Original Research

CLINICAL CHARACTERISTICS AND OUTCOMES OF CANCER PATIENTS REQUIRING INTENSIVE CARE UNIT ADMISSION: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Advances in oncology and critical care have improved the survival of cancer patients; however, many still require intensive care unit (ICU) admission because of postoperative needs, disease-related complications, or treatment-associated adverse events. Data on the clinical characteristics and outcomes of critically ill cancer patients remain limited in developing countries.

Materials and Methodology: This prospective observational study was conducted over one year in the ICU of a tertiary care teaching hospital in Gujarat, India. A total of 500 adult patients with confirmed solid or hematological malignancies requiring ICU admission were included. Demographic characteristics, cancer-related variables, indications for ICU admission, severity scores, ICU interventions, and outcomes were recorded. Factors associated with hospital mortality were analyzed using univariate analysis.

Results: The mean age of the patients was 59.8 ± 13.6 years, and 59.0% were males. Solid tumors accounted for 91.0% of cases, while 46.0% had Stage IV disease. Gastrointestinal malignancies (29.0%) were the most common cancer type, followed by lung cancer (18.0%). Postoperative monitoring was the leading indication for ICU admission (55.0%), followed by sepsis/septic shock (16.0%) and acute respiratory failure (13.0%). Mechanical ventilation was required in 37.0% of patients, vasopressor support in 29.0%, and renal replacement therapy in 7.0%. ICU mortality was 16.0%, while hospital mortality was 21.0%. Advanced age, metastatic disease, recurrent or progressive malignancy, unplanned ICU admission, sepsis, acute respiratory failure, higher APACHE II and SOFA scores, mechanical ventilation, vasopressor requirement, and renal replacement therapy were significantly associated with hospital mortality ($p<0.05$).

Conclusions: Most cancer patients admitted to the ICU survived to hospital discharge despite requiring intensive organ support. Mortality was primarily associated with disease severity, advanced malignancy, and organ dysfunction. Early identification of high-risk patients and timely critical care intervention may improve outcomes.

Keywords: Cancer, Intensive Care Unit, Malignancy, Mortality, Organ Support, Outcome.

INTRODUCTION

Advances in cancer screening, early diagnosis, surgical techniques, chemotherapy, radiotherapy, targeted therapies, and immunotherapy have significantly improved survival among patients with malignancies over recent decades [1–3].

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Consequently, an increasing number of cancer patients are living longer and are at risk of developing critical illnesses related to the malignancy itself, treatment-associated toxicities, postoperative complications, infections, or other acute medical conditions requiring intensive care unit (ICU) admission [4,5].

Cancer patients constitute a substantial proportion of critically ill patients, accounting for approximately 15–20% of ICU admissions worldwide [6,7].

Common indications for ICU admission include postoperative monitoring following major oncological surgery, sepsis, acute respiratory failure, cardiovascular instability, oncological emergencies, and treatment-related adverse events [4,8]. Historically, ICU admission for cancer patients was frequently considered controversial because of poor perceived prognosis and concerns regarding resource utilization [9]. However, advances in both oncology and critical care medicine have substantially improved short- and long-term survival, leading to a reassessment of ICU admission policies for this population [5,9].

Several studies have reported encouraging outcomes among critically ill cancer patients. In a large prospective multicenter study, Soares et al. demonstrated that survival was primarily influenced by the severity of organ dysfunction, performance status, and the need for mechanical ventilation rather than cancer-related characteristics alone [10]. Similarly, Martos-Benítez et al. identified advanced cancer stage, unplanned ICU admission, sepsis, chemotherapy-related adverse events, and invasive mechanical ventilation as important predictors of hospital mortality [8]. Population-based studies have further shown that ICU support should not be considered futile, as a substantial proportion of cancer patients achieve meaningful short- and long-term survival following critical illness [6,11].

Recent advances in targeted therapies and immunotherapy have altered the epidemiology of ICU admissions among cancer patients by improving cancer survival while simultaneously introducing novel treatment-related toxicities requiring critical care management [2]. Contemporary studies have demonstrated variations in admission patterns and outcomes according to cancer type, disease stage, treatment status, and severity of acute illness [12]. Nevertheless, uncertainty remains regarding prognostic factors and optimal utilization of ICU resources, particularly in resource-constrained healthcare settings.

Therefore, the present prospective observational study was undertaken to evaluate the clinical characteristics, indications for ICU admission, management practices, and outcomes of cancer patients requiring intensive care and to identify factors associated with their clinical outcomes.

