Short Communication

Population-based cancer incidence in Sikkim, India: report on ethnic variation

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BACKGROUND: A Population-Based Cancer Registry (PBCR) was set up in Sikkim (a state in the North Eastern India) in 2003. We examined incidence rates by ethnic groups from 2003–2008.

METHODS: Age-adjusted incidence rates (AARs) per 100,000 person-years were calculated by direct method using the world standard population, and analysed by ethnic group (Bhutia, Rai and other).

RESULT: There were a total of 1,148 male and 1,063 female cases of cancer between 2003 and 2008 on the Sikkim PBCR. The overall AARs were 89.4 and 99.4 per 100,000 person-years in males and females, respectively. Incidence rates were highest amongst the Bhutia group (AAR = 172.4 and 147.4 per 100,000 person-years in males and females, respectively), and the largest difference in rates were observed for stomach cancers with AARs being 12.6 and 4.7 times higher in the Bhutia group compared with other ethnic groups in males and females, respectively.

CONCLUSION: These observations call for further epidemiological investigations and the introduction of screening programmes.

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The Population-Based Cancer Registry (PBCR) in Sikkim was started in 2003 under the National Cancer Registry Programme (NCRP) of the Indian Council of Medical Research (ICMR). The initiative by the ICMR to commence six PBCRs in the North Eastern states of India was due to the possible higher incidence of cancer reported under the project on development of an atlas of cancer in India (Nandakumar et al., 2005). Cancer registration as in the other PBCRs in India is active.

Cancer of the stomach among migrant ethnic groups has been studied in Illinois, USA (Cho et al., 1996). Similarly, American ethnic groups like the American Indians and Alaska Natives have shown greater risk for stomach cancers than the non-Hispanic Whites (Wiggins et al., 2008).

There is paucity of data on the prevalence of oesophageal cancer risk factors by race, ethnicity and gender. However, a study showed that age-adjusted oesophageal cancer incidence rates in blacks was more than twice the rate in whites (8.63 vs 4.39, P < 0.05) (Baquet et al., 2005).

In a study conducted among specific American Pacific Islander population in the US, it was found that incidence of liver cancer among Samoan men was the highest (Miller et al., 2008).

The incidence rates of nasopharyngeal cancer are as high as 300–800 cases per 1 million in some Cantonese regions of Southern China (Muir et al., 1987).

In India, however, no study has been done on ethnic populations with reference to incidence of stomach, oesophageal, nasopharyngeal, and liver cancer.

In Sikkim, there are 13 ethnic groups having diverse lifestyle and dietary habits. The Bhutias were early immigrants from the Tibetan province of Khams (Risley, 1928). The dominant heterogeneous Nepalese population of various ethnicities, including the Rais, are later immigrants from Nepal (Lama, 1994; Menon and Banerjea, 2005). We report the incidence and patterns of cancer including the ethnic variation observed during the first 6 years (2003–2008) of registry operation.

MATERIALS AND METHODS

The PBCR covers the entire state of Sikkim, with a population of 540,851 (2001 census of India). A standard incidence and mortality form by the NCRP is used to collect the respective information. This form has set guidelines and is followed by all 24 PBCRs within the NCRP network. The third edition of the International Classification of Diseases for Oncology (ICD-O-3) was used to classify tumours, and only malignant neoplasms (those with behaviour code 3) are included in the registry (April et al., 2000).

The registry population area at risk was estimated using the 1991 and 2001 census population (Census of India 1991, 2001) by sex, as well as the growth rate during that interval using the difference distribution method (Takiar and Shobana, 2009). The population estimation according to ethnic group was estimated using the 2001 census population and ethnic breakup of the population provided by Directorate of Economics, Statistics,
Monitoring and Evaluation (DESME) (State Socioeconomic census, 2006). The 13 ethnic groups as defined by DESME were aggregated into the following 3 main groups due to small numbers of cases: Bhutia, Rai and others (including all 11 other ethnic groups). The age-adjusted incidence rates (AAR) per 100 000 person-years, were calculated by direct method using the world standard population (Jensen et al., 1991).

RESULTS

There were 2211 registered cancer cases during the 6-year period, 2003–2008. The average annual AAR per 100 000 population for all sites was 89.4 in males and 99.4 in females. The most common site of cancer in males was stomach cancer that comprised 15% of all sites of cancer, followed by cancer of the oesophagus (10%). In females, the most common site of cancer was cancer of the cervix uteri accounting for 11.7% of all cancers in females, followed by cancer of the breast (9.1%). Among females, cancers of the stomach and oesophagus were also among the leading sites of cancer 8.1% (AAR-8.75) and 7.6% (AAR-7.5), respectively.

The average AAR of all sites of cancer combined in both males and females are slightly lower than the urban registries and higher than that of the only rural registry data of Barshi. However, when the AARs of specific sites of cancer are examined, higher incidence rates are seen in cancers of the stomach, oesophagus, and nasopharyngeal cancer in both sexes (National Cancer Registry Programme. Indian Council of Medical Research, 2010).

Table 1 gives the distribution of the number of cases by sex and ethnic group, alongside the population at risk in each category. The Bhutia group comprised approximately 13% of the population but accounted for almost double the proportion of cancers.

