RESEARCH COMMUNICATION

Changing Trends in Incidence of Ovarian Cancer - the Indian Scenario

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Abstract

Ovarian cancer has emerged as one of the most common malignancies affecting women in India. The present communication reports the trends in the incidence rate of ovarian cancer for Indian women. The data published in Cancer Incidence in Five Continents for various Indian registries for different periods and / or publication by the individual registries served as the source material. Mean annual percentage change (MAPC) in rates was computed using relative differences between two time periods. During the period 2001-06, the age-standardized incidence rates (ASR) for ovarian cancer varied from 0.9 to 8.4 per 100,000 person years amongst various registries. The highest incidence was noted in Pune &Delhi registries. The Age Specific Incidence Rate (ASIR) for ovarian cancer revealed that the disease increases from 35 years of age and reaches a peak between the ages 55-64. The trend analysis by period showed an increasing trend in the incidence rate of ovarian cancer in most of the registries, with a mean annual percentage increase in ASR ranged from 0.7% to 2.4 %. Analysis of data by ASIR revealed that the mean annual percentage increase was higher for women in the middle and older age groups in most of the registries. Estimation of annual percent change (EAPC) in ovarian cancer by Poisson regression model through Maximum Likelihood Estimation (MLE) for the data of 3 population-based cancer registries vs. Mumbai, Chennai and Bangalore for the period 1983-2002 revealed that linear regression was found to be satisfactory fit between period and incidence rate. Statistically significant increase in EAPC was noted with the crude rate (CR,) ASR, and ASIR for several age-groups. Efforts should be made to detect ovarian cancer at an early stage by educating population about the risk factors. Most of the ovarian cancers are environmental in origin and consequently, at least in principle avoidable.

Key Words: Ovarian cancer - time trend - Indian scenario - calendar years

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Introduction

Ovarian cancer is an important cause of morbidity and mortality, especially in the middle aged women. During the year 2002, it ranked third in frequency (4.1%) among all cancers in women, with an estimated 2, 04, 499 new cases occurring in the world (Parkin et al., 2005). The age-standardized incidence rate (ASR-World) varied from as low as 0.06 per 100,000 women in China, Hong Kong to a high of 16.3 in Switzerland, St Gall-Appenzell (Parkin et al., 2002).

In India, during the period 2004-2005, proportion of ovarian cancer varied from 1.7% to 8.7% of all female cancers in various urban and rural population based registries operating under the net- work of the National Cancer Registry programme (NCRP) of Indian Council Medical Research. The proportion of this cancer was 6.0% and 7.7% of all cancers among females in rural Barshi and Ahmedabad registry areas (National Cancer Registry Programme, 2008). A systematic cancer trend analysis helps to understand the changing cancer risk and how it is in future. It offers clues as to the understanding causes of the disease and the variation in frequency around different geographical areas. The cancer trend analysis is important information for public health and health care planning for prevention and control. In the present communication, an attempt has been made to analyze the time trends of ovarian cancer for Indian population by year of diagnosis and age of women.

Materials and Methods

Incidence rates (age-standardized to the world-standard population as well as age specific) for ovarian cancer between 1968 and 2002 were obtained from volumes III-IX of Cancer Incidence in Five Continents (CI5)((Waterhouse, et al., 1976; 1982; Muir, et al., 1987; Parkin et al., 1992; 1997; 2002; Curado et al., 2007). The CI5 included incidence data reported by the Indian Population- Based Cancer Registries (PBCRs) covering

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areas Ahmedabad, Bangalore, Chennai, Delhi, Mumbai, Nagpur, Pune, Trivandrum, and Karunagapalli. Volumes III-IX generally provided data for 5-year time periods 1968-72, 1973-77, 1978-82, 1983-87, 1988-92, 1993-97 and 1998-02 respectively. The Bangalore data for 1998-2002 and data for other registries (Bangalore, Mumbai, Bhopal, Barshi, New-Delhi, Chennai, 2004-05; Kolkata 2005; North Eastern registries, 2005-06; Ahmedabad-rural 2005, Nagpur, Pune and Aurangabad data for 2001) were obtained from the individual registry publications or from the publications of the National Cancer Registry Programme (NCRP) of Indian Council of Medical Research (ICMR) (National Cancer Registry Programme, 2008; Cancer Incidence and Patterns in Urban Maharastra-2007, Mumbai, India; CIV, 2007).

