

A Retrospective Analysis of Survival Outcomes in Cancer Patients: Influence of Demographics, Cancer Type, Stage, and Treatment Modalities in Puducherry

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Abstract

Background

Cancer remains a leading cause of mortality worldwide, with survival outcomes influenced by demographic, clinical, and treatment-related factors. Understanding these patterns is crucial for enhancing early detection, refining treatment strategies, and informing public health interventions. Objective To analyze survival outcomes among 40 cancer patients, focusing on the impact of gender, cancer type, stage at diagnosis, and treatment modality.

Methods

This retrospective observational study examined anonymized records of 40 cancer patients. Variables included age, gender, cancer type, stage (I–IV), treatment modality (surgery, chemotherapy, radiation), and survival status. Descriptive statistics and cross-tabulations were used to identify survival trends across subgroups.

Results

Female patients had a significantly higher survival rate (80%) compared to males (30%), largely due to favorable outcomes in breast and cervical cancers. Stage I cancers showed 100% survival, while Stage IV had only 12.5%. Surgical treatment was associated with the highest survival (90%), followed by radiation (33%) and chemotherapy (14%). Colon, stomach, and lung cancers demonstrated the poorest outcomes, while breast, cervical, and endometrial cancers had excellent survival rates.

Conclusion

Survival in cancer patients is strongly influenced by stage at diagnosis, treatment type, and cancer type. Early detection and surgical intervention are critical for favorable outcomes. Gender disparities and treatment-specific trends highlight the need for personalized oncology approaches. These findings support targeted screening and

individualized care strategies to improve cancer prognosis.

Keywords: cancer, survival outcomes, prognosis, demographics, cancer stage, treatment modality, retrospective analysis.

Introduction

Cancer is a global health challenge, accounting for nearly 10 million deaths annually and ranking as the second leading cause of mortality worldwide. Despite significant advances in diagnostic technologies and therapeutic interventions, survival outcomes remain heterogeneous across populations, influenced by a complex interplay of biological, demographic, and clinical factors. Understanding these patterns is essential for optimizing treatment strategies, improving early detection, and tailoring interventions to individual patient profiles.

The prognosis of cancer patients is shaped by several key determinants. Age and gender are known to influence both the incidence and progression of various cancers. For instance, breast and cervical cancers predominantly affect women, while prostate cancer is exclusive to men. Moreover, older patients often present with comorbidities that complicate treatment and recovery.

Cancer type and stage at diagnosis are critical prognostic indicators; early-stage cancers generally offer better survival prospects, whereas advanced-stage malignancies are associated with poorer outcomes due to metastasis and limited therapeutic efficacy. Treatment modality also plays a pivotal role in determining patient survival. Surgical resection remains the cornerstone for localized tumors, while chemotherapy and radiation are often employed for systemic or advanced disease. However, the effectiveness of these treatments varies widely depending on tumor biology, patient tolerance, and stage at presentation. Evaluating the relative impact of these modalities on survival can guide clinicians in selecting the most appropriate therapeutic course.

Materials and Methods

Study Design and Objective

This study employed a retrospective observational design to investigate survival outcomes among cancer patients, with a specific focus on how demographic characteristics, cancer type, stage at diagnosis, and treatment modality influence prognosis. The primary objective was to identify patterns and associations that could inform clinical decision-making and highlight areas for early intervention and targeted therapy.

Data Source and Patient Selection

The dataset comprised 40 anonymized patient records extracted from clinical archives. Each record included six key variables:

- Age (numerical, in years)
- Gender (Male/Female)
- Cancer Type (e.g., Breast, Lung, Colon, Prostate, Cervical, etc.)
- Cancer Stage (Stage I to Stage IV, based on TNM classification)
- Treatment Modality (Surgery, Chemotherapy, Radiation Therapy)
- Survival Status (Alive or Deceased at the time of data collection)

Patients were included if their records were complete across all six variables. Cases with missing data, ambiguous staging, or multiple concurrent malignancies were excluded to maintain analytical clarity and reduce confounding.

Variable Definitions

Cancer Stage was categorized according to standard clinical staging, with Stage I representing localized disease and Stage IV indicating metastatic spread. Treatment Modality referred to the primary intervention received, with no overlap assumed between modalities unless explicitly stated. Survival Status was binary, based on documented outcomes at the time of data extraction.

Data Processing and Analysis

Data were cleaned and structured using spreadsheet software. Descriptive statistics were used to summarize the distribution of patients across demographic and clinical categories. Equity distributions were calculated for categorical variables (gender, cancer type, stage, treatment). Survival rates were computed as the proportion of patients alive within each subgroup.

Cross-tabulations were performed to explore relationships between variables, such as stage vs. survival, treatment vs. outcome, and gender vs. cancer type. Visualizations, including bar charts, pie charts, and stacked plots, were generated to illustrate key trends. These graphical representations helped highlight disparities in survival across cancer types and stages, as well as the relative effectiveness of different treatment modalities.

