

Original Research Article

Incidence and trends of cancer in Goa, India: a single center retrospective study

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ABSTRACT

Background: Cancer incidence and mortality are major global health concerns influenced by lifestyle, environment, and healthcare access. This study analyzed cancer trends in Goa, India, and estimates cancer incidence from 2019 to 2024. With India facing a high cancer burden impacting its workforce and healthcare, the study examines the socio-demographic profiles of cancer registry patients, providing insights into regional cancer patterns.

Methods: This retrospective study, conducted at a tertiary care hospital analyzed data from the cancer registry over five years (April 2019 to March 2024), including histopathologically confirmed cancers. Demographic data, cancer types, and treatment details were collected. Cancer trends were analyzed by year, gender, and age group using descriptive statistics and time series analysis.

Results: Data from 570 cancer cases revealed a crude incidence rate of 39.14 per 100,000. The male-to-female ratio was 1.35:1, with 57.37% males and 42.63% female cases. The highest prevalence was in ages 60-70 (27.4%) and 70-80 (26%). Common cancers were breast (26.85%) and colon (19.09%) cancer. Tiswadi and Bardez regions had the highest cases, contributing 30.53% and 30%, respectively.

Conclusions: The study highlighted a rising cancer trend in Goa, with a higher prevalence among older adults and females, particularly for breast, colon, and oral cancers. These findings emphasize the need for enhanced screening programs, early detection, and targeted interventions to mitigate the cancer.

Keywords: Breast cancer, Cancer incidence, Chemotherapy, Metastasis, Non-Hodgkin's lymphoma

INTRODUCTION

Cancer remains a significant global health challenge, causing nearly 10 million deaths in 2020, according to the WHO, with low- and middle-income countries, bearing a large portion of the burden.¹ In 2022, India's cancer incidence rate was reported at 100.4 per 100,000 people, with an estimated 1.46 million new cases.² The most prevalent types include breast, lung, and cervical cancers, with an age-standardized incidence rate of 97.4 per

100,000 people and a mortality rate of 68 per 100,000.³ This rise could be due to factors such as rapid urbanization, lifestyle changes, and increased life expectancy.^{4,5}

Goa, a small coastal state in western India, presents a distinct profile in terms of cancer incidence, shaped by its unique demographic, environmental, and sociocultural factors. Dietary habits, tobacco use, alcohol consumption, red meat consumption, high body mass index (BMI), and

type 2 diabetes mellitus play significant risk factors in influencing regional cancer trends.⁶ The Global Burden of Disease Study (1990-2016) reported a significant rise in cancer incidence in Goa, increasing from 52.5 per 100,000 in 1990 to 97.0 per 100,000 in 2016.⁷

Data from the National Cancer Registry Programme (NCRP) indicates that breast cancer (27%), cervical cancer (15.2%), and oral cavity cancers (5.6%) are the most prevalent in Goa.^{8,9} These cancers impose a substantial burden on patients and the healthcare system, challenging its ability to provide adequate treatment and support. This retrospective study, based on data from a tertiary care hospital, aimed at estimating the incidence and trends of cancer in Goa over five years (April 2019-March 2024), offering critical insights to inform cancer prevention and treatment strategies in the region.¹⁰ Cancer burden highlights the urgent need for enhanced healthcare infrastructure, targeted awareness programs, and preventive measures.

This study underscores the importance of region-specific data to guide effective cancer control strategies, improve early detection, and optimize treatment outcomes, ultimately reducing the cancer-related burden on individuals and the healthcare system in Goa.¹¹

