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An analysis of cancer patients who were admitted to hospitals in National Capital Territory, Delhi

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Abstract

India is now in the epidemiological transition stage of having to face the challenge of increasing number of both communicable and non-communicable diseases burden. Recently cancers have become the second most fatal disease among the non-communicable diseases category next only to cardiovascular diseases. Cancer affects all age groups and both sexes with a high mortality rate and low survival rate. The process of continuously gathering epidemiological data on reportable neoplasms in a systematic manner with the aim of assisting in the evaluation and management of the impact of malignant disease in the community is known as cancer registration. Hospital-based and population-based cancer registries are the two primary categories of cancer registries. While Hospital-Based Cancer Registries (HBCRs) seek to improve cancer treatment, Population-Based Cancer Registries (PBCRs) seek to identify all cancer cases that occur in a specific population. A report on different hospitals based on data regarding cancer patients from 2017 to 2020 was recently released by the Dr. B. R. Ambedkar Institute of Rotary Cancer Hospital, (AIIMS), New Delhi. The report provides detailed information on almost 13 categories of cancer management variables and traits that are specific to male and female patients. In order to comprehend the current epidemiological trend of the disease in and around Delhi, the purpose of this study is to examine the epidemiological details of cancer patients registered with the reporting hospitals in Delhi with respect to age, sex, cancer site, diagnostic techniques, preferred treatment, mortality, etc. among the cancer groups based on the cancer registry for the years 2017–2020.

Keywords: *Cancer epidemiology, Cancer registry, Dr. B. R. Ambedkar Institute of Rotary Cancer Hospital, AIIMS Delhi.*

Introduction: - The demographic shift in India is manifested by rising life expectancy and falling fertility rates. A higher percentage of the population is geriatric as life expectancy at birth rises. Higher rates of non-communicable diseases, particularly cancer, are positively correlated with a nation's proportion of elderly citizens. The ageing of the population is frequently cited as the primary cause of rising cancer incidence, mortality, and medical expenses. Cancer is among the non-communicable diseases that are becoming a significant public health issue in India. For prevention and treatment, these lifestyle-related diseases require specialized infrastructure and human resources, as well as a lengthy latent period. Inadequate physical activity, poor dietary habits, alcohol consumption, and tobacco use are the primary risk factors for the major non-communicable diseases, including cancer. Based on data from the cancer registry, it is estimated that approximately 8 lakh new cases of cancer will occur in India annually; at any given time, this number is likely to be three times higher or approximately 24 lakh cases. Cancer has now attained the status of the second most common non- communicable disease in India responsible for maximum mortality with about 0.3 million deaths per year. This can be attributed to the poor availability of preventive measures, diagnostic methods and treatment facilities for the disease. All types of cancers have been reported in Indian population. The causes of high incidence of these cancers may be both internal (genetic, mutations, hormonal, poor immune conditions) and external or environmental factors (food habits, in detribalization, over growth of population, social conditions etc.). There are many similarities among the diseases that make up the cancer group. All of the body's living cells have the potential to develop cancer, and the natural history of various cancer types varies. Environmental factors are responsible for approximately 80% of all cancers, according to epidemiological studies. The most significant and avoidable environmental exposures are those associated with lifestyle. In India, lung and oral cancer are the most common types of cancers among men, whereas cervical and breast cancer among women. There were 556,400 cancer-related deaths in India in the year 2020. The age range of 30-69 years was occupied by 71% of cancer patients. The dynamics of cancer epidemiology are crucial for public health experts to comprehend in order to plan future strategies, as cancer is the second most common non-communicable disease in India and contributes significantly to the overall number

of fatalities. According to the World Cancer Report, the worldwide cancer rate is expected to rise at a startling rate. Global cancer rates are expected to rise by 50% by 2030, reaching 15 million new cases.

Cancer registries

The idea of recording information on all cancer cases in defined communities dates from the first half of the twentieth century, and there has been a steady growth in the number of such cancer registries since. Originally, they were concerned primarily with describing cancer patterns and trends. Later, many were able to follow up the registered patients and calculate survival. In the last 30 years the role of registries has expanded further to embrace the planning and evaluation of cancer control activities, and the care of individual cancer patients. Cancer registration is the process of continuing systematic collection of data on the occurrence, characteristics, and outcome of reportable neoplasm with the purpose of helping to assess and control the impact of malignant disease in the community.

