

## RESEARCH COMMUNICATION

# Trends in Cancer Incidence in Female Breast, Cervix Uteri, Corpus Uteri, and Ovary in India

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### Abstract

Trends in breast, cervix uteri, corpus uteri and ovarian cancers in six population based cancer registries (Mumbai, Bangalore, Chennai, Delhi, Bhopal, and Barshi) were evaluated over a period of the last two decades. For studying trends we used a model that fits this data is the logarithm of  $Y=ABx$  which represents a Linear Regression model. This approach showed a decreasing trend for cancer of the cervix and increasing trends for cancers of breast, ovary and corpus uteri throughout the entire period of observation in most of the registries. The four cancers, breast, cervix, corpus uteri and ovary, constitute more than 50% of total cancers in women. As all these cancers are increasing, to understand their etiology in depth, analytic epidemiology studies should be planned in a near future on a priority basis.

**Key Words:** Trends - breast - cervix - corpus uteri - ovary

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### Introduction

The information relating to cancer incidence trends forms the scientific basis for planning an organization of prevention, diagnosis and treatment of cancer in a community. The trends may also give rise to the hypothesis concerning the etiology and biology of cancer. Analysis of time trends in cancer incidence can be utilized to predict cancer incidence in future years, to help in making decisions regarding preventive, diagnostic and therapeutic facilities to be made available in the country, and to conduct epidemiologic research. Changes in incidences of specific cancers over a period of time would indicate changes in exposure to various factors of etiologic importance.

This paper documents trends in breast, cervix uteri, corpus uteri and ovarian cancers among the female population in six population based cancer registries (Mumbai, Bangalore, Chennai, Delhi, Bhopal, and Barshi) over a period of last two decades. All these registries are under the network of National Cancer Registry Programme (NCRP) of Indian Council of Medical Research (ICMR), New Delhi. The clean data is available for 22 years of period (1982-2003) for Mumbai, Bangalore, Chennai, registries and for 16 years of period (1988-2003) for Delhi, Bhopal and Barshi registries. The data used for trend analysis from these six registries has been coded in one format, i.e. for topography codes ICD-10 (WHO,1992) and for morphology ICD-O3 (IARC, 1982) has been used. For calculating various rates, population by age, sex and year has been estimated by using "Distribution Method" (National Cancer Registry Programme, 2006) by using 1981, 1991, 2001 Census

figures for all these registries. For calculating age adjusted incidence world standard population (WHO, 2000) has been used.

### Materials and Methods

In India first population based cancer registry was established in Mumbai (Bombay) by Indian Cancer Society in 1964 covering the urban population of Greater Mumbai. NCRP was launched by ICMR in 1981, establishing another two population based cancer registries at Chennai and Bangalore. Subsequently new population based cancer registries were commissioned by ICMR under the network of NCRP at Bhopal and New Delhi in 1986 and rural cancer registry at Barshi-Maharashtra in 1987. Various analytic approaches and measures of trends including geographical display and the overall mean annual percentage rate of change in age adjusted incidence rates or age specific rates as well as modeling by age, period and cohort have been used to study the trends in cancer incidence. For studying trends we use a model that fits this data is the logarithm of  $Y=ABx$  which represents a Linear Regression Model where 'Y' is the estimated incidence rates per 100,000 population and 'x' is the calendar year – initial year for the current data. Capital 'A' therefore represents the estimated rate of the initial year and  $(B-1)*100$  gives the Average Annual Percentages Change in the incidence rates during the period (Cancer Incidence and Mortality in Greater Mumbai, 2005). The observed and estimated (based on model fitting) age adjusted incidence rates for each site for all registries are shown diagrammatically. The estimates of the average annual percentage rates in

**Table 1. Average Age-Adjusted Incidence Rates for Breast, Cervix, Corpus Uteri and Ovary Cancers for Various Registries**

| Registry  | Breast | Cervix | Corpus uteri | Ovary |
|-----------|--------|--------|--------------|-------|
| Mumbai    | 25.8   | 16.5   | 2.4          | 6.8   |
| Bangalore | 20.8   | 24.3   | 2.5          | 4.7   |
| Chennai   | 22.7   | 34.0   | 2.0          | 5.4   |
| Delhi     | 27.9   | 22.9   | 3.1          | 8.0   |
| Bhopal    | 20.7   | 21.0   | 1.9          | 5.2   |
| Barshi    | 8.4    | 24.9   | 0.4          | 1.5   |

incidence rates of various cancers by sex are given in tabular form.