METHODS

This present research study was conducted as a retrospective study at Healthway Hospitals Pvt. Ltd., a tertiary care center located in Goa, India. The study focused on analyzing cancer trends and data from the hospital over five years, spanning from April 2019 to March 2024. Approval for the study was obtained from the institutional ethics committee (IEC) before its initiation. All procedures adhered to the principles outlined in the Declaration of Helsinki to ensure ethical compliance. Patient identities were anonymized to maintain confidentiality, and strict protocols were followed to safeguard the privacy and confidentiality of all medical records used in the study. The hospital's role as a tertiary care center provided a comprehensive dataset, allowing for a detailed analysis of cancer incidence and trends in the region. Data for the study was collected from patient medical records, ensuring a comprehensive overview of each case. The information gathered included demographic details such as age, gender, and taluka (locality), along with specific cancer-related data, including the type of cancer, primary site, date of diagnosis, cancer stage, and the treatments administered. For statistical analysis, the collected data was processed using descriptive statistics to summarize the findings, including calculating percentages, means, and standard deviations. All statistical analyses were conducted using SPSS version 27, ensuring accurate and reliable interpretation of the data to assess cancer incidence trends and treatment patterns during the study period.

Inclusion criteria

All the patients were diagnosed with any type of cancer and treated at Healthway Hospital, Goa, during the specified study period.

Exclusion criteria

Patients were excluded from the study if their medical records were incomplete or they were diagnosed with cancer outside the defined study period.

RESULTS

In the present study, a total of 570 cancer cases were analyzed, revealing an upward trend over five years. Year 1 recorded the lowest count with 90 cases, which increased to 110 in year 2 and 114 in both years 3 and 4. The highest number, 142 cases, was observed in year 5, marking a significant rise. This steady increase highlights a concerning growth in cancer incidence. The findings underscore the need for enhanced preventive measures and early detection strategies, refer (Figure 1).

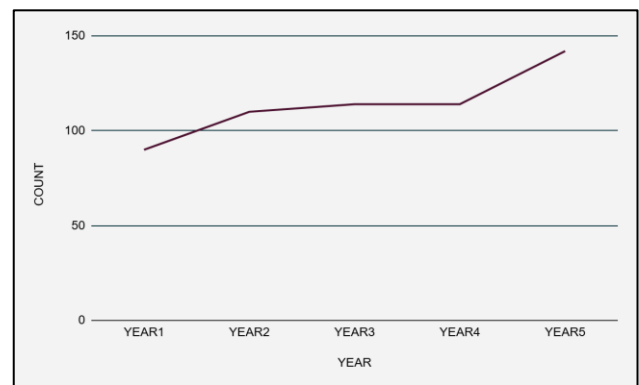


Figure 1: Distribution of cancer cases across different years.

The age distribution revealed a predominant cancer burden in economically active and elderly populations. The highest prevalence was in the 60-70 age group (27.4%, 156 cases), followed by the 70-80 group (26.0%, 148 cases). The 50-60 age group accounted for 18.6% (106 cases), while younger groups (0-20 years) contributed minimally at 2% combined. Patients above 80 years comprised 8.7% (49 cases). Notably, individuals over 50 years had a sixfold higher incidence compared to those under 50, underscoring the impact of age on cancer risk.

Over five years, a total of 570 cancer cases were registered at the study site. Of these, 327 cases (57.37%) were male and 243 cases (42.63%) were female, resulting in a male-to-female ratio of approximately 1.35:1. This data indicates a higher prevalence of cancer among males compared to females. The highest number of cases was

recorded in 2023-2024, with 142 cases, accounting for 24.91% of the total cases over the study period.

The distribution of cancer cases across various talukas revealed significant regional variations. The talukas of Tiswadi and Bardez had the highest number of cases, with 174 cases (30.53%) and 171 cases (30.00%), respectively. Ponda followed with 82 cases (14.37%) and Salcete with 55 cases (9.65%). In contrast, talukas such as Marmugao (19 cases, 3.33%) and Bicholim (12 cases, 2.11%) reported relatively lower numbers. Quepem and Sanguem each had just one case (<0.2%). The remaining 32 cases (5.61%) were categorized under “others”. These findings suggest that urbanized and economically active regions, such as Tiswadi and Bardez, experienced a higher burden of cancer, potentially influenced by lifestyle factors and better diagnostic access in these areas.

Table 1: The distribution of cancer types.

