

The incidence of Type 1 (insulin-dependent) diabetes mellitus in subjects aged 0–19 years in Luxembourg: a retrospective study from 1977 to 1986

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Summary. A decrease in the incidence of Type 1 (insulin-dependent) diabetes mellitus in the age group 0–14 years has been observed from north to south over north-western Europe. To evaluate whether this trend could be found in Luxembourg (a small country between the Netherlands and France) we performed a retrospective study over a period of 10 years. Information concerning all Type 1 diabetic patients (aged 0–19 years at diagnosis), diagnosed between January 1, 1977 and December 31, 1986 was obtained through paediatricians, internists, general practitioners and the Luxembourg Diabetes Association (LDA). The LDA was used as the ascertainment group (to estimate the real number and incidence of Type 1 diabetes mellitus). During the study period 91 Type 1 diabetic patients aged between 0–19 years

were diagnosed. An incidence of 11.2 was found in boys (0–19 years). Girls in the same age group showed a considerably lower incidence of 8.8. Standardised incidence (using as standard the world population) revealed an almost similar incidence in the Netherlands and Luxembourg (respectively 10.3 and 10.2) for the age group aged 0–14 years. In France a considerably lower incidence is found (3.6). To what extent different methodology contributes to the differences remains to be clarified. Further prospective studies are necessary to investigate the role of environmental and genetic factors.

Key words: Type 1 (insulin-dependent) diabetes mellitus, incidence.

Since the late 1970's the incidence of Type 1 (insulin-dependent) diabetes mellitus in subjects under the age of 20 years has been studied in different countries around the world [1–6]. In western Europe a decrease in incidence seems to be present from north to south [2]. Since the same genotypes of the major histocompatibility complex are found in association with Type 1 diabetes mellitus in most north western European countries, differences in environmental agents seem to play a major role [7–9]. Furthermore, in several countries the incidence of Type 1 diabetes has doubled or even tripled over the past three decades [2, 10–12]. In Midwestern Poland an apparent epidemic was observed in 1982–1984 [13]. For further identification of possible environmental risk factors the development of registries for Type 1 diabetes mellitus world wide has been stressed by LaPorte et al. (Diabetes Epidemiology Research International) [12]. Luxembourg is a small country (366,150 inhabitants) situated between the Netherlands and France and between Belgium and Germany.

To evaluate whether the incidence of Type 1

diabetes mellitus in Luxembourg shows a decrease compared with the northern European countries, we performed a retrospective study over a period of 10 years. We feared that a longer study period might influence the completeness of the recruitment, since no national diabetes register is available in Luxembourg. The health care system provides for hospitalisation of most newly-diagnosed Type 1 diabetic patients either in a paediatric unit or a unit of internal (endocrinology or diabetology) medicine.

Subjects and methods

A questionnaire was sent to specialists (paediatricians, $n=34$, and internists $n=88$) and general practitioners ($n=225$). Most patients were expected to have been hospitalised at diagnosis. Since Luxembourg is a small country with a limited number of specialists and clinics (there is only one paediatric clinic) it seemed feasible to obtain an answer from most specialists. However, to reduce any risk of missing newly diagnosed patients we also included general practitioners (GP's). They were asked to give initials or name, sex, date of birth, month and year of the first insulin injection and nationality of the Type 1 diabetic patients, who were diagnosed between Jan-

Table 1. Observed number of newly diagnosed Type 1 (insulin-dependent) diabetic patients over a ten-year period in Luxembourg (January 1, 1977-December 31, 1986)

	Age group (years)								Total	
	0-4		5-9		10-14		15-19		Female	Male
	Female	Male	Female	Male	Female	Male	Female	Male		
1977	0	2	2	1	0	1	1	3	3	7
1978	2	1	0	4	1	0	2	0	5	5
1979	1	0	2	1	1	3	0	2	4	6
1980	2	2	2	3	1	2	2	0	7	7
1981	1	0	0	1	1	0	1	1	3	2
1982	0	1	0	1	2	3	1	0	3	5
1983	0	0	0	1	0	3	1	0	1	4
1984	1	1	1	0	2	1	2	0	6	2
1985	1	0	2	0	2	2	1	2	6	4
1986	0	0	1	3	0	3	1	3	2	9
Total	8	7	10	15	10	18	12	11	40	51

