

Cancer Trends in Different Zones of India

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Abstract

Introduction: The incidence of cancer has doubled between 1990-2016 and the crude DALY has also increased by 25.3%. Neoplasms are the seventh leading cause of death in the country. Women are largely affected by cancer of the breast, cervix uteri and men are commonly affected by cancer of the lungs, lip-oral, stomach, colorectal and esophagus. Cancer trends helps to identify patterns and progress of disease which will further aid research, policy decisions and clinical practice/ services. The aim of this paper is to identify the cancer trends in different zones of India. **Methodology:** A secondary review was conducted by reviewing published literature/ articles using search engines- google scholar and PubMed. National and international reports like Medically Certified Cause Disease, National Cancer Registry Program Report, GLOBOCAN cancer statistics report. **Results:** Northeastern zone of India has the highest cancer incidences with some of the highest Crude rates (per 1 lakh population) reported across the country. Among males' crude rates was observed to be- in Aizawl district (206.2), followed by Kamrup urban (190.5) and Mizoram state (146.1) and among females Aizawl district (174.6). The second highest incidences and crude rates were reported from the Southern Zone of India- for males- Thiruvananthapuram district (170.4), Kollam district (159.4) and for females- Thiruvananthapuram district (164.8), Chennai (141.4) and Kollam district (139.1). **Conclusion:** Incidences of cancer are rising in India with most cases occurring from the northeast and southern zones of India.

Keywords: Cancer, incidence rate, crude DALY, cancer trends, Indian studies, disease, secondary review, vulnerability, and dose of exposure.

INTRODUCTION

Cancer is a disease of unregulated cell growth in any organ system with its symptoms known to present itself in the most insidious, non-specific ways. The etiology of cancer is multi-factorial such as genetic predisposition, exposure to radiation, lifestyle choices like consumption of alcohol, tobacco, inappropriate/ unhealthy diet, physical inactivity, high body mass index, and smoking. Association of the dose of exposure, duration of exposure, age of the exposed holds significance and decides the vulnerability of the exposed to the disease ^[1]

The demographic distribution of India is different from that of some of the developed countries of the world. A demographic transition has been underway post-

independence with a steady increase in the average life expectancy of the population. India has a considerable proportion of younger population which gives a broader base on the age pyramid. Increase in life expectancy

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can also be a reason for the rise in incidences of cancer in the country in the higher age groups [2]. Along with the demographic transition, an epidemiological transition is seen. An added challenge to the country's healthcare is- where communicable diseases have not fully declined to low levels there is a rising burden of non-communicable diseases which accounts for 60% of the total death in the country.

Cancer has a substantial morbidity and mortality rate and a large proportion of cases are diagnosed when they have already entered advance stages of the diseases [3]. Multidisciplinary management is required and a deficit is noticed in the country in terms of human resources, infrastructure especially in public sector outside major cities. Cancer care also requires a multisectoral approach to solve the issues faced. These approaches need to be addressed right from policy level, public health expenditure, improving infrastructure, increasing human resources, and finally aiding research in this field.

A nationwide study was conducted to estimate the incidence of 28 types of cancer in every state of India from 1990 to 2016 and it was found that the number of new cases has doubled due to cancer between the years 1990-2016. The crude DALY for cancer has also increased by 25.3% from 1990 (16.8%) to 2016 (34.2%) [4]. As per reports from 2016, ten cancers responsible for the highest proportion of total cancer DALYs were stomach (9.0%), breast (8.2%), lung (7.5%), lip and oral cavity (7.2%), pharynx other than nasopharynx (6.8%), colon and rectum (5.8%), leukemia (5.2%), cervical (5.2%), esophageal (4.3%), brain and nervous system (3.5%). Tobacco ranked as the leading risk factor for cancers. The highest proportion of cancer DALYs could be attributed to tobacco consumption (10.9%) in India. [5]

India's age standardized incidence rates 2020 for all cancer stands at 97.1 per 100,000 for both sexes at all ages. The age standardized mortality rates in 2020 for all cancers stands at 63.1 per 100,000 population for both sexes at all ages [6]

As per the MCCD report 2020, Neoplasms are the 7th leading cause of death in the country responsible for 4.7% of the total medically certified death, with women having a larger share of deaths (5.4%) as compared to

men (4.3%). The top 5 cancer in women are breast, lip-oral, cervix, lung, and gastric. While in men the top 5 cancers are lip-oral, lung, stomach, colorectal, and esophagus [6]. Identifying cancer trends can help to understand the progress (increase/decrease), pattern of cancer in different ages, gender, regions over the years benefiting both the policy makers and clinicians.

