COMPARATIVE EPIDEMIOLOGY SHOWING GENDER DISPARITY IN CANCER PATIENTS IN RAIPUR, CHHATTISGARH

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Abstract

Background: Cancer represents a growing public health concern globally, with increasing incidence and mortality rates, particularly in developing regions. Understanding regional variations and temporal trends in cancer epidemiology is essential for effective disease control and prevention. This study consists of gathering and analysing hospital registry data to evaluate the extent of cancer over a six-year period from 2018 to 2023 and suggest to develop priority actions.

Method: All data were collected from medical record department of Sanjivani Cancer Care hospital (SCCH), Karuna Cancer hospital, Radiant Super Speciality Cancer hospital, Raipur Chhattisgarh, India, spanning the six-year period from 2018 to 2023. Also cancer sites' data taken from the department of histopathology and hospital records of three years. The analysis was conducted utilizing suitable statistic tools using MS Excel and also presenting data via various graphs formation.

Observation: A total of 12661 patients were registered between 2018 and 2023, out of which 45.25% were males. In Females, breast cancer is Single site 42.6% in Females, which is alarming followed by cervical and uterine cancers accounted for 22.5% of all cancer cases in the Raipur region. In Males, Buccal mucosa cancer was the leading cancer as a Single site (27.5% of all cancers in males). Lungs and Tongue cancer, all sites clubbed, was most common in males (35.25%). Raipur city represented around 50% of all cases at the study centre.

Conclusion: Tobacco-related cancers are most common in the male population, and stringent implementation of a national tobacco control program is the most appropriate measure to curtail incidences and hence mortality in this male population. Therefore, preventing ourselves from exposure to carcinogenic edibles or harmful environmental factors will lower the risk of cancer. Gender-related cancer were more common in the female population, and resource-appropriate screening is a suitable option for these diseases. A population-based cancer registry is required to further define the pattern pertinently, or an epidemiological study is required to find causes of the noticeably lower incidence of cancer of the cervix.

Key words: Buccal mucosa cancer, breast cancer, tobacco, female reproductive parts, raipur, Gender based comparative epidemiology.

1.1 Introduction

Globally, developing nations are experiencing an epidemiological shift. Communicable, infectious diseases are being replaced by non-communicable diseases (NCDs), such as diseases caused by pollution and lifestyle choices (Bollyky et al., 2017) . Because epidemiology records disease distribution across populations, identifies risk factors (such as food, inactivity, and pollutants), and assesses the efficacy of interventions. Peyush, (2023) suggested that it is essential for comprehending and managing non-communicable diseases (NCDs). Cancer is a leading global health burden, with cases and deaths expected to rise significantly by 2050, especially in low-resource countries. Sociodemographic factors as well as lifestyle changes can be attributed to the rise of this disease (Hasani et al., 2023) Although age-standardized mortality rates are declining, progress remains insufficient to meet the 2030 Sustainable Development Goals. Addressing this challenge requires coordinated national and global efforts focusing on prevention, early detection, and effective treatment strategies. Countries are Focusing on implementation of cancer-control strategies across the continuum of prevention, diagnosis, and treatment. Researchers project 18.6 million deaths in 2025, with global cancer deaths expected to rise by 75% by 2050. Athanasios Valavanidis, 2026.

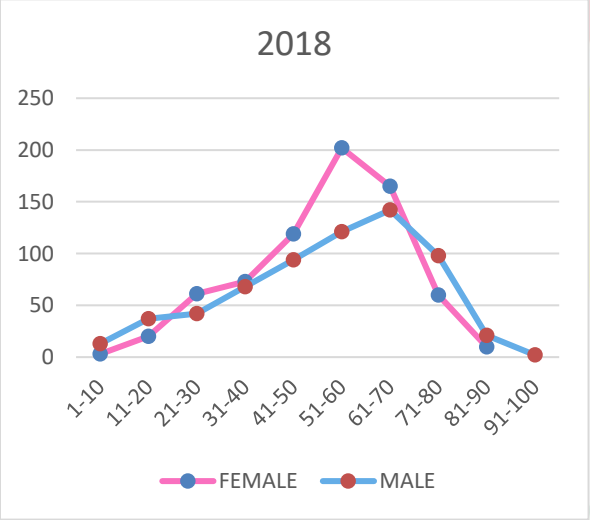
Global cancer cases and deaths have risen over the past decade due to population growth and aging, with nearly 20 million new cases and 9.7 million deaths in 2022. All developed countries Organisation for Economic Co-operation and Development (OECD) (Stone, 2025) advanced in the last decades principal approaches of cancer control for cancer prevention, early detection, diagnosis/treatment and palliation, as described by the World Health Organization WHO, (2026) By significant advancements in global campaigns of prevention, Annual screening for tumours, advanced medical treatment and new effective anticancer drugs. Mortality rates have declined, with 5-year survival rates reaching a record 70% in 2026 Yezdan et al., 2025.