**Results**

The average age adjusted incidence rates for breast, cervix uteri, corpus uteri and ovary for various registries are presented in Table 1. The average age adjusted incidence rates for breast cancer ranged from 14.2 to 27.6 for Bangalore, 4.4 to 11.6 for Barshi, 18.2 to 22.9 for Bhopal, 18.4 to 30.6 for Chennai, 24.8 to 30.3 for Delhi, and 20.7 to 30.7 for Mumbai registry. More or less the average age adjusted incidence rate for breast cancer are almost of the same order in all urban registries. For cervical cancer Chennai has reported higher incidence rates followed by Barshi, Bangalore, Delhi, Bhopal, and Mumbai registry. When compared the incidence of corpus uteri with developed countries all the Indian registries have reported very low incidence rate, ranging from 0.37 in Barshi registry to 3.11 for Delhi registry. The average

**Table 2. Annual % Change in Age-Adjusted Incidence Rates for Breast, Cervix, Corpus Uteri and Ovary Cancers for Various Registries**

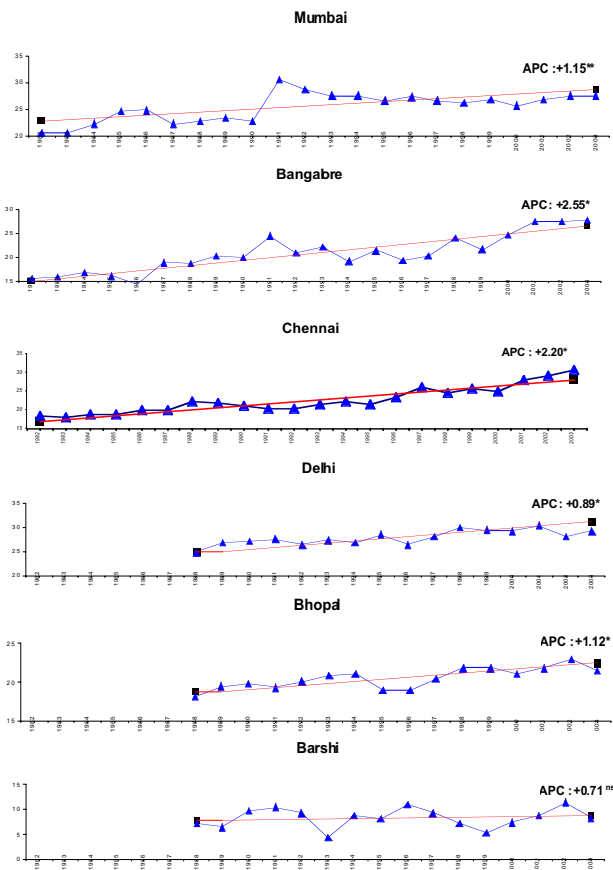
| Registry  | Breast             | Cervix              | Corpus uteri        | Ovary              |
|-----------|--------------------|---------------------|---------------------|--------------------|
| Mumbai    | 1.15**             | -1.72**             | 1.83**              | 1.13**             |
| Bangalore | 2.55*              | -2.74**             | 5.83*               | 1.47*              |
| Chennai   | 2.20*              | -3.13**             | 2.73*               | 0.99*              |
| Delhi     | 0.89*              | -3.58*              | 3.60*               | 0.72 <sup>ns</sup> |
| Bhopal    | 1.12*              | -1.16*              | -4.13 <sup>ns</sup> | 0.19 <sup>ns</sup> |
| Barshi    | 0.71 <sup>ns</sup> | -2.18 <sup>ns</sup> | 0.09 <sup>ns</sup>  | 4.67 <sup>ns</sup> |

