Observation

Did the Chernobyl incident cause an increase in Type 1 diabetes mellitus incidence in children and adolescents?

To the Editor: The Chernobyl incident was a major humanitarian disaster, which has resulted in a plethora of health problems that are still far from being fully recognised. Most studies analysing the medical consequences of this catastrophe have so far focused on diseases such as thyroid cancer, leukemia, immune and autoimmune pathology [1, 5]. An increase in the incidence of Type 1 diabetes mellitus, a disorder involving the immune system, was observed within the residential population of Hiroshima among survivors of the atom bomb detonation [3]. A significant increase of Type 1 diabetes was also reported in infants in the Byelorussian Gomel region in the period between 1986 and 1999 [2]. Recent studies have also shown that thymectomy and a sub-lethal dose of gamma radiation induces Type 1 diabetes in rats [4]. Based on these observations, we analysed the relationship between radiation exposure arising from the Chernobyl incident and the development of Type 1 diabetes mellitus.

We conducted a long-term incidence study in two regions of Belarus with the same population size, genetics, ethnic, and environmental factors between 1980 and 2002 to estimate the most recent trends of the incidence dynamics of Type 1 diabetes in children and adolescents before and after the Chernobyl accident.

We selected two regions of Belarus, the areas surrounding the cities of Gomel and Minsk, to evaluate Type 1 diabetes incidence dynamics in children and adolescents between 0 and 18 years of age. The Gomel region received major doses of radiation exposure after the Chernobyl incident making it one of the most radioactively contaminated areas in Belarus. In contrast to Gomel, the Minsk region was only exposed to minimal significant radiation due to favourable meteorological conditions (such as wind speed and direction), so we chose Minsk as the control region. The total number of years the population is under the risk to develop Type 1 diabetes was 3,435,404 in Gomel and 3,181,129 in the Minsk region between 1980 and 1986, and 6,768,447 and 6,927,710, respectively, between 1987 and 2002. Other conditions, such as ethnic background, environmental factors and the system of diagnosing and reporting Type 1 diabetes are similar in the two regions from 1980 to 2002.

We collected data on the incidence of Type 1 diabetes between the years 1980 and 2002 from the final statistical reports of the local Type 1 diabetes incidence registers in Minsk and Gomel. The investigations have been carried out in accordance with the Declaration of Helsinki as revised in 2000. Case ascertainment and completeness were based on the capture-recapture method and estimated at 100%. Data concerning total population sizes in the Gomel and Minsk areas were obtained from the national statistical annuals. The incidence rate (IR) in each case was calculated per 100 000 inhabitants per year using 95% confidence intervals (CI). Trends in incident dynamics were analysed using a linear function as given in formula y=a+bx and using regression analyses.

A total of 945 patients with Type 1 diabetes with an onset of the disease at 0 to 18 years of age were included in the study. There were 643 patients residing in the Gomel region

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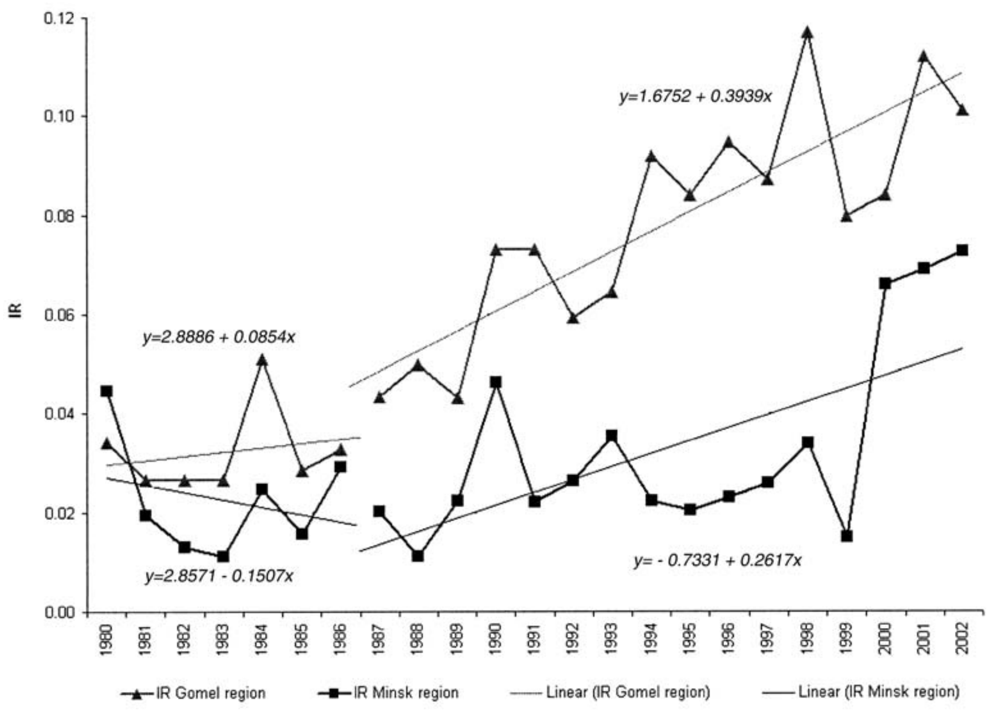

