Asian Journal of
Epidemiology

Study on the Enraging Severity of Cancer in West Bengal, India from 2003 to 2010

Arpita Chatterjee

Department of Research and Development, Barasat Cancer Research and Welfare Center, Barasat College, Banamalipur, Barasat, Kolkata 700 124, India

ABSTRACT

Cancer mortality rates are climbing in India and it is under-reported due to poor recording of the cause of death. An effective population-based screening program can give reliable data on over-all malignancy profile. An 8-year (2003-2010) multi-centre based study was assessed to understand the malignancy profile in the population of West Bengal. The cancer frequency was moderate during 2003 to 2006, after that it rises drastically and reached maximum peak in 2010. The most frequently affected organs were breast, cervix, stomach, lung, oesophagus, ovary, cheek, prostrate, liver and pancreas, gall bladder and tongue. The incidence in rural areas was slightly low compared to more polluted urban counterparts. Malignancies are in epidemic peak in this population with new cancer cases and greater increase among females. The largest threat among females was seen for breast and cervix cancer, among males for prostate cancer. Among children of age group below 10 years non hodgkin's lymphoma was alarmingly high, followed by acute lymphoblastic leukemia and acute myelocytic leukemia. Exposure to various environmental toxicants, industrial wastages, asbestos dusts, colored agricultural commodities and food products incredibly elevate the levels of malignant risk and status. Multiple neoplastic syndromes were common for cancers of liver-lung-brain, breast-ovary, prostrate-lung-bone and others in this population and more specifically in multiple endocrine neoplasias. This devastating cancer scenario can be prevented by public education on tobacco and its health hazards, recommended dietary guidelines, safe sexual practices and lifestyle modifications.

Key words: Malignancy, cancer cluster, pollution, population based study, west bengal

INTRODUCTION

Cancer in all forms posing threat worldwide with over 10 million new cases, approximately 5.3 million men and 4.7 million women and causes over 6 million of deaths that include the developed and developing countries (Parkin *et al.*, 2001). Despite significant advances achieved in cancer treatment, cancer still causes pain and death in modern world (Khorshid, 2009). The lifetime cumulative risk indicates that an average of one of 10 to 13 people in the urban areas was stricken by cancer during their lifetime (ICMR, 2000). It is widely held that 80-90% of human cancers may be attributable to environmental and lifestyle factors such as tobacco, dietary practices, inadequate physical activity, alcohol consumption, infections due to viruses and sexual behavior (Galvao *et al.*, 2007). In India the majority of cancer is diagnosed in the advanced stage and hence morbidity remains high. Beside this, cancer mortality rates are under-reported due to poor recording of the cause of death. So, the challenge is to implement an effective screening program using new cancer markers and their regulation by modern techniques. Incorporating screening for cancers into

peripheral health infrastructure can have a significant effect on reducing mortality from these diseases (Murthy and Mathew, 2004). Population-based cancer registry is the source of data in estimating the incidence and mortality as it records all cancer cases occurring in a defined region. The Indian Council of Medical Research initiated a network for cancer registries in different regions of the country in 1982. But the population covered by the above registries is very limited (only 5%) and thus it gives few idea on the extent of the cancer problem in India (Mathew, 2003). Keeping in view the paucity of reliable data in a country with wide socio-cultural diversity, the present investigation was directed towards an understanding of malignancy profile in the population of West Bengal to study the changing spectrum of cancer epidemiology and also the cancer cluster.

MATERIALS AND METHODS

A retrospective study was assessed for successive eight years from 2003 to 2010. The malignancy was diagnosed by various investigations like radio-imaging, molecular markers, cytology and histo-pathological examinations from patients attending to multi-centre based cancer detection programs organized by Barasat Cancer Research and Welfare Centre, a prime health centre covering many districts of eastern India. The data of age, sex, pathological status of cancer patients, demographic as well as environmental data was recorded. Socioeconomic status of the concerned family was determined as per criteria of Kumar (1993). Written informed consent was obtained from all in accordance with the guidelines from hospital center review board.

RESULTS

The present investigation revealed that cancer rate was alarmingly high in females as compared to males. The incidence in rural areas was slightly low compared to more polluted urban counterparts. The most frequently affected organs were breast, cervix, stomach, lung, oesophagus, ovary, cheek, prostrate, liver, pancreas, gall bladder and tongue as shown in Table 1. Lung, oesophagus, stomach, prostrate and tongue cancers are much higher in men, while in females the cancers of cervix and breast are predominant forms followed by those of stomach and oesophagus. There is variation in the site-wise distribution within the population.

