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Short Communication

Childhood cancer in the south Asian population of England (1990–1992)

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Summary Cancer incidence in 1990–92 among English south Asian (residents with ethnic origins in India, Pakistan or Bangladesh) and non-south Asian children is compared. Standardized incidence ratios show significant overall excesses in south Asians (131), largely due to higher rates in south Asian boys, and specific excesses for leukaemia (141), lymphoid leukaemia (141), lymphoma (172) and hepatic tumours (375). Aetiological investigation is required. © 2001 Cancer Research Campaign http://www.bjcancer.com

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There are more than 1.4 million residents in England with ethnic origins in the Indian sub-continent, representing approximately 3.0% of the total population and 5.4% of the population aged 0–14 (OPCS, 1993). Despite substantial religious and cultural heterogeneity within the group as a whole (referred to as south Asian in this paper), differences from other ethnic groups have been demonstrated for a wide range of health outcomes (Soni Raleigh et al, 1990; Wild and McKeigue, 1997; Mather et al, 1998). Previous studies on childhood cancer in the south Asian population have either been limited to regional geographical areas (Muir et al, 1992, 1995; Powell et al, 1994, 1995; Varghese et al, 1996) or have not reported incidence or mortality rates (Stiller et al, 1991; Swerdlow et al, 1995) through lack of population denominator data. This study combined numerator data from 4 regional cancer registries with denominator data from the 1991 census, incorporating approximately 80% of the resident south Asian population, to derive the first near national sex-specific estimates of childhood cancer incidence in the south Asian population of England.

The study methods have been described in detail elsewhere (Cummins et al, 1999; Winter et al, 1999). The data set consisted of cases of incident cancer (ICD9: 140–208) in children aged 0–14 years registered between 1990 and 1992, in areas covered by Thames, Trent, West Midlands and Yorkshire cancer registries. The list of cancer registrations was run against the Nam Pehchan computer software package (Bradford Health Authority) to produce a list of matches against the program's dictionary of south Asian names and then subjected to a range of further computer and visual inspection methods to classify each case as either south Asian or non south Asian. Denominator data allowing the calculation of incidence rates by ethnic group was provided by the 1991 census (OPCS, 1993). For the purpose of the study, a south Asian case was defined as a person whose name was identified as consistent with an ethnic origin in peoples indigenous to India, Pakistan or Bangladesh thus including migrants with these ethnic origins from East Africa and elsewhere, while the south Asian denominator consisted of the population with self-ascribed ethnicity to these countries in the 1991 census. All cases aged 0 –14 were classified according to the International Classification of Childhood Cancer (Kramarova and Stilker, 1996). Incidence rates directly standardized to the world standard population and standardized incidence ratios with 95% confidence intervals were calculated for each of the main diagnostic groups. The standardized incidence ratios were calculated as the ratio between the observed and expected number of south Asian cases using the non-south Asian population as the standard population. Confidence intervals for the standardized incidence ratios were based on exact 95% confidence intervals for the expectation of a Poisson distribution according to the number of observed cases where the number of south Asian cases was less than or equal to 60 and on the Normal approximation to the Poisson distribution where the number of south Asian cases exceeded 60 (Esteve et al, 1994).

The Nam Pehchan computer program identified 203 south Asian names from the 1819 cases considered in total. After visual inspection, 160 program positives were confirmed as south Asian and 16 program negatives were also classified as south Asian, yielding a total of 176 south Asian cases (9.7%) in the final classification. Age-standardized incidence rates (ASR) and standardized incidence ratios (SIR%) for the main diagnostic groups are presented in Tables 1 and 2. Overall incidence rates were higher in south Asians (ASR 15.0) than non-south Asians (ASR 11.5) and higher in males than females for both south Asians (ASR 18.7 cf. 11.1) and non-south Asians (ASR 12.6 cf. 10.3). Standardized incidence ratios indicated a significant excess of south Asian cases for leukaemia (SIR 141), lymphoid leukaemia (SIR 141), lymphoma (SIR 172) and hepatic tumours (SIR 375) in both sexes combined, and for lymphoma (SIR 210), retinoblastoma (SIR 384)

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Table 1 Age-standardized incidence rates per 100 000 person-years (1990–92)

	South Asian			Non-south Asian		
Sex	***n***	**Rate**	**95%CI**	***n***	**Rate**	**95%CI**
Male	112	18.7	15.1–22.2	930	12.6	11.8–13.5
Female	64	11.1	8.3–13.9	713	10.3	9.5–11.0
Total	176	15.0	12.7–17.3	1643	11.5	10.9–12.1

Table 2 Age-standardized incidence rates per 10^5 person-years and standardized incidence ratios (1990–92)