Fig. 1. Incidence of Type 1 diabetes mellitus in children and adolescents 0–18 years of age in Gomel and Minsk regions of Belarus, 1980–2002

Table 1. Incidence of Type 1 diabetes in children and adolescents of 0 to 18 years of age in the Belorussian Gomel and Minsk regions, 1980–2002

Year	Gomel region		Minsk region	
	Crude incidence rate (IR)	CI 95%	Crude incidence rate (IR)	CI 95%
1980	3.42	2.59–4.25	4.45	3.48–5.42
1981	2.64	1.91–3.37	1.95	1.30–2.6
1982	2.65	1.91–3.39	1.29	0.76–1.82
1983	2.66	1.92–3.4	1.11	0.61–1.61
1984	5.1	4.08–6.12	2.46	1.72–3.2
1985	2.85	2.09–3.61	1.56	0.97–2.15
1986	3.27	2.45–4.09	2.91	2.10–3.72
1980–1986	3.23	2.42–4.04	2.25	1.54–2.95
1987	4.33	3.38–5.28	2.01	1.34–2.68
1988	4.98	3.97–5.99	1.11	0.61–1.61
1989	4.31	3.37–5.25	2.22	1.52–2.92
1990	7.31	6.07–8.55	4.63	3.62–5.64
1991	7.31	6.06–8.56	2.2	1.50–2.9
1992	5.93	4.79–7.07	2.64	1.88–3.4
1993	6.44	5.24–7.64	3.54	2.65–4.43
1994	9.18	7.75–10.61	2.24	1.53–2.95
1995	8.4	7.02–9.78	2.04	1.36–2.72
1996	9.46	7.98–10.94	2.31	1.58–3.04
1997	8.71	7.28–10.14	2.59	1.81–3.37
1998	11.7	10.02–13.38	3.39	2.48–4.3
1999	7.97	6.56–9.38	1.49	0.88–2.1
2000	8.4	6.95–9.85	6.6	5.30–7.9
2001	11.2	9.57–12.83	6.9	5.56–8.24
2002	10.1	8.46–11.74	7.26	5.86–8.66
1997–2002	7.86	6.52–9.19	3.32	2.44–4.2

(male/female ratio, 0.94) and 302 patients in the Minsk region (male/female ratio, 1.09).

The results of our research did not show any significant differences in the incidence of Type 1 diabetes among children and adolescents between the two regions from 1980 to 1986, i.e. before Chernobyl (Fig. 1). The crude and adjusted incidence rates are shown in Table 1. During the 1980–1986 period, the average IR in the Gomel area was 3.23±0.33 (CI: 2.42–4.04), and 2.25±0.44 (CI: 1.54–2.95) per 100 000 inhabitants in the Minsk area. The coefficients of regression “b” were 0.09±0.18 in Gomel and –0.15±0.23 in Minsk. We verified a significant increase of Type 1 diabetes cases in the Gomel region in contrast to Minsk between 1987 and 2002 ($p<0.001$), with the IR up to 7.86±0.56 per 100 000 (CI: 6.52–9.19; b=0.39±0.08) in Gomel and 3.32±0.49 (CI: 2.44–4.2; b=0.26±0.09) in Minsk. Moreover, we have verified the significant increase of Type 1 diabetes incidence in the Gomel region after Chernobyl in comparison with the 1980–1986 period ($p<0.05$), while no such increase was observed in Minsk. The highest average incidence rate of Type 1 diabetes in the Gomel region was registered in 1998 (IR=11.7; CI: 10.02–13.38; Fig. 1, Table 1).

We thus have a significant and documented increase in the incidence of Type 1 diabetes in children and adolescents after Chernobyl in the radioactively contaminated area of Gomel compared to Minsk. The effect of radiation contamination on the development of Type 1 diabetes has been contained for a prolonged period, and has not yet reached its maximum. The data emphasise the need to analyse the epidemiology of Type 1 diabetes as it relates to environmental irradiation exposure.

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