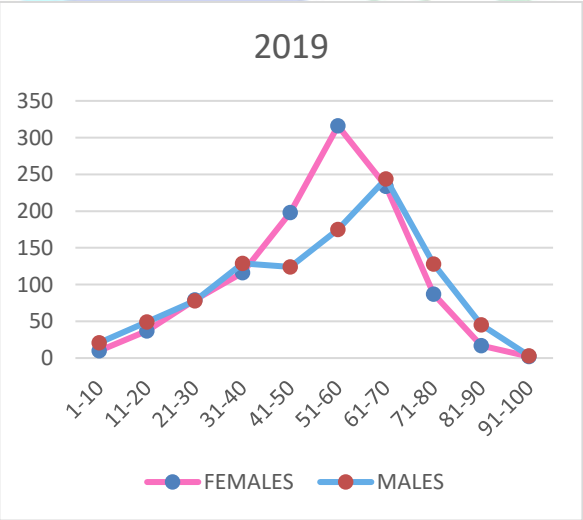
Detailed discussion on recent cancer database is important for planning, monitoring and evaluating cancer control activities. This article aims to provide an update on the cancer incidence estimates in Raipur, Chhattisgarh by gender, age groups, location and cancer sites etc. criteria for six years ranging from 2018 to 2023.

1.2 Materials and Methods

This study is a retrospective, observational, multicenter epidemiological investigation conducted to analyse the comparative patterns of cancer cases in the Raipur region of Chhattisgarh over a period of six years (2018–2023). Data were collected from multiple healthcare centers / hospitals located in Raipur (Sanjivani Cancer care hospital and Radiant Super speciality Cancer hospital). Also data regarding sites of cancer taken from the department of histopathology and hospital records of three years (2023 -2025). These centres have healthcare facilities, and providing cancer treatments to a diverse patient population. The study population comprised all diagnosed cancer patients (male and female) whose clinical records were available. Further detailed information was also collected by asking cancer patients, directly face to face. All together data then analysed to assess the extent of the issue. The data analysis was conducted utilizing suitable statistics tools using MS Excel. MS Excel is widespread, user-friendly, easy to learn, and powerful for developing statistical analysis, recommended by (Todorova, 2019).

