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Neuroblastoma incidence and survival in European children (1978–1997): Report from the Automated Childhood Cancer Information System project

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ABSTRACT

The Automated Childhood Cancer Information System (ACCIS) collects and presents data on childhood cancer in Europe. This report describes trends (1978–1997) and geographical differences (1988–1997) in incidence and survival for 6202 children with neuroblastoma from 59 registries in 19 countries, grouped into five regions (British Isles, West, East, North, and South). The age-standardised incidence rate (ASR) of neuroblastoma in Europe in 1988–1997 was 10.9 cases per million children, being highest in infants (52.6). The ASR of neuroblastoma increased in Europe from 8.4 in 1978–1982 to 11.6 in 1993–1997, mostly due to an increase in infants (from 35.4 to 57.8). Overall 5-year survival was 59%, ranging from 47% (East) to 67% (West). It improved markedly from 37% in 1978–1982 to 66% in 1993–1997, especially in infants. A certain amount of overdiagnosis in children under 2 years of age may explain the increased incidence rates and partially the increase in survival. Survival of older children (aged 2–14 years), which is likely to be largely affected by therapy, has also improved from 21% to 45%.

1. Introduction

Neuroblastoma is a typical example of an embryonal tumour of childhood.[1,2] In developed countries it is the most common tumour in infants (children aged less than 1 year), whereafter its occurrence decreases gradually with age; it is rare in school children and almost never seen in adolescents.

Neuroblastoma and related tumours (ganglioneuroblastoma and ganglioneuroma) arise from the neural crest cells that colonise sympathetic ganglia and adrenal medulla in foetal life. These neoplasms are a family of tumours characterised by an array of biological and clinical features ranging from spontaneous regression and the capability of differentiation to benign neoplasm in infants, but potentially aggressively

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disseminating in older children.[1,2] The aetiology of neuroblastoma is largely unknown.[1–4] The raised risks of being diagnosed with neuroblastoma in either early- or late-stage disease support the hypothesis that neuroblastoma consists of at least two distinct disease entities.[2,4]

Prognosis for neuroblastoma is related to extent of disease at diagnosis, infants with localised disease having the best chance of survival. Other prognostic factors are biological features, such as histopathology, tumour ploidy and *MYCN* amplification. These features are used clinically to assign neuroblastoma patients to risk groups with tailored therapeutic strategies.[1,2,5]

This dependence of survival on stage and age, together with the availability of a simple urine test for a tumour marker, made neuroblastoma seem an ideal, and thus-far only, candidate for screening.[1,6–10] Studies of the feasibility or effectiveness of neuroblastoma screening were carried out in England, France, Germany and North America in the 1990s.[9–12] Until recently, screening was mandatory in Japan. The results of the recent major evaluations of neuroblastoma screening led to a non-introduction in Germany and discontinuation of the screening programme in Japan.[13]

This paper presents incidence and survival rates for neuroblastoma among European children, diagnosed during 1978–1997 and made available in the framework of the Automated Childhood Cancer Information System (ACCIS), a collaborative project of 80 population-based cancer registries in 35 European countries.[14] In the interpretation of the observed geographical and temporal patterns of incidence and survival we consider screening activities as they occurred during the study period in the areas covered, as well as the insights into the nature of neuroblastoma gained from these screening studies.

2. Material and methods

Analyses are based on the ACCIS database, which is described in detail elsewhere [Steliarova-Foucher, Kaatsch, Lacour and colleagues, this issue]. The ACCIS Scientific Committee evaluated quality and comparability of the registry data-sets, using standard[15] and specific criteria for childhood data-sets. All cases of neuroblastoma (including ganglioneuroblastoma) as defined by diagnostic group IV (a) in the International Classification of Childhood Cancer[16] were included. The analyses are based on a grand total of 6202 neuroblastoma cases from 59 contributing registries in 19 countries. Details of coverage and data quality are presented in Table 1. Countries were grouped into five regions (North, British Isles, West, East, and South), according to geographical location combined with data availability (Table 1). The regional comparisons are based on the most recent 10-year period 1988–1997. Time trends are presented by 5-year periods from 1978 to 1997. Numbers of cases and data quality indicators for the time trend analyses are shown in Table 2. Variation in incidence is reported for age-groups 0, 1–4, 5–9, and 10–14 years. In addition, we also report survival results for the age group 2–14 years, which is outside the target age-range for screening and consists mostly of advanced stage cases.[1,2,6–9,11,12] In the absence of stage-specific information these data can be used as an indicator for changes in survival related to improvements in therapy.

Table 1 – Data-sets contributed by the European cancer registries for the analyses of neuroblastoma incidence and survival in children (age 0–14 years), with indicators of coverage, data quality, and follow-up (Source: ACCIS)

Region	Registry	Period	Time-trend	*n*	Basis of diagnosis			Survival analysis				Notes
					MV	DCO	Unknown	*n*	Closing date	FU > 5 years	Median	
					%	%	%			%	Years	
British Isles	IRELAND, National	1994–1997		18	94	0	0	18	31.12.1998	0	2.7	
	UNITED KINGDOM, England & Wales	1978–1995	+	1327	93	<1	<1	1309	31.1.2001	99	12.0	P Nb
	UNITED KINGDOM, Northern Ireland	1993–1996		9	67	0	0	9	31.12.1999	0	0.6	
	UNITED KINGDOM, Scotland	1978–1997	+	152	94	0	0	152	31.12.1999	85	8.7	
East	BELARUS, National	1989–1997		101	99	0	0	100	1.9.2000	70	6.5	P
	ESTONIA, National	1978–1997	+	45	98	0	0	42	31.12.1998	78	9.3	
	HUNGARY, National	1978–1997	+	428	97	–	0	423	1.1.2000	78	10.5	P
	SLOVAKIA, National	1978–1997	+	206	100	0	0	192	31.12.1997	65	6.7	
	GERMANY, NCR (only former East)	1978–1989	+	320	100	0	0	243	31.12.1987	61	6.3	S
North	DENMARK, National	1978–1997	+	156	97	1	<1	144	31.12.1997	84	11.4	
	FINLAND, National	1978–1997	+	184	100	0	0	178	31.12.1998	72	8.6	