaluating the clinical profiles and outcomes of oncology patients who required critical care. The study's retrospective nature involved looking back at existing patient records to understand their characteristics and outcomes.

Study Setting- The study was conducted in ICU of a tertiary care hospital that provided comprehensive cancer care services. This setting was chosen because it represented a specialized environment where critically ill cancer patients received intensive treatment.

Study Participants- The study involved adult oncology patients admitted to the ICU during the study period. All participants were confirmed to have a cancer diagnosis and were critically ill, warranting admission to the ICU. Patients under 18 and those with incomplete medical records were excluded from the study.

Study Sampling- The study included adult oncology patients who were critically ill and required ICU admission. Patients were included based on the following criteria:

Inclusion criteria- Adult patients (18 years and older) with a confirmed cancer diagnosis and those who require critical care.

Exclusion criteria- Pediatric patients (under 18 years) and those with incomplete medical records.

Study Sample Size- 101 consisted of all eligible oncology patients admitted to the ICU during the specified study period. The actual number depended on the availability of patient records and how many patients met the inclusion criteria. This approach ensured the sample was representative of the population treated in the ICU.

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Study Data Collection Parameters- Data collection parameters included demographic data such as age, gender, and address. Clinical data, such as the type and stage of cancer and comorbidities, were also recorded. ICU admission details included the indication for ICU admission, the length of stay, and GCS scores. Laboratory data encompassed hemoglobin, TLC, PT, INR, and bilirubin levels. Treatment data covered antibiotics, mechanical ventilation, vasopressors, and renal replacement therapy. The outcome data included discharge status, categorizing patients into DAMA, death, and discharge.

Study Procedure- The study followed a systematic data extraction and analysis procedure. Patient records were thoroughly reviewed, and relevant data were extracted and entered into a structured format to ensure consistency and minimize errors. The data collection process was meticulously followed, anonymizing patient records to maintain confidentiality. This method provided a reliable dataset for subsequent analysis.

Data Collection- Data were collected retrospectively from the ICU patient records, focusing on all eligible patients admitted during the study period. The retrospective design meant researchers used existing patient records, extracting data systematically according to pre-defined criteria.

Statistical Analysis- Statistical analysis involves multiple statistical techniques. Descriptive statistics were used to summarize demographic and clinical characteristics. Comparative analysis was conducted using chi-square tests and ANOVA to assess the association between clinical variables and patient outcomes. Finally, multivariate analysis was performed using logistic regression to identify predictors of mortality in the studied population. This comprehensive approach ensured robust findings.

Ethical Approval- The study received ethical approval from the hospital's ethics committee, with researchers adhering strictly to ethical standards. Patient confidentiality was prioritized throughout the study, with all records anonymized and securely handled to ensure compliance with ethical guidelines.

RESULTS

Demographics and Clinical Characteristics- The study included 101 patients with a mean age of 56.5 years (SD 16.9). The age range was 20 to 90 years. Male patients constituted 63.4% of the sample, while females were 36.6%. 71.3% of the patients were from rural areas, and 28.7% were from urban areas. The most common comorbidities observed were cardiovascular diseases (41.6%) and renal diseases (12.9%) (Table 1).

Table 1: Demographics and Clinical Characteristics

Characteristic	Total Patients (n=101)
Age (years)	56.5 (16.9)
Gender	
- Male	64 (63.4%)
- Female	37 (36.6%)
Residence	
- Rural	72 (71.3%)
- Urban	29 (28.7%)
Comorbidities	
Cardiovascular Diseases	42 (41.6%)
- Renal Diseases	13 (12.9%)

ICU Admission Details- Indications varied, with the most common reasons being respiratory failure, sepsis, and altered mental status. The average GCS score was 12.7 (SD 3.3), ranging from 3 to 15 (Table 2).

Table 2: ICU Admission Details

Indication for ICU Admission	Number of Patients (%)
Respiratory Failure	35 (34.7%)
Sepsis	28 (27.7%)
Altered Mental Status	17 (16.8%)
Cardiogenic Shock	10 (9.9%)
Acute Kidney Injury	8 (7.9%)
Neurological Emergency	3 (3.0%)

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Laboratory Data- Mean hemoglobin levels were 12.5 g/dL (SD 1.7). Total leukocyte count (TLC) was elevated in 57.4% of the patients, with 23.8% showing decreased levels. 28.7% of the patients had PT levels greater than 12 seconds, and 63.4% had INR values above 1. Elevated bilirubin levels were noted in 61.4% of patients, and 83.2% had albumin levels below 4 g/dL (Table 3).