Although there are several PBCRs operating in India, data over sufficient duration enabling study of trends was available for Mumbai and a few registries only. Continuous data from 1968 to 2002 was available for population-based registry of Bombay (Mumbai). The Bangalore and Chennai registries which were established during the year 1982 provided data for four successive five-year calendar periods from 1983 to 2002. Limited data was available from Ahmedabad registry. The Nagpur and Pune registries although had data for long term, however, data was missing for some in-between 5 year periods. Delhi registry provided data for three successive 5-year periods.

The trend component was studied by calculating (i) mean annual percentage change in the , age standardized rate or age specific incidence rates and through modeling of data by estimating annual percent change (EAPC) through regression analysis.

(i) Calculation of mean annual percentage change in the crude rate, age standardized rate or age specific incidence rates: In this approach, the trend component has been isolated according to (i) 5-year calendar period and by (ii) considering age of woman along with calendar period. Data for Bangalore and Chennai (Madras) relate to periods 1983-87 and 1998-2002, while the data for Mumbai relate to the periods 1968-72 and 1998-2002. Similarly, for Nagpur and Pune, the data relate to the 1980-82 and 1998-2002 periods and to 1973-77 and 1998-2002 respectively. Data for Ahmedabad relate to periods 1983-87 and 1993-97, while the data for Delhi relate to the period 1988-92 and 1998-2002.

Measures of trend over time period have been estimated as overall or mean annual percentage change (MAPC%) in age standardized (ASR) and age-specific incidence rates (ASIR). The estimation of MAPC% was done by taking (i) relative difference in the incidence rates between latest-time (period t) with further-most period (base-line period t_0) and (ii) dividing this difference by the product of the number of years covered between the two time periods and the baseline period incidence rate. Further this quotient was expressed as a percentage. This relation can be mathematically represented as:

MAPC%= [(Incidence rate at latest time period t- Incidence rate at base-line period t_0)/ (Incidence rate at base-line period t_0 * number of actual years covered between the two time periods)]*100. The pooled ASIR were estimated for the age groups 15-34, 35-44, 45-54, 55-64 and above 65+ years to have more stabilized incidence rates.

ii) Modeling of data: Calculation of estimated annual percent change (EAPC) through regression analysis: An annual percent changes in incidence rates of cancer in each age group were estimated by means of a linear regression analysis through the Maximum Likelihood Procedure. The logarithm of the respective incidence rates on the midpoint of the five-year time period was considered. The mathematical expression was of the form:

[i.e. loge (incidence rate) = $\alpha_0 + \alpha_1 a + \beta y$] ; where a: age, y: year of diagnosis, α_0, is a constant, α_1 and , β are regression coefficients.

The coefficients including the average annual change in incidence rate was calculated from the maximum likelihood estimate of the parameter for the year of diagnosis. Further, estimation of annual percent change (EAPC) was done as EAPC= $100*(e^{\beta} -1)$. This change was regarded as statistically significant if the p-value was less than or equal to 0.05. For the purpose of uniformity and comparison, published data from Mumbai, Chennai and Bangalore was employed for the five periods from 1983-2002.

For most of the sites, a satisfactory fit in terms of a linear model was obtained with a Poisson error distribution for the number of incidence cases. Separate analysis was performed for each of the age groups (0-4, 5-9, 10-14, … 75+ year) with the age terms being retained in the model.