The cancer registries are mainly two types:

1. Population based cancer registry
2. Hospital based cancer registry.

The goal of Population-Based Cancer Registries (PBCRs) is to track down every cancer case that arises within a specific population. They are used to track prevention, early detection, and cure (treatment) programs in addition to giving data on present and prospective service needs. By gathering case data from various sources (such as treatment facilities, physicians and pathologists, and death certificates), Population-Based Cancer Registries track the annual number of new cancer cases (also known as incident cases) in certain populations over time.

The enhancement of cancer treatment is the goal of Hospital-Based Cancer Registries, or HBCRs. In order to better understand cancer patient's diagnosis, treatment, and survival, they gather comprehensive data. Serving the needs of the hospital's cancer program, hospital management, and most importantly, each patient, is the goal of the hospital-based registry. A hospital registry duty include documenting things like the hospital's cancer burden and generating an annual report to the hospital administration on the cancer activities that have occurred over the year.

Hospital Based Cancer Registries (HBCRs) give insight into the scope and trends of patient care in a particular hospital. They aid in the planning of the amenities needed in the particular hospital as well as the assessment of treatment results. Additionally, they support epidemiologic research and the Population-Based Cancer Registry in the area.

One of the few developing nations with a national cancer control program is India, which aims to reduce tobacco-related cancers, cure uterine cervical cancer early, and provide therapy, pain relief, and palliative care by expanding its health infrastructure. To understand the depth of the problem and cancer burden, the National Cancer Registry Programme (NCRP) was commenced by the Indian Council of Medical Research (ICMR) with a network of cancer registries across the country in December 1981. Three Population Based Cancer Registries (PBCRs) at Bangalore, Chennai and Mumbai and three Hospital Based Cancer Registries (HBCRs) at Chandigarh, Dibrugarh and Thiruvananthapuram were commenced from 1 January 1982 and Institute Rotary Cancer Hospital New Delhi (DR. B.R.A. Institute of Rotary Cancer Hospital New Delhi) started functioning in 1983-84 on 35 beds with infrastructure of 2 floors. Recently it has been converted into a 200 bedded, 7th floor building. Prime Minister of India Sh. Atal Bihari Vajpayee inaugurated this center on October 5, 2003. The PBCRs have gradually expanded over the years and as of now there are 23 PBCRs under the NCRP network. The Dr. B. R. Ambedkar Institute of Rotary Cancer Hospital, AIIMS, New Delhi a Population Based Cancer Registry, was established at the 1983-84 in Delhi. Best of radio diagnostic and radiotherapy machines including state of art linear accelerator, brachytherapy, stereotactic radiotherapy and intensity modulated radiotherapy are available at this centre. Vacuums assisted advanced mammography unit, first of its kind in India, has made stereotactic breast biopsy possible. Prostate cancer can be diagnosed at an early stage with help of Tran rectal sextant biopsy. Radio frequency ablation of liver cancer has also been initiated. Recently, Dr. B. R. Ambedkar Institute of Rotary Cancer Hospital (AIIMS), New Delhi has published a report on various hospital based statistics of the different types of cancer patients enrolled, diagnosed, treated and their survival status etc. from 2017 to 2020. The report gives exhaustive details of nearly 13 categories of variables related to the cancer characteristics attributed to both males and females patients separately. Out of that few very relevant demographic, morbidity, diagnostic, therapeutic and mortality aspects have been analyzed here to understand the cancer trends in Delhi at present.

Objective of studies an attempt has been made to epidemiologically analyze the details of cancer patients registered with the reporting hospitals in Delhi in relation to the age, sex, site of cancers, diagnostic methods, treatment of choice, mortality etc. among the cancer groups based on the cancer registry for a period from 2017 to 2020 in order to understand the trend of the disease.