1.3 Results with Interpretations:





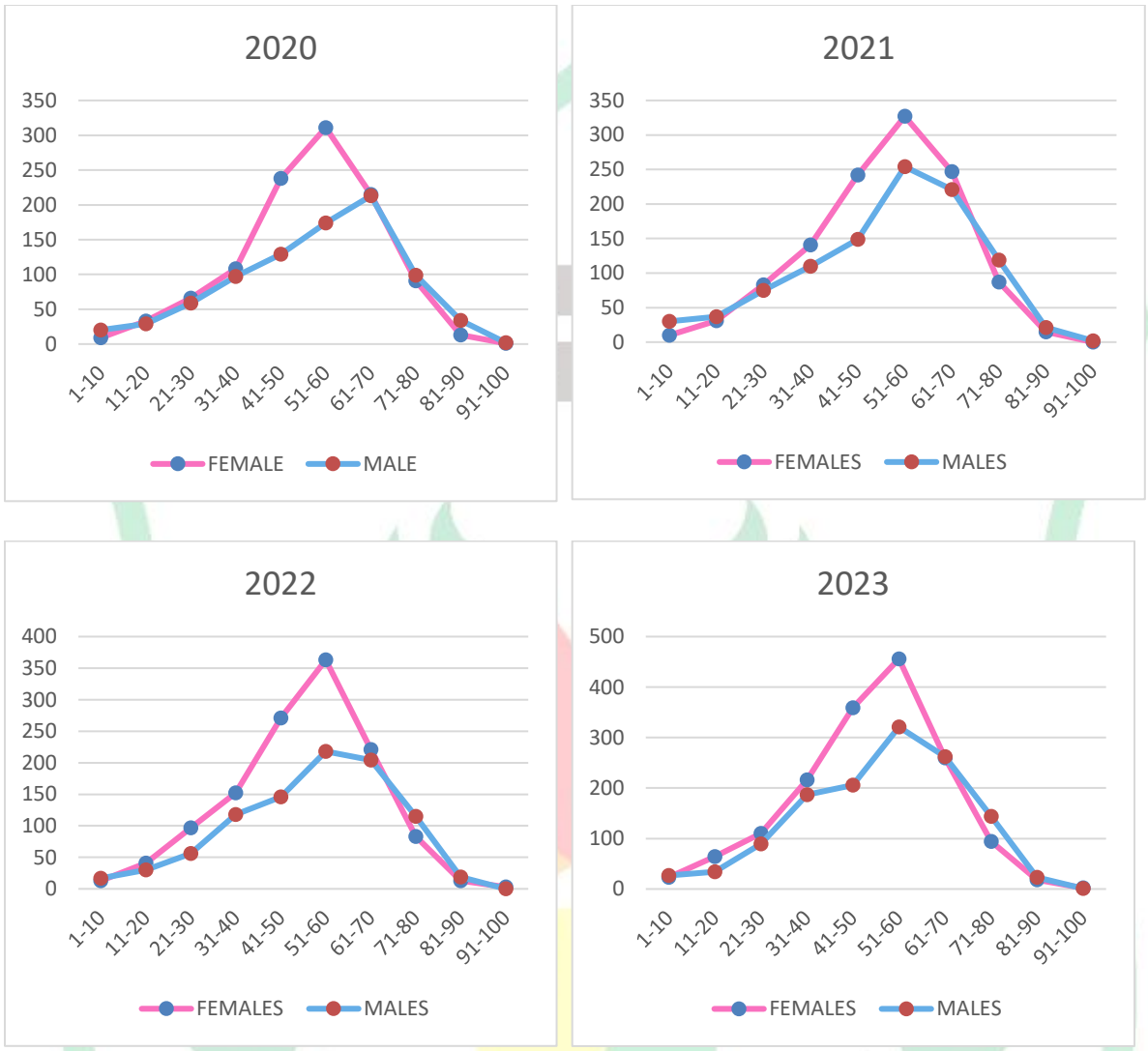


Figure 1:- Includes all 6 line charts above, where X- axis showing total number of females and males cancer patients vs at Y- axis showing age groups in each year from 2018 to 2023 year.

Females consistently accounted for a higher proportion of cases each year, contributing approximately 52–55%, while males comprised 45–48%. It is prominent that gender gap widened over time, particularly after 2021. During these years Females increased by ~125% (713 → 1602) and Males increased by ~103% (638 → 1294).

This leads to interpretation that the rising percentages indicate an increasing cancer burden in Raipur, likely due to improved detection and reporting, increased environmental and lifestyle risk exposure. Also the higher female proportions suggest better screening and greater healthcare utilization. Male variations reflects changing exposure to tobacco and occupational risks.

Further Histopathology departments' data gives us information about various sites of cancer or body parts suffering from cancer for three years i.e. from 2023 to 2025. These data are carefully kept in histograms as shown in Figure 2 and Figure 3 below.

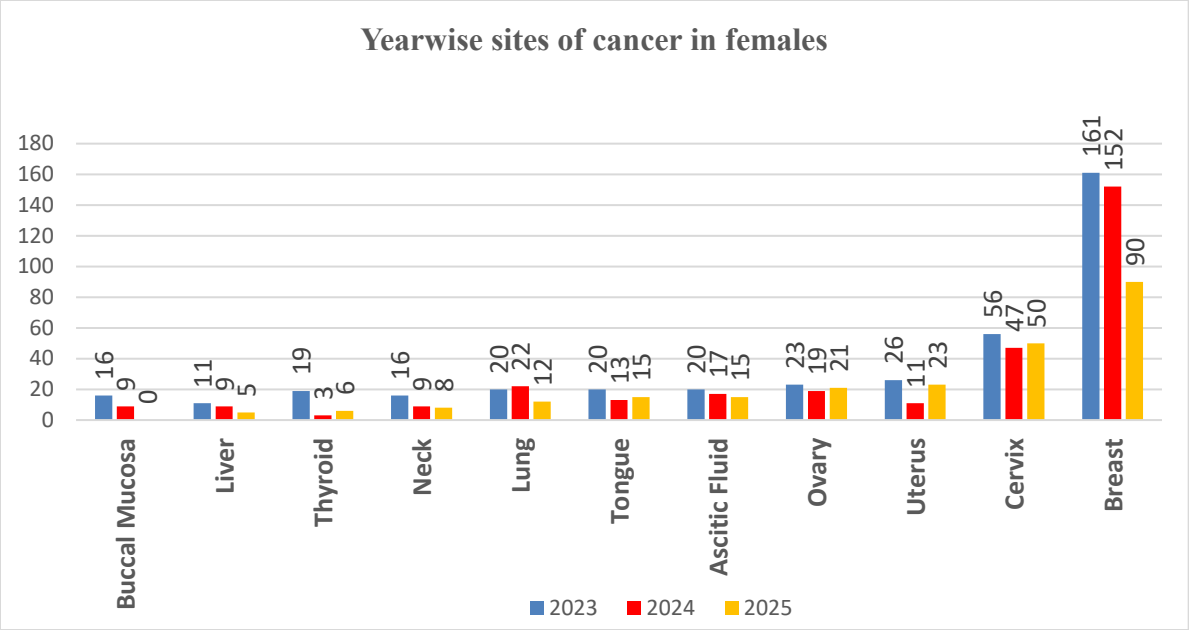


Figure 2 : Yearwise sites of cancer in number of females

Figure 2 describes that in females, for years, breast has consistently been the most commonly diagnosed cancer site (35-45%) while the second most commonly diagnosed cancer site for women is cervix (increasing popularity predicted in 2025). Concern rises to know that breast, cervix, ovary, and uterus combine to account for ~65-75% of total female cancer diagnoses.

The remaining cancers represented are lung, thyroid, tongue and buccal mucosa which, although present, only account for a small percentage of the female cancer cases diagnosed annually. Breast and reproductive cancers dominate the distribution of female cancers diagnosed every year indicating the importance of early detection and screening programs.