The top five cancers in men and women account for 47.2% of all cancers; these cancers can be prevented, screened for and/or detected early and treated at an early stage. This could significantly reduce the death rate from these cancers. [7]

	MEN	WOMEN
1	LIP, ORAL CAVITY	BREAST
2	LUNG	LIP, ORAL
3	STOMACH	CERVIX
4	COLORECTAL	LUNG
5	ESOPHAGUS	GASTRIC

Table 1: The top five cancers in men and women

METHODOLOGY

A systematic search was carried out using EMBASE, COCHRANE, Google Scholar, and PubMed databases to identify articles discussing cancer trends in different zones of India. Two independent reviewers were involved in the identification and screening and extraction of information from these articles. We used the key words like "Cancer Trends AND India" AND "Burden of Cancer". Other sources included reports like MCCD report 2020, NCRP report 2020, GLOBOCAN cancer statistics 2020. The country was categorized into these zones- Northeast zone (Manipur, Mizoram, Meghalaya, Nagaland, Sikkim, Tripura, West Bengal, Kamrup Urban), South zone (Kerala, Andra Pradesh, Tamil Nadu), West zone (Maharashtra, Gujarat), North zone (Delhi, Punjab, Uttarakhand, Himachal Pradesh, Jammu and Kashmir). The types of studies included are based on incidence and prevalence of cancers in India. Along with this articles published on state wise incidences or burden of cancer was included. Studies excluded are interventions or recent advances in the cancer treatment. Also duplicate articles were excluded from the study.

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources

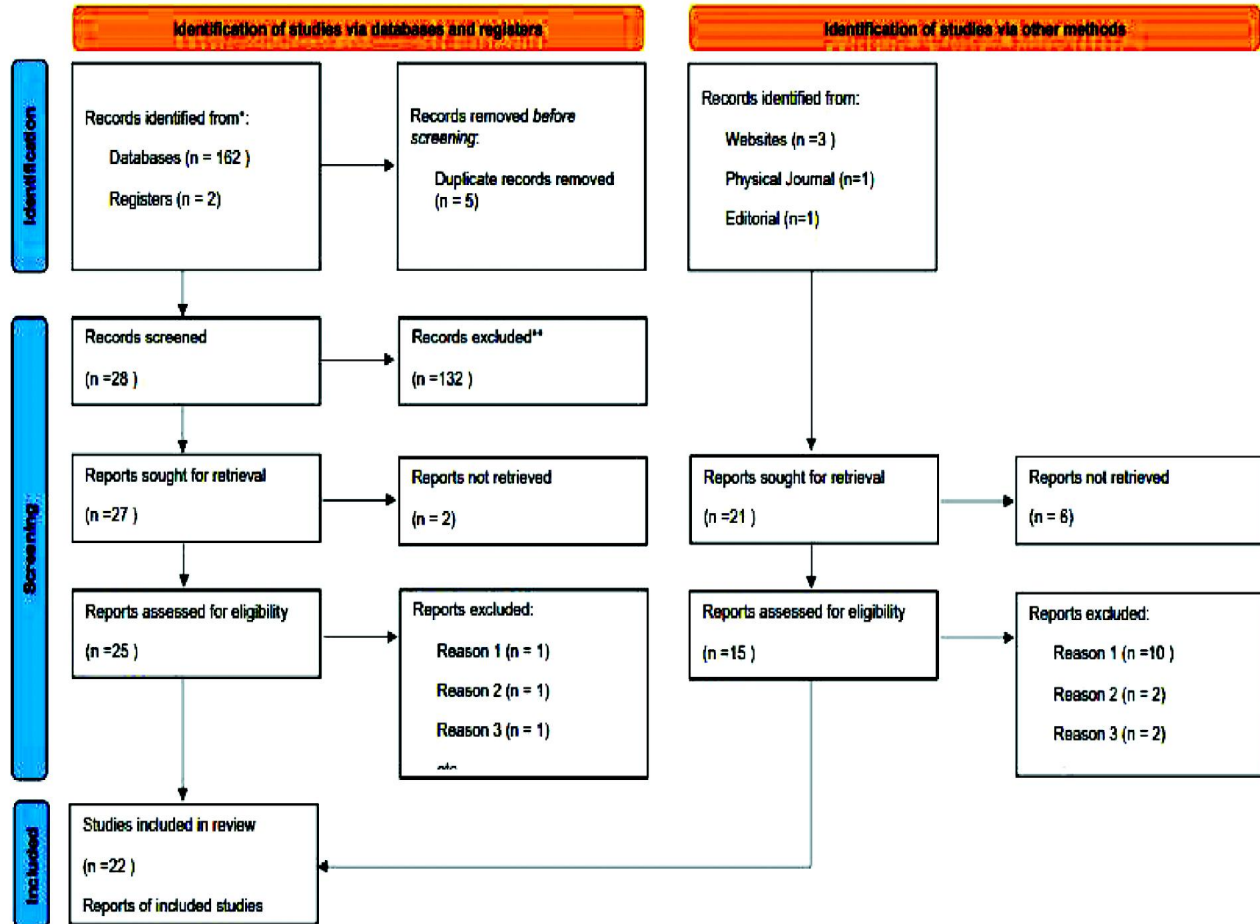


Figure 1: PRISMA flow diagram for search outcome of systematic review on cancer trends in different zones of India.