Type of cancer	Number of cases	Percentage
Breast cancer	153	26.85
Colon cancer	109	19.09
Oral and pharyngeal cancer	36	6.29
Ovarian cancer	21	3.68
Other/undiagnosed cases	251	44.03

The analysis of cancer types revealed that breast cancer was the most prevalent, with 153 cases accounting for 26.85% of the total cancer diagnoses. Colon cancer followed closely with 109 cases, representing 19.09% of the total. Other significant cancer types included oral and pharyngeal cancers (36 cases, 6.29%) and ovarian cancer (21 cases, 3.68%). A portion of the cases remained undiagnosed as they were outpatients who presented primarily for symptom management rather than full diagnostic workups. These findings underscore the burden of cancers commonly associated with lifestyle and genetic predispositions, highlighting the need for targeted awareness and early detection efforts (Table 1).

Among gastrointestinal (GI) cancers, colon cancer emerged as the most common type, accounting for 109 cases (19.09%). Additionally, oral and pharyngeal cancers were notable, with 36 cases (6.29%).

In the domain of obstetrics and gynecology (OBG), ovarian cancer was the most frequently diagnosed, comprising 21 cases (3.68%) of the total cancer cases. Although gynecological cancers were significantly represented in the study population, ovarian cancer was less prevalent compared to more common types such as breast and colon cancers. This distribution underscores the varied cancer burden across different anatomical sites within the population.

Age group distribution of breast cancer cases

The distribution of age groups among breast site classifications is summarized as follows. Out of the total 152 cases, the age group 50-60 had the highest number of cases (44, 28.95%), followed by the 60-70 age group with 37 cases (24.34%), and the 70-80 age group with 32 cases (21.05%). The 40-50 age group accounted for 21 cases (13.82%), while the 30-40 age group had 8 cases (5.26%). The 20-30 age group had 1 case (0.66%), and the 80-90 age group had 7 cases (4.61%). Lastly, the 90-100 age group accounted for 2 cases (1.32%). A total of 0 cases were observed for the 0-20 age group. The analysis demonstrates a steady increase in the prevalence of breast cancer with advancing age, peaking in the 50-60 years age, highlighting the critical need for targeted screening and early detection strategies for middle-aged and older women (Figure 2).

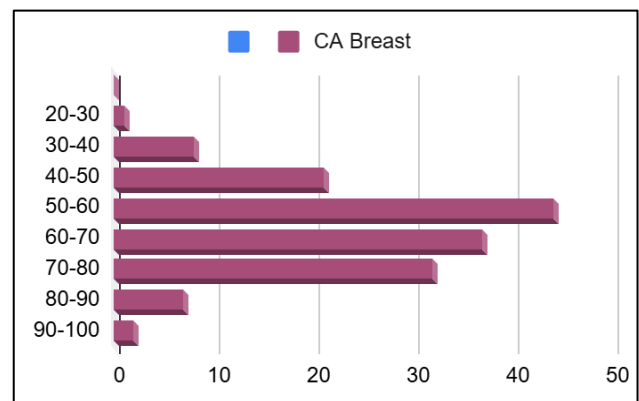


Figure 2: The distribution of age groups among breast cancer.

Table 2: The colon cancer distribution.

Colon (count)	Age group	Percentage
1	20-30	0.91
2	30-40	1.82
10	40-50	9.09
11	50-60	10.00
35	60-70	32.73
1	60-71	0.91
35	70-80	31.82
12	80-90	10.91
2	90-100	1.82

Age group distribution of colon cancer

A total of 110 patients were identified with colon cancer, with the majority falling into the 60-70 age group (32 individuals, 32.73%). The 70-80 group follows closely, comprising 35 patients (31.82%). Other notable groups include 80-90 years (12 patients, 10.91%), 50-60 years (11 patients, 10.00%), and 40-50 years (10 patients, 9.09%). Smaller numbers are seen in the 30-40 and 90-100 ranges, with two patients each, and one patient each

in the 20-30 and 60-71 age brackets (0.91%). This distribution highlights a predominance of colon cancer cases in the 60-80 age range (Table 2).