Table 1.Age adjusted Incidence Rates per 100,000 person years (ASR) for Ovarian Cancer in Indian Registries

Registry	Type of registry	Period	ASR	%
Urban				
Aurangabad[b]	Urban	2001	1.7	
Bangalore[a]	Urban	2004-05	6.2	5.3
Mumbai (Bombay)[a]	Urban	2004-05	6.5	6.3
Bhopal[a]	Urban	2004-05	6.5	7.3
Delhi[a]	Urban	2004-05	8.3	7.1
Chennai (Madras)[a]	Urban	2004-05	5.4	4.5
Kolkata[a]	Urban	2005	4.6	6.0
Nagpur[b]	Urban	2001	6.7	
Trivandrum[c]	Urban	1998-2002	4.8	
Pune[b]	Urban	2001	8.4	
Rural				
Ahmedabad[a]	Rural	2001	3.4	7.7
Barshi[a]	Rural	2004-05	3.8	6.0
Karunagapalli[c]	Rural	1998-02	4.8	
NEPBCRs				
Dibrugarh[a]	Urb Rural	2005-06	5.6	8.7
Kamrup Urban Dist[a]	Urb Rural	2005-06	7.7	6.0
Silchar Town[a]	Urb Rural	2005-06	0.9	2.0
Imphal West Dist[a]	Urb Rural	2005-06	7.6	5.9
Mizoram state[a]	Urb Rural	2005-06	2.3	1.7
Sikkim State[a]	Urb Rural	2005-06	3.5	4.4

[a]National Cancer Registry Programme (2008); [b]Cancer Incidence and Patterns in Urban Maharastra-2007, Mumbai, India; [c]Curado et al., 2007; NEPBCRs, North-Eastern Population-based cancer Registries

Quadratic term (a^2) was added and retained if there was a substantial improvement in the model in terms of deviances.

Results

Age-standardized Incidence rates of ovarian cancer

The ASR of ovarian cancer during the period 2001-2006 ranged from 0.9 (Silchar town) to 8.4 per 100,000 women (Table 1). Pune had the highest ASR of ovarian cancer. Comparison of the ASRs of ovarian cancer amongst registries indicates differences in the occurrence of this cancer.

Age-specific incidence rates of ovarian cancer

The distribution of age-specific incidence rates of ovarian cancer for seven urban registries and two rural registries for year 1998-02 in the broad age groups is shown in table 2. It shows that the disease does not occur at very young age. Incidence- rates increased with increasing age. The age-specific incidence rates start increasing from 35 years and reach peak at 55-64 years with the exception of Mumbai and Pune registries. A comparative assessment of age-specific incidence-rates amongst different registries revealed that registry areas with lower ASR of ovarian cancer showed lower age specific incidence rates and vice versa. The mean age at occurrence of ovarian cancer varied between 52.2 to 59.5 years in the various registries (Table 2).

Time trends in occurrence of ovarian cancer

Period effect. Although there are several population-based registries operating in the country, data over sufficient duration enabling study of time trends are available for Mumbai and a few other registries only. Continuous data from 1968 to 2002 are available for population-based registry of Bombay (Mumbai). In the Bombay Registry, during the various five-year calendar periods age adjusted incidence rate of ovarian cancer has revealed almost continuous increasing trend except during the year 1978-82. The annual age adjusted incidence rate was 4.9 per 100, 000 person years during the year 1983-87 and 1998-02 and increased to 7.1 during the years 1998-02 (table 3). Mean annual percent change was found to be 1.28%. The data available from the other two registries located in the state of Maharashtra viz. Nagpur and Pune, revealed an increasing trend in the incidence of ovarian cancer. In these registries, the average annual percentage increase in the ASR was found to be 2.44% & 1.59% respectively. The Bangalore and Chennai registries, which were established in 1982, provided data for four successive five-year calendar periods from 1983 to 2002. The MAPC in ASR was observed to be 0.71% and 0.26% respectively. Ahmedabad registry indicated a slight decrease in incidence rates over various calendar years. Karunagapalli and Thiruvananthapuram (Trivandrum) registries were not considered for trend analysis as data for five year periods consisted of only two such periods.

