RESEARCH COMMUNICATION

Descriptive Epidemiology of Primary Brain and CNS Tumors in Delhi, 2003-2007

N Manoharan[1]*, PK Julka[2], GK Rath[3]

Abstract

The Delhi Population Based Cancer Registry data during the period 2003-2007 were used to describe the epidemiology of primary malignant brain and central nervous system tumors in Delhi. A total of 1989 brain and CNS tumors cases in 1291 males and 698 females were registered during the period 1st January 2003 to 31st December 2007. The age adjusted (world population) incidence rates were 3.9 per 100,000 for males and 2.4 per 100,000 for females. Gliomas were the most frequently reported histology both in males (26.6%) and females (23.2%). A male predominance in incidence was observed for all histological classifications. The rates in Delhi are low compared to the incidences reported from developed countries.

Keywords: Cancer registration - brain and CNS - incidence - histology

Asian Pacific J Cancer Prev, **13**, 637-640

Introduction

Brain tumors though not frequent, contribute significantly to morbidity because of their relatively poor survival rate. A number studies from Western countries has reported on the pattern, incidence and mortality of brain and central nervous system (CNS) tumors. But no population based data have hitherto been reported on the descriptive epidemiology of brain and CNS tumors from India. So an attempt has been made to present the descriptive analysis of malignant brain and CNS tumors from Delhi.

Materials and Methods

The data collected by Delhi Population Based Cancer Registry (PBCR) was utilized for this study. The Delhi PBCR was established 1986 in Dr. BRAIRCH, AIIMS, New Delhi with the aim of obtaining reliable cancer morbidity and mortality data among the Delhi urban residents. Delhi, the capital of India covers an area of 1483sq.kms. The population of Delhi includes Hindu, Urdu, English and Punjabi speaking masses. The literacy rate of Delhi is approximately 81.8%. The rural and urban compositions of Delhi are 591.9 and 891.1 sq. kms respectively. According to 2001 census, the total population of Delhi was 13850507 (Urban: 12905780; Rural: 944727) with 93.01% of people living in urban areas. The Delhi PBCR covers only the urban area of the Delhi.

The data were collected by the Medical Social Workers of Delhi Population Based Cancer Registry who were well trained in cancer registration techniques. The method of data collection has been described in detail elsewhere (Manoharan et al., 2009). The sources of registration for data are 162 major Govt. Hospital /Centers/ Institution and more than 250 private hospitals and nursing homes and from the vital statistics departments of the municipal corporations. The primary site and morphology data were coded using the International Classification of Disease for Oncology (ICD–O, 3rd edition) (Fritz and Percy, 2000). Information on other variables was coded according to the international guidance (Jensen et al., 2003). These codes were converted to ICD.10 (1994) for tabulation.

The data utilized for this study covers the period from 2003-2007 with a primary tumor at any of the following sites (International Classification of Diseases for Oncology codes) : brain (C71.0-C71.9), meninges (C70.0-C70.9), spinal cord, cranial nerves and other parts of central nervous system (C72.0-C72.9) and pituitary and pineal glands (C75.1-C75,3). The population at risk during the five year period was estimated using Difference Distribution Method (Takiar & Shobana, 2009) based on the Census figures of 1991 and 2001(Census of India, 1991; 2001). The total population in Delhi Urban during 2003-07 was 77579532; comprising 42672801 (55.0%) males and 34906731 (45.0%) females with a sex ratio of 818 females per 1000 males. Table 1 gives the population at risk by sex and 5 years age groups.

Univariate statistics was used to describe the distribution of tumors by sex. Age-specific, crude and age-standardized (world) were used to obtain incidence rates. For national and international comparison of the incidence, the age-adjusted incidence rates were used. Childhood tumors were defined as those diagnosed in patients <15 years old.

*[1]Delhi Cancer Registry, [2]Radiation Oncology, [3]Chief, Dr.B.R.A.Institute Rotary Cancer Hospital, All India Institute of Medical Sciences, New Delhi, India *For correspondence: nmano67@yahoo.com*

Results

During 2003 to 2007, a total of 1989 primary malignant brain and CNS tumors were registered. A male preponderance was observed in the incidence of brain tumors (64.9%). The majority of the tumors occurred in the age group 45-54 year age group both in males and females. Pediatric brain tumors contributed 9.3% of total brain tumors. The incidence of childhood brain tumor is higher in male children (17.4%) compared to female children (13.9%).

The distribution primary brain and CNS tumor incidence by sex for the major histology groupings are presented in Table 1. The most frequently reported histologies were gliomas (25.4%), glioblastomas (21.5%) and astrocytomas (20.6%). Patients with glioblastomas had the highest mean age at diagnosis followed by oligondrogliomas and astrocytomas. Patients with lowest average age at onset were neuroblastoma followed by medulloblastomas.

Age-specific incidence rates along with crude and age adjusted incidence rates for the most common histological types in males and femaels are presented in Table 2. The crude and age adjusted (world population) incidence rates for males were 3.0 per 100,000 and 3.9 per 100,000 respectively. The incidence for all brain and CNS tumors increases with age and the highest rate was seen in 55-64 years age group. The most common histology, glioblastoma multiforme increases sharply with increasing age and attains a peak at 55-64 years age group. The rates for gliomas and astrocytoma also increase with age and attain a peak at 65+ and 55-64 years age groups respectively.

