RESEARCH COMMUNICATION

Cancer in Women in Mumbai, India

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Abstract

The challenge of population based cancer registration in developing countries is enormous. In India, the first Population Based Cancer Registry named "Bombay Cancer Registry" was established by the Indian Cancer Society in Mumbai (formerly Bombay) in 1963, covering the population of the Mumbai Agglomeration. Up to now this registry has collected epidemiological information on more than 200,000 cancer incidence cases and 100,000 cancer deaths. At present this registry covers an area of 603.00 sq.kms having a population of 12 million. Here, an attempt has been made to analyse and interpret cancer incidence and mortality data for women, registered in Mumbai during 1993-97.

Key-words: Epidemiology - incidence - trends - risk factors - ethnic groups

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Historical Background

The Mumbai Cancer Registry was established in June 1963 as a unit of the Indian Cancer Society, at Mumbai, with the aim of obtaining reliable morbidity and mortality data on cancer, from a precisely defined urban population (Greater Mumbai). The actual compilation of data could however only begin in 1964. Until then, no continuing surveys had ever been undertaken anywhere in India. Initially, up to 1975, the project was initiated in collaboration with and with financial support from Biometry branch of the National Cancer Institute of the Department of Health in Bethesda, U.S.A.. During 1975-80 the project received grants from the Department of Science and Technology of the Government of India at New Delhi and from the Indian Cancer Society. Since September 1981, the project has been partially supported by the Indian Council of Medical Research, at New Delhi.

Demographic Characteristics of Greater Mumbai

Greater Mumbai, a densely populated urban metropolis on the west coast of India, occupies an area of 603.0 square kilometers and is the smallest administrative district in Maharashtra State. It is situated between Latitudes $18^0$54' and $19^0$18' North and Longitudes $70^0$47' and 73^0 00' East. In India, a population census is undertaken every ten years, the last one being in 2001. The population of Greater Mumbai as per the 2001 census (on 1st March) was 11,914,398 (55.2% males, 44.8% females) with a sex ration of 811 females per 1000 males and having a density of 19,760 inhabitants per sq.km., confirming the fact that it was the most heavily populated district in Maharashtra State.

The decennial growth rate of the population between 1991 and 2001 was of the order of 20.2. The literacy rate was found to be 87.0%.

Greater Mumbai is the industrial heart of India and has a multi-religious, multi-lingual population, representing every state in the Union, approximately 68.0% being Hindus, 16.8% Muslim, 4.5% Christians (mostly Hindu converts), 5.6% Neo-Buddhists, 3.6% Jains (an ultra-conservative Hindu sect.), 0.8% Parsis (Zorostrians) and 0.5% Sikhs.

For the convenience of civic administration and census operation, Greater Mumbai is divided into 15 wards, which are further sub-divided into 88 section. Currently, the city functions as the administrative Capital of Maharastra State. For revenue collection, the Greater Mumbai area is divided into two units, the Mumbai City area proper and the Mumbai Suburban District.

Greater Mumbai is in fact an island, joined to the mainland by a number of bridges. It has a warm and humid climate, the period from November to February being

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comparatively cooler when the temperature ranges between $20^0$and 28^0C. From the month of March onwards, the weather starts getting warmer. April to June is hot, the temperature often touching 35^0C during daytime. The rains start by mid-June and continue through July, August and September. The average annual rainfall is 2500mms. (Annual Report of the Executive Health Officer for the year 1986, Mumbai Municipality, 1990).

Cancer Registration System in Greater Mumbai.

Staff members personally visit the wards of the co-operating hospitals regularly; to interview all confirmed cancer patients and also those who are under cancer investigation. The record files maintained by the various departments of these hospitals viz. Pathology, Hematology, Radiology and the various registers in the specialized surgical and medical wards, are also examined. The requisite details obtained for each patient, are crosschecked with the information collected from the various departments of the collaborating hospitals, to ensure completeness of record. Full information about every cancer patient registered at each and every hospital is thus obtained, irrespective of whether or not the patient is subsequently treated at the particular hospital. Additional information is obtained every time a cancer patient is re-admitted or re-examined at the Institution.