Age and period wise incidence rates. The ASIR of ovarian cancer by broad age groups of 15-34, 35-44, 45-54, 55-64, & 65+ by period along with MAPC% between the latest and further most periods for the various registries are shown in Tables 4 a, b, &c. The ASIR by period revealed an increase in the incidence of the disease in many age groups in various registries. The MAPC in the youngest age group of 15-34 years were 4.36 and 2.82 in Mumbai and Nagpur respectively. For the last age interval of 65+ years, the MAPC ranged from 0.93% to 5.67% in the various registries. Further, in many of the registries, increase in MAPC was noted in all the age-intervals. Even in Delhi, except for the first age interval of 15-34, increases

Table 2. Age-specific Incidence Rates for Ovarian Cancer per 100,000 Person Years by Broad Age Groups in Various Indian registries, 1998-02

Age (Yrs)	Bangalore	Chennai	Delhi	Mumbai	Nagpur	Pune	Trivandrum	Karunagapalli	Barshi
15-34	1.10	1.55	1.94	2.10	3.59	1.41	1.62	1.95	0.28
35-44	5.09	5.30	10.2	6.26	11.2	5.25	5.99	5.64	2.10
45-54	11.6	15.8	20.0	16.3	13.6	15.6	13.1	15.6	5.62
55-64	20.5	21.0	28.6	22.0	18.4	21.6	14.6	8.38	3.65
65+	21.7	18.6	25.3	28.9	8.38	31.1	13.6	13.6	3.92
Mean age*	58.9	57.4	57.0	58.5	52.2	59.5	56.0	55.1	55.1

Source: Curado et al., 2007; *at reporting

Table 3. Trends in Age-standardized Rates (ASR) per 100,000 Person Years for Ovarian Cancer in Various Registries by Calendar Year and Mean Annual per-cent Change (MAPC) between the Earliest and Last Period

Period	Ahmedabad[a]	Bangalore[b]	Chennai[b]	Mumbai[c]	Nagpur[d]	Pune[e]	Delhi[f]
1968-72	N.A.	N.A.	N.A.	4.90	N.A.	N.A.	N.A.
1973-77	N.A.	N.A.	N.A.	7.20	N.A.	4.60	N.A.
1978-82*	N.A.	N.A.	N.A.	7.20	4.10	5.10	N.A.
1983-87	4.00	4.90	5.70	6.50	N.A.	N.A.	N.A.
1988-92	N.A.	4.29	5.73	7.22	N.A.	N.A.	7.50
1993-97	3.56	5.05	5.49	8.01	9.55	6.98	8.40
1998-02	N.A.	5.60	6.00	7.10	6.40	6.80	8.30
Mean %	-0.73	0.71	0.26	1.28	2.44	1.59	0.70

[a]Change in incidence of ovarian cancer per year between 1983-1997 (i.e. over 15 years); [b]1983-2002; [c]1968-2002; [d]1980-2002; [e]1973-2002; [f]1988-2002; N.A., not available

Table 4. Age Specific Incidence Rates for Ovarian Cancer and Mean Annual Percent Change (MAPC) in Broad Age Groups from Initial to Latest periods in Various Indian Registries

Age	Ahmedabad			Bangalore					Chennai				
	1983-87	1993-97	MAPC	1983-87	1988-92	1993-97	1998-02	MAPC	1983-87	1988-92	1993-97	1998-02	MAPC
15-34	1.33	0.67	-3.29	1.58	1.50	1.31	1.10	-1.50	1.81	1.47	1.93	1.55	-0.71
35-44	4.81	4.54	-0.37	5.20	6.35	5.01	5.09	-0.11	8.32	7.35	5.21	5.30	-1.81
45-54	10.41	9.73	-0.43	12.66	11.19	11.67	11.57	-0.43	13.91	14.39	13.54	15.84	0.70
55-64	11.42	11.73	0.18	14.74	14.16	24.98	20.52	1.96	18.92	17.80	20.88	20.99	0.55
65+	11.97	9.17	-1.56	14.93	8.18	16.36	21.74	2.28	14.00	17.44	13.81	18.59	1.64