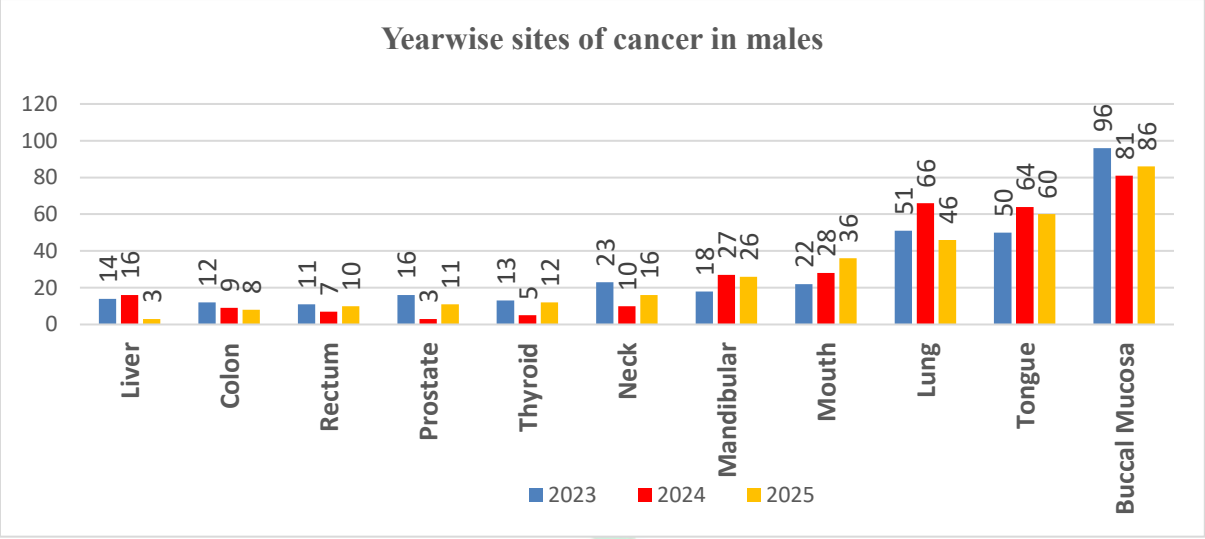


Figure 3: - Year-wise sites of cancer in number of males

Figure 3 clearly explains, that in male's buccal mucosa has historically been identified as having the highest incidence of cancers (approximately 22%-29% annually) followed by lingual or pulmonary cancers (approximately 14%-18% of cases). Head and Neck cancers as a whole are on the rise. All other types of cancer (colorectal; liver; prostate; thyroid; rectal) continue to have low incidences (<5% of all cancers) in males. In conclusion, oral cancers (buccal mucosa, tongue, mouth) and pulmonary cancers will continue to dominate the cancer statistics among males and prove to be closely associated with tobacco and lifestyle risk factors.

The comparative evaluation of cancer site distribution indicates clearly defined gender specific epidemiology differential in prevalence. In males, the majority of cancers are located in buccal mucosa, tongue and lung (solid) tumours predominantly due to well-established risk factor variables i.e., tobacco usage, alcohol consumption, exposure to occupational substances. In contrast, female cancers are dominated by breast cancer, as well as gynaecological cancers (cervical, ovarian and uterine). The relatively high prevalence of cancers of the reproductive system in females indicates the association between hormonal, reproductive, and screening factors.