Trend analysis of cancer incidence data for the period showed that the overall rates of cancer are increasing with greater increase among females. The cancer frequency was moderate during 2003 to 2006 (below 7.71%), but it rises drastically from 2007 (14.15%) and reached maximum (21.88%) in the last year as shown in Table 1. The largest increase among females was seen for cancer of the breast and among males for cancer of the prostate. Increasing trends were noticed for lymphoma, urinary bladder, gall bladder and brain tumors in both sexes. Cancer of the colon was increasing in females and kidney cancer in males. Cancer of parotid and uterus showed a decreasing trend in both sexes.

Result revealed that among children of age group below 10 years non hodgkin's lymphoma (NHL) was alarmingly high (4.95% considering all the cancer cases), followed by acute lymphoblastic leukemia (ALL, 2.13%) and acute myelocytic leukemia (AML, 1.99%). The frequency of these cancers drastically increases after 2006 and it reached peak at 2009 for NHL and AML showing 20.33 and 24.24% frequency rate on that particular year and for ALL it reached peak at 2010 with 28.30% frequency rate as shown in Table 1.

The result highlighted that in different types of carcinoma of females breast cancer (18.84%) and cervix cancer (17.27%) were most threatening in the population of West Bengal. Both of them proportionally increased in successive years from 2003 to 2010. The present investigation also

Table 1: Year-wise distribution of different types of cancer in West Bengal

Types of cancer	2003	2004	2005	2006	2007	2008	2009	2010	Total
Brain	-	-	-	-	1(12.50)	2(25.00)	2(25.00)	3(37.50)	8(0.16)
Keratosarcoma	-	-	1(20.00)	-	1(20.00)	1(20.00)	1(20.00)	1(20.00)	5(0.10)
Cheek	27(16.36)	17(10.30)	20(12.12)	12(7.27)	19(11.52)	21(12.73)	23(13.94)	26(15.76)	165(3.32)
Tongue	13(11.3)	11(9.57)	4(3.48)	15(13.04)	12(10.43)	19(16.52)	21(18.26)	20(17.39)	115(2.31)
Tonsil	2(5.56)	5(13.89)	3(8.33)	2(5.56)	6(16.67)	5(13.89)	6(16.67)	7(19.44)	36(0.72)
Thyroid	7(15.91)	4(9.09)	3(6.82)	5(11.36)	5(11.36)	6(13.64)	7(15.91)	7(15.91)	44(0.89)
Parotid	4(19.05)	4(19.05)	-	1(4.76)	2(9.52)	3(14.29)	3(14.29)	4(19.05)	21(0.42)
Colon	2(7.69)	4(15.39)	2(7.69)	-	2(7.69)	5(19.23)	6(23.08)	5(19.23)	26(0.52)
Liver and pancreas	15(9.74)	18(11.69)	7(4.55)	12(7.79)	16(10.39)	22(14.29)	29(18.83)	35(22.73)	154(3.09)
Lung	16(4.94)	39(12.04)	29(8.95)	20(6.17)	36(11.11)	51(15.74)	60(18.52)	73(22.53)	324(6.52)
Breast	34(3.63)	60(6.41)	45(4.81)	83(8.87)	142(15.17)	177(18.91)	185(19.76)	210(22.44)	936(18.84)
Oesophagus	30(11.86)	18(7.11)	17(6.72)	22(8.69)	34(13.44)	39(15.42)	42(16.60)	51(20.16)	253(5.09)
Stomach	34(9.58)	17(4.79)	26(7.32)	36(10.14)	53(14.93)	57(16.06)	64(18.03)	68(19.15)	355(7.15)
Deodinum	-	-	-	-	1(25.00)	1(25.00)	1(25.00)	1(25.00)	4(0.08)
Rectum	3(4.84)	3(4.84)	9(14.52)	9(14.52)	6(9.68)	11(17.74)	9(14.52)	12(19.35)	62(1.25)
Gall bladder	8(6.72)	8(6.72)	8(6.72)	13(10.92)	14(11.76)	19(15.97)	23(19.33)	26(21.85)	119(2.39)
Urinary bladder	9(14.29)	12(19.05)	7(11.11)	-	5(7.94)	9(14.27)	11(17.46)	10(15.87)	63(1.27)
Pennis	6(5.77)	3(2.88)	11(10.58)	6(5.77)	14(13.46)	21(20.19)	21(20.19)	22(21.15)	104(2.09)
Cervix	34(3.96)	45(5.24)	47(5.48)	78(9.09)	142(16.55)	161(18.77)	163(19.00)	188(21.91)	858(17.27)
Uterus	3(20.00)	1(6.67)	2(13.33)	-	1(6.67)	3(20.00)	2(13.33)	3(20.00)	15(0.30)
Ovary	6(2.24)	6(2.24)	11(4.10)	14(5.22)	41(15.30)	58(21.64)	63(23.51)	69(25.75)	268(5.39)
Prostrate	1(0.47)	1(0.47)	5(2.34)	2(0.94)	38(17.76)	46(21.49)	59(27.57)	62(28.97)	214(4.31)
Osteosarcoma	12(10.81)	19(17.12)	10(9.01)	5(4.51)	13(11.71)	18(16.22)	16(14.41)	18(16.22)	111(2.23)
Kidney	-	-	1(6.25)	3(18.75)	1(6.25)	3(18.75)	4(25.00)	4(25.00)	16(0.32)
ALL	-	1(0.94)	2(1.89)	6(5.66)	16(15.09)	23(21.70)	28(26.42)	30(28.30)	106(2.13)
AML	-	-	1(1.01)	16(16.16)	14(14.14)	21(21.21)	24(24.24)	23(23.23)	99(1.99)
CML	-	1(5.56)	1(5.56)	3(16.67)	2(11.11)	4(22.22)	4(22.22)	3(16.67)	18(0.36)
NHL	25(10.16)	23(9.35)	7(2.85)	9(3.66)	40(16.26)	43(17.48)	50(20.33)	49(19.92)	246(4.95)
Hodgkin's lymphoma	3(2.56)	17(14.53)	5(4.27)	8(6.84)	16(13.68)	18(15.39)	22(18.80)	28(23.93)	117(2.36)
Lymphoma	4(3.96)	-	13(12.87)	3(2.97)	9(8.91)	23(22.77)	21(20.79)	28(27.72)	101(2.03)
Retromolar trigone	1(20.00)	1(20.00)	-	-	1(20.00)	-	1(20.00)	1(20.00)	5(0.10)
Total	299(6.02)	338(6.80)	297(5.98)	383(7.71)	703(14.15)	890(17.92)	971(19.55)	1087(21.88)	4968

