

RESEARCH COMMUNICATION

Trends in the Incidence of Non-Hodgkin's Lymphoma in India

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Abstract

Non-Hodgkin's Lymphoma is the 11th most common cause of cancer incidence. It is most frequent in high income countries, with rates more than twice those of middle - to low - income countries. It is usually fatal, with a 5 year survival rate of less than 35 percent. It is not a single cancer, but rather a wide group of cancers (including entities such as Burkitt's lymphoma and diffuse large B-cell lymphoma), each with a distinct geographical distribution, development path, age profile and prognosis. Non-Hodgkin's lymphoma is increasing in incidence world wide. On this background, in this paper an attempt has been made to study the trends in Non-Hodgkin's Lymphoma in various Indian populations in both sexes.

Key Words: Trends - Non-Hodgkin's lymphoma - incidence - India

Asian Pacific J Cancer Prev, 9, 433-436

Introduction

Non-Hodgkin's Lymphomas are a very varied group of neoplasm more common in males than in females. It is a heterogeneous group comprising lymphosarcoma, reticulosarcoma and Burkitt's lymphoma and other malignant neoplasms of lymphoid tissue including mycosis fungoides. Geographically, Non-Hodgkin's lymphoma is most common in developed countries, although in the developing world there are areas of moderate to high incidence in some middle-eastern countries (Saudi Arabia, Israel) and in parts of Sub-Saharan Africa. The latter is due to the high incidence of Burkitt's lymphoma, an aggressive subtype of Non-Hodgkin's lymphoma particularly in children in tropical Africa. Papua New Guinea also has high rates of Burkitt's lymphoma.

The incidence rates of Non-Hodgkin's lymphoma have risen dramatically in the last 30 years, particularly in developed countries, including Western Europe, North America and Australia (Parkin et al., 2005). This may in part reflect better diagnosis, or changing classification systems. However, these considerations together do not account for the extent of increase. Likewise, the fact that Non-Hodgkin's lymphoma is a complication of AIDS does not completely account for the increasing trend. In contrast to incidence, mortality rates have, in general, been declining as a consequence of improvement in therapy. On this background, in this paper an attempt has been made to document the trends in incidence of Non-Hodgkin's lymphoma in five old (Mumbai, Bangalore, Chennai, Delhi and Bhopal) urban registries in India in both sexes over a period of two decades.

Materials and Methods

All these registries are under the network of National Cancer Registry Programme (NCRP) of Indian Council of Medical Research (ICMR), New Delhi. Clean data are available for 22 years of period (1982-2003) for Mumbai, Bangalore and Chennai registries and for a 16 year period (1988-2003) for Bhopal and Delhi registries. The data used for trend analysis from these 5 registries have been coded in the same format, i.e. for topography ICD-10 (WHO-1992) and for morphology ICD-03 (WHO, 2000). For calculating various rates, population by age, sex and year has been estimated by using distribution Method (National Cancer Registry Consolidate Report of Cancer registries, 2006) by using 1981, 1991 and 2001 Census figures for all these registries. For calculating age adjusted incidence rates, the world standard population (IARC, Scientific Population Publication, 1992) has been used.

In India the first population based cancer registry was established in Mumbai (Bombay) by the 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 another two new population based cancer registries were commissioned by ICMR under the network of NCRP at Bhopal and New Delhi in 1986.

Various analytic approaches and measures of trends including geographical display and the overall mean annual percentage rate of change in age adjusted incidence rate or age specific rates, as well as modeling by age, period and cohort has been used to study the trends in cancer incidence. For studying trends we have used a

Table 1. Age Adjusted Incidence Rates for Non-Hodgkin's Lymphoma by Sex and Year for Various Cancer Registries