<sup>ns</sup> – Not Significant , \* , \*\* - Significant at 0.05, 0.01 level

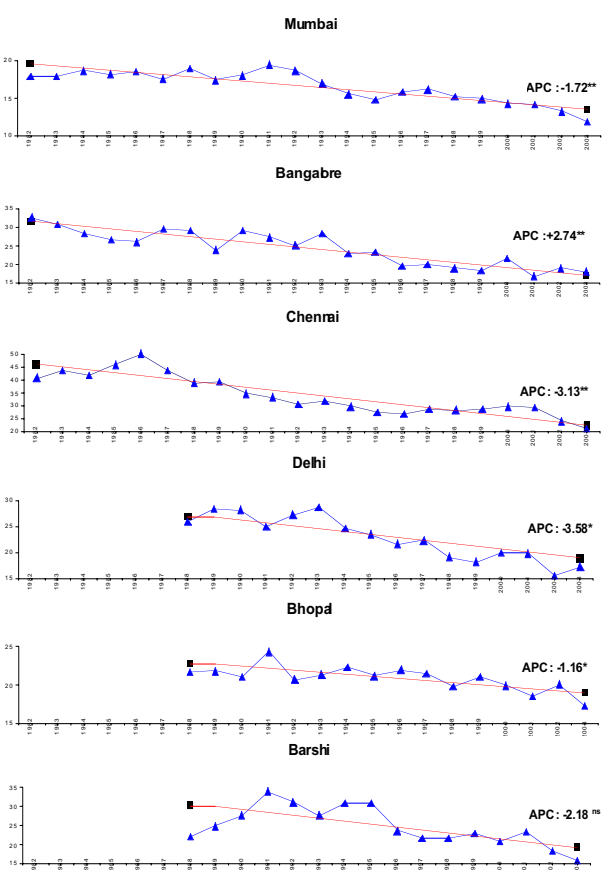
age adjusted incidence rate for ovarian cancer is somewhat of the order 6.0 per 100,000 population in Indian urban registries.

When we ranked leading sites of cancer in females in various registries, in starting period cervix was the leading site followed by the breast and cancer of the ovary occupied 3rd place in Delhi, 4th in Mumbai, 5th in Chennai, Bhopal and Barshi and 6th place in Bangalore registry. At present in all the registries cervix and breast has interchanged their places as compared to starting period i.e. breast is a leading site and followed by the cervix. In recent period cancer of the ovary has retained 3rd place in ranking or there is improvement in ranking in all the registries as compared to its ranking in the starting period.

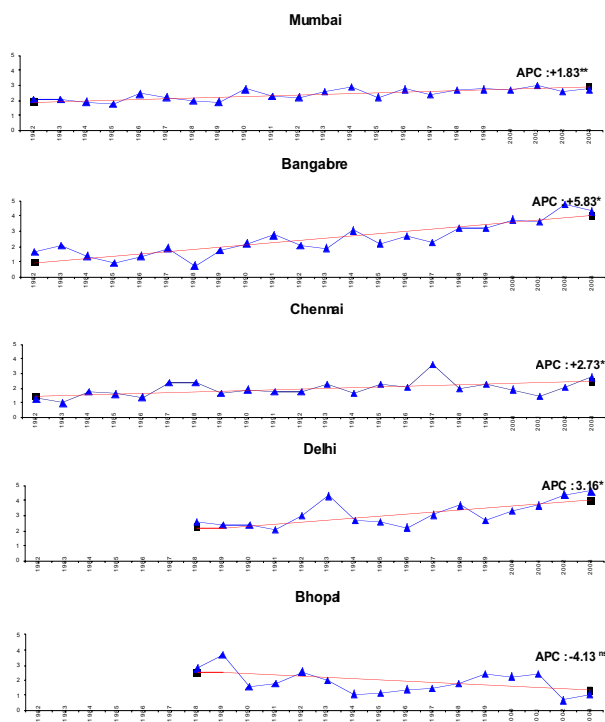
The observed and expected age adjusted incidence rates over a period of time for these sites are presented by line graphs in Figures 1 to 4. The values of average annual percentage changes in age-adjusted rates with statistical