Age	Delhi				Mumbai							
	1988-92	1993-97	1998-02	MAPC	1968-72	1973-77	1978-82	1983-87	1988-92	1993-97	1998-02	MAPC
15-34	2.23	2.28	1.94	-0.85	0.86	1.55	1.62	1.36	1.32	1.57	2.10	4.13
35-44	8.24	9.28	10.15	1.55	5.45	5.85	6.13	6.26	6.92	7.46	6.26	0.43
45-54	19.42	22.56	19.99	0.20	12.01	18.93	16.29	16.66	16.16	18.69	16.25	1.01
55-64	27.25	26.91	28.58	0.32	17.46	23.73	23.26	20.33	26.86	25.70	22.03	0.75
65+	18.94	24.38	25.27	2.22	14.30	25.48	26.55	25.13	26.87	32.84	28.92	2.92

Age	Nagpur				Pune				
	1980-82	1993-97	1998-02	MAPC	1973-77	1978-82	1993-97	1998-02	MAPC
15-34	2.18	5.38	3.59	2.82	1.41	1.36	0.84	1.41	0.00
35-44	6.42	12.90	11.16	3.21	3.99	6.62	5.36	5.25	1.05
45-54	7.59	26.14	13.89	3.61	11.36	16.10	16.23	15.58	1.24
55-64	15.15	17.34	18.37	0.93	18.58	17.95	24.69	21.58	0.54
65+	6.91	16.61	8.38	0.93	11.51	7.34	31.32	31.09	5.67

Table 5. Estimated Annual Percentage Change (EAPC) in the Incidence Rates for Ovarian Cancer in Different Ages during the Years 1983-2002

Registry	Mumbai			Chennai			Bangalore		
Age (in yrs)	EAPC (%)	P value	devia. /df	EAPC (%)	P value	devia. /df	EAPC (%)	P value	devia. /df
0-4	-	-	-	-	-	-	-	-	-
5-9	-	-	-	-	-	-	-	-	-
10-14	-	-	-	-	-	-	-	-	-
15-19	-	-	-	-	-	-	-	-	-
20-24	4.071	0.03	0.252	-	-	-	-	-	-
25-29	4.196	0.05	0.327	0.090	0.97	0.462	1.582	0.65	0.502
30-34	1.491	0.16	0.083	0.552	0.83	0.518	-1.990	0.51	0.383
35-39	1.227	0.17	0.059	-3.729	0.00	0.116	2.276	0.20	0.128
40-44	0.170	0.85	0.063	-0.817	0.67	0.266	3.118	0.40	0.547
45-49	-0.160	0.82	0.038	0.662	0.56	0.096	0.190	0.92	0.128
50-54	0.743	0.24	0.029	1.258	0.21	0.072	2.521	0.31	0.248
55-59	0.995	0.26	0.056	0.431	0.71	0.100	2.041	0.37	0.208
60-64	0.864	0.37	0.067	3.624	0.01	0.150	5.982	0.00	0.152
65-69	-0.399	0.67	0.065	0.864	0.62	0.227	5.675	0.05	0.316
70-74	4.404	0.00	0.141	2.573	0.36	0.415	-0.926	0.53	0.074
75+	4.707	0.01	0.135	1.268	0.57	0.348	2.224	0.38	0.203
CR	2.562	0.00	0.009	1.552	0.00	0.012	3.407	0.00	0.032
ASR	1.126	0.00	0.008	0.763	0.07	0.013	2.706	0.01	0.044

in incidence over period were noted in all other age intervals. For women above the age of 64 years, the MAPC was found to be highest (5.67%) in Pune followed by Mumbai and Delhi. The Ahmedabad registry demonstrated decrease in MAPC% in all the age intervals except in the age group of 55-64 years.