RESULTS

As per the National Cancer Registry Program 2020 report, which included data from 28 population-based cancer registry (PBCR) and 58 hospital-based cancer registries (HBCR) collected from year 2012-2016 shows that cancer of lung, mouth, stomach, and esophagus were most common cause of cancers among males in the country. While breast and cervix uteri were the most common cancer site for females.

Table 2: The projected cancer cases for 2025 are:

Site and cause of cancer	2020		2025	
	No of cases	%	No of cases	%
all sites	1392179	100	1569793	100
Tobacco related cancers	377830	27.1	427273	27.2

Gastrointestinal Tract	273982	19.7	310142	19.8
Breast	205424	14.8	232832	14.8
Lymphoid & hematopoietic	124931	9.0	138592	8.8
Cervix uteri	75209	5.4	85241	5.4
Corpus uteri and ovary	70400	5.1	79765	5.1
prostate	41532	3.0	47068	3.0
Central Nervous system	32729	2.4	36258	2.3

A comparison of Age adjusted Incidence rate from 28 PBCRs under NCRP are shown in fig 2 for males and fig 3 for females.

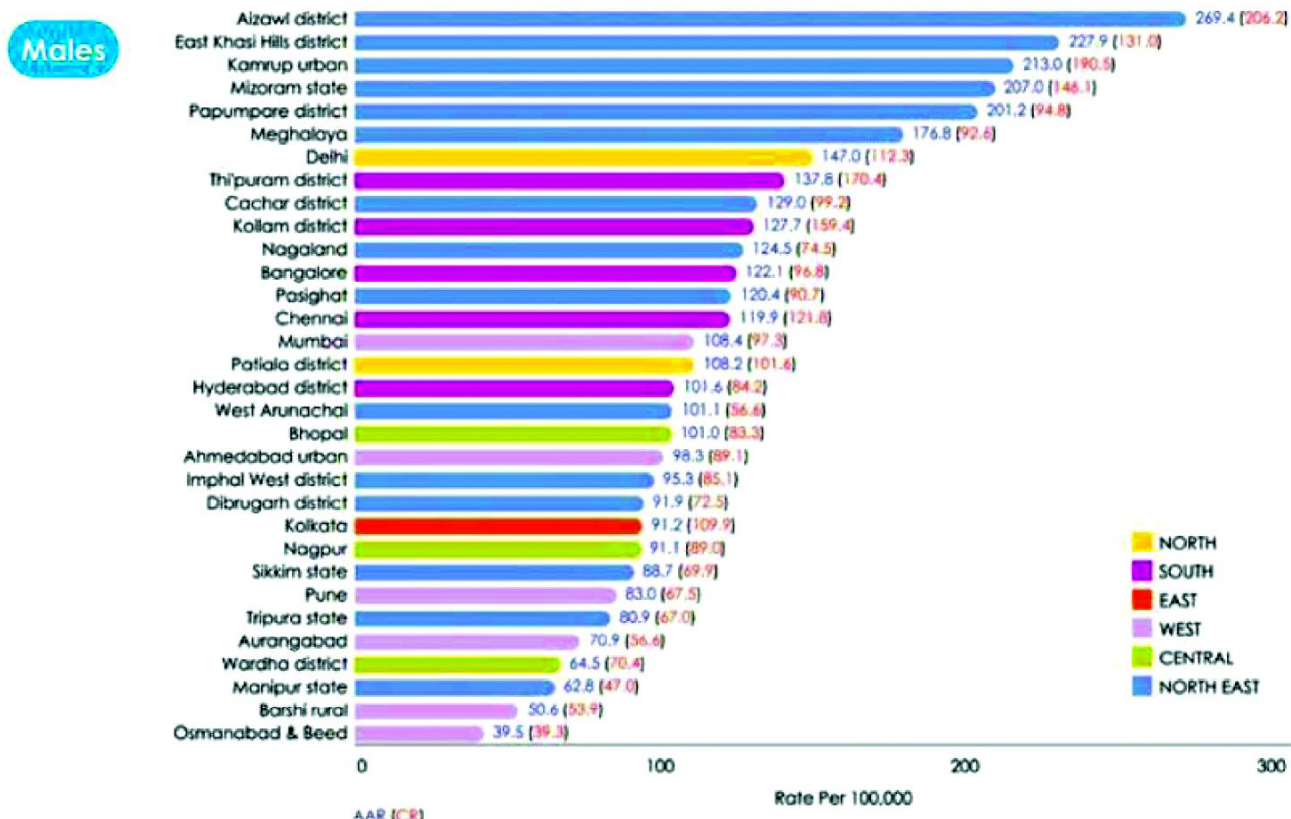


Figure 3: Age adjusted Incidence rate from 28 PBCRs under NCRP among males

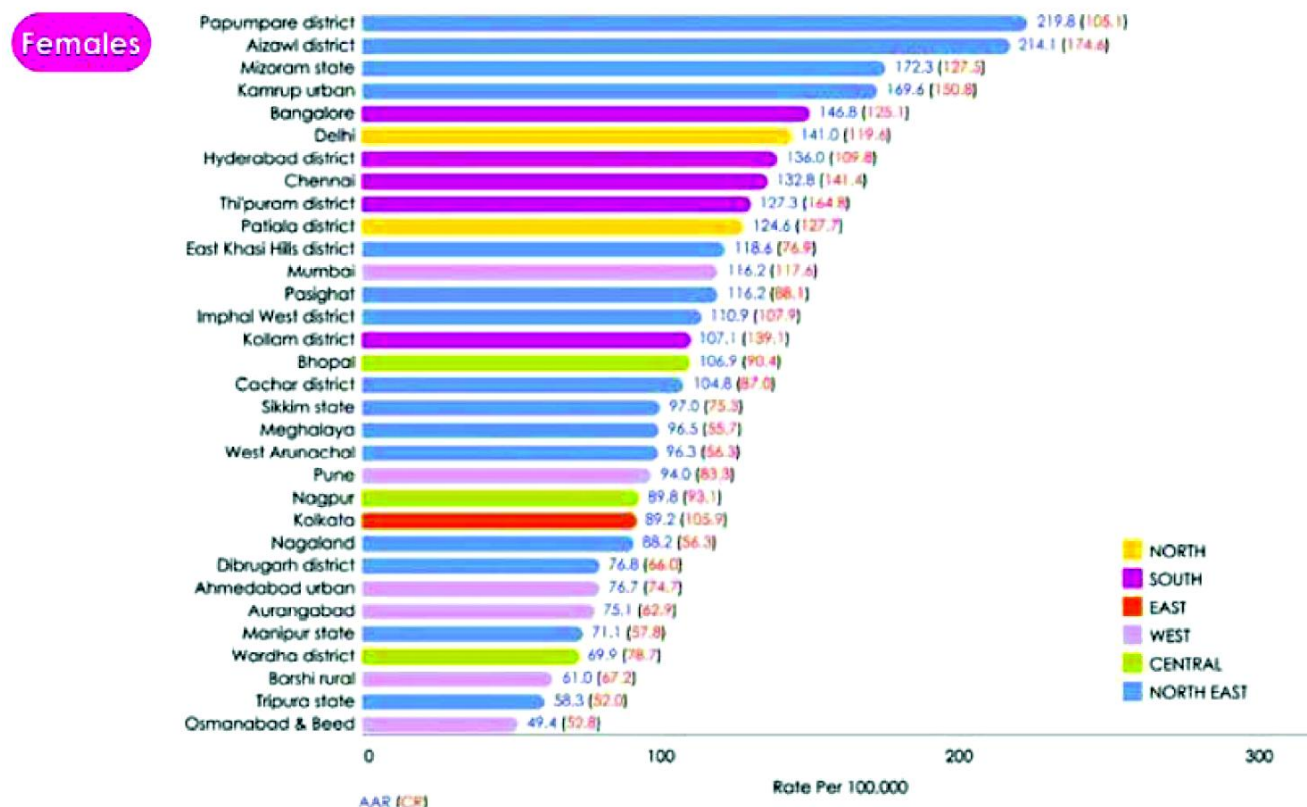


Figure 4: Age adjusted Incidence rate from 28 PBCRs under NCRP among females

Changes in Ten Leading Sites (%) for Six Selected PBCRs (1982 - 2016)

