

Cancer: A Retrospective analysis of Age Distribution, Comorbidities, and Treatment Regimen.

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ABSTRACT:

Background: Cancer is a significant global public health issue. This study aimed to examine the demographic and clinical characteristics of cancer patients at a tertiary care center.

Methods: A Retrospective analysis was conducted on 96 cancer patients admitted between 2022 to 2024. The study analyzed various factors, including age, gender, comorbidities, cancer type, and treatment choice.

Results: Most of the patients were female (72.92%), with an average age of 51 -60 years. Breast cancer was the most prevalent (44.79%), followed by stomach cancer (16.67%). Hypertension was the most common comorbidity (50%). Chemotherapy was the most frequently used treatment (39.58%). Time trends of Breast and Stomach cancer showed upward trend, Ovarian cancer showed increase trend between 2022 and 2023 and decrease trend between 2023 and 2024 and Oral/ head and neck cancer shows downward trend and colon cancer shows plateau over the three years (2022 to 2024).

Conclusion: This study offers valuable insights into the demographic and clinical profiles of cancer patients in a tertiary care center. The findings emphasize the significance of personalized treatment approaches and cancer prevention strategies.

Key Words: Cancer types, Chemotherapy, Comorbidity, Demographics, Time trend.

I. INTRODUCTION:

Cancers are one of the most devastating classes of human pathologies, presenting a versatile range of hallmark clinical features and leading to millions of deaths each year around the globe.¹

According to the International Agency for Research on Cancer (IARC) and the American

Cancer Society (ACS), Global Cancer Observatory (GLOBOCAN) estimates, there were approximately 20 million new cancer cases and 9.7 million cancer-related deaths worldwide in 2022.²

According to the National Cancer Registry Programme (NCRP), National Centre for Disease Informatics and Research (NCDIR) of the Indian Council of Medical Research (ICMR-NCDIR), the projected cancer incidence in India in 2020 was approximately 14,61,427 cases, with a crude incidence rate of 98.7 per 100,000 population.³

Currently, 30 to 50% of cancers can be prevented by avoiding risk factors and applying established prevention strategies. The impact of cancer can also be minimized through early detection, along with proper treatment. Cancer treatments involve a multimodal approach, including surgery, chemotherapy, and/or radiation therapy. Chemotherapy continues to be a widely chosen treatment option.

Over the past few decades, chemotherapeutic agents have played a significant role and remain the primary choice for treating advanced-stage cancers, particularly when surgery or radiation therapy cannot be used for specific reasons.⁴

Numerous retrospective studies have been conducted globally on specific cancers, social factors, demographic factors, and clinicopathological aspects of breast cancer, cervical cancer, gastric cancer, and others. However, studies focusing on overall cancers and demographic factors in secondary care centers are less common.⁵

Our study was done as a retrospective analysis of various cancer. The aim of this study was to evaluate the age, gender, comorbidities, and treatment regimen associated with various cancers.

II. METHODS

Study Design

This retrospective study was conducted among various cancer patients admitted to a cancer care center over a 2-year period from 2022 to 2024. Data were obtained from the Medical Record Department at a secondary care hospital in Kanchipuram, Tamil Nadu. Patient records were reviewed to gather information on demographic details, medical history, medication history, personal information, cancer type and stage, cancer confirmation reports, treatment information, surgical details, chemotherapy records, and laboratory results.

Study Population

The study analyzed the medical records of 96 patients from 2022 to 2024, representing 14 different cancer types. All patients underwent radiological imaging, and cancer diagnoses were confirmed through core biopsies. To be eligible, patients had to be male or female, aged between 30 and 90, and have received either adjuvant or neoadjuvant chemotherapy. Patients under 30, pregnant women, those experiencing side effects, and those with high mortality rates were excluded.