As a result of such data collected from different hospitals, one and the same patients is sometimes found to be registered at two or more hospitals. Care is taken to see that multiple entries of the same patient are not made in our records. On the other hand in some instances, complete medical information is obtained by combining the data obtained from two or more hospitals, of one and the same patient. Patients attending the clinics (out-patient department) of various hospitals are not included in our Registry, except in the case of the Tata Memorial Hospital, because of medical details and information on the residential status, in the record files maintained in the out-patient clinics of general hospitals.

Supplementary information can often be gleaned from the death records maintained by the Vital statistics Division of the Mumbai Municipal Corporation. Copies are made of all death certificates, which mention cancer or tumor as the cause of death. These death certificates are then matched against the registered cases in our files. Every cancer death not traceable to an entry in our files, is labeled as an "unmatched death" and the date of death is then taken as the date of first diagnosis, and is so registered in the corresponding year's data file. Furthermore copies of all death certificates where the term 'cancer' or 'Tumor' is mentioned as the cause of death, are individually scrutinized to confirm the statements.

General Medical Practioners who are also family physicians are not contacted individually, but if any of them is found to have signed the death certificate of a patient dying of cancer, then he is approached personally, to obtain as complete a report as possible, of these patients, whether or not they have already been listed in the Registry. In many instances, the diagnosis may appear to have been based on incomplete examination, if the patient had been seen for the first time in an advanced stage of the disease. The certifying physician is then again approached personally to obtain further clarification.

After collecting the necessary information from the various collaborating institutes, the Performa sheets are classified into three groups, resident, non-resident and residence not known. Non-residents cases are filed site wise and sexwise. If the cancer patient, whose duration of residence is not known, is found enrolled in the electoral rolls, he is considered as a resident. All other cases, whose duration of residence is not known, are field alphabetically. The resident cases are cross-checked with the cards of the alphabetic index. Previously responses cases were edited, registered and filed according to the site of cancer, the sex of the patient and registration number.

Copies of the death certificates, from the Vital Statistics Departments of the Municipal Corporation are classified according to residential criteria. Non-resident cases are filed alphabetically, as per cause of death and sex. Resident cases are checked with the alphabetic index. Unmatched cases are registered in the morbidity files. All cancers death are filed numerically, by sex and cause of death.

Materials and Methods

Two major sources have been utilized for data collection first is all hospitals, nursing homes and consultants in private practice in the registry area are second is the vital statistics division of the department of public health of the Mumbai Municipal Corporation. Cancer incidence is defined as the occurrence of new cancer cases in a defined population during a specified time period for these papers the data collected for the period of 5-years i.e. 1st Jan 1993 to 31st Dec 1997 has been utilized. For Topography the coding system revised by the World Health Organization using code numbers 140-208 as a published in the manual of the International Classification of Diseases, injuries and cause of death (9th revision of 1997) has been utilized. For Morphology coding the International classification of diseases for oncology (1976) (ICD-O), simultaneously has been utilized. For histology coding the World Health Organization 1979 edition of International Classification of Diseases for oncology (ICD-O) giving histogenic and malignancy codes is followed, in conjunction with the primary site code suggested by World Health Organization.

Results

During 1993-97, 39,980 cancer cases (20379 males, 19601 females) were registered in Mumbai. At all the site groups, except the breast and genital organs higher occurrence was noted in male. The digestive system as a whole in males was the commonest cancer site, followed by the buccal cavity and pharynx. In woman cancer involved the breast most frequently, followed by the genital organs and the digestive system. For all the cancers together crude,

age-adjusted and cumulative incidence rates for males were 70.7, 119.9 and 12.67 and in females 81.2, 123.7 and 13.4 respectively. The lifetime risk is 1 in 8 in both the sexes. Crude and age adjusted mortality rates in males were 38.8 and 60.9 and in females 38.6 and 57.7 respectively were noted (Table I).

