RESEARCH COMMUNICATION

Time Trend in Breast and Cervix Cancer of Women in India – (1990-2003)

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Abstract

The Indian Council of Medical Research (ICMR) started a National Cancer Registry Programme (NCRP) in the year 1982 with the main objective of generating reliable data on the magnitude and pattern of cancer in India. There are about 20 Population Based Cancer Registries (PBCR) which are currently functioning under the network of NCRP. The present paper aims to provide the time trends in the incidence of breast and cervix cancer among females of India. The incidence data collected by Bangalore, Barshi, Bhopal, Chennai, Delhi and Mumbai over the period 1990 to 2003 formed the sources of data. In the year 1990, cervix was the leading site of cancer followed by breast cancer in the registries of Bangalore (23.0% vs. 15.9%), Bhopal (23.2% vs. 21.4%), Chennai (28.9% vs. 17.7%) and Delhi (21.6% vs. 20.3%), while in Mumbai breast was the leading site of cancer (24.1% vs. 16.0%). By the years 2000-3, the scenario had changed and breast had overtaken as the leading site of cancer in all the registries except in Barshi (16.9% vs. 36.8%). The time trend analysis for these sites suggested a significant decreasing trend in the case of cervix in Bangalore and Delhi registries, while the registries of Bhopal, Chennai and Mumbai did not show any significant changes. However, in the case of breast cancer, a significant increasing trend was observed in Bhopal, Chennai and Delhi registries with Bangalore and Mumbai registries demonstrating no such significant changes. Histopathologic confirmation for both malignancies was found to be more than 80% in these registries. It is concluded that in India the cervix cancer rates are decreasing while breast cancer is on the increase.

Key Words: Breast cancer - cervix cancer - time trends - annual percentage change (APC) - India

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Introduction

The Indian Council of Medical Research (ICMR) started a National Cancer Registry Programme (NCRP) in the year 1982 with the main objective of generating reliable data on the magnitude and pattern of cancer in India. There are about 20 Population Based Cancer Registries (PBCR) which are currently functioning under the network of NCRP. The cancer incidence data collected over the period of 15-20 years have clearly shown that breast and cervix are the two leading sites of cancer and contribute to more than 40% of the total cancer cases among women in India (NCRP, 2001; 2006). It is estimated that every year, around 78,800 new cancer cases of cervix and 78,400 cases of breast cancer are occurring in India.

The objectives of the present paper are: 1) To provide the time trends in the cancer incidence of breast and cervix uteri among the women of India; 2) To assess the period of shift from cervix cancer to breast cancer as the leading site of cancer among Indian urban women; 3) To examine and compared the age specific rates for both sites at two different points of time; 4) To provide the percentile age distribution of cancer cases of both the cancer sites.

Materials and Methods

The cancer incidence data collected by five urban and one rural Population Based Cancer Registry (PBCR), termed simply as registry under the network of NCRP over the period of 1990-2003 was considered for the study purposes. The Registries included were: Bangalore, Barshi, Bhopal, Chennai, Delhi and Mumbai. Among these except Barshi which is a rural registry, all other are urban based registries. These registries are collecting data on cancer incidence cases using a core proforma provided by the NCRP. The data is sent regularly by registries to NCRP where the data is subjected to various consistency checks including the duplicate checks and then processed for reporting the various rates.

All the cases of breast and cervix cancer formed the subjects for the present study. The following information related to them were noted and utilized for further analysis: 1) Percentage of cases to total cases of cancer. This information was utilized to form an idea about the burden of these cancer sites in relation to total cancer cases in the registries; 2) Method of diagnosis , clinical, microscopic

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and others (X-ray, DCO, endoscopy, biochemical and immunological tests, ultrasound); 3) Age specific incidence rates; 4) Crude Rate (CR) and Age Adjusted Rate (AAR) per 100,000 person years; 5) Age distribution.

In general, prior to year 1990, cervix was the leading site of cancer among all the registries. The ratio of breast to cervix cancer cases was assessed by each year and registry mainly to assess the shift in trend from cervix to breast cancer as the leading site of the cancer. The earliest change in the ratio from below one to above one, for a given year, was taken as the sign of shift in the trend of cancer among the Indian women.

To assess the time trend in AAR of breast and cervix uteri cancer cases, the Join point regression analysis (2005) was attempted with log transformed AAR values. The Annual Percentage Change (APC) with respect to time was calculated separately for both the sites. A positive APC was considered as having an increasing trend in the rates while a negative APC was taken to represent a decreasing trend in the rates.