Patient and Public Involvement Statement

Patients and/or the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

Data Collection and Entry

We reviewed the medical records of patients registered between 2022 to 2024, selecting 96 patients based on the inclusion criteria. Data were collected using a standardized form or template designed for this study, which included demographic details (age, gender, medical history, medication history, chief complaints, comorbidities, smoking history), disease factors (type and stage of cancer), treatment details (type of treatment, chemotherapy cycles), drug information (name, dose, frequency, duration, dilution, cost), laboratory results, cancer confirmation reports, and hospital stay duration.

Statistical Analysis

Statistical analysis was performed using Python (Jupyter Notebook). Cancer type and the treatment association were analyzed using Chi-Square test. Analysis of Age Differences Across Cancer Types was performed using One –Way ANOVA test and the Analysis of association

between age, treatment type and stage of cancer was performed using Two- Way ANOVA test.

III. RESULTS

Data of consecutive cancer patients registered between 2022 to 2024 were obtained from the hospital records through the Medical Record Department at a secondary care hospital. During 2-year tenure, a total of 96 cases were obtained.

The frequency distribution of common cancer across different age groups indicated that the highest prevalence was in the 51-60 years age group in figure 2. The study revealed a female: male percentage of 69%:31%, indicating a strong female predominance. Overall the common cancer, breast cancer, stomach cancer, and ovarian cancer showed the highest prevalence among the different cancer types in figure 3. Conventional chemotherapy (C) is the most common treatment (figure 4) across most cancer types, especially for stomach, ovarian, pancreatic, and colorectal cancers.

The most common chemotherapy used in first cycle setting were TAC regimen includes docetaxel (Taxotere) + doxorubicin (Adriamycin) + cyclophosphamide (16.95%) followed by 5-fluorouracil and carboplatin (11.86%), cisplatin (10.16%), paclitaxel (8.47%), oxaliplatin and gemcitabine (3.38%) in figure 5. docetaxel (22.37 %) was the most frequently used medication in chemotherapy table 1 and figure 6.

The mostly commonly used drug regimen for various cancer are:

1. Breast cancer (n=19) : doxorubicin (80mg IV) + docetaxel (120mg IV) + cyclophosphamide (900mg IV).
2. Stomach cancer (n=5): cisplatin (50mg IV) + 5-Fluorouracil (100mg IV).
3. Ovarian cancer (n=11): docetaxel (120mg IV) + carboplatin (450mg IV).
4. Oral / Head and Neck Cancer (n=3): 5-Fluorouracil (500mg IV) + carboplatin (50 mg IV) and
5. Colon cancer (n=3): oxaliplatin (100mg IV).

The chi-square test resulted in a test statistic of 33.46 with 24 degrees of freedom. With a **p-value of 0.093**, we cannot reject the null hypothesis at the standard 0.05 significance level, suggesting that the **association between cancer type and treatment type may be due to chance**.

However, the Cramer's V value of 0.4175 indicates a moderate association between cancer type and treatment choice. This suggests that while not statistically significant at the

conventional threshold, there may be some clinically relevant patterns in how treatments are assigned to different cancer types.

The one-way ANOVA yielded an $(F(6,89) = 1.25, p > 0.05)$, which does not exceed the critical value of 3.00 at the $\alpha=0.05$ significance level. Therefore, we fail to reject the null hypothesis. This indicates that there are **no statistically significant differences in mean age across the different cancer types** in this dataset.

Despite the lack of statistical significance, there are some observable trends in the descriptive statistics:

- Breast cancer patients tend to be younger (mean age = 52.70 years)
- Other cancer types have higher mean ages, with the "Other Cancers" category having the highest mean age (62.00 years)
- The overall age range across all cancer types is substantial (33-82 years)

In two-way ANOVA, all the **p-values are greater than 0.05**, indicating that there are **no statistically significant differences** in the mean age across different cancer stages. Additionally, the **interaction between treatment type and cancer stage** significantly influences the mean age. This suggests that **age distribution varies** depending on the combination of cancer stage and treatment type.