When age adjusted incidence rates for all site together in females were compared globally the highest incidence rate was noted for New Zealand-Maori population (333.7) While Algeria-Setif population noted lowest incidence rate (57.4) (Figure 1). When these rates are compared nationally Delhi registered highest incidence rate (133.1) and Barsi recorded lowest rate (56.3) (Figure 2).

In Mumbai the breast being the leading site with uterine, cervix coming second in rank. Malignant lesions of the digestive system also accounted for a substantial number of cases. The oeosphagus was the fourth leading site. (Figure 3).

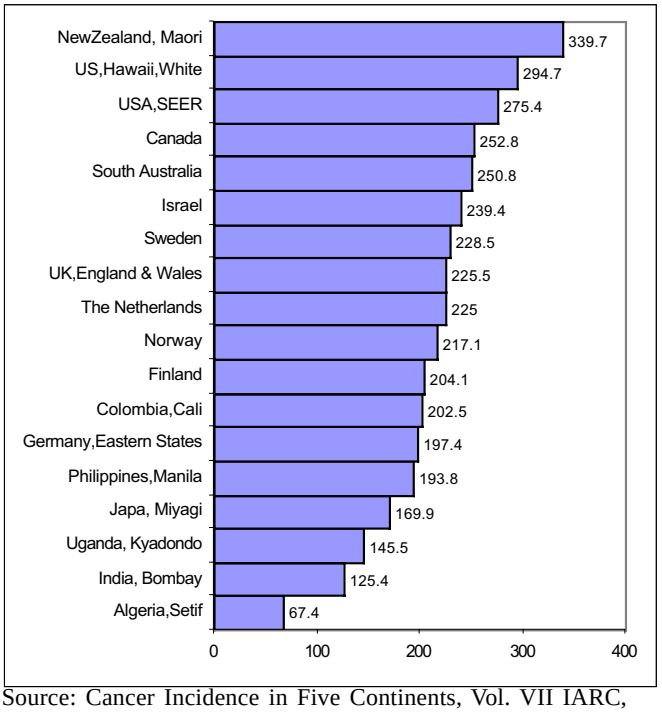
In females the highest incidence of leukemia was noted in children having ages 0-9 and in young adult population having population age 15-24. Breast was the leading site in the children having the age 10-14. From the age 25 onwards in every age group breast was the leading site in female population (Table 2).

Cancer incidence rates were found to increase sharply with age the curves for men and women however were quiet distinct. At the younger ages the incidence rates were found to be somewhat higher in males. Age specific incidence rates were higher in females only between the ages 25-64. The frequent occurrence of cancers involving the female genital organs and the breast, perhaps accounts for most of the differences noted between male and female rates, between the ages 25-64. Around the age of 64 the incidence curves for men and women intersect, the male rates for older males are perhaps primarily due to high incidence of lung, stomach, larynx, and prostate cancers.

The number of cases with percentage distribution by method of diagnosis in females for all cancers together and breast, cervix, and ovary are presented in Table 3. About 80% cases were diagnosed through microscopic confirmation and 6% by death certificate only. In the female population of Mumbai during 1993-97, the percentage of having microscopic confirmation is found higher for breast

Table 1. Incidence & Mortality Information, Greater Mumbai, 1993-97.

	Male	Female
Incidence Cases	20,379	19,601
Crude Rate (Per 100,000)	70.7	81.2
Age Adjusted Rate (Per 100,000)	119.9	123.7
Cumulative Incidence Rate (%)	12.67	13.04
Life Time Risk	8	8
Cancer Deaths	2367	2006
Crude Death Rate	38.8	38.6
Age Adjusted Death Rate	60.9	57.7



Source: Cancer Incidence in Five Continents, Vol. VII IARC, Publication No-143

Figure 1. International Comparison of Age Adjusted Incidence Rates 1988-92.

and cervical cancers than the cancer of ovary (Table 3.)