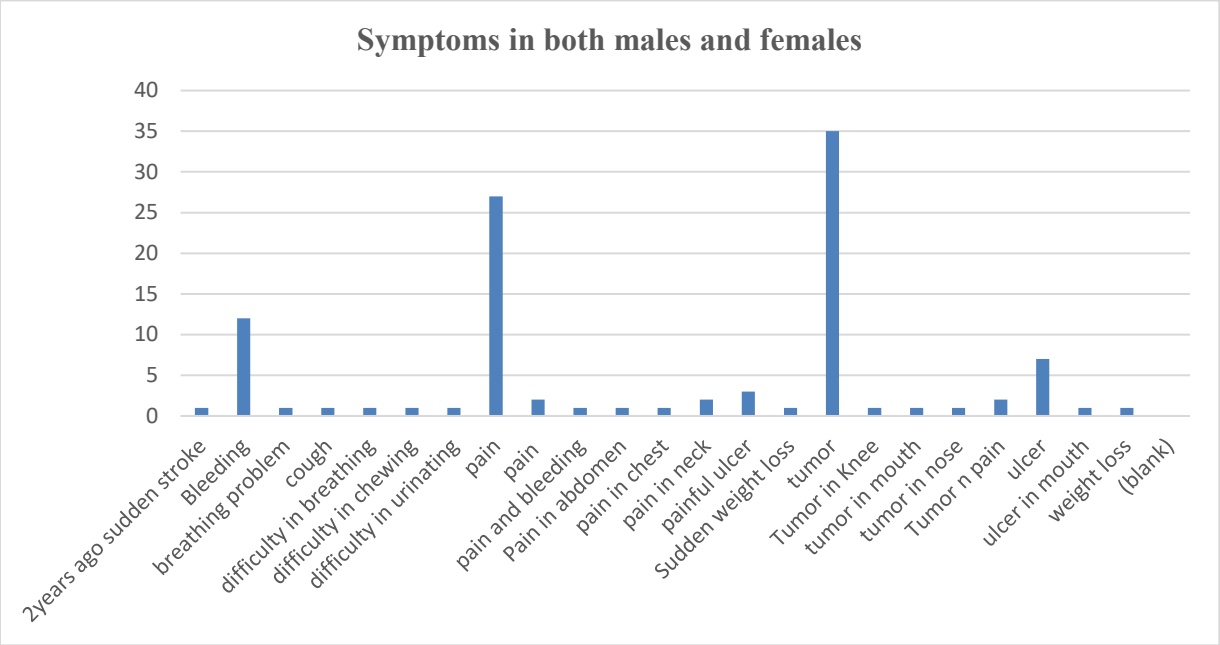


Figure 4 :- Symptoms in both males and females

In Figure 4, the symptom distribution shows that tumor-related presentations account for the highest proportion (~29%), followed by pain-related symptoms (~15%) and bleeding (~12%) specially in case of involvement of female reproductive organs. Other symptoms such as ulcers (~7%), general tumor complaints (~5%), and site-specific pain (chest, abdomen, mouth, each <5%) contribute smaller proportions. Rare symptoms including breathing difficulty, swallowing issues, and weight loss each constitute ≤3%.

Overall, the findings indicate that tumor mass and pain are the most dominant presenting complaints, while early or non-specific symptoms remain relatively underreported.

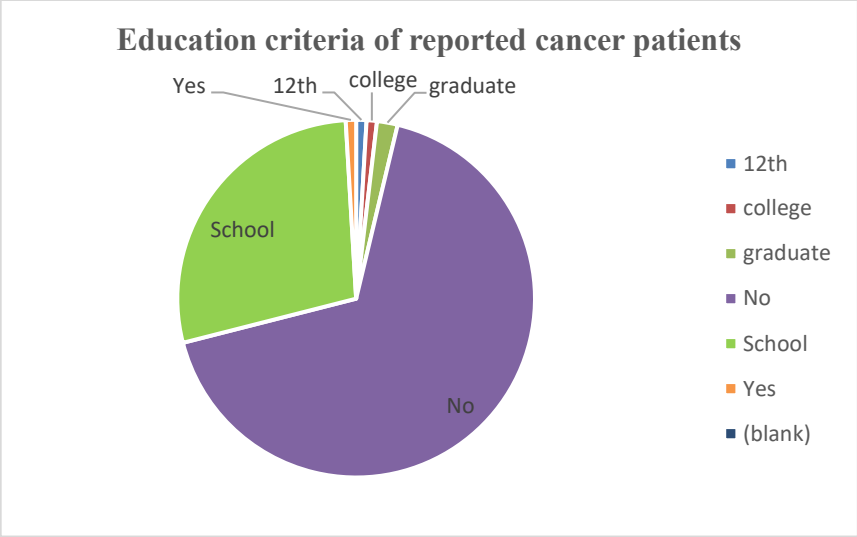


Figure 5 : Education criteria of reported cancer patients

The data indicates that in Raipur multiple cancer hospitals a majority of cancer patients (~65–70%) had no formal education, followed by those with school-level education (~25–30%). Very small proportions were observed among graduates (~2–3%), college-educated (~1–2%), and 12th pass (~1%) individuals.