		South Asian		Non-south Asian		SIR	
Diagnostic group	**Sex**	***n***	**Rate**	***n***	**Rate**	**Ratio**	**95%CI**
I. leukaemia	m	36	6.1	326	4.5	137	95–189
	f	28	4.9	236	3.4	146	97–212
	mf	64	5.5	562	4.0	141*	108–180
Ia. lymphoid leukaemia	m	30	5.2	265	3.6	140	94–201
	f	21	3.7	184	2.7	141	87–217
	mf	51	4.5	449	3.2	141*	104–186
II. lymphomas	m	23	3.8	128	1.7	210*	133–316
	f	4	0.7	57	0.8	84	22–215
	mf	27	2.3	185	1.3	172*	113–250
IIa. Hodgkin's disease	m	9	1.5	50	0.6	207	94–392
	f	1	0.2	22	0.3	52	1–290
	mf	10	0.8	72	0.5	159	76–293
IIb. non-Hodgkin's lymphoma	m	6	0.9	38	0.5	184	67–400
	f	1	0.2	19	0.3	65	1–364
	mf	7	0.6	57	0.4	146	58–301
III-XII. other groups	m	53	8.8	476	6.5	136*	102–179
	f	32	5.6	420	6.0	93	63–132
	mf	85	7.2	896	6.3	116	92–144
III. central nervous system	m	19	3.0	178	2.4	127	76–199
	f	11	1.8	175	2.5	76	37–137
	mf	30	2.4	353	2.4	102	68–146
IV. sympathetic nervous system	m	4	0.8	82	1.2	64	17–165
	f	5	0.9	53	0.8	121	39–283
	mf	9	0.8	135	1.0	87	39–165
V. retinoblastoma	m	7	1.3	24	0.3	384*	153–790
	f	0	0.0	23	0.3	0	0–170
	mf	7	0.7	47	0.3	195	78–402
VI. renal tumours	m	2	0.3	40	0.6	63	7–230
	f	2	0.4	40	0.6	65	7–235
	mf	4	0.4	80	0.6	64	17–165
VII. hepatic tumours	m	2	0.4	10	0.1	242	29–874
	f	2	0.3	3	0.0	837	100–3021
	mf	4	0.3	13	0.1	375*	102–961
VIII. malignant bone tumours	m	7	1.0	45	0.6	177	70–365
	f	2	0.4	41	0.6	56	6–204
	mf	9	0.7	86	0.6	120	54–228
IX. soft-tissue sarcomas	m	6	1.0	56	0.8	132	48–288
	f	5	0.9	45	0.6	136	44–317
	mf	11	0.9	101	0.7	134	66–239
X. germ cell	m	3	0.5	16	0.2	233	48–681
	f	3	0.5	17	0.2	211	43–618
	mf	6	0.5	33	0.2	222	81–483
XI. carcinoma	m	0	0.0	20	0.3	0	0–173
	f	1	0.2	19	0.3	61	1–342
	mf	1	0.1	39	0.3	30	0–166
XII. other/unspecified	m	3	0.4	5	0.1	727*	150–2125
	f	1	0.2	4	0.1	296	8–1647
	mf	4	0.3	9	0.1	531*	144–1360
total	m	112	18.7	930	12.6	147*	120–177
	f	64	11.1	713	10.3	110	84–141
	mf	176	15.0	1643	11.5	131*	112–152

*95%CI for standardized incidence ratio (SIR) does not include 100.

Table 3 Standardized incidence ratios (SIR) by main diagnostic group and 5-year age group

Diagnostic group		Male			Female			Total		
	Age group	*n*	SIR	95%CI	*n*	SIR	95%CI	*n*	SIR	95%CI
Leukaemia	0–4	18	142	84–225	12	122	62–213	30	133	89–191
	5–9	10	109	52–200	10	171	81–315	20	133	80–205
	10–14	8	177	76–350	6	175	64–382	14	177	96–297
	0–14	36	137	95–189	28	146	97–212	64	141*	108–180
Lymphomas	0–4	9	504*	230–957	1	70	2–391	10	311*	149–573
	5–9	7	160	64–329	1	94	2–524	8	146	63–289
	10–14	7	146	58–302	2	88	10–317	9	128	58–243
	0–4	23	210*	133–316	4	84	22–215	27	172*	113–250
Other groups	0–4	22	134	83–203	13	88	46–151	35	112	78–157
	5–9	15	127	70–209	8	88	38–175	23	110	69–166
	10–14	16	151	86–245	11	103	51–184	27	127	83–185
	0–14	53	136*	102–179	32	93	63–132	85	116	92–144
Total	0–4	49	159*	117–210	26	100	65–147	75	132*	103–166
	5–9	32	126	86–178	19	119	71–186	51	123	91–162
	10–14	31	156*	105–221	19	116	69–181	50	138*	102–182
	0–14	112	147*	120–177	64	110	84–41	176	131*	112–152

*95%CI for standardized incidence ratio (SIR) does not include 100.

and all diagnostic groups combined (SIR 147) in males. No significant differences were observed in south Asian females.