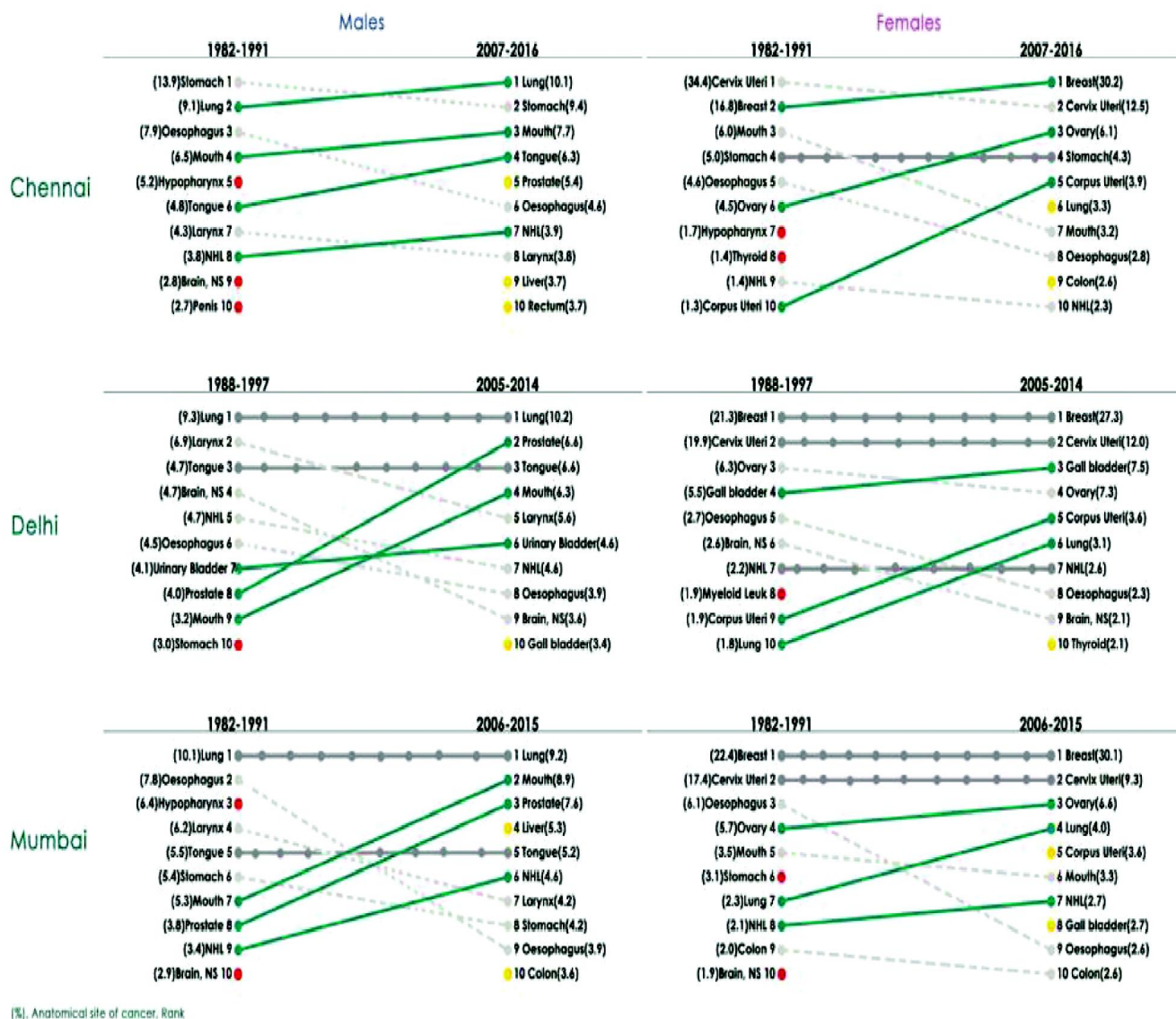


Figure 5: Changes in ten leading sites for six selected PBCRs

North-Eastern Zone:

The cancer incidence rate is highest in north-eastern zone of the India and this incidence rate is highest for all types of cancers. Cancers of the oesophagus, hypopharynx, stomach, lung, liver, and cervix are highly prevalent comparatively other forms of cancers in NE zone. The incidence rate of cancers varies across the different regions of the north-eastern zone of the country. [8] The cancer of different sites and their highest incidence in different areas of NE zone is given below (Table 3).

SITE	AREA OF NE ZONE
1 OESOPHAGUS	
Men	East Khasi hills district of Meghalaya
Women	East Khasi hills district of Meghalaya
2 STOMACH	
Men	Aizawl District
Women	Papumpare District
3 Lung	
Men	Aizawl District
Women	Aizawl District

4 Liver	
Men	Papumpare District
Women	Papumpare District
5 Gall Bladder	
Men	Kamrup urban
Women	Kamrup urban
6 Nasopharynx	
Men	Nagaland
Women	Nagaland
7 Breast	
Women	Aizawl district
8 Cervix	
Women	Papumpare district

Table 3: The cancer of different sites and their highest incidence in different areas of NE zone.