MATERIALS AND METHODOLOGY

This prospective observational study was conducted in the Intensive Care Unit (ICU) of a tertiary care teaching hospital in Gujarat, India, over a period of one year from June 2024 to May 2025. The study was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants or their legally authorized representatives.

All consecutive adult patients (≥18 years) with a confirmed diagnosis of solid organ or haematological malignancy who required ICU admission and had an ICU stay of more than 24 hours were included in the study. Patients younger than 18 years, those with an ICU stay of 24 hours or less, readmissions during the same hospitalization, and patients with incomplete clinical records were excluded. Demographic details, including age and sex, along with cancer-related characteristics such as type of malignancy, primary tumor site, disease stage, presence of metastasis, cancer status (newly diagnosed, remission, recurrence, or progression), and ongoing oncological treatments, were recorded. Information regarding ICU admission, including source and indication of admission, planned or unplanned admission, and the presence of conditions such as sepsis, septic shock, respiratory failure, cardiovascular instability, postoperative monitoring requirements, or treatment-related complications, was collected prospectively using a structured case record form. Severity of illness at ICU admission was assessed using the Acute Physiology and Chronic Health Evaluation II (APACHE II) score and Sequential Organ Failure Assessment (SOFA) score.

Details of organ support measures, including invasive mechanical ventilation, vasopressor therapy, renal replacement therapy, blood transfusions, and other critical care interventions, were documented. The primary outcome measure was ICU mortality, while secondary outcomes included hospital mortality, duration of ICU stay, duration of hospital stay, requirement for organ support, and discharge status.

Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software free version. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, as appropriate, whereas categorical variables were presented as frequencies and percentages. Comparisons between survivor and non-survivor groups were performed using Student's t-test or Mann–Whitney U test for continuous variables and Chi-square test or Fisher's exact test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULT

During the study period, we have included consecutive 500 patients who were admitted to the ICU according to inclusion and exclusion criteria.

Table 1. Baseline Characteristics of Cancer Patients Admitted to ICU (n = 500)

Characteristic	Number (n=500)	Percentage (%)

Age Group (years)	<40	75	15.0%
	40–59	210	42.0%
	≥60	215	43.0%
Gender	Male	295	59.0%
	Female	205	41.0%
Type of Malignancy	Solid Tumors	455	91.0%
	Haematological Malignancies	45	9.0%
Cancer Status	Newly Diagnosed	90	18.0%
	Controlled/Remission	120	24.0%
	Active Disease	205	41.0%
	Recurrent/Progressive Disease	85	17.0%
Stage of Cancer	Stage I–II	125	25.0%
	Stage III	145	29.0%
	Stage IV/Metastatic	230	46.0%
Presence of Metastasis	Yes	225	45.0%
	No	275	55.0%
Source of ICU Admission	Operating Room/Postoperative	275	55.0%
	Hospital Ward	165	33.0%
	Emergency Department	60	12.0%
Type of ICU Admission	Planned	310	62.0%
	Unplanned	190	38.0%

Table 1 shows the baseline characteristics of 500 cancer patients admitted to the ICU. The mean age was 59.8 ± 13.6 years, with most patients aged ≥60 years (43.0%) and 40–59 years (42.0%). Males constituted 59.0% of the study population. Solid tumors were the predominant malignancy (91.0%), while hematological cancers accounted for 9.0%. Active disease was present in 41.0% of patients, and 46.0% had Stage IV/metastatic cancer. Metastasis was observed in 45.0% of cases. More than half of the admissions originated from the operating room (55.0%), and the majority were planned ICU admissions (62.0%). Overall, the study population was predominantly composed of older male patients with solid malignancies and advanced-stage disease.

Table 2. Primary Cancer Sites (n = 500)

Primary Cancer Site	**Number**	**Percentage (%)**
Gastrointestinal (Colorectal, Gastric, Esophageal, Hepatobiliary)	145	29.0%
Lung	90	18.0%
Breast	55	11.0%
Head & Neck	50	10.0%
Genitourinary	45	9.0%
Gynecological	40	8.0%
Haematological	45	9.0%
Others	30	6.0%

Table 2 presents the distribution of primary cancer sites among the 500 patients admitted to the ICU. Gastrointestinal malignancies were the most common, accounting for 29.0% of cases, followed by lung cancer (18.0%). Breast cancer constituted 11.0% of admissions, while head and neck cancers accounted for 10.0%. Genitourinary and hematological malignancies each represented 9.0% of cases, whereas gynecological cancers comprised 8.0%. Other malignancies collectively accounted for 6.0% of the study population. Overall, gastrointestinal and lung cancers were the leading malignancies requiring ICU admission.