The Turkey's HSD post-hoc test results for cancer stages indicate: All p-values are greater than

0.05, suggesting that cancer stage does not significantly affect the age of patients in this dataset. The results align with the earlier ANOVA findings.

Data of consecutive new cancer patients between the January 2022 to December 2024 were retrieved from the medical reports along with their baseline demographic profile. We analyzed time trends of most frequently occurred cancers includes breast, stomach, ovarian, oral/head and neck, colon cancers.

Overall, the most common type of all cancers was breast cancer (n=43) and the second most common cancer was stomach cancer (n=16). With respect to time, both breast and stomach cancer showed upward trend with number of breast and stomach cancer increased by 7% (Between 2022 and 2023) and 20% (Between 2023 and 2024) for breast and 14% (Between 2022 and 2023) and 16% (Between 2023 and 2024) for stomach cancer respectively.

Among other cancers, ovarian cancer (n=13), oral/head and neck (n=5) and colon cancer (n=4) were third, fourth and fifth. Among these ovarian cancer increase trend between 2022 and 2023 and decrease trend between 2023 and 2024 and oral/head and neck cancer shows downward trend and colon cancer shows plateau over the three years (2022 to 2024) in table 2 and figure 1.

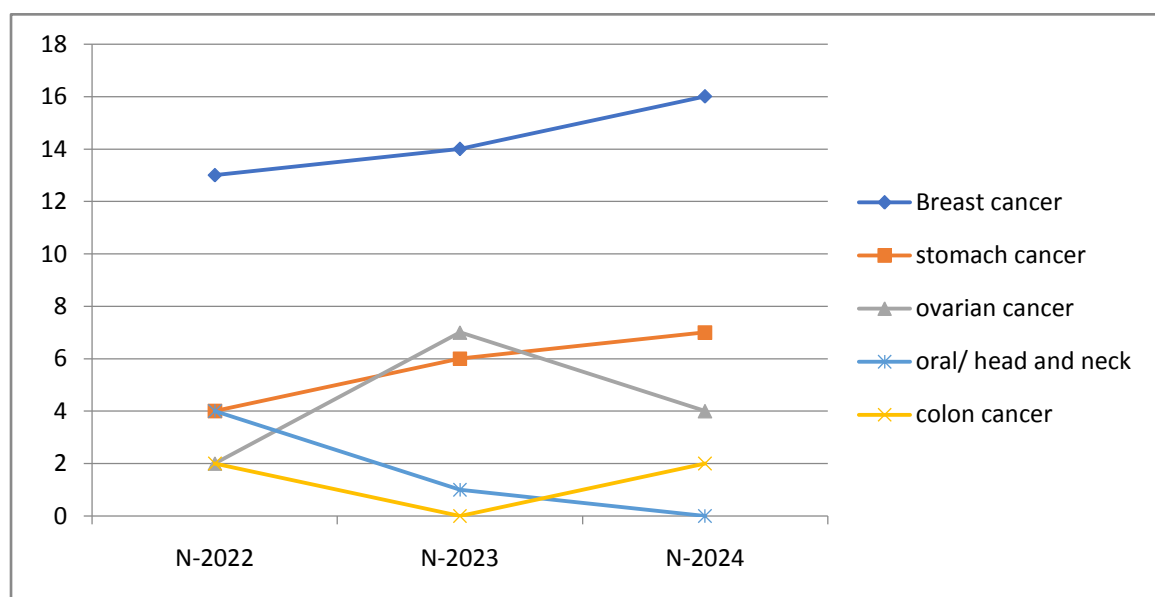


FIGURE 1 Time trends of five common cancers registered between January 2022 and December 2024 in descending orders.