The digit in parenthesis represents the percentages of frequency

revealed that breast cancer is common in females of urban population with high socio-economic status, whereas cervix cancer is prevalent in rural women with low socio-economic status. The risk of ovarian cancer was low at early days but from 2007 it rises alarmingly and reached 25.75% in the year 2010.

DISCUSSION

The demographic study highlights that the cancer rate is climbing at epidemic proportions in this population and the ignorance is partially responsible for that climax. Maybe we wish to ignore the fact that in many areas the cancer rates for particular cancers are spiraling out of control. Urbanization, industrialization, changes in lifestyles and food habit, population growth and ageing all have contributed for epidemiological transition in the country (Ahmed *et al.*, 2006; Oricha *et al.*, 2005). The absolute number of new cancer cases is increasing rapidly, due to growth in size of the

population and increase in the proportion of elderly persons as a result of improved life expectancy following control of communicable diseases (Murthy and Mathew, 2004). Beside this malignant burst newer and newer types of cancer emergence are also pronounced and this feature is more threatened in polluted sites.

The result was in line with the early investigation that in this population the cancer of the breast and cervix forms a largest group (Chatterjee and Mukherjee, 2009, 2011). Previous observation also proved that for the last 50 years, the breast cancer rate has been rising in every area of the industrialized world; with a rise of 26% in USA from 1973 to 1988. North American women have one chance in nine of developing invasive breast cancer at some point in their lives (Laux, 2005). Gall bladder cancer was high as per reported fact in West Bengal (Parkin *et al.*, 1997). Stomach carcinoma was increasing in this population with higher incidence among males as compared to females as was reported in early investigation (Chatterjee, 2009). The observation was also at per with the fact that overall cancer in children especially has risen 10.8% in the past decade (Miller *et al.*, 1993). Previous observation revealed that during the last 15-year period, the incidence among children of ALL increased 10.7% and the incidence of NHL increased 19.2% (Sahni, 2006). ALL is most common in childhood with a peak incidence at 4-12 years of age; the overall cure rate in children is 85% (Pui, 2000). Among children ages 1-14 years cancer causes more deaths in the U.S. than any other disease (American Cancer Society, 2000).