Table 3. Indications for ICU Admission (n = 500)

Indication	**Number**	**Percentage (%)**
Postoperative Monitoring	275	55.0%
Sepsis/Septic Shock	80	16.0%
Acute Respiratory Failure	65	13.0%
Cardiovascular Instability/Shock	35	7.0%
Treatment-related Toxicity	25	5.0%

Neurological Emergencies	10	2.0%
Other Causes	10	2.0%

Table 3 depicts the indications for ICU admission among the 500 cancer patients. Postoperative monitoring was the most common reason for ICU admission, accounting for 55.0% of cases. Sepsis or septic shock was the second most frequent indication (16.0%), followed by acute respiratory failure (13.0%). Cardiovascular instability or shock contributed to 7.0% of admissions, while treatment-related toxicities accounted for 5.0%. Neurological emergencies and other miscellaneous causes each represented 2.0% of ICU admissions. Overall, postoperative care and acute medical complications, particularly sepsis and respiratory failure, were the leading indications for ICU admission in this study population.

Table 4. ICU Interventions and Outcomes (n = 500)

Variable	Number	Percentage (%)
Mechanical Ventilation	185	37.0%
Vasopressor Support	145	29.0%
Renal Replacement Therapy	35	7.0%
Blood Product Transfusion	115	23.0%
ICU Mortality	80	16.0%
Hospital Mortality	105	21.0%
Survived to Hospital Discharge	395	79.0%
Median ICU Stay (days)	4 (IQR 2–8)	—
Median Hospital Stay (days)	12 (IQR 7–20)	—

IQR=Inter Quartile Range

Table 4 summarizes the ICU interventions and outcomes among the 500 cancer patients. Mechanical ventilation was required in 37.0% of patients, making it the most commonly utilized organ support modality. Vasopressor support was administered to 29.0% of patients, while 23.0% received blood product transfusions. Renal replacement therapy was required in 7.0% of cases. The ICU mortality rate was 16.0%, whereas the overall hospital mortality rate was 21.0%. A total of 79.0% of patients survived to hospital discharge. The median ICU stay was 4 days (IQR: 2–8 days), and the median hospital stay was 12 days (IQR: 7–20 days). These findings indicate that although a substantial proportion of patients required advanced organ support, the majority survived and were successfully discharged from the hospital.

Table 5. Univariate Analysis of Factors Associated with Hospital Mortality among Cancer Patients Admitted to ICU

Variable	Survivors (n=395)	Non-survivors (n=105)	p-value
Age ≥60 years	155 (39.2%)	60 (57.1%)	0.001
Stage IV/Metastatic Disease	155 (39.2%)	75 (71.4%)	<0.001
Presence of Metastasis	150 (38.0%)	75 (71.4%)	<0.001
Recurrent/Progressive Cancer	50 (12.7%)	35 (33.3%)	<0.001
Unplanned ICU Admission	115 (29.1%)	75 (71.4%)	<0.001
Sepsis/Septic Shock at Admission	40 (10.1%)	40 (38.1%)	<0.001
Acute Respiratory Failure	35 (8.9%)	30 (28.6%)	<0.001
APACHE II Score ≥20	95 (24.1%)	75 (71.4%)	<0.001
SOFA Score ≥8	80 (20.3%)	70 (66.7%)	<0.001
Mechanical Ventilation Required	95 (24.1%)	90 (85.7%)	<0.001
Vasopressor Support Required	70 (17.7%)	75 (71.4%)	<0.001
Renal Replacement Therapy Required	15 (3.8%)	20 (19.0%)	<0.001
ICU Stay >7 Days	55 (13.9%)	35 (33.3%)	<0.001

Table 5 shows the results of univariate analysis of factors associated with hospital mortality among cancer patients admitted to the ICU. Hospital mortality was significantly higher among patients aged ≥60 years, those with Stage IV/metastatic disease, presence of metastasis, and recurrent or progressive malignancy ($p<0.001$). Clinical factors associated with increased mortality included unplanned ICU admission, sepsis/septic shock, acute respiratory failure, higher APACHE II and SOFA scores; requirement of mechanical ventilation, vasopressor support, renal replacement

therapy, and prolonged ICU stay (>7 days). Among these variables, the strongest associations with mortality were observed for mechanical ventilation, vasopressor requirement, high illness severity scores, and advanced-stage cancer ($p<0.001$ for all).

DISCUSSION

The present prospective observational study evaluated the clinical characteristics and outcomes of 500 cancer patients requiring ICU admission in a tertiary care teaching hospital. The mean age of the study population was 59.8 ± 13.6 years, and the majority of patients were males (59.0%). Similar findings were reported by Zheng et al., who observed a mean age of 63.2 years with 56.5% male patients [7], and by Bos et al., who reported a male predominance among cancer patients admitted to the ICU [6]. These findings suggest that older adults, particularly males, constitute a substantial proportion of critically ill cancer patients requiring intensive care support.