The crude and age adjusted (world population)

Table 1. Distribution of Primary Brain and CNS Tumor Incidences by Major Histology Groupings and Sex

Histology	Male			Female			Total		
	Frequency	%	Mean Age	Frequency	%	Mean Age	Frequency	%	Mean Age
Astrocytoma/Diffuse/Pilocytic	269	20.8	38.2	142	20.3	38.9	411	20.7	38.4
Oligodendroglioma/Anaplastic Olig.	47	3.6	37.8	36	5.2	40.2	83	4.2	38.8
Glimom/Mixed Glioma	343	26.6	38.2	162	23.2	37.0	505	25.4	37.8
Glioblastoma	279	21.6	51.9	149	21.3	52.1	428	21.5	52.0
Embroyonal/primitive/medulloblat.	93	7.2	12.0	33	4.7	16.7	126	6.3	13.2
Neuroblastoma	20	1.5	7.4	11	1.6	14.2	31	1.6	9.8
Ependymoma/analplatic ependymo	25	1.9	31.8	18	2.6	27.4	43	2.2	30.0
Lymphoma	9	0.7	30.2	3	0.4	37.0	12	0.6	31.9
Nerve sheeth tumour	9	0.7	40.3	9	1.3	33.3	18	0.9	36.8
Miscellaneous	12	0.9	40.8	5	0.7	36.4	17	0.9	39.5
Neoplasm, unspecified	185	14.3	39.4	130	18.6	36.4	315	15.8	38.2
Total	1291	100.0	38.8	698	100.0	39.0	1989	100.0	38.9

Table 2. Primary Brain and CNS Tumor Incidence Rates by Age at Diagnosis

Histology	00-14	15-24	25-34	35-44	45-54	55-64	65+	CR	AAR
Males:									
Astrocytoma/Diffuse/Pilocytic	0.2	0.4	0.8	0.8	0.9	1.9	2.0	0.6	0.7
Oligodendroglioma/Anaplastic Olig.	0.0	0.1	0.1	0.2	0.3	0.3	0.1	0.1	0.1
Glimom/Mixed Glioma	0.4	0.3	0.8	1.2	1.7	2.5	2.2	0.8	1.0
Glioblastoma	0.0	0.1	0.3	0.6	2.0	4.7	4.2	0.7	1.0
Embroyonal/primitive/medulloblat.	0.5	0.2	0.0	0.1	0.1	0.1	0.0	0.2	0.2
Neuroblastoma	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Ependymoma/analplatic ependymo	0.1	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.1
Lymphoma	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Nerve sheeth tumor	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
Miscellaneous	0.3	0.1	0.3	0.5	0.7	1.2	2.5	0.4	0.6
Neoplasm, unspecified	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0
Total	1.7	1.2	2.5	3.4	5.9	11.3	11.3	3.0	3.9
Females:									
Astrocytoma/Diffuse/Pilocytic	0.1	0.3	0.5	0.6	0.7	0.9	1.3	0.4	0.5
Oligodendroglioma/Anaplastic Olig.	0.0	0.1	0.0	0.2	0.3	0.3	0.1	0.1	0.1
Glimom/Mixed Glioma	0.2	0.2	0.6	0.6	1.1	1.3	0.7	0.5	0.5
Glioblastoma	0.0	0.1	0.1	0.4	1.9	2.6	2.0	0.4	0.6
Embroyonal/primitive/medulloblat.	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Neuroblastoma	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Ependymoma/analplatic ependymo	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Lymphoma	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nerve sheeth tumor	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Miscellaneous	0.2	0.2	0.3	0.4	0.9	0.9	1.0	0.4	0.4
Neoplasm, unspecified	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total	0.9	1.0	1.7	2.4	5.2	6.2	5.3	2.0	2.4

Table 3. Age Standardised Incidence Rates (per 100,000) for Brain and CNS in Delhi and Other Indian Registries, 2006-08, Males and Females

Males		Females	
Place	AAR per 100,000	Place	AAR per 100,000
Bangalore	4.0	Sikkim State	4.0
Delhi (2003-07)	3.9	Bangalore	2.7
Pune	3.3	Chennai	2.5
Thiruvananthapuram	3.0	Delhi (2003-07)	2.4
Mumbai	3.0	Pune	2.3
Chennai	3.0	Mumbai	2.1
Sikkim State	2.9	Thiruvananthapuram	1.8
Kollam	2.7	Nagpur	1.8
Nagpur	2.5	Kollam	1.6
Bhopal	2.4	Bhopal	1.6
Kolkata	2.0	Aizwal District	1.5
Aurangabad	1.8	Kolkata	1.4
Ahmedabad Rural	1.7	Kamrup Urban District	1.0
Aizwal District	1.7	Ahmedabad Rural	1.0
Kamrup Urban District	1.5	Aurangabad	0.9
Ahmedabad Urban	1.5	Ahmedabad Urban	0.9
Mizoram State (MZ)	1.2	Imphal West District	0.8
Barshi Rural	1.2	Barshi Rural	0.7
MZ-Excluding Aizwal	0.9	Mizoram State (MZ)	0.6
Dibrugarh District	0.7	Manipur State (MR)	0.5
Barshi Expanded	0.5	Barshi Expanded	0.5
Manipur-Excl. Imphal West	0.5	MR-Excluding Imphal West	0.4
Manipur State	0.5	Dibrugarh District	0.3
Imphal West District	0.5	Cachar District	0.1
Cachar District	0.5	MZ-Excl. Aizwal	0.0