The epidemic peak of cancer scenario can be considered as cancer cluster, as the incidence pattern is greater than expected number of cases of cancer within a group of people in a geographic area or a certain period of time. In certain region a similar types of cancers are pronounced in groups and seems to show one kind of association in them due to similar environmental status. This multiple neoplastic syndrome was common for cancers of liver-lung-brain, breast-ovary, prostrate-lung-bone and others in this population and more specifically in multiple endocrine neoplasias. Since, it is hard to prove, the jury is still out on many of these cancer clusters, may be due to the environmental pollution and dietary toxicants which are vulnerable carcinogens causing cancers world wide. Previous study reported cancers associated with exposures to agricultural chemicals, including prostate cancer, testicular cancer, breast cancer, NHL, soft tissue sarcoma and Hodgkin's disease (Sahni, 2006). On tobacco and its health hazards, recommended dietary guidelines, safe sexual practices and lifestyle modifications form the main features of primary prevention of cancer (Murthy and Mathew, 2004).

Present epidemiological studies indicate that environmental pollution may be responsible for increased rate of morbidity and mortality in malignancy, as the severity is higher in more polluted urban areas as compared to rural areas. This may cause due to use of various carcinogenic products, knowingly or unknowingly, in their daily life and also due to the increased environmental pollutants in modern days. This devastating cancer scenario can be altered in a positive direction by regular screening and by training the prevention measures of life style modification in a wide scale through proper way.

ACKNOWLEDGMENTS

REFERENCES

Ahmed, K., S.M. Shahid, M. Jawed, Z. Islam and F. Hatim, 2006. An evaluation of urinary bladder carcinoma with respect to age, sex, stage and grade. Int. J. Cancer Res., 2: 219-223.

American Cancer Society, 2000. Cancer Facts and Fig-2000. American Cancer Society, Atlanta, Georgia.

Chatterjee, A., 2009. A six-year demographic study on stomach cancer incidence in rural population of West Bengal. J. Environ. Physiol., 2: 80-85.

Chatterjee, A. and G. Mukherjee, 2009. Relationship and susceptibility of ABO blood groups with various malignant disorders found in West Bengal. Sci. Culture, 75: 133-136.

Chatterjee, A. and G. Mukherjee, 2011. Epidemiological survey and PCR based detection of mutation for breast cancer in West Bengal. Asian J. Microbiol. Biotechnol. Environ. Sci., 13: 61-66.

Galvao, J., J.A. Abreu, T. Cruz, G.A.S. Machado and P. Niraldo *et al.*, 2007. Biological therapy using propolis as nutritional supplement in cancer treatment. Int. J. Cancer Res., 3: 43-53.

ICMR, 2000. A consolidated study of population based registries data, cancer statistics 1990-96. National Cancer Registry Programme, New Delhi.

Khorshid, F.A., 2009. Potential anticancer natural product against human lung cancer cells. Trends Med. Res., 4: 8-15.

Kumar, P., 1993. Social classification-need for constant updating. Indian J. Community Med., 68: 60-61.

Laux, M.T., 2005. Breast cancer: An overview. Int. J. Cancer Res., 1: 1-80.

Mathew, A., 2003. Cancer Registration with Emphasis on Indian Scenario. In: Basic Information for Cancer Registry Documentation, Mathew, A. (Ed.). Regional Cancer Centre, Trivandrum, pp: 1117.

Miller, B.A., L.A.G. Ries, B.F. Hankey, C.L. Kosary, A. Harras, S.S. Devesa and B.K. Edwards, 1993. SEER Cancer Statistics Review: 1973-1990. NIH Publications, USA.

Murthy, N.S. and A. Mathew, 2004. Cancer epidemiology, prevention and control. Curr. Sci., 86: 518-527.

Oricha, B.S., A. Yakubu, B.A. Yahaya, C.J. Yakubu and B.A. Ekele, 2005. Breast cancer and food: A quasi-epidemiological evidence of a role for dietary phytoestrogens in Northwestern Nigerian women. Int. J. Cancer Res., 1: 21-24.

Parkin, D.M., S.L. Whelan, J. Ferlay, L. Raymond and J. Young, 1997. Cancer Incidence in Five Continents. IARC Scientific Publications, Lyon, France.

Parkin, D.M., F. Bray, J. Ferlay and P. Pisani, 2001. Estimating the world cancer burden: Globocan 2000. Intl. J. Cancer, 94: 153-156.

Pui, C.H., 2000. Acute lymphoblastic leukemia in children. Curr. Opin. Oncol., 12: 3-12.

Sahni, A., 2006. Cancer epidemiology. Health Admin., 17: 14-15.