**Figure 1. Trends in Age Adjusted Incidence Rates in Various Registries: Breast- Females**



**Figure 2. Trends in Age Adjusted Incidence Rates in Various Registries: Cervix Uteri- Females**



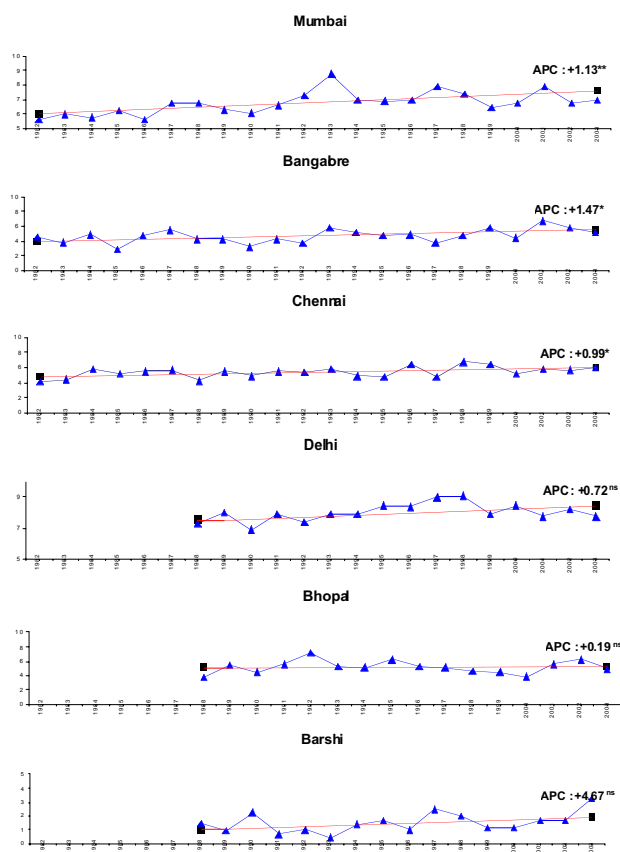
**Figure 3. Trends in Age Adjusted Incidence Rates in Various Registries: Corpus Uteri- Females**

significance for these sites in six registries are given in Table 2. The increase in the incidence for breast cancer was significant in all urban registries. There has been statistical significant decrease in the incidence of cervical cancer in all registries over a period of time. There has been increase in the incidence of corpus uteri cancer for all the registries except Bhopal registry. The increase was found statistical significant for Mumbai, Bangalore, Chennai, and Delhi registries. There has been increase in the incidence of ovarian cancer in all the registries but increase was only significant in older registries such as Mumbai, Chennai, and Bangalore.

### Discussion

Data utilize from this registries have maintained the strict definition for inclusion or exclusion of cancer cases through out the entire period of study. Carcinoma in-situ and papillomas of bladder cancer are excluded from the registration. Throughout the entire period under the study the entire data for all the registries has been coded using ICD-10 for topography and ICD-O-3 for morphology. There has been no change in coverage areas of each registry during the entire study period.

Before attempting an interpretation of trends it is of the importance to evaluate the reliability of the incidence data. Various indices of reliability have been proposed for e.g., proportion with microscopic verification of diagnosis (MV), proportion registered by death certificate alone (DCO), and percentage of deaths in relation to incidence (M/I) (WHO, 1992). The percentage of MV between these registries is ranged 77 to 87% in males and 75 to 89% in females; the percentage of DCOs ranged from 1 to 8% while mortality incidence ratio ranged in between 25 to 75% (National Cancer Registry Programme,



**Figure 4. Trends in Age Adjusted Incidence Rates in Various Registries: Ovary- Females**

2006). The data from these six registries has been accepted for publications in the VI, VII, VIII volumes of Cancer Incidence in Five Continents published by International Agency for Research on Cancer, Lyon, France (Cancer Incidence in Five Continents, 1992; Cancer Incidence in Five Continents, 1997; Cancer Incidence in Five Continents, 2002). It appears that cancer registration within registries is of acceptable standard and interpretation of the observed trends can be attempted.