In the present study, solid tumors accounted for 91.0% of all malignancies, whereas hematological malignancies constituted only 9.0% of cases. Comparable observations were reported by Soares et al., who found that 93% of ICU admissions involved patients with solid tumors and only 7% had hematological malignancies [10]. Similarly, Martos-Benítez et al. reported that 94.3% of patients had solid tumors [8]. This predominance of solid malignancies may reflect the higher prevalence of these cancers and the frequent need for postoperative intensive care following major oncological surgeries.

Nearly half of the patients in the present study had Stage IV or metastatic disease (46.0%), and metastasis was present in 45.0% of cases. These findings are consistent with Vigneron et al., who reported metastatic disease in approximately 50–60% of ICU-admitted patients with solid malignancies [2]. Advanced-stage disease remains common among critically ill oncology patients because of disease progression, treatment-related complications, and increased vulnerability to organ dysfunction.

Gastrointestinal malignancies (29.0%) were the most common primary cancer site in the present study, followed by lung cancer (18.0%). Similar patterns were observed by Liu et al., who reported lung, colorectal, esophageal, and gastric cancers as the most frequent malignancies among ICU admissions [5]. Vigneron et al. also identified lung and gastrointestinal cancers as the predominant tumor types requiring intensive care [2]. The high representation of gastrointestinal cancers may be attributable to the large number of major abdominal surgeries requiring postoperative ICU monitoring.

Postoperative monitoring was the leading indication for ICU admission in the present study, accounting for 55.0% of admissions, followed by sepsis/septic shock (16.0%) and acute respiratory failure (13.0%). These findings closely resemble those reported by Soares et al., where postoperative care (57%), sepsis (15%), and respiratory failure (10%) were the most common reasons for ICU admission [10]. Bos et al. also demonstrated that postoperative admissions constitute a substantial proportion of ICU utilization among cancer patients [4].This emphasizes the continuing importance of perioperative critical care in oncology practice.

Regarding ICU interventions, mechanical ventilation was required in 37.0% of patients, vasopressor support in 29.0%, and renal replacement therapy in 7.0%. Similar observations have been reported in previous studies, where the requirement for organ support was closely linked to disease severity and outcomes [8,10]. Soares et al. and Martos-Benítez et al. identified mechanical ventilation as one of the strongest predictors of mortality among critically ill cancer patients [8,10].

The ICU mortality rate in the present study was 16.0%, while hospital mortality was 21.0%. These mortality rates are lower than those reported by Soares et al., who observed a hospital mortality of 30% [10], and Zheng et al., who reported an in-hospital mortality of 24% [7]. The lower mortality observed in the present study may be explained by the high proportion of planned postoperative admissions and advances in oncological and critical care management. Nevertheless, mortality remains substantial and highlights the severity of illness among this patient population.

Univariate analysis demonstrated that advanced age, Stage IV disease, metastatic cancer, recurrent or progressive malignancy, unplanned ICU admission, sepsis/septic shock, acute respiratory failure, higher APACHE II and SOFA scores, mechanical ventilation, vasopressor requirement, renal replacement therapy, and prolonged ICU stay were significantly associated with hospital mortality. These findings are in agreement with those reported by Martos-Benítez et al., who identified advanced cancer stage, unplanned admission, sepsis, and invasive mechanical ventilation as major predictors of mortality [8]. Similarly, Soares et al. found that poor performance status, organ failure severity, mechanical ventilation, and active malignancy were independently associated with adverse outcomes [10]. Vigneron et al. also reported metastatic disease, progressive cancer, and the extent of organ failure as important determinants of mortality [2].

Overall, the findings of the present study corroborate previous international studies and indicate that although outcomes of critically ill cancer patients have improved considerably, mortality remains strongly influenced by disease stage, severity of acute illness, and the requirement for advanced organ support. Early recognition of critical illness,

timely ICU admission, and aggressive management of reversible complications may contribute to improved outcomes in this vulnerable patient population.

CONCLUSION

Cancer patients requiring ICU admission were predominantly older individuals with solid malignancies, and postoperative monitoring was the most common indication for admission. Despite a considerable burden of critical illness, most patients survived to hospital discharge. Advanced-stage disease, unplanned ICU admission, sepsis, respiratory failure, higher severity scores, and the need for organ support were significantly associated with mortality. Early ICU intervention and prompt management of acute complications may improve outcomes in this vulnerable patient population.

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