incidence rates for females were 2.0 per 100,000 and 2.4 per 100,000 respectively (Table 2). In females also the age specific rates increases sharply with increasing age and the highest rate was noted in 55-64 years age group. The most common histology as per ASR in females was glioblastoma multiforme followed by gliomas and astrocytomas. All the brain and CNS tumors with these histologies increased with age and it attained a peak in the 55-64 years age group.

Table 3 compares the age-standardized incidence rates for brain and CNS tumor in Delhi with registries reported from India in males and females respectively (National Cancer Registry Programme, 2010).

Discussion

The Delhi Population based Cancer Registry has been collecting the data on cancer patients since 1986. The data collection procedure, quality checks etc. been standardized. The data is complete, valid and prone to international standards.

The brain and CNS tumors are the eighth commonest cancer among the Delhi males. The age specific incidence of brain tumors steadily increases with the age and the same trend has been observed in many other registries reported from India. Though the incidence of brain tumors in Delhi males is second highest among the Indian registries with Bangalore reporting the highest incidence, there is markedly not much difference. The lowest incidences of brain tumor among males were observed in Cacher District of Assam (0.3 per 100,000).

The primary malignant brain and CNS tumors rank tenth in terms of common cancer among Delhi females. The highest incidence of brain and CNS tumors was reported from Sikkim State followed by Bangalore with Delhi occupying the fifth place among the Indian registries reported. Nil rates were reported from the Mizoram State (Excluding the capital Aizwal).

Both male and female rates are low compared to the incidence rates reported from developed Western countries and the rates are comparable with other Asian countries (Curado et al., 2007). Global differences in rates tend to correspond to the level of economic development, with the highest rates in North America, Australia and Western Europe and the lowest rates in Asia, South and Central America. According to GLOBOCAN 2008 (2010) estimates, the North Europe experiences the highest incidence rates for both males and females, while Eastern Africa experiences the lowest incidence of rate of malignant brain and CNS tumors.

The male preponderance in overall incidence rates and for most histologies in Delhi is in confirmation with several other studies reported elsewhere from the world. Brain tumors are classified according to the cell type from which originate. The majority of tumors of central nervous system is derived from glial cells, the most malignant and frequent being glioblastoma. During the past decade the incidence of glioblastoma's in the elderly has increased by 1-2% per year but to some extent this may be due do the introduction of high-resolution neuroimaging (Yeole BB, 2008).

The factor that may cause brain tumors is uncertain. White race, exposure to radiation, certain chemical exposure in occupation-working in the rubber, petro chemical or metal industries and family history of brain cancer postulated to increase the risk of brain and CNS tumors. So in order to understand the etiology of brain tumors in depth epidemiological studies are required.

References

Census of India (1991). Part IV-A-C Series – Socio Cultural Tables; Series 31 – Delhi.

Census of India (2001). Registrar General of India, Socio Cultural Tables; C14, Population by Five Year Age group by Residence and Sex, New Delhi (www.Censusindia.net)

Curado MP, Edward B, Shin HR et al. (2007). Eds. Cancer Incidence in Five Continents Vol. IX, IARC Scientific Publication No.160, Lyon, France.

Fritz & Percy C, Jack A. et al (2000). International Classification of Diseases for Oncology, 3rd ed. Geneva; WHO.

GLOBOCAN 2008 V1.2, Cancer Incidence and Mortality Worldwide : IARC Cancer Base No.10 (Internet). Lyon, France: IARC; 2010. Available from: http://globocan.iarc.fr/accessed on 28/12/2011.

International Statistical Classification of Diseases and Related Health Problems – 10th revision (1994), World Health Organization, Geneva.

Jensen OM, Parkins DM, MacLennan R, Muir CS, Skeet R eds. (2003). Cancer Registration principles and methods. IARC Technical report No.95, Lyon: IARC Press

Manoharan N, Tyagi BB, Raina V (2009). Cancer incidences in urban Delhi - 2001-05. *Asian Pacific J Cancer Prev*, **10**,

799-806.
National Cancer Registry Programme (ICMR) (2010).Three year report of Population Based Cancer Registries 2006-2008 – First Report of 20 PBCRs in India. Bangalore, India.
Takiar R, Shobana B (2009). Cancer incidence rates and the problem of denominators – a new approach in Indian cancer registries. *Asian Pacific J Cancer Prev*, **9**, 123-6.
Yeole BB (2008). Trends in the Brain Cancer Incidence in India, *Asian Pacific J Cancer Prev*, **9**, 267-70.