Estimated annual percentage change (EAPC) in the incidence in different 5 year periods through regression analysis.

EAPC was attempted by Poisson regression model between the period and incidence rates for (i) each of the 5 year age specific incidence rates (ASIR) (0-4, 5-9,…..=>75), (ii) crude rate (CR), and (iii) age adjusted rate (ASR) for the data of 3 PBCRs viz. Mumbai, Chennai and Bangalore for the period 1983-2002 for ovarian cancer. Results of analysis revealed that for most of the age groups linear regression was found to be a satisfactory fit between period and incidence rate as noted through the deviance/df values. Statistically significant increase in EAPC was noted with CR, ASR, and ASIR amongst several age groups. The estimated EAPC in CR & ASR ranged from 1.56% to 3.41% and 0.76% to 2.71% respectively amongst the three registries and was found to be statistically significant (P ranged from 0 to 0.07). When different 5 year age-wise incidence rates were considered although no consistent pattern was noted EAPC was found to be significant for several five year age groups.

Discussion

The absolute number of new cancer patients in India is increasing rapidly due to an increase in the size of the population as well as an increase in the proportion of elderly persons due to improved life expectancy (Murthy et al., 1990). In the country, cancer of the ovary is one of the most common cancers amongst females and occupied third/fourth rank among cancers occurring in women during the year 2004-05 amongst various Indian registries. In the present communication, time trends in the incidence of ovarian cancer have been examined using the data provided by the Indian population based registries established in the country. In general, trends in the incidence of ovarian cancer may occur from a variety of factors such as initiation of screening programme, changes in diagnostic methods, completeness & reliability of data, changing profile of risk factors in the population, or as a consequence of better health awareness. As regards completeness and reliability of data it has been reported that the data collected by the Indian population- based registries are both complete and reliable (National Cancer Registry Programme, 2001; Parkin et al, 2002).

Modeling of the data through age, birth cohort and calendar time period are the appropriate techniques for analyzing trends in cancer. However, the above approach could not be adopted in the present analysis, as the data was not available for a sufficiently long period of time from various registries other than Mumbai. Hence, mean annual percent change in the age standardized rate and age specific incidence rate in ovarian cancer was computed between the earliest and latest time periods to evaluate the change over the time period. In addition to above, estimated annual percentage change in ovarian cancer was computed for crude rate, age standardized rate and ASIR at various five year age intervals from the data of three registries viz. Mumbai, Chennai and Bangalore.

The present trend analysis has revealed a steady increase in the age-standardized incidence rate of ovarian cancer ranging from 0.26% to 2.44% per year in different registries over a period of time. Further analysis of data by age-specific incidence rates against period could be attempted for seven registries only. Mumbai, Nagpur and Poona showed an increase in mean annual percent change in all the age intervals after 35 years. In the other three registries Viz. Ahmedabad, Bangalore and Chennai, an increase in the mean annual percent change could be noted in 55-64 years age group. The increase in the incidence over time period suggests that there has been an increasing exposure to risk factors for the disease over successive calendar years. Some of the very widespread changes in the incidence of ovarian cancer may be accounted for by the trends, in aspects of reproductive behavior that are known to be associated with the risk of ovarian cancer such as progressively smaller family size and proportion of never married women. Nulliparous women are also at an elevated risk (Tomatis, 1990).

Time trend analysis for ovarian cancer has been examined for the city of Bombay for the period 1968- 87 based on the Bombay population based registry data by employing age-period cohort model. An increase of 0.31% per annum in the age-standardized incidence rate has been reported from the observation period 1968-72 to the prediction period of 1998-2002. A small increase due to birth cohort effect has also been reported (Yeole, 1997). A systematic examination of time trends in cancer risk for most of the major cancers, and for different countries and regions of the world has been studied by Coleman et al (1993). It has been reported that the survival of patients with ovarian cancer has improved in recent years in some of the countries, due to earlier stage at diagnosis and possibly due to introduction to the combination of chemotherapy with Cisplatin (Coleman et al. 1993).