Table 3: Laboratory Data

Laboratory Parameter	Number of Patients (%)	Normal Range (if applicable)
Hemoglobin		
- <10 g/dL	20 (19.8%)	
- 10-12 g/dL	45 (44.6%)	
- >12 g/dL	36 (35.6%)	Male: 14-18 g/dL Female: 12-16 g/dL
TLC		
- <4000/mm^3	24 (23.8%)	
- 4000-11000/mm^3	57 (56.4%)	
- >11000/mm^3	20 (19.8%)	
PT/INR		
- PT > 12 seconds	29 (28.7%)	
- INR > 1	64 (63.4%)	
Bilirubin		
- Normal	39 (38.6%)	0.2-1.2 mg/dL
- Elevated	62 (61.4%)	
Albumin		
- <4 g/dL	84 (83.2%)	3.5-5.0 g/dL
- ≥4 g/dL	17 (16.8%)	

Treatment and Interventions- Antibiotics were administered to 90.1% of the patients. Invasive mechanical ventilation was provided to 11.9% of the patients. Non-invasive ventilation was used for 37.6%. Vasopressor therapy was administered to 48.5% of the patients. Renal replacement therapy was required for 6.9% of patients (Table 4).

Table 4: Treatment and Interventions

Treatment/Intervention	Number of Patients (%)
Antibiotics	
- Administered	91 (90.1%)
- Not Administered	10 (9.9%)
Mechanical Ventilation	
- Invasive	12 (11.9%)
- Non-invasive	38 (37.6%)
- Not Required	51 (50.5%)
Vasopressors	
- Administered	49 (48.5%)
- Not Administered	52 (51.5%)
Renal Replacement Therapy	
- Required	7 (6.9%)
- Not Required	3 (93.1%)

Patient Outcomes- Of the total patients, 41.6% were discharged, 26.7% died, and 31.7% left against medical advice (DAMA). The mean length of stay in the ICU was 6.8 days (SD 6.4), ranging from 1 to 37 days (Table 5).

Table 5: Patient Outcomes

Outcome	Number of Patients (%)
Discharged	42 (41.6%)
Death	27 (26.7%)
Left Against Medical Advice (DAMA)	32 (31.7%)

Kidney Related Parameter-The table presents creatinine, blood urea, and urine output, highlighting key indicators of renal function and metabolic status (Table 6).

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Table 6: Parameters Such As_Creatinine, Blood_Urea, and Urine_Output

Parameter	Category	Frequency	Percentage
As_Creatinine	<2	72	71.3%
	>2	27	26.7%
	Total	101	100.0%
Blood_Urea	<18	70	69.3%
	>18	31	30.7%
	Total	101	100.0%
Urine_Output	<1200 ml	22	21.8%
	>1200 ml	75	74.3%
	Total	101	100.0%

Multiple comparisons- The multiple comparisons analysis revealed significant associations between different outcomes for the dependent variables of Age and GCS Score. Specifically, for Age, the analysis showed that patients with higher Glasgow Coma Scale (GCS) scores were significantly more likely to be discharged ($p<0.05$), with a standard error of 4.303. Additionally, there was a significant association between ICU admission indications and patient outcomes, as indicated by the large standard errors and significant p-values ($p<0.05$) for comparisons between DAMA (Discharge Against Medical Advice), death, and discharge. Similarly, for GCS Score, patients with lower scores were significantly associated with higher mortality rates and decreased likelihood of discharge ($p<0.05$), with standard errors of -2.594 and -1.926, respectively. These findings underscore the importance of both GCS scores and ICU admission indications in predicting patient outcomes and highlight the need for targeted interventions to improve outcomes for critically ill patients (Table 7).

Table 7: Multiple comparisons

Dependent Variable	(I) Outcome	(J) Outcome	Std. Error	Sig.
Age	LSD	DAMA	-0.932	0.811
		DEATH	4.303	0.038
	DAMA	DISCHAGE	9.050*	0.811
		DEATH	4.303	0.038
	DEATH	DISCHAGE	-9.050*	0.038
		DAMA	-9.982*	0.016
GCS_Score	LSD	DAMA	-2.594*	0.001
		DEATH	-0.668	0.415
	DAMA	DISCHAGE	2.594*	0.001
		DEATH	-1.926*	0.014
	DEATH	DISCHAGE	0.668	0.415
		DAMA	-1.926*	0.014

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Comparative and Predictive Analysis- Chi-square and ANOVA tests revealed significant associations between ICU admission indications, GCS scores, and patient outcomes. Patients with higher GCS scores were more likely to be discharged (p<0.05) (Table 8).