The frequency distribution of the ages of the selected cases were pooled for all the registries and then percentile distribution was attempted. The percentiles considered were: 10th, 25th, 50th, 75th and 90th. For calculation of age specific rates, four major age groups were considered namely <35 years; 35-45 years; 45-65 years and ≥ 65 years. To compare the changes in the age specific rates of above four broad age groups by sites, over the period of time, the mean annual percentage change (MAPC%) was calculated. It is defined as the percentage relative difference over the period of time and can be given by the following formula:

MAPC(%) = (b – a)*100/(a*t) where 'a' is the initial value of rate; 'b' is the final values of the rate and 't' is time period elapsed from base year to the last year.

Results

Table 1 provides the area covered, average female population at risk and cancer cases covered by different registries for the period 2001-03. The crude rate (CR) ranged between 64.1 per 100000 person years in Bhopal registry to 103.1 in Chennai registry while the AAR ranged from 92.1 in Bhopal registry to 116.5 in Delhi registry. The Barshi registry being the rural registry, registered the lowest CR/AAR (49.6/53.3 per 100000 person years).

The percentage of breast and cervix cancer cases to total cases according to different periods and registries are shown in Table 2. All the registries showed an increasing trend in the percentage of Breast cancer cases to total cases, registered over the years. In terms of MAPC%, Bangalore and Chennai showed more than 3% change over the years while Delhi, Bhopal and Mumbai showed changes between 1-2%. However, the registry of Barshi showed no such change in the percentage cases. In case of cervix cancer, all the registries showed a decreasing trend in the percentage of cervix cancer cases to total cases, registered over the years. In terms of MAPC%, the registry of Bangalore and Delhi showed more than 2% change while in the case of other registries, the change was between 1-2%. The registries of Bangalore (1996), Bhopal (1997-98), Chennai (2001-03) and Delhi (1994) showed a shift in the trend mainly after the year 1994. In the case of Mumbai, the breast cancer continues to be the leading site while in the registry of Barshi, still cervix continues to be the leading site of cancer among the women.

Table 1. Area Covered, Average Female Population at Risk, Cancer Cases, Crude (CR) and Age Adjusted Rates (AAR) (2001-2003)

Registry	Area*	Population	Cancers	CR	AAR
Bangalore	365.7	2,833,346	2,416	85.3	115.1
Barshi	3713.4	240,052	119	49.6	53.3
Bhopal	284.9	732,128	469	64.1	92.1
Chennai	170.0	2,162,934	2,230	103.1	115.2
Delhi	685.3	6,155,839	5,015	81.5	116.5
Mumbai	603.0	5,490,891	4,597	83.7	101.7
Pooled	5822.3	17,615,190	14,846	-	-

* Sq. km.

Table 2. Percentages of Breast and Cervix Cancers Relative to Total Cases over Time

Site Year	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
Breast						
1990	15.9	17.7	21.4	17.7	20.3	24.1
1995	20.1	13.5	22.4	20.0	22.9	24.4
2001-03	24.6	16.9	24.9	26.1	25.1	27.5
MAPC%	3.91	-0.32	1.17	3.39	1.69	1.01
Cervix						
1990	23.0	49.0	23.2	28.9	21.6	16.0
1995	21.1	54.1	23.9	25.2	18.6	13.8
2001-03	15.9	36.8	19.7	21.2	14.9	13.0
MAPC%	-2.20	-1.78	-1.08	-1.90	-2.22	-1.34

MAPC%, mean annual percentage change

The AARs for breast and cervical cancer by different years and registries are shown in Tables 3 and 4, respectively.

The age specific rates for breast cancer at two points of time along with MAPC% is shown in Table 5. For all the registries, except Barshi registry, the MAPC% was found to be maximum for the age group of below 35 years. This suggests that the rise in cancer incidence rate was relatively higher in younger age group as compared to other age groups. For Barshi, the maximum MAPC% was found to be for the age group of 45-65 years which indicates that the changes which we are observing in Barshi registry are mainly due to rise seen in the age group of 45-65 years. However, in the case of cervix cancer, the overall decrease in the rates, over the years, can be attributed to major reduction in the rates of 35-45 years and 45-65 years age group cases (Table 6).