Age group distribution of ovarian cancer

The common cancer type related to obstetrics and gynecology (OBG) is ovarian cancer, with 21 cases accounting for 3.68% of the total cancer diagnoses. This highlights a significant occurrence of gynecological cancers within the study population, though ovarian cancer remains less prevalent compared to other types like breast and colon cancer (Figure 3).

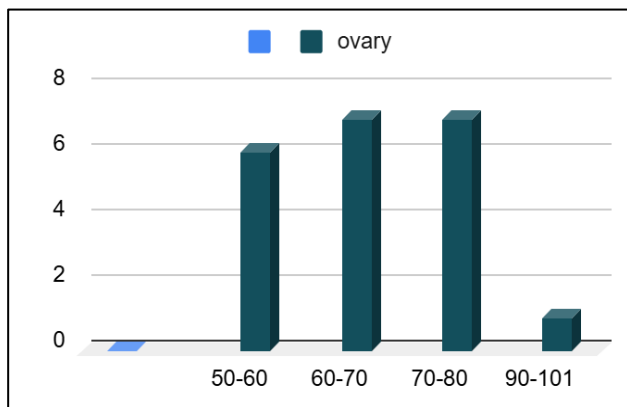


Figure 3: Age-wise distribution of ovarian cancer.

Among the 21 cases analyzed, 3 (14.29%) were metastatic cancers, including “ovarian cancer with metastases”, “metastatic nodule in the peritoneum”, and “metastatic thyroid carcinoma”, each contributing 4.76%. The remaining 18 cases (85.71%) were non-metastatic. This distribution highlights that metastatic cancers represent a smaller, yet advanced subset of the total cases. The findings underscore the relative rarity of metastasis within this cohort.

The in-depth analysis of cancer trends, examining the interplay between demographic factors such as age, gender, and geographic distribution with various cancer types. Breast cancer emerged as significantly more common among women aged 60 to 70, while prostate cancer was notably prevalent in men within the same age group. Colon cancer was identified in both genders, with a higher prevalence observed among the elderly population. These findings underscore the critical role of demographic parameters in understanding cancer distribution and highlight the need for age- and gender-specific prevention and screening strategies.

DISCUSSION

The analysis of cancer trends from various studies provides valuable insights into the regional, demographic, and age-related patterns of cancer. The studies revealed both similarities and differences in the cancer burden, particularly when considering age, sex, geographical

distribution, and the prevalence of common cancers. The significant similarity across all studies is the prevalence of cancer among older age groups. In current study, 84% of cases were in patients over 50, with the highest incidence in the 60-70 and 70-80 age groups. The study analyzed by Sathishkumar et al and Xu et al observed the highest incidence of cancer in the 60-70 and 70-84 age groups, respectively, aligning with our findings, where 32.73% of colon cancer cases were reported in the 60-70 age group, followed by the 70-80 age group.^{2,12} In the study by Saini et al, the median age for males and females was 55 and 50 years, while our study showed a predominance of patients in the 60-70 and 70-80 age groups (27.4% and 26%, respectively). However, the median age reported in Saini et. al. study was notably lower than in our study, possibly due to differences in the cancer types studied, earlier age of exposure to risk factors, or variations in healthcare-seeking behavior and diagnostic practices in their population.¹³ Cancer incidence rises sharply in these older age groups across the studies, emphasizing the growing cancer burden among the elderly population. Sex disparities in Saini et al study, the male-to-female ratio was 1.63:1, however in our study, it was slightly lower at 1.35:1, with 57.37% male and 42.63% female patients.¹³ Sathishkumar et al study reported a male-to-female ratio of 1.35:1, identical to our study, indicating a consistently higher cancer burden in males. This similarity highlights the influence of shared risk factors like smoking, Alcohol consumption and occupational hazards.² However, the proportion of breast cancer in females was slightly higher in the Sathishkumar et al study (28.8%) compared to our study (26.85%), potentially due to variations in screening practices, awareness levels, and dietary habits.² According to Xu et al and Fitzmaurice et al, it is vital to underline that breast cancer remains the most prevalent cancer in females across all studies, emphasizing the need for gender-specific preventive strategies and early detection.^{12,14} Study shows a high prevalence of breast cancer among females in both Saini et al study (37.36%) and our own (26.85%).¹³