Due to the limited sample size (n=40), inferential statistical tests (e.g., chi-square, logistic regression) were not applied. Instead, the analysis focused on identifying observable patterns and clinically relevant trends.

Ethical Considerations

All data used in this study were anonymized before analysis. No personally identifiable information was accessed or stored. The study adhered to ethical guidelines for retrospective research, ensuring confidentiality and responsible data handling throughout the process.

Result

Table 1 Gender-Based Survival Outcomes

Gender	Total Patients	Alive	Deceased	Survival Rate
Male	20	6	14	30%
Female	20	16	4	80%

This table shows a clear survival advantage for female patients. Out of 20 women, 16 survived, while only 6 out of 20 men did. This disparity may be due to the types of cancers prevalent in each gender. Female patients were more likely to have breast or cervical cancer, which had better outcomes, while male patients more often had lung or prostate cancer, which showed poorer survival.

Table 2 Cancer Type and Survival

Cancer Type	Total Cases	Alive	Deceased	Survival Rate
Breast	10	10	0	100%
Lung	6	1	5	17%
Prostate	5	2	3	40%
Colon	5	0	5	0%
Ovarian	2	1	1	50%
Cervical	2	2	0	100%
Endometrial	1	1	0	100%
Stomach	1	0	1	0%
Other	8	5	3	62.5%

This table highlights which cancer types had better or worse outcomes. Breast, cervical, and endometrial cancers had perfect survival, likely due to early detection and effective treatment. Colon and stomach cancers had 0% survival, indicating aggressive progression or late diagnosis. Lung cancer had the lowest survival among major types.

Table 3 Stage-Wise Survival Analysis

Cancer Stage	Total Patients	Alive	Deceased	Survival Rate
Stage I	10	10	0	100%
Stage II	12	8	4	67%
Stage III	10	2	8	20%
Stage IV	8	1	7	12.5%

This table shows a steep decline in survival as cancer stage advances. Stage I patients all survived, while Stage IV patients had very poor outcomes. This underscores the importance of early detection and timely treatment.

Table 4 Treatment Modality and Survival

Treatment Type	Total Patients	Alive	Deceased	Survival Rate
Surgery	20	18	2	90%
Chemotherapy	14	2	12	14%
Radiation	6	2	4	33%

Surgery was the most effective treatment, with a 90% survival rate. Chemotherapy had the lowest survival, likely because it was used in more advanced cases. Radiation had intermediate results, often used as a supportive or palliative measure.

Discussion

This retrospective analysis highlights several critical factors influencing survival outcomes in cancer patients. The findings reinforce established oncological principles while offering nuanced insights into gender disparities, cancer type prognosis, stage-specific survival, and treatment efficacy.

Gender-based differences in survival were prominent, with female patients exhibiting significantly higher survival rates than males. This trend aligns with global data showing better outcomes in cancers more prevalent among women, such as breast and cervical cancers, which benefit from robust screening programs and early detection strategies. In contrast, lung and prostate cancers are more common in men, often present at advanced stages, contributing to poorer survival.

Cancer type was a strong determinant of prognosis. Breast cancer patients in this cohort had a 100% survival rate, consistent with literature indicating high survival when diagnosed early and treated surgically. Conversely, colon and stomach cancers showed 100% mortality, reflecting their aggressive nature and frequent late-stage presentation. Lung cancer, with a survival rate of just 17%, remains one of the deadliest malignancies globally due to its rapid progression and limited response to conventional therapies.

Stage at diagnosis emerged as the most powerful predictor of survival. Patients diagnosed at Stage I had universally favorable outcomes, while those at Stage IV faced a survival rate of only 10%. This gradient underscores the importance of early detection and timely intervention, echoing findings from large-scale epidemiological studies.

Treatment modality also significantly influenced survival. Surgical intervention yielded the highest survival rate (90%), particularly in early-stage cancers. This supports existing evidence that surgery offers curative potential when tumors are localized. Chemotherapy, while essential for systemic disease, was associated with lower survival in this cohort, possibly due to its use in advanced-stage patients and the inherent limitations of cytotoxic regimens. Radiation therapy showed moderate effectiveness, consistent with its role as an adjunct or palliative measure in many treatment protocols.

Conclusion

This study highlights that cancer survival is strongly influenced by stage at diagnosis, treatment type, and cancer type. Early-stage detection and surgical intervention were associated with the highest survival rates, especially in breast and cervical cancers. In contrast, advanced-stage cancers and those treated primarily with chemotherapy showed poorer outcomes. Gender differences also emerged, with female patients experiencing significantly better survival. These findings emphasize the need for early diagnosis and personalized treatment strategies to improve cancer care.

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