Year	Males					Females				
	Mumbai	Bangalore	Chennai	Delhi	Bhopal	Mumbai	Bangalore	Chennai	Delhi	Bhopal
1982	2.5	3.1	2.7	-	-	1.8	1.4	1.3	-	-
1983	3.0	2.9	2.2	-	-	1.9	1.4	1.3	-	-
1984	3.1	3.1	2.2	-	-	2.2	1.6	0.9	-	-
1985	3.8	2.7	3.4	-	-	1.9	1.0	1.5	-	-
1986	3.3	3.0	2.6	-	-	2.1	2.4	1.6	-	-
1987	3.9	1.6	3.4	-	-	2.5	1.9	1.0	-	-
1988	2.8	3.7	3.0	4.8	1.0	2.3	1.2	1.6	2.3	1.2
1989	3.6	2.8	3.5	4.8	0.6	2.7	2.0	1.7	2.4	0.5
1990	3.9	4.5	4.0	4.3	2.1	2.3	2.3	1.9	3.1	2.1
1991	3.5	3.3	3.3	4.5	1.0	2.9	2.1	2.0	3.2	0.4
1992	4.5	3.6	3.3	5.2	1.8	2.2	3.2	2.0	2.5	1.3
1993	4.4	3.9	3.3	4.7	3.2	3.3	2.4	2.0	2.6	0.5
1994	4.8	3.0	2.7	5.3	2.1	3.4	1.9	2.0	3.0	0.4
1995	4.6	3.0	3.7	4.3	2.4	2.6	1.9	2.4	2.9	1.1
1996	4.1	2.3	3.5	5.4	1.6	3.0	1.6	1.8	2.9	1.6
1997	3.9	3.1	3.4	4.8	3.6	2.9	2.2	2.5	3.1	2.2
1998	4.3	3.5	4.1	4.7	2.7	2.9	2.3	2.7	2.6	3.0
1999	4.7	3.0	4.8	4.5	3.3	2.5	2.2	2.1	3.2	1.3
2000	4.7	3.6	4.4	6.0	4.8	3.3	2.6	2.3	3.1	2.6
2001	3.8	3.9	3.4	5.2	3.3	2.5	3.1	2.2	3.3	1.2
2002	4.8	3.7	5.1	5.5	3.3	3.3	2.7	1.8	3.9	1.9
2003	4.2	4.4	4.3	5.2	3.0	2.8	3.0	2.1	2.8	1.8

model that fits this data is the logarithm of $Y=AB^x$ which represents a Linear Regression Model where "Y" is the estimated incidence rates per 100,000 population and "x" is the calendar year minus initial year for the current data. Capital "A" therefore represents the estimated rate of the initial year and $(B-1)*100$ gives the Average Percentage Change in the incidence rates during the period (Cancer Incidence & Mortality in Greater Mumbai- 2001, Indian Cancer Society, 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 of are given in tabular form.

Results

Age adjusted incidence rates for Non-Hodgkin's Lymphoma by sex and year for various registries are presented in Table 1. The average age adjusted incidence rates along with its annual percentage change for Non-Hodgkin's lymphoma for both the sexes are presented in

Table 2. Average Age Adjusted Incidence Rate and Annual Percentage Change in Age Adjusted Rates for Non-Hodgkin's Lymphoma by Sex for Various Cancer Registries

Registry	Average Adjusted Incidence rate		Annual Percentage Change	
	Male	Female	Male	Female
Mumbai	3.92	2.60	2.14**	2.23**
Bangalore	3.26	2.11	1.26NS	3.30**
Chennai	3.47	1.85	2.65**	3.39**
Delhi	4.95	2.93	0.97*	1.07*
Bhopal	2.49	1.44	9.58**	7.10*

* - significant at the 0.05 level, ** - significant at the 0.01 level

Table 2. Among various Indian Registries, the average age adjusted incidence rate for Non-Hodgkin's lymphoma, the highest incidence was noted for Delhi Registry (4.45 for males and 2.93 for females) and lowest incidence was observed for Bhopal registry (2.49 for males and 1.44 for females).