The results of the regression analysis clearly show that the incidence of breast cancer in females of all six registries has been increasing over the last two decades. As for all the registries, the data are complete and reliable the increase is not an artifact but probably due to a change in exposure to etiological factors. It was of the interest to find out whether the increase was due to cohort effect. Study carried out by Yeole et al (1990) for Mumbai data the age specific curves for cohort show discernible though not very striking effect, the average percentage change was not significant in some age groups. The reason for this was not clear. However, the diverse sociocultural and religious background of the population appears to be reflected in the differential rates of cancer in the various groups.

An attempt was made to relate the observed trend in breast cancer incidence to changes in exposures to some known etiological factors. A first full term pregnancy before the age of 20 years is known to be a protective factor and non childbearing single woman have been shown to be at higher risk than married woman. If India, the mean age at marriage for all females in the Census

synthetic cohorts progressively increase from 13.5 years in 1911-21 to 17.2 years (Agrawala,1992), and 19.9 in 1991-2001. Hence it can be inferred that the proportion of woman having a first child before 20 years is gradually decreasing. Decennial Census data on marital status have also that the proportion of "never married" in females has increased from 358 per 100,000 females in 1921 to 450 in 1971 (Rele et al., 1980). In Mumbai in the 1960's, the mean age at marriage was 17 years in all woman (Rele et al., 1980). In the decennial Census 431 out of 1000 females in 1961 (Census of India, 1965) and 486 in 1981 (Census of India, 1986) were never married in Mumbai. Thus increasing trend in breast cancer incidence is most likely due to the progressive increase in age at marriage leading to delayed first birth and an increase in the proportion of never married woman.

All the registries showed decreasing trend in the age adjusted incidence rate for cervical cancer, the highest and lowest values of average percentage change are 3.58 for Delhi and 1.16 for Bhopal registry respectively. Earlier two studies carried out on Mumbai population showed that the declining trend was due to a cohort effect (Yeole et al., 1981; Jayant and Yeole, 1987). The major etiologic factors of cervical cancer are early age at 1st coitus, multiple partners and infection with viral agents. From a study of differential rates in the various religious groups in Mumbai, it has been reported that the predominate factors having etiologic role in cervical cancer in the Indian situation are perhaps early age at first coitus and poor penile hygiene which may correlate with the basic etiologic viral factors. Furthermore, it has been also shown that these two factors have an additive effect (Jayant, 1987). Thus a possible explanation for the declining trend seems to be either an increase in age at first coitus or a better level of penile hygiene. However, over the years the level of penile hygiene is not likely to have changed, as the incidence of penile cancer is remain stable. Thus it is most likely that the decline is due to an upward shift in age at marriage (Jayant, 1986). Substantial evidence for this explanation could be had from the estimates of mean ages at marriage, compiled from the special decennial cancer survey that indicate in India the average age at marriage for woman was 12.5 years during 1921-31, and increased to 17.2 years in 1961-71, and to, 19.9 in 1991-2001.

An increasing trend in age adjusted incidence rates for ovary and corpus uteri was here observed for most of the registries but significant increases were noted only in metropolitan registries. Endometrial cancers share many epidemiological features and risk factors with breast cancer (Yeole and Jussawalla, 1997). The incidence rises rapidly in woman up to age 50 and thereafter at a much reduced rate. A strong protective effect of menopause is evident. Earlier age at menarche has been observed among endometrial cancers at least in premenopausal woman. Nulliparous woman are at increased risk but there appears to be no association with age at first birth (LaVecchia et al., 1984).

Ovarian cancer shares certain risk factors with breast cancer and endometrial cancer, and is affected by ovulation, pregnancy, whether complete or incomplete,

and use of combined oral contraceptives and breast feeding, as a protective measure.

In conclusion, all these four cancers, of the breast, cervix, corpus uteri and ovary, continue to serious diseases in Indian women. As many of these cancers are increasing, analytic epidemiology studies should be planned in a near future on a priority basis to understand the etiology of these cancers in depth.

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