Standardized incidence ratios for the principal diagnostic groups by sex and 5-year age band are presented in Table 3. In the 0–4 age group, significant south Asian excesses were observed for males and both sexes combined for lymphoma (SIR 504 and 311) and all groups combined (SIR 159 and 132), and in the 10–14 age group for all groups combined (SIR 156 and 138). Again, there were no significant differences in south Asian females.

This study has identified a significant excess of childhood cancer among the south Asian population in England, predominantly due to higher rates in south Asian boys. It confirms previous reports, based on smaller regional data sets over longer periods, of an overall Asian excess (Powell et al, 1994) and of a higher proportion of male cases among Asians compared to non-Asians (Varghese et al, 1996). The pattern of type-specific occurrence in these data is also in keeping with previous studies, with higher south Asians rates reported for lymphoma (Powell et al, 1994; Varghese et al, 1996) and retinoblastoma (Parkes et al, 1994). This might be expected, as there is some overlap in the cases included in these studies, but approximately two-thirds of the cases in this series have not been previously reported and represent a larger population base. The finding of higher overall rates in south Asian children is in sharp contrast to the substantially lower overall cancer rate observed for south Asian adults compared to the non-south Asian adult population (Winter et al, 1999). Whilst subgroup variations may be important, they were not investigated because of insufficient numbers of cases and potential for misclassification.

While it is beyond the scope of this paper to attribute the excesses described in south Asian children to specific causes, the existing literature may provide clues to possible aetiologies. Large scale mixing of urban and rural populations has been associated with increases in childhood leukaemia and lymphoma (Kinlen et al, 1995). The higher rates of leukaemia in both male and female south Asian children could be construed as supporting this hypothesis, as it constitutes a significant excess in a migrant population largely originating from rural areas. Census estimates suggest that most of these cases will have been born in the UK but it is unlikely that their parents were (OPCS, 1993). The degree to which they can be regarded as an isolated population will be determined by their parents' level of contact with the dominant population. So genetic and other environmental causes must also be given due consideration. The striking excess of lymphoma among south Asian boys also requires explanation. The absence of a similar pattern for leukaemia argues against recording bias and it likely reflects an amplification of the excess seen in the general population.

Higher south Asian rates for hepatic tumours were observed in both children and adults (Winter et al, 1999). The link between hepatitis B infection and hepatocellular carcinoma is well established (Esteve et al, 1994) and a higher prevalence of hepatitis B infection has been reported in south Asian adults (Boxall et al, 1994). The contribution of hepatocellular carcinoma to the excess found in this dataset could not be established because histological coding was incomplete.

In the absence of self-ascribed ethnicity, attribution of south Asian ethnicity on the basis of names has been shown to be a feasible alternative (Nicoll et al, 1986; Cummins et al, 1999). With childhood cancers, the impact of misclassification resulting from the adoption of English names by south Asians is likely to be greater than for adult cancers. As the study protocol involved classifying doubtful names as non-south Asian, the consequence will have been to underestimate the true number of south Asian cases and misclassification of cases of mixed south Asian origin as south Asian will have been small. The excesses described therefore form minimal estimates. The broad consistency of the findings with those from previous studies using self-ascribed ethnicity to identify south Asian cases supports the validity of the methodology used.

Previous work suggests a transition towards higher western cancer risk in the migrant south Asian adult population (Winter et al, 1999) and this study confirms an excess cancer risk in south Asian children, the magnitude of which is probably of the order of 30–40% (Powell et al, 1994). The childhood excess is occurring in ethnic groups that display low cancer rates in the Indian subcontinent. While south Asians form a relatively small proportion of the

total English population, approximately 50 per cent are under the age of 25 and the number of children at risk will therefore increase substantially over the next few decades. The higher overall rates and leukaemia and lymphoma incidence in south Asian children should be a cause for concern and explanations sought. Existing studies (UKCCS, 2000) may be informative in this regard, although a well-designed case–control study in the south Asian population will probably be required to address the key aetiological questions. Areas for investigation should include population mixing (Kinlen et al, 1995), paternal smoking (Sorahan et al, 1997), breast-feeding (Shu et al, 1999) and infant feeding patterns (Lawson et al, 1998).

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