Methodology

This record based review was done using the data published in the National Cancer Registry. The data analyzed was taken from the Dr. B. R. Ambedkar Institute of Rotary Cancer Hospital (AIIMS), New Delhi. The hospital based data collected was for a period of four years from 2017 to 2020 which was published in national cancer registry website. The data was analyzed for age and sex wise distribution, followed by the leading types [causes]

of cancer based on site of affection. The top ten cancers based on site of origin and the various methods of diagnosis of cancers for both the sexes were also compiled. Finally the total number of deaths due to cancer was analyzed. The age wise distribution was done in order to find out the age group wise distribution of cancer among the population. Based on the total number of deaths, the mortality to incident rate of cancer for Dr. B. R. Ambedkar Institute of Rotary Cancer Hospital, All India Institute of Medical Sciences (AIIMS), New Delhi was also calculated.

Results: - Age and sex distribution

The analysis of the cancer registry data shows that the total number of cancer patients registered in the Dr. B. R. Ambedkar Institute of Rotary Cancer Hospital (AIIMS), New Delhi for the years 2017-2020 was 33230. Among them males were 15731 (47.34%) and females were 17499 (52.66%). Sex wise distribution among males shows that the highest incidence of cancer was found in the age group of 0-19 years and those above 70 years age group (around 60% affected). While among females the highest incidence was found to be in the 30-49 year age group (around 61%) followed by 50-59 age group (around 54%). Thus it seems the young and the old among the males have more incidence of cancer while the middle aged women have more incidence of cancer (Table 1). The data shows that the highest incidence of cancer was in the age group of 50-59 years with 8776 (26.41%) cases followed by 60-69 years age group with 7446 (22.41%) and 40-49 years age group with 7105 (21.38%) cases. The least reported incidence was in the less than 10 year age group with 472 (1.42%) cases. The data from Table 1 shows that as age advances the incidence of cancer also increases. The incidence is more above the age of 40 years.

Table 1: Age group and sex wise distribution of prevalence of cancer among patients (2017-2020).

Age group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-9	292	61.86	180	38.14	472	1042
10-19	511	60.62	332	39.38	843	2.54
20-29	836	52.48	757	47.52	1593	4.79
30-39	1397	39.36	2152	60.64	3549	10.68
40-49	2617	36.83	4488	63.17	7105	21.38
50-59	4020	45.81	4756	54.19	8776	26.41
60-69	4004	53.77	3442	46.23	7446	22.41
>70	2054	59.61	1392	40.39	3446	10.37
Total	15731	47.34	17499	52.66	33230	100.00

Cancer site of origin

The data was analyzed to find out the top cancer sites among males and females patients based on the site of origin diagnosed. Among the male patients, cancer of Stomach (9.2%) is the leading site followed closely by lungs (8.9%). Cancer mouth, pharynx, leukemia, tongue, Oesophagus, colon-rectal and anal canal also were commonly seen. Among the female patients, cancer of cervix-uteri (25.5%) and Ca breast (22.4%) were the top cancer sites. This is followed by Ca ovary (5.3%), mouth (5.2%), leukaemias (4.0%), stomach (3.7%), oesophagus (3.2%) and colon-rectal-anal canal (3.0%). Registry had documented cancers identified from about 50 different sites in body and from among them the most commonly prevalent had been mentioned above (Table 2).

Methods of diagnosis

Different methods were used to diagnose cancer when the patient approaches the health facility. The most commonly used diagnostic techniques for diagnosis of cancers were microscopy (which includes histology, cytology, blood films, bone marrow study etc.), X-ray/imaging techniques and clinical assessment. Microscopy was the most common diagnostic method used to diagnose 82.44% of the patients, followed by X-ray/imaging techniques (8.39%). Clinically, the diagnosis was done in 7.78% patients. X-ray/imaging method are used more among the male patients (62.70%) when compared to the female patients (37.30%) (Table-3)

Table 2: Top cancers by site of origin among male and female patients (2017-2020)

