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Review – Kidney Cancer

Regional Geographic Variations in Kidney Cancer Incidence Rates in European Countries

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Abstract

Context: Marked unexplained national variations in incidence rates of kidney cancer have been observed for decades in Europe.
Objective: To investigate geographic variations at the regional level and identify European regions with high incidence rates of kidney cancer.
Evidence acquisition: Regional- and national-level incidence data were extracted from the Cancer Incidence in Five Continents databases, local cancer registry databases, and local published reports. World population age-standardised rates (ASRs) were calculated for the periods 2003–2007 and 1988–1992. Rates by period and sex were compared using map visualisation.
Evidence synthesis: During 2003–2007, the highest ASR was found in the Plzen region, Czech Republic (31.4/100 000 person-years in men). Other regions of the Czech Republic had ASRs of 18.6–27.5/100 000 in men, with a tendency for higher rates in regions south of Prague. Surrounding regions, including eastern Germany and regions of Slovakia and Austria, had medium-to-high incidence rates (13.0–16.8/100 000 in men). Three other areas in Europe showed higher incidence rates in men compared with the rest of the continent: Lithuania, Estonia, Latvia, and Belarus (15.0–17.6/100 000); Iceland (13.5/100 000), and northern Italy (up to 16.0/100 000). Similar regional differences were observed among women, with rates approximately half of those observed in men in the same region. In general, these regional geographic variations remained stable over the periods 1988–1992 and 2003–2007, although higher incidence rates were detected in the Baltic countries in 2003–2007.
Conclusions: Several European regions show particularly high rates of kidney cancer incidence. Large variations were observed within countries covered by national healthcare systems, implying that overdetection is not the major factor.
Patient summary: We present regional geographic variations in kidney cancer incidence rates in Europe. We highlight several regions with high incidence rates where further studies should be conducted for cancer control and prevention.

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1. Introduction

With approximately 115 000 new cases diagnosed in Europe in 2012, cancer of the kidney, renal pelvis, and ureter (International Classification of Diseases [ICD]-10 code C64-66) combined is the seventh most common cancer and accounts for 3.3% of all new cancer cases diagnosed [1]. In this study, we considered kidney cancer arising in the renal parenchyma (C64), which comprises more than 90% of these three subtypes [2]. World population age-standardised incidence rates (ASRs) of kidney cancer have been shown to vary considerably across European countries [1–6]. For the period 2003–2007, the highest incidence rates in men were observed in the Czech Republic (22.1/100 000 person-years), Lithuania (17.6/100 000 person-years), and Estonia (16.0/100 000 person-years); the lowest incidence rates were observed in Cyprus (4.8/100 000 person-years), Serbia (6.1/100 000 person-years), and Bulgaria (6.7/100 000 person-years). The highest incidence rates in women were observed in the Czech Republic (9.9/100 000 person-years), Iceland (8.3/100 000 person-years), and Lithuania (8.1/100 000 person-years); the lowest incidence rates were observed in Cyprus (2.1/100 000 person-years) and Bulgaria (3.0/100 000 person-years) [2]. Although representing less than 1.5% of the total European population, the Czech Republic accounts for almost 3% of all kidney cancer cases diagnosed in Europe yearly [1].

These international geographic variations remain unexplained. In addition, a few regional reports have revealed intriguing variations in kidney cancer incidence rates within countries [7–10]. Systematic analyses of regional incidence rates have been sparse and have so far focused on northern Europe, where differences between national rates are moderate [11,12]. A review of the regional cancer registry data published periodically in the Cancer Incidence in Five Continents (CI5) series of monographs indicated that for the period 2003–2007, higher incidence rates in men were observed in eastern German registries adjacent to the Czech Republic, such as Brandenburg (16.1 per 100 000 person-years) and Mecklenburg-Western Pomerania (16.9 per 100 000 person-years), than in other German registries, such as Schleswig-Holstein (10.0 per 100 000 person-years) and Hamburg (10.1 per 100 000 person-years). Kidney cancer incidence rates observed in women showed similar variations. These data suggest a potential regional gradient in kidney cancer incidence rates across Europe.

Here we investigated geographic variations in kidney cancer incidence rates via map visualisation across 32 European countries as defined by the United Nations [13] and/or European Union member states (Supplementary Fig. 1). We identified several regions with remarkably high incidence rates. In addition, we estimated standardised incidence ratios (SIRs) to measure the changes in incidence rates from 1988–1992 to 2003–2007. Finally, regional geographic patterns of incidence were compared between these two periods.

2. Evidence acquisition

Most of the regional and national incidence data were extracted from the published CI5 series, volume VII (period 1988–1992) and latest published volume X (period 2003–2007) [2,3]. The CI5 monographs are released approximately every 5 yr and provide comparable high-quality statistics on the incidence of cancer recorded in population-based cancer registries worldwide.

In addition, incidence data from 10 regional registries in Germany, Poland, Spain, and Portugal were retrieved from data submitted to CI5 volume X. These data did not meet the stringent inclusion criteria of CI5 for European cancer registries, but we consider these were of sufficient quality to allow for geographic analysis. ASRs were computed using the world standard population proposed by Segi [14] and modified by Doll et al [15] as the reference population.

Additional regional incidence data were extracted from local published reports or local cancer registry databases. We obtained regional ASRs for 15 regional registries in the Czech Republic through the database of the National Oncological Register [7]; for six regional registries in Romania from the National Institute of Public Health in Bucharest (provided by co-author Dana Mates); for seven regional registries in the Free State of Bavaria, Germany from the database of the Population Based Cancer Registry Bavaria [16]; for eight Slovakian registries from published reports of the National Health Information Centre, Slovak Republic [17–21]; for 27 Ukrainian registries from published reports of the National Cancer Registry of Ukraine [22]; and for nine regional registries in Austria from published reports of Statistics Austria [23].

From these databases we extracted all cases coded as ICD-10 C64 (malignant neoplasms of kidney). Approximately 90% of malignant neoplasms of kidney are renal cell carcinoma, although C64 also comprises a few other histologic subtypes such as nephroblastoma [24].

All regional registries included in our analysis and the corresponding data sources are listed in Supplementary Table 1, which also highlights the exact periods covered when the periods 1988–1992 or 2003–2007 were not fully covered.

All sources used the world standard population proposed by Segi [14] and modified by Doll et al [15] to compute the ASRs, except for the nine Austrian registries, which used a slightly different reference population, the WHO standard population [25], for the two periods. To allow comparison of rates between Austria and other countries, we corrected the reported ASRs with a multiplicative factor calculated from the registry-specific ratios of ASRs using both reference populations, available for the period 1993–1997 from the European Network of Cancer Registries EUROCIM database (Supplementary Table 2) [26].

SIR and 95% confidence interval (CI) data [27] were used to measure changes in incidence rates from 1988–1992 to 2003–2007. Incidence data from all registries for the periods 1988–1992 and 2003–2007 and corresponding SIRs are given in Supplementary Table 3.

Spatial data for administrative regions were collected from the GADM database of global administrative areas [28]. The data were analysed and visualised using R v.3.0.3 statistical software [29].