For studying trends and its predominance in total Cancers and it's ranking based on age adjusted incidence rates at initial period and at the end of study periods were compared for each registry. At Mumbai registry the age adjusted incidence rates was 2.8 (9th rank) for males and 1.8 (12th rank) for females in initial period, while at the end of study period; it has been increased to 4.5 (6th rank) for males and 3.1 (7th rank) for females. At Chennai Registry at initial period the age adjusted incidence rate was 2.5 (8th rank) for males and 1.3 (10th rank) for females, at the end of study period it has been increased to 4.7 (6th rank) in males and 2.0 (9th rank) for females. At Delhi registry at initial period, age adjusted incidence rate was 4.8 (4th rank) for males and 2.3 (8th rank) for females, it has been to increased to 5.1 (11th rank) for males and 3.3 (5th rank) for females at the end of the study period. At Bhopal registry, the age adjusted incidence rate has been increased from 0.8 to 3.1 in males and from 0.8 to 1.9 in females from initial period to end of study period. At Bangalore registry, the increase in incidence for Non-Hodgkin's Lymphoma was from 3.6 to 4.1 in males and from 1.4 to 2.9 in females from initial periods to the end of study period.

The observed and expected value of age adjusted incidence rates over a period of time for non Hodgkin's lymphoma for various registries are presented by line graph in Figure 1 for Males and in Figure 2 for females. Linear regression method showed that there has been statistically significant increased in the incidence of Non-

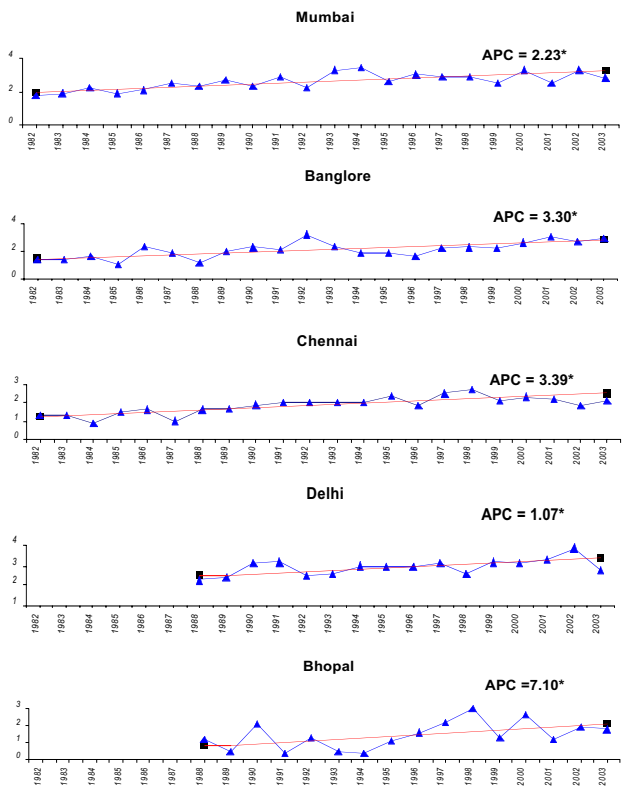


Figure 1. Trends in Non-Hodgkin's Lymphoma Incidence Rates - Males

Hodgkin's Lymphoma in both the sexes in all registries. The maximum increase in age adjusted incidence rate over a entire period of observation was noted for Bhopal registry in the both sexes (9.58% for males and 7.10% for females) while lowest increase was not for Delhi registry in both the sexes (males 0.97%, females 1.07%).

Discussion

The incidence of malignant Non-Hodgkin's lymphoma is increasing worldwide. The incidence of these tumors has increased since 1960, especially in Western countries (e.g. Nordic countries and the USA), and, although some of the increase may be due to improved diagnosis and changes in classification, a proportion at least is likely to be real (Barnes et al., 1986).