Common Cancer sites among Males	Male		Common Cancer sites among Females	Female	
	No.	%		No.	%
Stomach	1446	9.2	Cervix Uteri	4462	25.5
Lungs	1404	8.9	Breast	3921	22.4
Mouth	1351	8.6	Ovary	921	5.3
Pharynx	1193	7.6	Mouth	914	5.2
Leukemia's	1165	7.4	Leukemia's	710	4.0
Tongue	1061	6.7	Stomach	645	3.7
Oesophagus	892	5.7	Oesophagus	599	3.2
Colon-rectal-anal	823	5.2	Colon-rectal-anal	531	3.0

canal			canal		
Non-Hodgkin's Lymphomas	655	4.2	Thyroid	467	2.7
Other sites	5741	36.5	Other sites	4329	25.0
Total	15731	100	Total	17499	100

(Cancers have been identified from about 50 different sites in the body)

Table 3: Method of diagnosis of cancers for all sites (2017-2020)

Method of diagnosis	Male patients		Female patients		Total	
	No.	%	No.	%	No.	%
Microscopy	12422	45.34	14973	54.66	27395	82.44
X-ray/imaging	1748	62.70	1040	37.30	2788	8.39
Clinical	1258	48.65	1328	51.35	2586	7.78
Other	303	65.73	158	34.27	461	1.39
Total	15731	47.34	17499	52.66	33230	100.0

(Microscopy=Histology, cytology, blood films, bone marrow study and other methods)

Treatment methods used

The most common treatment procedure of choice for most of the patients was combination of radiotherapy and chemotherapy (28.56%). This is followed by chemotherapy alone (20.00%) and radiotherapy alone (11.86%). Surgery alone was the treatment of choice for about 8.62% patients while a combination of surgery + chemotherapy + radiotherapy was given to 7.79% of patients. Among 825 patients who received combination therapy of surgery + chemotherapy + radiotherapy, about 73.82% were female patients and about an average 60% of those who received combination of radiotherapy + chemotherapy and surgery + chemotherapy and radiotherapy alone were female patients (Table 4).

Table 4: Type of treatment procedures used for all site cancers only at the regional institute (2017-2020) (excluding the cancers previously treated).

Type of treatment used	Male		Female		Total	
	No.	%	No.	%	No.	%
Surgery [S]	527	57.72	386	42.28	913	8.61
Radiotherapy [R]	492	39.14	765	60.86	1257	11.86
Chemotherapy [C]	1211	57.15	908	42.85	2119	20.00
S+R	163	43.82	209	56.18	372	3.51
S+C	192	36.57	333	63.43	525	4.95
R+C	1176	38.86	1850	61.14	3026	28.56
S+R+C	216	26.18	609	73.82	825	7.79
Others	137	8.78	1423	91.22	1560	14.72
Total	4114	38.82	6483	61.18	10597	100.0

Among those who underwent surgery or radiotherapy treatment, about 57.72% were male patients while among those received combination therapy of surgery + radiotherapy, 43.82% were male patients. The data shows that radical treatment was the most favored treatment adopted by institutions to treat patients with different type of cancers. Nearly 89.93% of the patients underwent radical treatment while only 10.07% were considered for palliative treatment. Among them about 60% were female patients (Table 5).

Table 5: Method of treatment adopted by institutions to treat cancers 2017-2020 (excluding the cancers previously treated).

Method of treatment Adopted	Male		Female		Total	
	No.	%	No.	%	No.	%
Radical Treatment	3679	38.60	3851	61.40	9350	89.93
Palliative Treatment	435	40.76	632	59.23	1067	10.07
Total	4114	38.82	6483	61.18	10597	100.0

Marital status and cancer

Cancers of different types were found to be very high among married men and women. Among the 15731 cancer affected male patients, 86.5% were married while only 10.6% were unmarried. Among the 17499 cancer affected female patients, 72.6% were married when compared to unmarried women (4.9%) while 21.2% affected were widows.