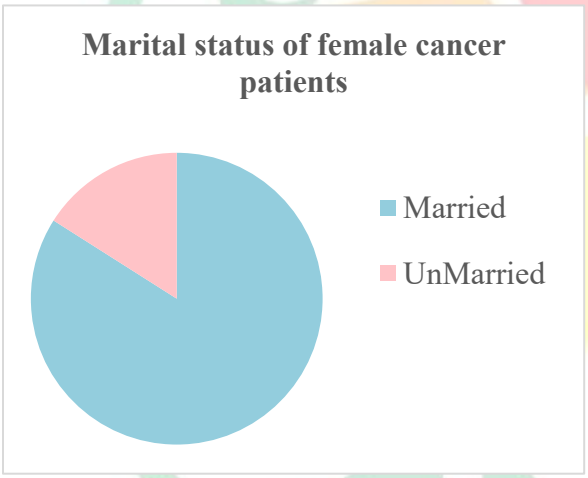


Figure 6 (a) :- Marital status of female cancer patients

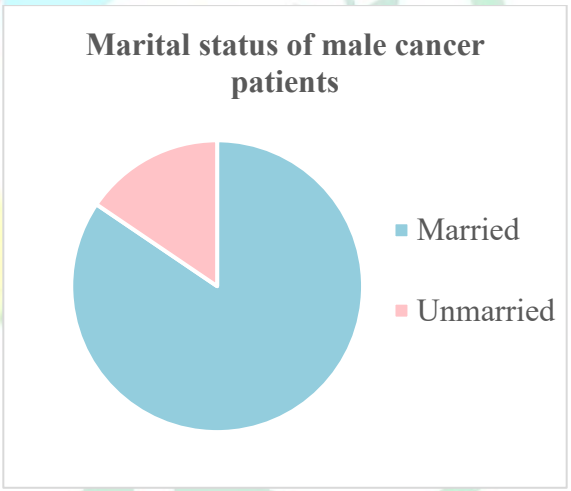


Figure 6 (b) :- Marital status of male cancer patients

The distribution in Fig 6(a) indicates that a large majority of female cancer patients were married (~80–85%), while unmarried females accounted for a smaller proportion (~15–20%).

This suggests that cancer occurrence in females is more commonly observed among the married population, which may be linked to factors such as age, reproductive history, and hormonal exposure, highlighting the importance of targeted screening and awareness in this group.

Similarly Majority of male cancer patients were married (~80–85%) shown in Figure 6 (b) while unmarried males constituted a smaller proportion (~15–20%).

This pattern suggests that cancer cases are more prevalent among married males, likely reflecting factors such as age distribution, lifestyle exposures (e.g., tobacco use), and long-term risk accumulation, emphasizing the need for targeted awareness and screening in this group.

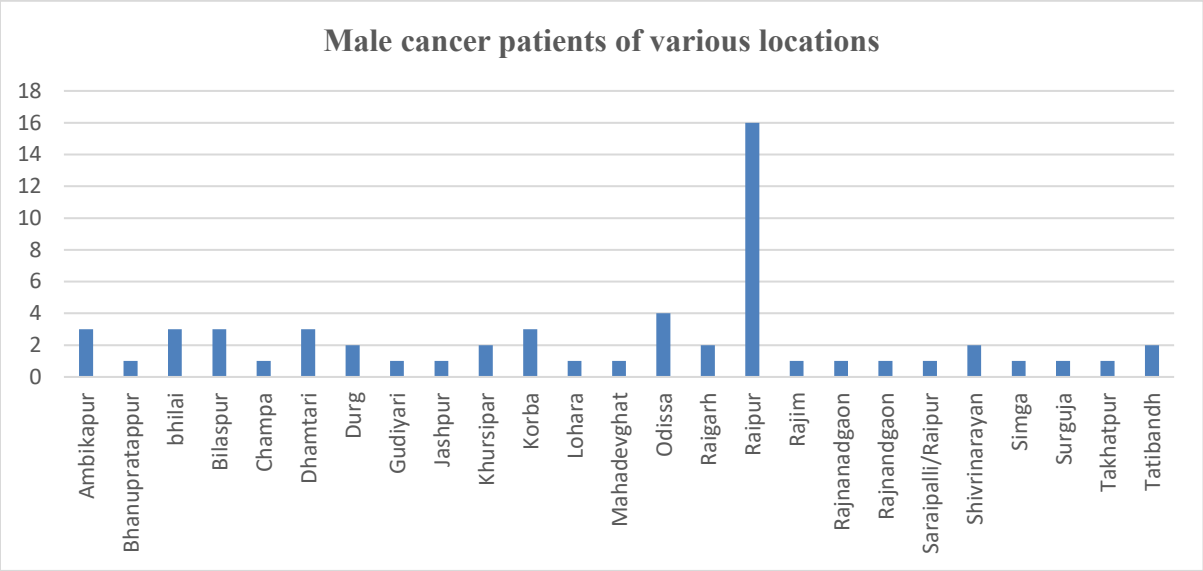


Figure 7 :- Male cancer patients of various locations

The analysis of male cancer patients across various locations indicates that Raipur serves as the primary epicenter for the male cancer patient population in this study. This concentration likely reflects Raipur's status as a state capital and a central hub for tertiary healthcare facilities, which often leads to higher reporting and registration rates in hospital-based registries Bang et al., 2012

The high volume of patients from Raipur and surrounding districts (like Durg and Tatibandh) highlights the critical need for strengthening oncology services in these high-incidence zones. Similar retrospective studies in central India have noted that tertiary care centers often cater to a large, diverse geographic region, spanning multiple districts and states Patel et al., 2023.