In females, for all cancers together, 31.3% patients werefound to have localized stage, for 29.6% patients have regional spread and 20% patients have distant metastasis. When cancers of breast, cervix and ovary are compared on clinical staging, the highest percentage of regional spread was found in breast, 41.8% and cervix 56.0% while 52.3% patients were having distant metastasis stage in ovarian cancer patients. (Table 4)

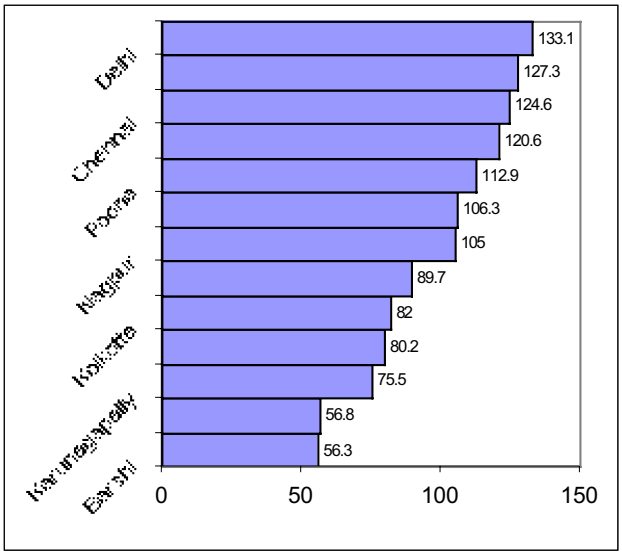


Figure 2. National Comparison of Age Adjusted Incidence Rates 1996

Table 2. Highest Incidence by Age,Greater Mumbai, Females, 1993-97.

	Age Group	Site Rate
0-4	Leukaemias	2.8
5-9	Leukaemias	2.1
10-14	Brain	1.6
15-19	Leukaemias	2.0
20-24	Leukaemias	1.2
25-29	Breast	4.1
30-34	Breast	11.3
35-39	Breast	22.6
40-44	Breast	44.0
45-49	Breast	61.5
50-54	Breast	80.0
55-59	Breast	85.5
60-64	Breast	104.6
65-69	Breast	126.0
70-74	Breast	136.7
75+	Breast	120.8
All Ages	Breast	29.1

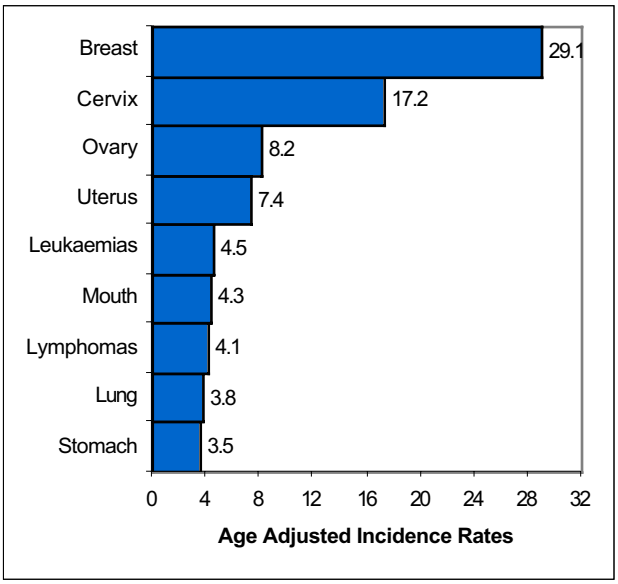


Figure 3. Leading Cancers in Women, Greater Mumbai, 1993-97.

Percentage distribution by education for various sites in females were presented in table 5. When percentage distributions by educational level at each site is compared cancer of the buccal cavity an d pharyngeal and cervical cancers were found to be more prevalent at the lower educational level. And the incidence starts to decrease as the education level increases. The exact reverse situation is observed for the cancers of breast and ovary.