The common method of diagnosis for breast cancer was by microscopic confirmation for both time points, with a slightly increasing trend over the years (Table 7). The common method of diagnosis for cervix cancer was also by microscopic confirmation (Table 8). The percentile age distributions of cancer cases according to two selected leading sites of cancer among women for two different periods are provided in Table 9. For both sites, in the period of 2001-03, there appears to be a slight shift in the age

Table 3. Time Trends in AARs of Breast Cancer Cases, 1990-2003

Year	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990	20.1	9.8	20.2	21.4	27.6	27.9
1991	24.9	10.7	20.0	20.6	27.9	30.8
1992	21.6	9.6	21.3	20.3	26.9	29.1
1993	23.3	4.4	20.7	21.6	28.5	28.3
1994	20.4	8.9	21.3	22.1	27.9	28.5
1995	23.2	7.8	18.5	21.6	30.1	27.4
1996	21.3	10.5	18.2	23.8	27.7	28.5
1997-98	25.2	8.1	24.5	30.4	30.8	30.8
1999	24.9	5.7	25.1	28.1	31.4	32.2
2000	28.7	7.8	26.0	27.9	31.6	30.9
2001-03	27.5	9.7	22.1	29.3	29.2	27.5
APC	2.25*	-1.04	1.77	3.61*	1.07*	0.31
95% CI	0.7-3.8	NS	NS	2.2-5.0	0.3-1.8	NS

APC, annual percentage change *significant at 5% level

Table 4. Time Trends in AARs of Cervical Cancer Cases, 1990-2003

Year	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990	29.2	27.8	21.8	34.7	28.8	18.0
1991	27.5	33.9	24.6	33.4	25.9	19.5
1992	26.1	31.1	21.1	30.9	28.0	18.8
1993	29.6	27.8	21.1	32.3	30.3	17.3
1994	24.6	30.1	22.3	29.9	26.4	15.9
1995	25.2	30.9	20.6	27.9	25.1	15.1
1996	21.7	23.8	21.3	27.0	22.7	16.3
1997-98	21.9	21.9	24.1	26.7	22.1	18.2
1999	21.1	24.1	25.0	31.5	19.4	17.7
2000	25.3	22.6	23.8	33.1	21.5	17.2
2001-03	18.1	19.1	18.7	24.8	17.6	13.0
APC	-3.17*	-3.87*	-0.18	-1.61	-3.96*	-1.72
95% CI	-4.7,-1.6	- 5.6,-2.1	NS	NS	-5.2,-2.7	NS

APC, annual percentage change *significant at 5% level

Table 5. Age Specific Rates of Breast Cancer in 1990 and 2001-03 and MAPC%

Variable	Age	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990	≤35	1.80	0.65	2.39	1.70	2.69	1.66
	35-45	25.30	37.10	24.45	30.40	41.30	40.05
	45-65	62.20	12.55	66.79	60.42	83.56	77.93
	≥65	54.10	36.96	44.74	73.84	72.60	103.70
2001-03	≤35	3.27	0.00	4.62	5.38	4.43	3.93
	35-45	30.77	15.97	29.87	39.91	34.45	31.21
	45-65	80.97	30.76	68.64	87.41	89.33	79.04
	≥65	95.34	20.80	54.91	85.10	88.28	101.51
MAPC%	≤35	5.85	-7.14	6.65	15.41	4.65	9.73
	35-45	1.54	-4.07	1.58	2.23	-1.18	-1.58
	45-65	2.16	10.37	0.20	3.19	0.49	0.10
	≥65	5.45	-3.12	1.62	1.09	1.54	-0.15

MAPC%, mean annual percentage change

Table 6. Age Specific Rates of Cervical Cancer in 1990 and 2001-03 and MAPC%

Variable	Age	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990	<35	2.15	3.35	2.10	2.05	2.44	1.45
	35-45	38.15	36.00	31.60	54.60	53.40	26.25
	45-65	92.27	99.63	69.22	115.45	84.61	52.27
	>=65	82.07	34.97	51.17	70.91	64.97	57.61
2001-03	<35	1.98	2.75	2.01	1.88	2.42	1.17
	35-45	19.11	23.95	20.15	26.46	20.10	16.67
	45-65	50.30	59.59	56.95	81.10	53.99	38.70
	>=65	72.00	62.41	63.09	73.79	52.33	44.24
MAPC%	<35	-0.59	-1.28	-0.29	-0.58	-0.08	-1.37
	35-45	-3.57	-2.39	-2.59	-3.68	-4.45	-2.61
	45-65	-3.25	-2.87	-1.27	-2.13	-2.58	-1.86
	>=65	-0.88	5.60	1.66	0.29	-1.39	-1.66

MAPC%, mean annual percentage change

Table 7. Percentage of Breast Cancers by Method and Duration of Period of Diagnosis

Year	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990-96						
Microscopic	88.4	89.7	87.8	84.4	81.1	80.4
Clinical	7.7	10.3	10.4	12.3	14.6	11.5
Others	3.9	0.0	1.8	3.3	4.3	8.1
Total	2,186	116	500	2,359	5,511	6,688
2001-03						
Microscopic	91.3	93.3	97.7	90.9	84.4	87.9
Clinical	5.8	6.7	2.0	9.1	13.9	6.8
Others	2.9	0.0	0.3	0.0	1.7	5.3
Total	1,781	60	351	1,744	3,777	3,789