There were various risk factors associated with several types of cancer. High intake of smoked meats, fermented vegetables, salt tea and H. pylori infection are seen in Aizawl and Papumpare district of Arunachal Pradesh and are associated with elevated risk of gastric cancers.^[8] There was a high prevalence of tobacco use both in smoked form as well as smokeless form in various parts of north-eastern zone especially in Mizoram state. There was a special form of tobacco used in Mizoram which is tobacco water, and it is the culture of using this water in various communities^[9] and tobacco smoking tobacco was considered as risk factor for lung cancers^[10]. Alcohol is identified as the risk factor for liver cancer. Arunachal Pradesh comes on the top when it comes to the alcohol consumption^[11] and the incidence of liver cancer was highest in Arunachal Pradesh of the NE zone^[12].

Southern Zone:

The total number of cancer cases reported in 5 PBCR's of the southern zone was

PBCR	Year	Total cases
Chennai	12-16	31271
Bengaluru	14-16	29049
Thiruvananthapuram	14-16	27833
Kollam	12-16	19710
Hyderabad	14-16	11596

Table: 4: The total number of cancer cases reported in 5 PBCR's of the southern zone.

Kerala's health trends with regards to cancer and NCD's in general are conflicting. On the one hand the state's healthcare indices are far better if not the best when compared to the rest of the country but despite this it faces tremendous challenges due to the epidemiological transition. The annual incidence rate of cancer in Kerala is 135.3 per 100,000 people (as of 2013). Tobacco (chewable and in cigarettes) has been a leading cause of cancer in the state. This risk factor is known to cause 18 distinct types of cancer like lung cancer, oral cancer etc. Kerala is one of the highest alcohol consuming states. Alcohol is the other common risk factor causing liver, gastric and breast cancer.

Cancer breast is the leading site of cancer in females. Hyderabad district ranked first in breast cancer (48.0 per 100,000) among all PBCRs.^[13]

Using data from the Chennai registry during 1982–2006 the total cancer burden is predicted to increase by 32% by 2012–16 compared with 2002–06, with 19% due to the impact of demographic changes. The incidence of cervical cancer is projected to drop by 46% in 2015 compared with current levels, while a 100% increase in future thyroid cancer incidence is predicted. Among men, a 21% decline in the incidence of esophageal cancer by 2016 contrasts with the 42% predicted increase in prostate cancer. Breast cancer would be the top sites for cancer followed by cervical cancer. Tobacco-related cancers accounted for 40%–45% of all cancers in men and 15%–20% of all cancers in women in Chennai and Dindigul. Breast cancer has been the most common cancer in Chennai since 2002 and its burden is predicted to increase by 73% in the next 10 years^[14]

Eastern Zone:

In Eastern zone of India, Bihar has the highest incidence of carcinoma gallbladder. A study showed that the incidence of Gall bladder and head-and-neck cancer is increasing while breast and cervical cancers are decreasing with time. The exact cause of carcinoma of gallbladder is still unknown but hypothesis including continuous arsenic exposure and proximity of river Ganga is postulated.^[15]

In West Bengal, the most frequent reported cancer in female is breast and in males is lung cancer. And the pattern of cancer in eastern India is a little different from other parts of India because of their different lifestyle and dietary habits^[16].

Five leading sites of cancer in males of state west Bengal

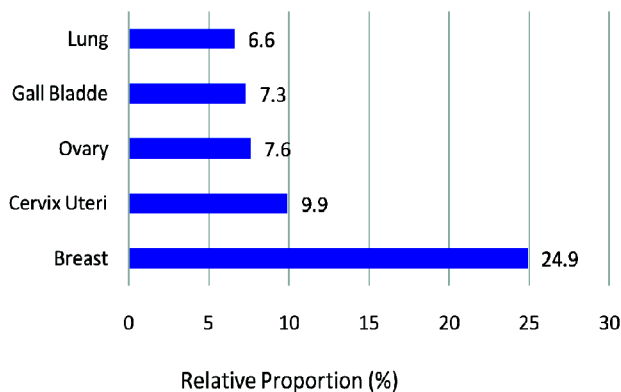


Figure 6: Five Leading Sites of Cancer In Males of West Bengal

Five leading sites of cancer in females of state west Bengal

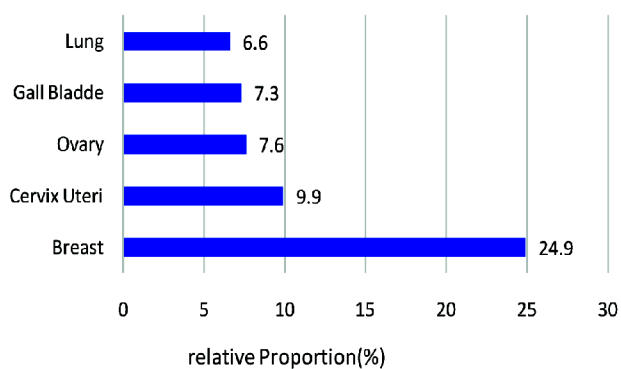


Figure 7: Five leading sites of cancer in females of West Bengal

In Odisha, there is higher incidence of oral cancer and cancer of gastrointestinal tract in males and cancer of breast and cervix in females.^[17]