Mortality due to cancers

The data released for the three years from 2016-2018 shows the mortality pattern among the cancer affected patients in relation to age group and sex. The mortality rate increases as the age advances. Cancer patients above

60 years of age showed the highest mortality rate of 46.28% followed by 40.91% belonging to the age group of 40-59 years. Thus about 87% of mortality among cancer affected patients is seen in the age group above 40 years while among children and adolescents the mortality rate was only 3.32%. Overall mortality rate among males is higher (54.52%) when compared to females (45.48%) (Table 6)

Table 6: Age group and sex wise mortality due to cancers in Delhi 2016-2018

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0-19	73	58.87	51	41.13	124	3.32
20-39	171	48.17	184	51.83	355	9.49
40-59	790	51.63	740	48.37	1530	40.91
>60	1005	58.06	726	41.94	1731	46.28
Total	2039	54.52	1701	45.58	3740	100.0

Case fatality rate due to cancers

The overall case fatality due to cancers for the years 2016-2018 shows that out of 15258 cancer patients registered, 3740 (24.51%) patients died. Among the males cancer patients 27.58% died while among female cancer patients 21.62% died. This data also shows that mortality among male patients was more when compared to female patients (Table 7).

Table 7: Case mortality rate due to cancers in Delhi 2016-2018

Gender	Incidence	Mortality	Case fatality Rate (%)
Male	7392	2039	27.58
Female	7866	1701	21.63
Total	**15258**	**3740**	**24.51**

Discussion

Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. There are over 100 different known cancers that affect humans. Most cancers are named for the organ or type of cell in which they start, for example, cancer that begins in the colon is called colon cancer; cancer that begins in melanocytes of the skin is called melanoma. Cancers figure among the leading causes of death worldwide, accounting for 9.7 million deaths in 2022. Lung, liver, stomach, colorectal and breast cancers cause the most cancer deaths each year. The most frequent types of cancer differ between men and women. This shows that the young and the old among the males have more incidence of cancer while the middle aged women have more incidence of cancer. The data from the registry shows that as age advances the incidence of cancer also increases. The incidence is more above the age of 40 years contributing to nearly 70% of the cancer patients reported. The least reported incidence was found among the less than 10 year age group. Among the male patients, cancer of Stomach is the leading site followed closely by lungs while among the female patients, cancer of cervix-uteri and breast were the predominant cancer sites.

A study conducted by Mohandas KM et al. based on all India statistics shows that Indian men were mostly suffering from oral, lung, stomach, colorectal, pharyngeal, and esophageal cancers while among the females, incidence of breast, cervical, and colorectal cancers are more marked. In women, breast cancer is the most common cause of cancer deaths, and the most frequently diagnosed cancer, accounting for more than 1 in 5 of all deaths from cancer in women. In men, the more common cancers are tobacco-related. For Indian women, cervical cancer is the second most common incident cancer. About 40% of all cancers in India are attributable to tobacco. The most commonly used diagnostic techniques for diagnosis of cancers were predominantly based on microscopy which includes histology, cytology, blood films, bone marrow study etc. The combination of radiotherapy and chemotherapy was the most common treatment procedure of choice for most of the patients which was followed by chemotherapy alone and radiotherapy alone. Surgery was also used as the treatment of choice for sizeable patients. Nearly 90% of the patients underwent radical treatment while only 10% were considered for palliative treatment. Among the male patients, 86.5% were married while among the female patients, 72.6% were married.

The review also shows that the mortality rate increases as the age advances. Cancer patients above 60 years of age showed the highest mortality rate. Mortality among cancer patients was very high in the age group above 40 years while among children and adolescents the mortality rate was very less. Overall mortality rate among males was higher when compared to females.

The overall case fatality rate due to cancer was about 25% as per the data available. Mohandas KM et.al describes that the overall cancer mortality rate in India is relatively high, at 68% of the annual incidence. This indicates that fewer than 30% of Indian patients with cancer survive 5 years or longer after diagnosis. Since there are limitations in the available data, the true proportion could be significantly lower. In India, quantifying the burden also faces other barriers: people may not recognize the signs of cancer, or not have the resources to go to a medical facility. Once at a clinic or hospital, lack of resources or medical equipment may mean the diagnosis is not made at the right time. Even when cancer is recognized, the family may lack the funds to pursue treatment and decide to abandon therapy before the patient is registered.