Table 1: analysis of common cancer

Variables	No. of patients(n)	Percentage (%)
Age group(year)		
31-40	12	12.5%
41-50	21	21.87%
51-60	31	32.29%
61-70	21	21.87%
71-80	10	10.42%
81-90	1	1.04%
Total	96	100%
Gender		
Female	70	72.92%
Male	26	27.08%
Co-morbid		
Hypertension	34	50%
Diabetes mellitus	20	29.41%
Hypothyroidism	11	16.18%
Others	3	4.41%
Type of cancer		
Breast cancer	43	36%
Stomach cancer	16	19%
Ovarian cancer	13	16%
Other cancer	10	12%
Oral/Head and neck cancer	5	4%
Colon cancer	4	2%
Pancreatic cancer	3	2%
Cervical cancer	2	2%
Cancer therapy		
Surgical therapy	0	0%
Radiation therapy	0	0%
Chemotherapy	38	39.58%
surgical chemotherapy	10	110.41%
Palliative chemotherapy	13	13.54%
Adjuvant chemotherapy	10	10.41%
Neoadjuvant chemotherapy	8	8.33%
Palliative surgery	2	2.08%
Surgical adjuvant chemotherapy	13	13.54%
Surgical neoadjuvant chemotherapy	2	2.08%
Drug		

docetaxel	49	22.37%
doxorubicin	34	15.07%
cyclophosphamide	33	15.07%
5-fluorouracil	26	11.87%
carboplatin	19	8.67%
cisplatin	26	11.87%
paclitaxel	13	5.94%
oxaliplatin	12	5.48%
gemcitabine	17	3.19%
Drug in first cycle chemotherapy		
docetaxel	10	16.95%
doxorubicin	10	16.95%
cyclophosphamide	10	16.95%
5-fluorouracil	7	11.86%
carboplatin	7	11.86%
cisplatin	6	10.16%
paclitaxel	5	8.47%
oxaliplatin	2	3.38%
gemcitabine	2	3.38%

Rank	Cancer	n			Total (n)
		2022	2023	2024	
1	Breast	13	14	16	43
2	Stomach	4	6	7	16
3	Ovary	2	7	4	13
4	Oral/ head and neck	4	1	0	5
5	Colon	2	0	2	4

TABLE 2 Time Trends of five most common type of cancers occurred between January 2022 and December 2024

TABLE 3: Analysis of association between age, treatment type and stage of cancer using Two way ANOVA:

Factor	F-Value	P-Value	Interpretation
Type of Treatment	50.04	0.000013	Significant difference in mean age across treatment types. Reject H_0 .
Stage of Cancer	5.65	0.0187	Significant difference in mean age across cancer stages. Reject H_0 .
Interaction (Treatment × Cancer Stage)	4.44	0.0118	Significant interaction effect between treatment type and cancer stage. Reject H_0 .

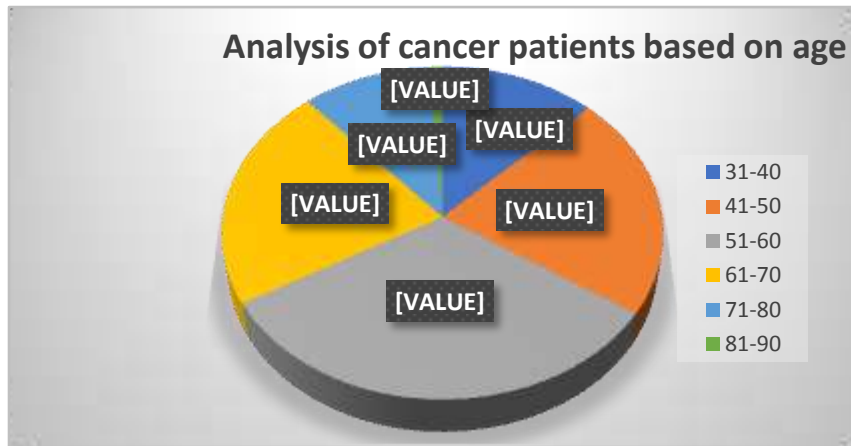


FIGURE 2 Analysis of cancer patients based on age:

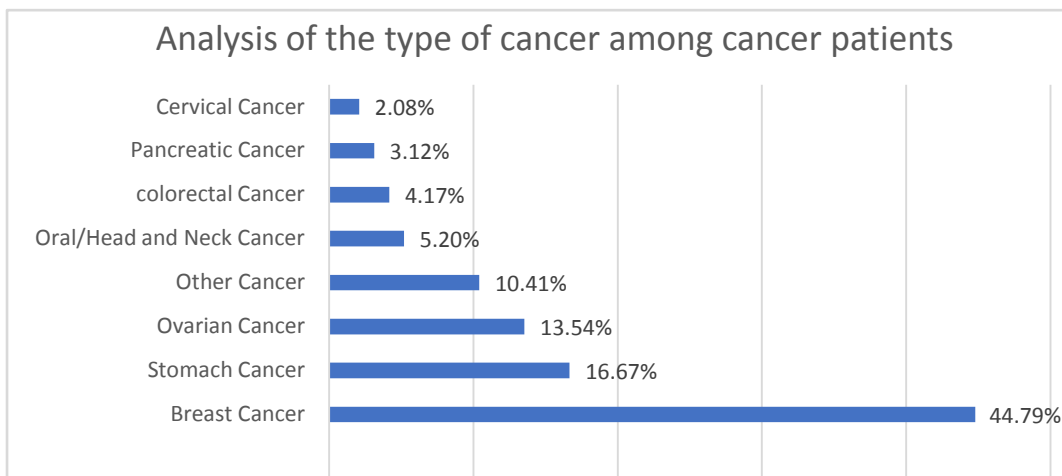


FIGURE 3 Analysis of the type of cancer among cancer patients

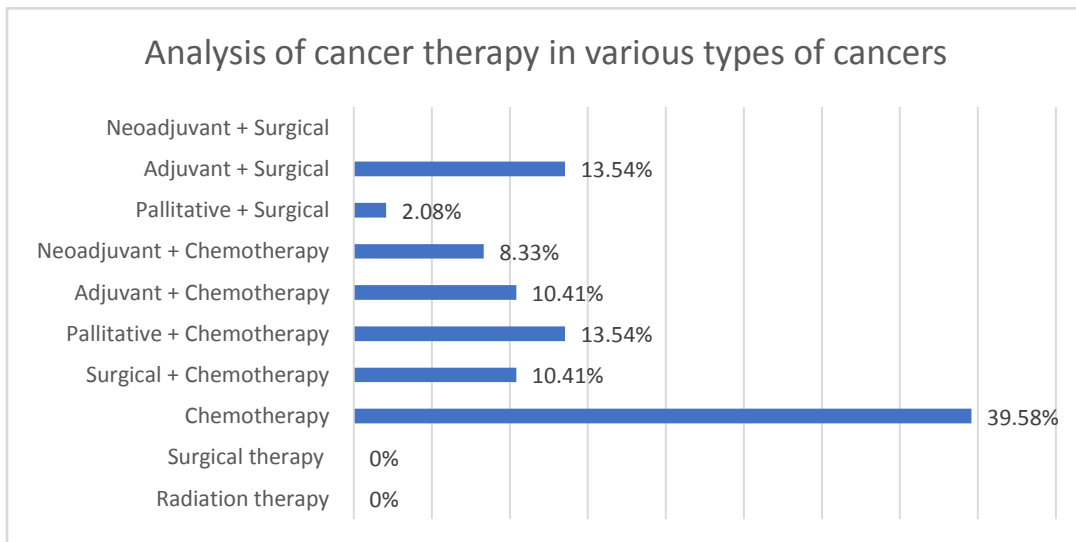


FIGURE 4 Analysis of cancer therapy in various types of cancers:

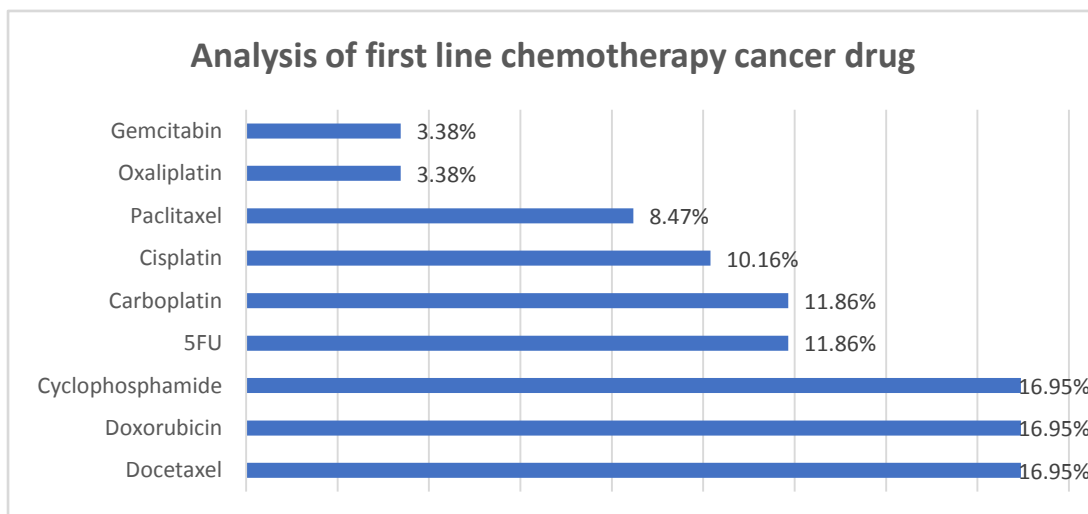


FIGURE 5 Analysis of first line chemotherapy cancer drug

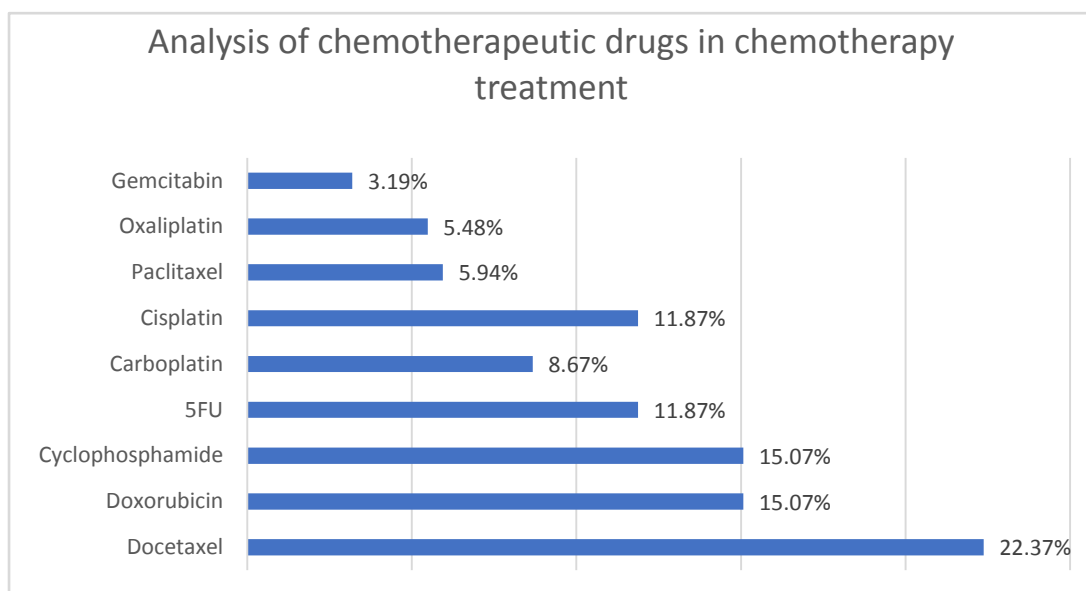


FIGURE 6 Analysis of chemotherapeutic drugs in chemotherapy treatment

IV. DISCUSSION

Cancer is one of the most prevalent diseases of the 20th century and continues to spread, with an increasing incidence in the 21st century.