Cancers of the uterine cervix appeared to be predominantly a disease of a married women. Our data shows that the frequency of breast cancers is more in spinsters than in married women (Table 6).

For the period 1982-98, the overall the age adjusted rates were seen to decrease by 0.48% per year in males and increase of 0.53% per year in females. Both, decrease in males and increase in females, the incidence is found to be

Table 3. Percentages by Method of Diagnosis, Greater Mumbai, Females, 1993-97.

Method	All Sites	Breast	Cervix	Ovary
Microscopic	15578(79.5)	3976(83.7)	2395(84.1)	1045(77.0)
X-Ray	542(2.8)	60(1.3)	37(1.3)	56(4.1)
Surgery	448(2.3)	124(2.4)	37(1.3)	36(2.7)
Clinical	1722(8.8)	351(7.4)	257(9.0)	148(10.9)
DCO	1311(6.7)	239(5.0)	123(4.3)	72(5.3)
Total	19601(100.0)	4750(100)	2849(100.0)	1357(100.0

Table 4. Percentages by Clinical Extent of Disease, Greater Mumbai, Females 1993-97

Extent of Disease	All Sites	Breast	Cervix	Ovary
Localized	6135(31.3)	1682(35.4)	675(23.7)	351(25.9)
Regional Spread	5795(29.6)	1984(41.8)	1596(56.0)	139(10.2)
Distant Met.	3921(20.0)	732(15.4)	301(10.6)	710(52.3)
Not Available	3750(19.1)	352(7.4)	277(9.7)	157(11.6)
Total	19601(100.0)	4750(100.0)	2849(100.0)	1357(100.0)

not statistically significant. In females statistical significant increase in incidence was observed for cancers of colon, gall bladder, urinary bladder, brain, corpus-uteri, ovary, kidney, and thyroid. While cancer of the oesophagus and stomach showed decreasing trends. The incidence was found to be more stable in female populations for cancers of tongue, rectum, liver, and larynx during 1982-98

Discussion

In women, cancers of breast, cervix, corpus uteri, and ovary are most predominant throughout the world. In our data highest incidence of breast cancer is reported and followed by cervix and ovary. When incidence of corpus uteri is compared globally the rate for Mumbai is very low when compared with rates reported by developed countries.

For studying the incidence by age for these cancers the pre-and postmenopausal age has to be considered separately. The pre-and postmenopausal graphs of incidence in different parts of the world suggest that environmental factors play an important role in the etiology of postmenopausal breast cancer. The association of breast cancer and marital status was one of the initial observations noted in the history of cancer epidemiology. In most of the population of the world breast cancer is more common in the urban than rural areas. Several investigators have shown positive correlations and socio-economic status and incidence and mortality for all these four cancers. (Dorn & Cutler 1959; Cutler & Young 1975 and Hirayama 1978)

The age specific incidence curve for breast cancer rises sharply from early adulthood to above the time of menopause. After that the rise occur at much lower rate. At menopause, after a variable period of irregular cycles, the hormonal milieu changes dramatically, the main alteration being that the ovaries stop producing oestrogen These changes also bring about a decrease in the turnover rate of breast epithelial cells; and early menopause, either natural or induced by ovearіectomy, has been shown consistently to reduce the risk for breast cancer (Trichopoulos et al 1988).

Several studies on risk factors of breast cancer have been conducted the World over of which those related to reproductive factors predominated. Early on set of menarche and late menopause were found to be increase risk and thus attention was focused on hormonal factors (De Waard and Baanders et al 1974; Mac Mahon et al 1970, Lilienfeld 1956). Lilienfeld suggested that from 35-40 years breast cancer rates do not differ by marital status or even by lower in single woman. Nulliparity, late age at first pregnancy (above 30 years) have been found to be associated with increased risk in several studies. Mac Mahon et al from an International study on marital, pregnancy factors made a significant observation that breast-feeding did not offer the protection as was supposed till that time. Obesity, high body mass index, adult weight gain, and lack of exercise have been observed as risk factors. Familiar breast cancer occurrence, alcohol consumption, increase of fat consumption have also been shown to increase breast cancer risk in some studies from western countries (Thomas et al 1988, Bowlin et al 1997, Li and Fraumeni, 1969).