Table 8. Percentage of Cervical Cancers by Method and Duration of Period of Diagnosis

Year	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990-96						
Microscopic	89.6	93.8	84.7	85.0	80.2	83.0
Clinical	8.4	5.9	14.5	13.6	17.8	11.3
Others	2.0	0.3	0.7	1.4	2.0	5.6
Total	2,523	388	537	3,320	5,153	4,125
2001-03						
Microscopic	90.0	93.9	96.0	89.9	80.9	90.5
Clinical	6.4	5.3	4.0	8.4	18.2	5.6
Others	3.6	0.8	0.0	1.7	0.9	3.9
Total	1,151	131	278	1,419	2,241	1,792

Table 9. Percentile Distribution of Age According to Site of Cancer (1990-1996) & (2001-03) Pooled for Registries

Percentile	Breast cancer		Cervix cancer	
	1990-96	2001-03	1990-96	2001-03
5	32.2	32.2	32.2	34.3
10	36.0	36.5	36.0	37.8
25	42.6	43.6	42.6	44.5
50	51.0	52.2	51.0	53.0
75	60.3	62.1	60.3	62.9
90	68.1	70.6	68.1	70.1
Total cases	17,360	16,046	17,360	16,046

distribution when compared to that seen in the period of 1990-96. In the breast cancer case, the median age shifted to 43.6 years from 42.6 years while for cervix cancer the shift was from 42.6 years to 44.5 years. According to 2001-03 data, in 10% of the women the age at occurrence of breast cancer/cervix cancer was below 36.5 years/37.8 years. For both the sites, about 90% of the cases were found by the age of 70 years.

Discussion

Breast and cervix cancer are the two major sites of cancer observed among the Indian women. According to

the latest report of NCRP, around 25% of the total cancer cases are reported to be that of breast cancer. Similarly, cervix cancer cases on an average constitute about 15% of the total cases in urban registries (NCRP- 2006).

However, in Barshi registry, the cervix cancer cases contribute around 37% of the total cases, which is quite high as compared to seen in other urban registries. This is probably due to the fact that in rural areas still cervix cancer is the leading site (NCRP- 2006). Our results are in line with earlier observations for change in time of breast and cervical cancers (Yeole et al., 1989; Murthy et al.,1990; 2005; Yeole, 2008) . The assessment of time trend in AAR also support the fact that there is an increasing trend in breast cancer and a decreasing trend in cervix cancer, over the period of time. In the case of breast cancer, the increasing trend appears to be quite high in Chennai registry then Bangalore and Delhi. However, in the case of cervix cancer, all the three registries namely Bangalore, Barshi and Delhi showed quite high decrease and their APC was ranging between 3.0-4.0. The recent data collected from five North East registries in the year 2003-04 has also shown that breast cancer has emerged as the leading site of cancer (NCRP, 2006). In view of the gradual change in the life style of Indian women, it is expected that the incidence of breast cancer may go up further in future. It has been documented that factors such as age, age at menarche, marital status, age at menopause, place of residence (rural/urban), religion and family history of breast cancer can all play roles as risk factors (Gaudette et al., 1996).

The method of diagnosis is an important tool to assess the validity of the cancer cases included in the registry report. For both the sites, in more than 85% of the cases were confirmed microscopically as cancer cases suggesting the good reliability of the data collected.

The data on clinical extent and mode of treatment is not available through Population Based Cancer Registry data. However, there are five Hospital Based Cancer Registries which are functioning under the network of NCRP. Based on the data from the Hospital Based Cancer Registries, it was observed that most of the breast and cervix cancer cases come late to the hospital for diagnosis and treatment (NCRP, 2007). With data of Bangalore, Chennai, Thiruvanthapuram, Dibrugarh and Mumbai HBCR data (NCRP, 2007), it was observed that except in the case of Mumbai, in other Hospital registries more than 70% of the breast cancer cases and more than 85% of the cases of cervix cancer presented with regional spread, at an advance stage of cancer. Further, for breast cancer, the major mode (>=85%) of treatment was that of surgery while for cervix cancer, it was radiology (>=95%).

Considering the percentile age distribution of the cases, it is clear that around 10% of the cases get breast orcervix cancers by the age of 36 years while 25% by the age of 43 years and 50% by the age of 52 years. There appears to be a slight positive shift in the percentile distribution of the age by 1 year in the case of breast cancer and 2 years in the case of cervix cancer. It is also observed that about 10 % of the cases are getting breast or cervix cancer beyond the age of 68 years.

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