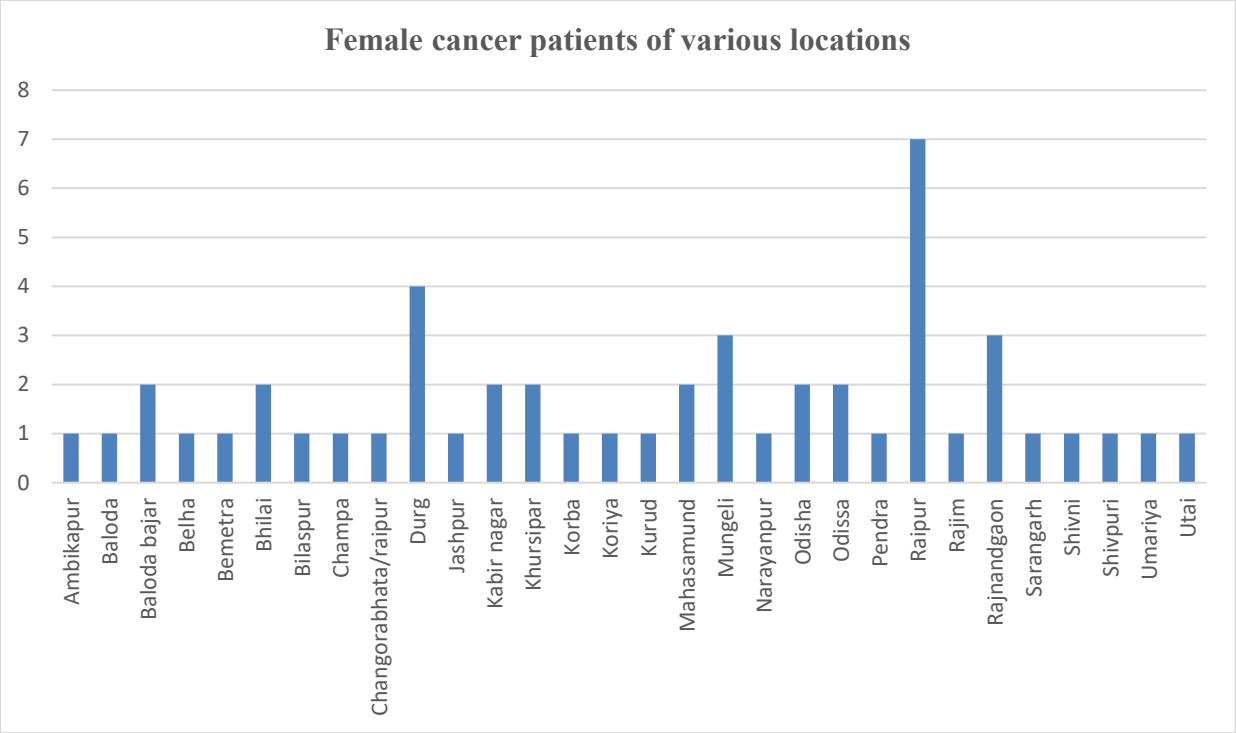


Figure 8:- Female cancer patients of various locations

Female cancer incidence is distributed very differently depending on where you live. In Raipur, where female cancer cases are located the majority of cases originated from Raipur (approx 20-22%) This was followed by Changorabhata/Raipur, Mahasamund and Rajnandgaon at (around12-13 and approx 8-9% respectively) Each of these affected areas has many more locations than they represented.

Overall, the distribution of reported female cancer cases results shows that the burden of female cancer cases is located near the urban centre (Raipur) which is considered the 'hotspot' area for female cancer incidence.

1.4 Discussion

Public health policy development is primarily driven by epidemiology in terms of disease monitoring and determining future strategies. Essentially, epidemiology involves a systematic process that incorporates observation, measurement, and reporting as part of collecting data on how often, where, and why certain health-related events occur within populations, Abdulhakim Fehaid Saleh Alfehaid et al., (2024)

In **north** India, e.g. in Himachal Pradesh, Ranta et al., 2024 found that cancer cases were nearly equally distributed between males (50.1%) and females (49.9%). Gender-specific trends revealed higher cancer incidences in females during middle age (28–57 years) and in males during older age (58 years and above).

Pandey et al., 2019 studied in **east** India state Bihar, the median age at the diagnosis was 55 years for carcinoma gallbladder while 53 years and 46 years for head-and-neck and breast cancer, respectively. Male-to-female ratio was 0.6 for carcinoma gallbladder and 1.8 for head-and-neck cancer. In Kolkata, during the 2-year period from 1 January 1998 to 31 December 1999, incidence rates were 102.1 per 100,000 males and 114.6 per 100,000 females. Which indicates that females have approximately 12% higher cancer incidence than males in this population, concluded by Sen et al., 2002.

Pandey et al., 2019 emphasised the need for detailed regional analysis which is critical for developing tailored public health interventions and allocating resources effectively, especially where cancer registries are lacking. Also here in **west** India, in Saurashtra, Saini et al., 2024 , observed that between 2012 and 2016, 62% were male cancer patients. Cancers of the cervix and uterus were discernibly less common in the Saurashtra region and accounted for only 12.37% of all cancers in females. In other west regions of India, Lung cancer was the leading cancer as a single site in males

(24.13% of all cancers in males) and breast cancer in females (37.36% of all cancers in females). Head and neck cancer, all sites clubbed, was most common in males (42%). In **south** India Kerala, Sunil kumar et al., 2024, observed 53.6% were males and 46.4% were females . The median age at diagnosis was 62 years (IQR, 54-70) for males and 57 years (IQR, 47-66) for females. The latest epidemiological study in Raipur done by Kumar Sinha et al., (2018) giving detailed insight of **central** India. Another paper regarding Raipur by, Raisa V. Patel & Shrivastava (2026) concluded that the highest cancer burden is concentrated in middle-aged and older adults, particularly within the 46–60 year age groups

Above illustration expressed in **Fig 9** and concludes the highlights evolving epidemiological patterns and underscores the need for targeted gender-specific prevention and screening strategies.