The various risk factors implicated in the etiology of cancer of the cervix are early age at first coitus, multiple sexual partners, infection with viral agents-the one implicated in recent years is the human papiloma virus, particularly but not exclusively subtype 16 and 18. The role of circumcision status of the male partner has not been reported consistently. It is possible that circumcision is of etiological importance; only in cultural groups unwear of penile hygiene as suggested by Jayant et al (Jayant et al 1987). The rarity of cervical cancer among Jewish woman may be construed to support the etiological role of circumcision. Furthermore, virtual absence of squamus carcinoma among nuns and woman who have never been sexually exposed suggest that the disease is transmitted venereally.

Endometrium cancer shares many epidemiological features and risk factors with breast cancer. The incidence

Table 5. Percentage Distribution by Education, Greater Bombay,1993-97.

Education	Breast	Cervix	Ovary	Oral	All Cancers
Illiterate	15.0	27.3	5.6	8.4	19.6
Up to primary	27.8	15.7	7.0	5.9	15.6
Secondary	39.2	8.6	8.1	3.9	8.2
College & Above	47.7	3.1	9.3	3.4	4.1

Table 6. Percentage Distribution by Marital Status, Greater Mumbai, 1993-97.

Marital Status	Breast	Cervix	Ovary	Total
Unmarried	3.9	0.6	9.3	6.7
Married	80.0	73.7	73.6	71.8
Widow +Div. + Sep.	15.2	25.4	16.4	20.9
Not Known	0.9	0.3	0.7	0.6

of Endometrium cancer rises rapidly in woman up to the age 50 and thereafter increases at a reduced rated. The suggestion of strong protective effect of menopause is evident. Earlier age at menarche has been observed among Endometrium cancers, at least in pre-menopausal woman. Nulliparoes woman are at increased risk, but there appears to be no association with age at first birth. (La Vecchia et al 1984).

Ovarian cancer shares certain risk factors with breast cancer and Endometrial cancer. It has been shown relatively consistently that factors associated suppression ovulation, such as pregnancy, whether complete or incomplete or the use of combined oral contraceptives and breast feeding, at as protective measures.

Trends in incidence of these cancers in Mumbai when compared with the trends reported from other countries are similar indirection but having different magnitudes. In most of the population of the world there has been a large increase in the incidence of breast, corpus uteri and ovarian cancer and a decrease in cervical cancer. Change in the age at the first birth of the first child has been correlated with the increase in the breast cancer incidence among Mumbai population (Yeole et al 1990). The decrease in the cervical cancer incidence rates that has been observed in Mumbai is due to increase in mean age at marriage (Yeole et al 1989). In India more than 60% cancers belong to breast, cervix, endometrium and ovary.

In conclusion it may be pointed out that breast cancer in urban India and cervical cancer in rural India have become priority health problems. Socio-demographic transition i.e. taking place would result in increase in female cancer load and particularly of breast cancer. Economic constraints together with higher education levels compelled many women to seek employment, which are different from that of earlier generation. This leads to late age at marriage and first delivery and less number of children becomes common. Such compelling need based social cultural practices are difficult to change in a preventing oncology program.

The present female patient attendance in the hospitals indicate that less than 10% attend for treatment in stage I disease. The necessesity for early detection of female cancer, when cure rate can be about 80%, need to be propagated in view of the fact that at present there are no known powerful modifiable lifestyle factors. The need is thus for early detection and follow strict treatment protocols developed and tested in Indian conditions. From the available estimates it may be seen that there would have been four million female cancer incidence cases (Breast – 80,000, Cervix – 100, 000 and Ovary – 20,000) annually in the country. The prevalence rate if considered 3 times the incidence rate indicates the approximate requirements for major curative and rehabilitative services.

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