Table 8: Comparative analysis

Analysis	Test Used	Associations Found	Significance
ICU Admission Indications vs. Outcomes	Chi-square test	Significant association between ICU admission indications and patient outcomes	p<0.05
GCS Scores vs. Outcomes	ANOVA test	Significant association between GCS scores and patient outcomes, with higher GCS scores correlating with a higher likelihood of discharge	p<0.05

Predictive Analysis- Logistic regression identified low GCS scores, elevated bilirubin, and the need for mechanical ventilation as significant predictors of mortality.

The predictive analysis, conducted through logistic regression, revealed several significant predictors of mortality among the studied population. Low GCS scores emerged as a significant predictor, with patients having lower GCS scores (OR: 2.15, 95% CI: 1.32-3.48) showing a significantly higher risk of mortality (p<0.05). Similarly, elevated bilirubin levels were identified as another significant predictor, with patients exhibiting elevated bilirubin levels (OR: 1.87, 95% CI: 1.15-3.04) having an increased likelihood of mortality (p<0.05). Furthermore, the need for mechanical ventilation emerged as a significant predictor of mortality, with patients requiring mechanical ventilation (OR: 3.49, 95% CI: 2.01-6.07) showing a substantially higher risk of mortality (p<0.05). These findings underscore the critical importance of monitoring GCS scores, bilirubin levels, and the need for mechanical ventilation in identifying patients at higher risk of mortality, thereby facilitating early intervention and targeted management strategies to improve patient outcomes (Table 9).

Table 9: Predictive Analysis

Predictor Variable	Predictive Analysis	Predictors of Mortality	Significance
GCS Scores	Logistic Regression	Low GCS scores (OR: 2.15, 95% CI: 1.32-3.48)	p<0.05
Elevated Bilirubin Levels	Logistic Regression	Elevated bilirubin levels (OR: 1.87, 95% CI: 1.15-3.04)	p<0.05
Mechanical Ventilation	Logistic Regression	Need for mechanical ventilation (OR: 3.49, 95% CI: 2.01-6.07)	p<0.05

These results provide insights into the clinical profiles and outcomes of oncology patients requiring critical care, highlighting areas where patient care can be improved.

DISCUSSION

The study thoroughly explored the demographic, clinical, and prognostic landscape among oncology patients necessitating critical care. In a cohort comprising 101 individuals ranging in age from 20 to 90, a nuanced portrayal of patient characteristics, treatment interventions, and outcomes emerged, shedding light on the multifaceted challenges inherent in managing this vulnerable population [13].

The demographic snapshot unveiled a predominantly male cohort (63.4%) with a mean age of 56.5 years. Notably, a substantial proportion hailed from rural areas (71.3%), underlining the necessity for equitable access to

critical care services across diverse geographical settings [14]. Comorbidities were prevalent, with cardiovascular diseases (41.6%) and renal diseases (12.9%) looming large, underscoring the intricate web of medical complexities often encountered in oncological patients [15].

Exploration of ICU admission details revealed a tapestry of clinical presentations, with respiratory failure (34.7%), sepsis (27.7%), and altered mental status (16.8%) emerging as predominant drivers of critical care admission. These findings resonate with the intricate interplay between cancer pathophysiology, treatment-related complications, and systemic organ dysfunction, necessitating comprehensive critical care management strategies tailored to individual patient needs [16].

The Glasgow Coma Scale (GCS) scores, a cornerstone of neurological assessment, painted a vivid picture of patient acuity, with an average score of 12.7. Neurological compromise often portends grave prognostic implications, warranting vigilant monitoring and prompt interventions to avert adverse outcomes. This underscores the pivotal role of neurocritical care in optimizing patient outcomes and mitigating the burden of neurological sequelae in oncology patients.

Laboratory data provided further insights into the intricate pathophysiological derangements underpinning critical illness in oncological cohorts. Hematological aberrations, including altered hemoglobin levels and total leukocyte counts, underscored the systemic inflammatory response often witnessed in critically ill cancer patients. Perturbations in coagulation parameters, exemplified by prolonged prothrombin times and elevated international normalized ratios, underscored the heightened thrombotic propensity and disseminated intravascular coagulation often observed in this population. Elevated bilirubin levels and hypoalbuminemia further underscored the multi-organ dysfunction syndrome frequently encountered in critically ill oncology patients, necessitating a holistic approach to resuscitation and organ support.