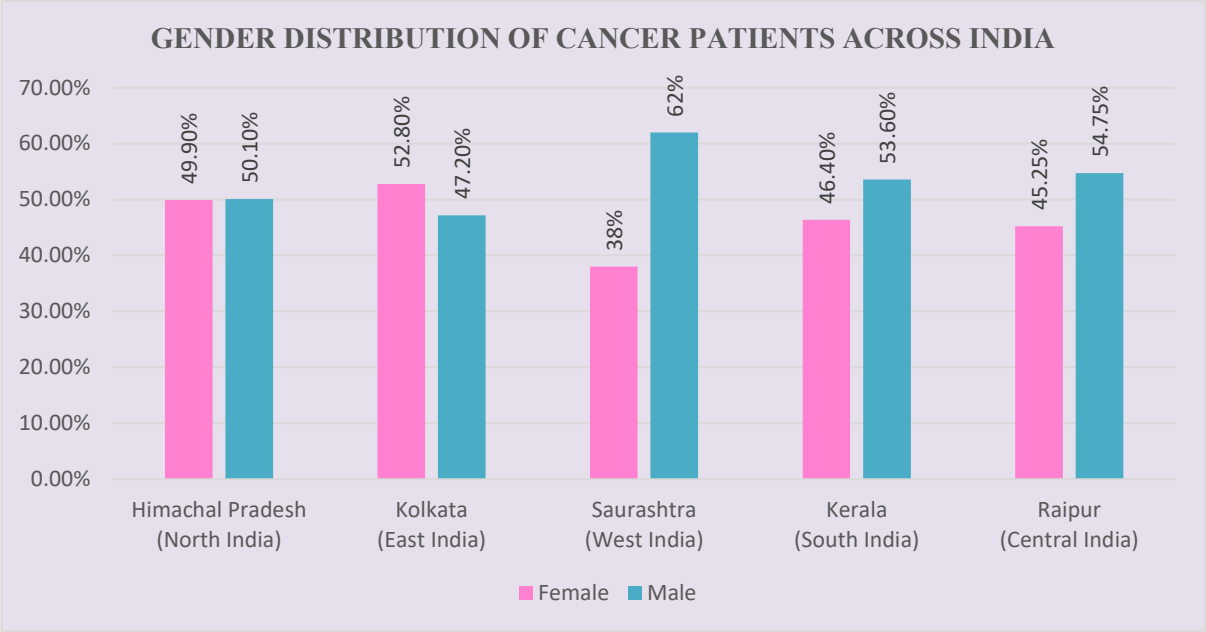


Figure 9: Regional Comparison of Major Cancer Patterns in Males and Females Across India

Risk factors, such as tobacco and alcohol use, environmental carcinogenic pollutants, improper nutrition and sedentary behaviour contribute substantially to the development of NCDs, which are sweeping the entire globe, with an increasing trend mostly in developing countries where, the transition imposes more constraints to deal with an increasing burden of over population with existing communicable diseases overwhelmed with increasing NCDs in poorly maintained sanitation and environment. To develop effective means for preventing and controlling cancer, we must understand how cancer epidemiology differs for so many variables and shows different trends over the time.

Raipur is capital city of Chhattisgarh which is rapidly developing state. Increase in urbanisation as well as rise in its population various factors such as carcinogenic pollutants in environment are generating and accumulating very speedily to harm the health of the population very widely. Understanding regional variations and temporal trends in cancer epidemiology is essential for effective disease control and prevention. Different strata of population are effected or react differently for the same carcinogenic trigger.

CONCLUSION

The comparative analysis of male verses female data shows differences in some major aspects related to total number, age, site of cancer etc indicating that the epidemiological characteristics of cancer are diversified. This observation of variations in diversified categories of male cancer cases and female cancer cases revealed brand new unknown aspects of the situation in Raipur.

Breast, cervix, ovary, and uterus combine to account for ~65-75% of total **female** cancer diagnoses.

Oral cancers (buccal mucosa, tongue, mouth) and pulmonary cancers will continue to dominate the cancer statistics among **males** and prove to be closely associated with tobacco and lifestyle risk factors.

Tumor mass and pain are the most dominant presenting complaints, while early or non-specific symptoms remain relatively underreported.

Patients with zero to minimal education status are reported in Raipur cancer care hospitals.

Patterns revealed in outcoming results suggest factors such as age distribution, reproductive history, and pollution exposure, lifestyle exposures (e.g., tobacco and alcohol use), and long-term risk accumulation.

To stop this fatal cancer disease, Policies and strict penalties should be made to Stop release of carcinogenic pollutants from the various sources and results emphasize on the need for targeted awareness and screening in each group.

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