All cancers can be cured if detected early enough. Cancer cells persist unless one of the following occurs: the tumor is surgically removed, chemotherapy or another cancer-specific treatment (such as hormonal therapy) is used, radiation therapy is administered, or the cancer cells shrink

and disappear naturally. Numerous studies have been published on cancer epidemiology, survival rate analysis, and time trends in cancer to predict and evaluate treatment approaches.

The reported cases of cancer were breast cancer (44.79%), stomach cancer (16.67%), ovarian cancer (13.54%), oral/head and neck cancer (5.20%), colon cancer (4.17%), pancreatic cancer (3.12%), cervical cancer (2.08%) and other cancer (10.41%). In our study used sociodemographic

(age, gender) and clinical data (comorbid, cancer therapy).

The frequency distribution of cancer among the age group showed that the peak prevalence among the 51-60 years age groups (32.29%). Women are more likely to develop cancer (72.92%) than men (27.08%). Above the sociodemographic (Age, Gender) was revealed from the study of rural tertiary care center by A. Farook et al.

The most peak prevalence in breast cancer compare with other type of cancer. It was correlates with study conducted by A. Farook et al.

In comorbid, hypertension was most prevalent. These findings align with the study conducted by Halen Fowler et al.

Overall, common cancers show a prevalent with chemotherapy. Most common of all cancers was breast cancer (44.79%) across all three consecutive years, with breast cancer patients tend to be younger (mean age = 52.70 years) and breast cancer shows a significant association with C+S (combined chemotherapy and surgery) treatment. The second most common was stomach cancer (16.67%) with adjuvant chemotherapy (AC) is most prevalent in stomach cancer cases compared to other cancer types. The third most common cancer was ovary (13.54%) across all three consecutive years, with neoadjuvant chemotherapy (NAC) appears more frequently in ovarian cancers than would be expected by chance. The fourth common was Oral/Head and Neck Cancer (5.20%) with surgical chemotherapy was the most frequently chosen option, selected by 40% of patients. After Oral/Head and Neck cancer, while colon cancer (4.17%) was most common among Chemotherapy was the peak prevalence treatment option, chosen by 100% of patients. The most of these patients had received treatment at hands of chemotherapy with inadequate skill or knowledge of oncology.

V. LIMITATIONS

The study's limitations include its retrospective methodology and confined sample size. Future research should include larger sample sizes and an examination of the long-term impacts of cancer patients. forthcoming studies should look into the effectiveness and other factors that influence cancer therapy results. We may look into cancer treatment in specific demographics, such as children and pregnant women.

VI. CONCLUSION

This retrospective study examined data from 96 cancer patients registered between 2022 to 2024 at a secondary care hospital. In a consequence of the small sample size, which results in a lack of statistical significance, there are some **noticeable trends in the descriptive statistics:**

The findings revealed that breast cancer was the most prevalent, followed by stomach and ovarian cancers. Most patients were female, and the highest cancer prevalence was observed in the 51-60 years age group. The study also identified time trends for common cancers, with both breast and stomach cancers showing an increasing trend.

Traditional chemotherapy was the most widely used treatment for various cancer types. Breast cancer patients tended to be younger, with a mean age of 52.70 years, and showed a significant association with combined chemotherapy and surgery (C+S) treatment. Stomach cancer patients had a higher prevalence of adjuvant chemotherapy (AC) treatment. Neoadjuvant chemotherapy (NAC) appears more frequently in ovarian cancers than would be expected by chance. The most common chemotherapy regimens used in the first line chemotherapeutic included TAC regimen (Docetaxel+ Doxorubicin+ cyclophosphamide) and 5-fluorouracil + Carboplatin.

Furthermore, this study offers important new insights into the clinical and demographic characteristics of cancer patients. The results of this research may inspire the development of personalized treatment regimens and emphasize the importance of early cancer detection and treatment. They also offer valuable insights for healthcare providers and policymakers, especially within the context of secondary care hospitals.

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