Treatment interventions delineated a multifaceted armamentarium to mitigate disease severity, alleviate symptom burden, and optimize organ function. Antibiotic administration, a cornerstone of sepsis management, was employed in most cases (90.1%), underscoring the ubiquitous threat of infectious complications in this vulnerable population. Mechanical ventilation, both invasive (11.9%) and non-invasive (37.6%), served as a lifeline for patients with respiratory failure, highlighting the imperative for respiratory support tailored to individual patient needs [17]. Vasopressor therapy, employed in nearly half of the cohort (48.5%), underscored the hemodynamic instability often witnessed in critically ill oncology patients, necessitating judicious titration and vigilant hemodynamic monitoring to avert adverse outcomes. Renal replacement therapy, required in a subset of patients (6.9%), underscored the heightened risk of acute kidney injury and renal dysfunction in this population, necessitating prompt recognition and aggressive management of renal insults to optimize patient outcomes.

Patient outcomes, the ultimate arbiter of therapeutic efficacy, painted a nuanced portrait of the critical care journey among oncology patients. While a significant proportion experienced favorable outcomes, including discharge (41.6%), a substantial minority succumbed to their illness (26.7%), underscoring the formidable challenges inherent in managing critically ill cancer patients. Discharge against medical advice (DAMA), observed in 31.7% of cases, underscored the complex interplay between patient autonomy, treatment preferences, and disease severity, warranting a nuanced approach to shared decision-making and patient-centered care delivery [18].

The length of ICU stays a surrogate marker of disease severity and resource utilization, exhibited considerable variability, with a mean duration of 6.8 days. This heterogeneity underscores the dynamic nature of critical illness trajectories in oncology patients, necessitating tailored prognostication and resource allocation strategies to optimize patient outcomes and mitigate healthcare costs.

The comparative analysis elucidated significant associations between ICU admission indications, GCS scores, and patient outcomes, underscoring the prognostic significance of neurological status and disease acuity in determining clinical outcomes. Notably, patients with higher GCS scores exhibited a greater likelihood of discharge, highlighting the pivotal role of neurological assessment in prognostication and treatment decision-making. These findings underscore the imperative for a multidisciplinary approach to critical care management, integrating neurological expertise,

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oncological insights, and prognostic acumen to optimize patient outcomes and enhance quality of life.

In predictive analysis, logistic regression identified low GCS scores, elevated bilirubin levels, and the need for mechanical ventilation as significant predictors of mortality [19]. These findings underscore the critical importance of vigilant neurological assessment, hepatic function monitoring, and respiratory support in identifying patients at heightened mortality risk, facilitating early intervention and targeted management strategies to improve patient outcomes and mitigate disease progression.

While the study offers valuable insights into the demographic, clinical, and prognostic landscape among oncology patients in critical care, it also presents several considerations for future research and clinical practice. The retrospective, single-center design of the study may limit the generalizability of findings, and the reliance on administrative databases could introduce inaccuracies. Moving forward, prospective multicentre studies are warranted to validate findings across diverse patient populations and settings. At the same time, longitudinal research is needed to elucidate long-term outcomes beyond the acute care phase. Additionally, interdisciplinary collaborations and the integration of advanced prognostic models and biomarkers hold promise for enhancing risk stratification and personalized therapeutic approaches. Furthermore, emphasis should be placed on patient-centred care, shared decision-making, and symptom management to optimize outcomes and quality of life for oncology patients in critical care. By addressing these considerations, future research endeavours can advance our understanding of crucial illnesses in oncology patients and inform strategies to improve care delivery and patient outcomes [20].

CONCLUSIONS

In conclusion, our study provides valuable insights into oncology patients' clinical profiles and outcomes requiring critical care admission within a single-centre tertiary care setting. The findings illuminate the complex challenges this patient population faces, including diverse clinical presentations, the prevalence of comorbidities, and the need for intensive treatment interventions. Our results underscore the importance of tailored management strategies and interdisciplinary collaboration in optimizing patient care. Further research is needed to validate our findings across broader patient cohorts and settings, focusing on refining prognostic models and enhancing personalized treatment approaches. Ultimately, our study contributes to the collective understanding of critical care in oncology and highlights avenues for improving outcomes and quality of life for these patients.

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