Table 2 gives the AAR for all sites and leading sites of cancer in both males and females by ethnic groups. The AAR in Bhutia males was 172.4 per 100 000 compared with 72.9 in the Rai group and 76.8 in the ‘others’ category. Likewise, among females the AAR for all sites of cancer was 147.4 compared with 111.9 and 87.8 for Rai and the ‘others’ group, respectively. Among the leading sites of cancer, cancer of the stomach showed the most significant difference between the Bhutias and the other two groups in both males and females. The AARs among the Bhutias was 12.6 and 4.7 times higher than the Rai group in males and females, respectively.

Supplementary Table III gives the number of cancers (all ages), relative frequencies (%), average annual crude, age-adjusted incidence rates (AAR), and proportion of microscopic verification (%) by site (ICD-10) and sex (2003–2008) of the PBCR, Sikkim. Supplementary Table IV gives the comparison of age-adjusted incidence rates (AAR) of common anatomical sites of cancer of PBCR, Sikkim with older PBCRs in India. Supplementary Figure 1 shows the comparison of AAR of stomach cancer of Sikkimese Bhutia population (2003–2008) with that of other countries (2008). Supplementary Figure 2 shows the comparison of AAR of oesophageal cancer of Sikkimese Bhutia population (2003–2008) with that of other countries (2008).

DISCUSSION

Data on cancer patterns helps in determining the strategies for cancer control and prevention in different countries. It provides
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Census of India (1991)

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April F, Constance P, Andrew J, Kanagaratnam S, Leslie S, Max P, Sharon D (eds) (2000) International Classification of Diseases for Oncology, 3rd edn. WHO: Geneva.

Baquet CR, Commiskey P, Meltzer S, Mishra SI (2005) Esophageal cancer epidemiology in blacks and whites: racial and gender disparities in incidence, mortality, survival rates and histology. J Natl Med Assoc 97(11): 1471 – 1478

Census of India (1991) Series-1, Sikkim. Office of the Registrar General: New Delhi.

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REFERENCES

April F, Constance P, Andrew J, Kanagaratnam S, Leslie S, Max P, Sharon D (eds) (2000) International Classification of Diseases for Oncology, 3rd edn. WHO: Geneva.

Baquet CR, Commiskey P, Meltzer S, Mishra SI (2005) Esophageal cancer epidemiology in blacks and whites: racial and gender disparities in incidence, mortality, survival rates and histology. J Natl Med Assoc 97(11): 1471 – 1478

Census of India (1991) Series-1, Sikkim. Office of the Registrar General: New Delhi.

Cancer from the journal Cancer website (http://www.nature.com/bjc)
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National Cancer Registry Programme. Indian Council of Medical Research (2010) Three Year Report of Population Based Cancer Registries. Bangalore, India

Phukan RK, Chetia CK, Ali MS, Mahanta J (2001) Role of dietary habits in the development of oesophageal cancer in Assam, the north-eastern region of India. Nutr Cancer 39: 204–209

Risley HH (1928) The Gazetteer of Sikkim, pp 5–38. Low Price Publications: Delhi

State Socioeconomic Census (2006). Department of Economic Statistic, Monitoring and Evaluation, Government of Sikkim: Gangtok, 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 10: 123–126

Wiggins CL, Perdue DG, Henderson JA, Bruce MG, Lanier AP, Kelley JJ, Seals BF, Espey DK (2008) Gastric cancer among American Indians and Alaska Natives in the United States, 1999–2004. Cancer Suppl 113(5): 1225–1233

Yoshihara M, Hiyama T, Yosjida S, Ito M, Tanaka S, Watanabe Y, Haruma K (2007) Reduction in gastric cancer mortality by screening based on serum pepsinogen concentration: a case control study. J Scan Gastroentrol 42: 760–764

(IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, vol.56). IARC Press: Lyon

Jensen OM, Parkin DM, Maclenan R, Muir CS, Skeet RG (eds) (1991) Cancer Registration Principles and Methods No. 95. IARC: Lyon

Lama, MP (1994) Sikkim: Society, Polity, Economy, Environment, Indus Publishing: New Delhi

Menon NRM, Banerjea, D, West Bengal National University of Juridical Sciences (2005) Allied Publishers: Sikkim, pp 5–13.

Miller BA, Chu KC, Hankey BF, Ries LAG (2008) Cancer incidence and mortality patterns among specific Asian and Pacific Islander populations in the U.S. Cancer Causes Control 19: 227–256

Miyamoto A, Kuriyama S, Nishino Y, Tsubono Y, Nakaya N, Ohmori K, Kurashima K, Shibuya D, Tsuji I (2007) Lower risk of death from gastric cancer among participants of gastric cancer screening in Japan: a Population Based Cohort Study. Prev Med 44: 12–19

Muir CS, Waterhouse J, Mack T (1987) Cancer Incidence in Five Continents. International Agency for Research on Cancer: Lyon, France. IARC Scientific Publication 88

Nandakumar A, Gupta PC, Gangadharan P, Visweswara RN (2005) Geographic pathology revisited: development of an Atlas of cancer in India. Int J Cancer 116: 740–754

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