The patterns of increasing incidence and mortality from Non-Hodgkin's Lymphoma are reported from France (Hill et al, 1990), Slovakia (Plesko et al., 1991), the UK, Singapore and the USA (Devesa et al., 1987, Doll, 1989). Barnes et al concluded after extensive review of pathological specimens, that the increase in incidence over 20 years in Yorkshire (UK) was genuine despite weakness in the registration data (Barnes et al., 1986). Lee et al (Lee et al.,1988) attributed the rapid increase in Singapore Chinese to a cohort effect, particularly in males, but speculated that improvements in diagnosis might be responsible. The brief report from Kingston and St. Andrew Jamaica (Brooks & Wolff, 1991) concludes that there was no overall increase in lymphoma between 1958 and 1987, although in fact the data provided show that the world standardized rate for Non-Hodgkin's lymphoma

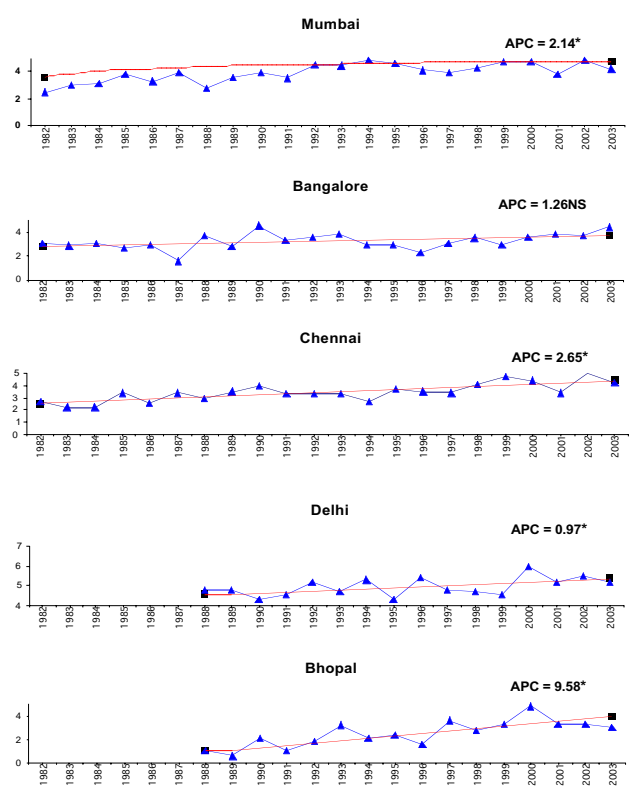


Figure 2. Trends in Non-Hodgkin's Lymphoma Incidence Rates - Females

almost doubled in both the sexes. Devesa et al (1987) showed that incidence in the USA more than doubled in both the sexes between 1947 to 1987, especially in persons over 65 years of age, which they attributed partly to more aggressive diagnostic techniques in the elderly and to primary or acquired immunosuppression.

Although AIDS has undoubtedly increased the risk of certain types of Non-Hodgkin's lymphoma greatly in young USA males (Harnly et al., 1988, Rabkin et al., 1991), the increases reported here are widespread, and they antedate AIDS epidemic. A shift in the distribution of Non-Hodgkin's Lymphoma sub-types toward higher grade tumors with extra nodal presentation has been observed during the period 1977-82, among young (20-49 years) males in Atlanta (USA) where, AIDS are probably uncommon (Boring et al., 1983). Eby et al (1988) showed that primary malignant lymphoma of brain in the USA, accounting less than 1% of Non-Hodgkin's lymphoma, had increased more rapidly than lymphoma at all other sites, and that this was unlikely to be due to AIDS, better diagnosis or changes of classification. The increases in Non-Hodgkin's Lymphoma are to a large and too longstanding to be explained by AIDS (Boring et al., 1983) or by Epstein Barr virus associated lymphoma in immunosuppressed transplant recipients (Doll, 1991), other causes should now be sought.

In most of the countries there has been increase in the incidence of Non-Hodgkin's lymphoma, we also observed statistically significant increase in the incidence of Non-Hodgkin's Lymphoma in all the Indian registries. It will be very encouraging to know whether this increase is real or due to improved diagnosis, change in classification or

due to AIDS. It has been suggested that studies should be planned to investigate the factors responsible for increase in the incidence of Non-Hodgkin's Lymphoma in Indian populations.

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