West Zone:

The highest rate of oral cancer in India is found in the Gadchiroli district of Maharashtra and it is the second leading cancer among women after cervical cancer and the risk factor for oral cancer is found to be high. In a hospital-based study in south Gujarat, the most common cancer in males was cancer of oral cavity and most common cancer in female found was cervical cancer and the main risk factor for oral cancer found was intake of tobacco products.^[18]

North Zone:

Delhi saw the highest incidence rate of cancer among children. The crude rate of incidences of cancer in the 2 PCBRs was 112.3 (Delhi) and 101.6 (Patiala district). A 2018 paper published in Lancet Oncol stated that the highest incidence rate (crude rate) of cancer among the northern states was seen in Haryana, Delhi, Himachal Pradesh, and Uttarakhand. The crude death rate due to cancer in northern states was highest in Haryana followed by Himachal Pradesh and Uttarakhand. The DALY rate for Pharynx cancer was highest in Haryana, and crude DALY rate for lung cancer was high in Jammu and Kashmir. Lung cancer was attributable to Tobacco consumption and pollution. The age-standardized incidence rate of leukemia decreased substantially from 1990 to 2016. The crude DALY rate for leukemia was highest Delhi and Punjab. In males, leukemia was the third and fifth leading cause of cancer deaths in Delhi and Punjab respectively in 2016, but lower in other states. The DALY rate for brain and nervous system cancer was highest in Delhi.

DISCUSSION

India is heterogeneous in Cancer. The high incidence of cancer was found in every zone of India, but the highest incidence of Cancer was seen in the northeastern zone of the country and the leading sites of cancer in northeastern zone were esophagus, stomach, liver, gallbladder, lung, breast, and cervix uteri. There were various risk factors found for these various kinds of cancer like high intake of smoked meats, fermented vegetables, salt tea and H. pylori infection were risk factors for gastric cancers, smoked tobacco was risk factor for lung cancer and intake of excessive alcohol was risk factor for liver and gallbladder cancers. Breast cancer and cervix cancer are the most common cancers in women of all zones of the country and the highest incidence of breast cancer was found in Hyderabad city in southern zone.

Almost one third of the cancers were seen to be associated with the intake of tobacco in India and the main type of cancer associated with tobacco use were oral cancer and lung cancer. Lung cancer was also associated with air pollution^[19]

The pattern of cancer in all zones is similar with higher incidence of lung and oral cancer in males and higher incidence of breast and cervix cancer in females except in northeastern zone where this pattern is different. In northeastern zones, there are higher incidence of

stomach and liver cancers. The global adult tobacco Survey (GATS) India mentioned the high use of tobacco in northeast parts of the country and the use of tobacco rate is around 45-55%.

CONCLUSION

The present study concluded that the northeastern zone has the highest incidence of cancer in India. Lung cancer is the most common cancer in males and breast cancer is most common in females and this pattern is similar in all zones except northeastern zone where the pattern is little bit different from other zones of the country. The incidence of Oral cancer is also high across all zones of the country and is found highest in the Gadchiroli district of Maharashtra. The maximum cancer incidence across the country is tobacco related and maximum use of tobacco is in northeastern zone of the country. This needs an urgent attention of the policy makers to design the comprehensive action plan to prevent and control of disease through clinical and non-clinical measures includes IEC and BCC activities.

Author Contributions:

MK conceptualised the study, compiled the data and drafted the manuscript. PS analysed and interpreted the data and contributed for preparing manuscript; and SS contributed towards manuscript preparation and finalisation of methodology. All authors read and approved the final manuscript.

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Conflict of Interest:

There are no conflicts of interest.