According to an earlier research in India, the three leading causes of cancer death in men aged 30-69 years were lung cancer (including larynx and trachea), oral cancer (including pharynx and lip) and stomach cancer. For women aged 30-69 years, the three most common fatal cancers were breast cancer, cervical cancer and stomach cancer. They also concluded that "Prevention of tobacco-related and cervical cancers and earlier detection of treatable cancers would reduce cancer deaths in India", particularly in the rural areas that are underserved by cancer services.

The substantial variation in cancer rates in India suggests other risk factors or causative agents that remain to be discovered. The fact that 71% of cancer deaths occur in those aged 30-69 years emphasizes the substantial social and economic gains that would be associated with a successful cancer prevention program. Interventions such as tobacco control, vaccination against human papilloma virus and hepatitis B, cervical cancer screening, and early detection and treatment of oral and breast cancers would have a substantial effect on the prevention of cancer deaths. To sum up, cancer has become a major killer disease in the country now. Deaths due to cancers are high among males and females and also among all age group affected with it. The overall case fatality rate due to cancer in Delhi was found to be about 25% which is very high. Mostly the affected patients report to the hospitals in an advanced stage of the disease. Hence it will be too late to receive a possible treatment/cure in spite of the best effort. Regular cancer screening and early detection of cancer is still a long way to go. There are only limited numbers of specialized hospitals, specialists and trained man power available to tackle this problem in India at present.

Cancer is Preventable

About 30% of cancer deaths are due to the five leading behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, excessive use of tobacco and alcohol. From epidemiological studies, it is clear that 70-90% reasons of developing cancer are related to environment and to the lifestyle of a person. So, to a great extent, it is preventable. Heredity also plays its role in causing cancer, which accounts for just five percent of cancer cases while the rest is caused by non-heredity factors such as lifestyle, food we eat, level of physical activity, personal hygiene, etc.

As per expert's opinion, all the major forms of cancers are preventable. Cervical cancer can be fully prevented with creating awareness among young women. Oral cancer can be prevented by not using tobacco and drinking alcohol. By avoiding very spicy and hot food it is possible to prevent the risk of developing esophageal and stomach cancer. Regular exercise, for at least 30 minutes in a day is necessary for leading a healthy lifestyle, which will also contribute to prevention of diseases like cancers.

Thus now more emphasis should be given to popularize the methods and lifestyle modifications which will help to prevent cancer in the long run.

National cancer control program

The national cancer control program was launched in 1975-76 with the main objectives of prevention, early diagnosis and treatment of cancers. In view of the magnitude of the problem and gaps in the availability of cancer treatment facilities in the country, the program was revised in 1984-85 and during 2004. The main objectives of the program are:

- Primary prevention of cancers by imparting health education.
- Secondary prevention i.e. early diagnosis of common cancers such as cancer cervix, mouth, breast and tobacco related cancers by screening/self-examination methods
- Tertiary prevention i.e. strengthening of the existing tertiary care institutions of comprehensive therapy including palliative care in terminal stage of cancer.
- Training of adequate man power to meet the cancer control activities.

Summary

Most of the cancers are amenable to primary and primordial prevention and can be prevented and controlled to a large extent. Health education and awareness creation about the warning signs for cancer must be highlighted and periodic screening must he popularized among the communities. The public sector alone may not be able to meet all the challenges posed by cancer in India. It is necessary to have a proper public private partnership to invest heavily on latest technology for cancer screening and therapy which will help to overcome the burden of cancer in the long run. There is strong need to make cancer a notifiable disease which may help to improve the assessments of the regional and national cancer burden. There needs to establish more number of new and improved cancer registries covering the uncovered regions so far. Public health initiatives directed at providing better living conditions in cities and villages, proper drainage and protected water supply, appropriate immunizations, preventing pollutions at all levels, advocating healthy life style by improving nutrition status of the vulnerable groups, provide exercise space for prevention of obesity and better working environment etc., will help to slow the increase in life style associated cancers.

More cancer research initiatives are needed to understand the epidemiological trends happening in our country which will help to plan and focus on programs to tackle this menace. Our health care delivery systems at the primary, secondary and tertiary care levels should be strengthened to meet the challenges posed by the spectrum of cancer diseases. All these actions are time consuming and need strong political will but will have a long term

beneficial effect not only for reducing cancer but also for the entire diseases burden in our country.

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