Incidence and mortality rates due to ovarian cancer have shown a slight decline over the last few decades in some of the developed countries. The Nordic countries are well-known high incidence areas of ovarian cancer, but even within Nordic countries, differences in incidence and mortality have been reported (Kjaerbye-Thygesen et al, 2005). It has been reported that in Denmark, during the period 1978-2002, the incidence and mortality have decreased from 14.3 to 13.3 and 10.8 to 9.0 per 100,000 woman-years. Further, it is reported that Denmark had the highest mortality in the world and the possible explanation offered is that, Danish distribution of stage at diagnosis seems less favourable compared to results from other countries.

The etiology of ovarian cancer is poorly understood. Parity and combined oral contraceptive use have been consistently documented as the protective factors. The protection afforded by parity has been documented to the order of nearly 40% (Coleman et al, 1993). La Vecchia (2001) in a review on epidemiology of ovarian cancer has indicated that cosmetic talc use and some aspect of diet (i.e. saturated fats, refined carbohydrates) may be associated with the increased risk of ovarian cancer. An inverse relationship with the vegetable consumption has been reported (La Vecchia, 2001). In a case-control investigation on cancer of the ovary, carried out at Bangalore, India, Nandakumar et al. (1995) have observed that tubectomy, as a method of family planning appeared to reduce the risk of development of ovarian cancer. Women with a family history of ovarian and breast cancer in first-degree relatives have also been reported to be at increased risk, but family history may account for only 4-5% of cases (Saxena et al, 2005).

The analysis of data by age-specific incidence rates over different calendar years and the increase noted in several registries suggest that the risk is increasing in successive calendar years and this was largely due to increased incidence in almost all age groups. Statistically significant increase in EAPC was noted with CR and ASR amongst all the registries. Similarly, several age groups revealed statistically significant increase in EAPC. The age effects represent differing risks associated with different age groups. The period effects represent variation in incidence rates over time that is associated with all age groups simultaneously.

These observations suggest that the possibly environmental and /or life-style factors affecting the change had influence on all the age groups. India is rapidly stepping towards industrialization vis-à-vis urbanization

resulting in change of life style factors, particularly an increase in age at marriage, delay in age at first birth, reduction in parity and improved socio-economic conditions etc (International Institute for Population Sciences, 1995). The above factors possibly might have contributed to gradual increase in the incidence of ovarian cancer in India. Based on trends data, there is every reason to believe that the burden of ovarian cancer will continue to grow not only in terms of the absolute number of cases but also in-terms of incidence. However, further studies are needed to elicit the causative factors responsible for the increase in the incidence of the disease and also their mechanism of action.

Ovarian cancer has emerged as one of the most common malignancies affecting women in India. Several registries have revealed an increasing trend in the incidence of cancer of ovarian. The main risk factors for endometrial cancer are similar to those of cancer of breast and ovary. There is convincing evidence about association of obesity, diabetes and hypertension with the cancer of corpus uteri. A diet high in saturated/animal fats possibly increases the risk, while diets high in vegetables & fruits possibly decrease the risk of cancer of corpus uteri. Efforts should be made to detect this cancer at an early stage by educating population about risk factors.

In conclusion, ovarian cancer has emerged as one of the commonest malignancy-affecting women in India. A steady increase has been observed in the incidence of the ovarian cancer in several registries. The highest increase over period was estimated in Nagpur where the mean annual percent increase was 2.4 %. Some of this increase could be due to improved certification and registration of the disease in the recent years and also could be due to increase in size of the population as well as an increase in the proportion of elderly women due to improved life expectancy. The age-standardized rates have shown an increase, which suggests that there has been an increasing exposure to risk factors for disease among women born during latter periods. Most ovarian cancers are environmental in origin and consequently, at least in principle avoidable.

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