REFERENCE

- (6)Geographic distribution and burden of cancers in India [Internet]. *India Against Cancer*. [cited 2022 Jul 4]. Available from: <http://cancerindia.org.in/geographic-distribution-burden-cancers-india/>
- [18] [19]Dhillon PK, Mathur P, Nandakumar A, Fitzmaurice C, Kumar GA, Mehrotra R, et al. *The burden of cancers and their variations across the states of India: The Global Burden of Disease Study 1990–2016*. The Lancet Oncology [Internet]. 2018 Oct;19(10):1289–306.
- Afsan Bhadelia. *Comprehensive value-based cancer care in India: Opportunities for systems strengthening*. Indian J Med Res 154, August 2021, pp 329–337. DOI: 10.4103/ijmr.IJMR_4251_20
- Chhophel Lamtha S. *Ethnic Variations in Gastric cancer in a tertiary care centre of Sikkim in North-East India*. Tropical Gastroenterology. 2016 Mar 1;37(1):42–5.
- Dhillon PK, Mathur P, Nandakumar A, Fitzmaurice C, Kumar GA, Mehrotra R, et al. *The burden of cancers and their variations across the states of India: The Global Burden of Disease Study 1990–2016*. The Lancet Oncology [Internet]. 2018 Oct [cited 2019 Jun 7];19(10):1289–306. Available from: <https://www.sciencedirect.com/science/article/pii/S1470204518304479>
- Global Cancer Observatory. *Global Cancer Observatory* [Internet]. Iarc.fr. 2018. Available from: <https://gco.iarc.fr/>
- GLOBOCAN 2020: *New Global Cancer Data*. [GLOBOCAN 2020: New Global Cancer Data | UICC](https://globoacan.org/)
- India Against Cancer [Internet]. *India Against Cancer. 2017*. Available from: <http://cancerindia.org.in/cancer-statistics/>
- Institute for health matrix and evaluation. *Global burden of disease compare viz hub. Seattle (WA): IHME; 2019*.
- International agency for research on cancer. World health organization. *Global cancer observatory*. Available from <https://gco.iarc.fr/>
- Ma X, Yu H. Global burden of cancer. Yale J Biol Med. 2006 Dec;79(3-4):85-94. PMID: 17940618; PMCID: PMC1994799.
- Mathur P, Shanker N, Das P, Sathishkumar K, Martina Shalini A, Chaturvedi M. *Cancer scenario in North-East India & need for an appropriate research agenda*. Indian Journal of Medical Research. 2021;154(1):27.

Available from: <https://www.sciencedirect.com/science/article/pii/S1470204518304479>

13. Mathur P, Shanker N, Das P, Sathishkumar K, Martina Shalini A, Chaturvedi M. *Cancer scenario in North-East India & need for an appropriate research agenda*. Indian Journal of Medical Research. 2021;154(1):27.
14. Ministry of Health and Family Welfare Government of India [Internet]. 2015. Available from: <http://rchiips.org/nfhs/NFHS-4Reports/India.pdf>
15. Pandey A, Raj S, Madhawi R, Devi S, Singh RK. *Cancer trends in Eastern India: Retrospective hospital-based cancer registry data analysis*. South Asian Journal of Cancer. 2019 Oct;08(04):215–7.
16. Report of National Cancer Registry Programme 2020 [Internet]. ncdindia.org. [cited 2022 Jul 4]. Available from: https://ncdirindia.org/All_Reports/Report_2020/default.aspx
17. Section II *Summary of Selected Anatomical Sites of Cancer* [Internet]. [cited 2022 Jul 4]. Available from: https://www.ncdirindia.org/All_Reports/Report_2020/resources/Chapter7CancerBreast.pdf
18. Sinha DN, Gupta PC, Pednekar M. Tobacco water: a special form of tobacco use in the Mizoram and Manipur states of India. *The National Medical Journal of India* [Internet]. 2004 Sep 1 [cited 2022 Jul 4];17(5):245–7. Available from: <https://pubmed.ncbi.nlm.nih.gov/15638304/>
19. Sudeep Gupta, Supriya Chopra, Rita Nair. *Improving outcomes of women's cancer in India: A multidisciplinary multisectoral approach*. Indian J Med Res 154, August 2021, pp 175-176. DOI: 10.4103/ijmr.ijmr_3335_21
20. Swaminathan R, Shanta V, Balasubramanian S. Original Articles. THE NATIONAL MEDICAL JOURNAL OF INDIA [Internet]. 2011 [cited 2022 Jul 4];24(2). Available from: <http://archive.nmji.in/archives/Volume-24/Issue-2/Original-Article-I.pdf>
21. Thejus Jayakrishnan, Jame Abraham. *Cancer an emerging healthcare crisis in Kerala*. BMH Med. J. 2020;7 (Suppl): S23-30. Geriatrics & Gerontology Initiative: International Workshop on Care of the Elderly.
22. Walser T, Cui X, Yanagawa J, Lee JM, Heinrich E, Lee G, et al. *Smoking and Lung Cancer: The Role of Inflammation. Proceedings of the American Thoracic Society* [Internet]. 2008 Dec 1 [cited 2019 Dec 14];5(8):811–5. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4080902/>