In Saini et al study, Jamnagar was identified as the leading region with 46.47% of the cancer cases. Moreover, the current study found that Tiswadi (30.53%) and Bardez (30.00%) were the hotspots for cancer cases. These urbanized and economically active regions likely exhibit higher cancer prevalence due to factors such as lifestyle, access to healthcare, and environmental exposures. The findings align with those from Xu et al and Fitzmaurice et al, who observed that urban and economically developed regions tend to report higher cancer incidences due to better diagnostic infrastructure and more comprehensive healthcare systems.^{12,15}

Cancer prevalence shows remarkable patterns across studies, particularly for breast and colon cancers. In both Saini et. al. and our studies, breast cancer emerged as the most prevalent cancer type among females, although the magnitude differed- 37.36% in Saini et al study compared

to 26.85% in our study.¹³ The difference in the prevalence of breast cancer may be attributed to variations in early screening practices, better awareness, and lifestyle factors such as unhealthy diet, obesity, and reproductive health. Colon cancer emerges as a common concern across various studies. Our study and Sathishkumar et al, research highlights the significant burden of colon cancer, with its prominence, particularly in elderly populations, pointing to the increased vulnerability of aging demographics to this cancer type.² According to studies from Portugal epidemiology, colon cancer ranks among the most prevalent cancers, reflecting aging populations and dietary influences, particularly high consumption of red and processed meats. Lung cancer, which was the most common in males in Saini et al study (24.13%), was overshadowed by colon cancer (19.09%) in our study.¹³ This divergence highlights regional differences in cancer trends, where lifestyle factors such as smoking and diet significantly influence the types of cancer prevalent in a particular region. However, lung cancer prevalence in Portugal tends to align more closely with smoking patterns, shows a decline due to robust anti-smoking campaigns over recent decades.^{16,17} This highlights the aging population's increased susceptibility to colon cancer, underscoring the need for targeted interventions aimed at early detection, particularly for those in the 60-70 and 70-80 age groups. oral and pharyngeal cancers (6.29%) were more significant in our study, while studies by Xu et al and Fitzmaurice et al did not highlight them as prominently.^{12,15} This could be due to regional lifestyle factors, such as the consumption of tobacco and alcohol, which play a critical role in the development of these cancers.

Across various studies, including Saini et al and ours, there is a clear demographic shift towards higher cancer incidence in older populations.¹³ In both studies, the majority of cancer cases occurred in individuals over 50, with our study reporting 84% of cases in this age group, compared to more than half in Saini et al study. Notably, the highest incidence was observed in the 60-70 and 70-80 age groups, underscoring the need for focused geriatric cancer care and research. Urbanization also plays a significant role, as seen in our study with higher cancer prevalence in Tiswadi and Bardez, mirroring the trends reported by Xu et al.^{4,12} These urbanized areas show increased cancer rates, likely due to better healthcare infrastructure and lifestyle factors. The findings emphasize that cancer prevalence is influenced not only by age but also by environmental, urbanization, and socioeconomic factors, highlighting the need for region-specific prevention strategies.¹⁸

CONCLUSION

The cancer trends across various studies reveal shared and distinct patterns based on age, gender, geographical region, and cancer type. Studies showed a growing cancer burden among the elderly population, particularly in urbanized regions with access to better healthcare

facilities. The cancer in males is consistently higher across all studies, with breast cancer remaining the most common type among females. Colon cancer shows a higher prevalence in both male and female populations, emphasizing the need for targeted screening and prevention. The differences in geographic distribution highlight the impact of urbanization and regional factors on cancer incidence. Collectively, these findings emphasize the need for tailored cancer prevention, early detection, and healthcare interventions based on demographic, geographic, and lifestyle factors to reduce the growing cancer burden.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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