Table 2. Ascertainment percentages and estimated numbers of newly diagnosed patients during the study period, calculated for the different age groups (all children: 0-4, 5-9, 10-14 and 15-19 years; boys and girls: 0-14, 0-19 years)

Age group (years)	Ascertainment percentage	Estimated number of new patients	Estimated SD
0-14			
Male	90	42.0	2.1
Female	100	28	0
0-19			
Male	92	53.5	2.6
Female	100	40	0
0-4	100	15	0
5-9	83.3	27.6	2.7
10-14	100	28	0
15-19	100	23	0

Table 3. Estimated incidence and standardised incidence (using the world population as standard) of Type 1 diabetes mellitus in male and female subjects (aged 0-19 years) in Luxembourg

Age group (years)	Estimated incidence (per year, per 100,000)	Estimated SD (per year, per 100,000)	Standardised incidence (per year, per 100,000)
0-14			
Male	12.4	0.6	12.4
Female	8.7	0	8.6
0-19			
Male	11.2	0.5	11.3
Female	8.8	0	8.7
0-4	7.3	0	7.2
5-9	12.9	0.1	13.2
10-14	11.6	0	11.6
15-19	8.5	0	8.5

January 1, 1977 and December 31, 1986 and who were under the age of 20 years at the time of their first insulin injection. The same information was also obtained through another group - the Luxembourg Diabetes Association, as suggested by LaPorte et al. - in order to assess the completeness of the data, received through the specialists

and the GP's [12]. All diabetic patients, both Type 1 and Type 2 (non-insulin-dependent), as well as family members or interested persons can become members of this Association. A questionnaire was sent to all members of the Luxembourg Diabetes Association (LDA) ($n=494$).

Statistical analysis

To determine the degree of completeness of our data, we performed an ascertainment survey. The estimation of corrected numbers of new patients was based on the capture/recapture census as described by Bishop and colleagues and Sekar and Deming [14, 15]. Ascertainment percentages were calculated using the data obtained through specialists and GP's versus those from the LDA.

It was assumed that the two groups provided the information independently. The number of new cases during the study period and the incidence per age group (0-4 years, 5-9 years, 10-14 years and 15-19 years) and per sex were estimated using the two groups. In order to compare the data from Luxembourg with other countries a standardised incidence was calculated, using the world population as standard population [16]. Detailed information on the distribution of the population of Luxembourg during the entire study period was provided by the Ministry of Economic Affairs of Luxembourg (STATEC).

Results

After two questionnaires and one phone call 100% of the paediatricians, 89% of the internists and 91% of the general practitioners answered the questionnaire. From 56% of the members of the Diabetes Association an answer was obtained. Ninety-one Type 1 diabetic patients were reported over the period of 10 years (Table 1).

Ascertainment percentages and the estimated numbers of new cases during the 10 years of the study are given for different age groups in Table 2. The estimated incidence and the standardised incidence are given in Table 3.

Children under the age of 5 were all reported by the specialists. Two children were recruited only

through the ascertainment group. The highest incidence was found in the age group from 5–9 and 10–14 years. Male subjects showed a higher incidence compared with female subjects, especially in the age group 5–14 years. Sixteen percent of children were not of Luxembourg nationality; they were Dutch, Danish, French, Italian or Portuguese. All children, however, had been living at least half a year in Luxembourg before Type 1 diabetes was diagnosed. During the study period the annual emigration percentage for children between 0–19 years varied between 1.3 and 1.7% (mean over 10 years, 1.4%). Immigration percentages varied between 1.5 and 1.9% during the study period with a mean of 1.7%.

In 17% of the reported cases only the year of diagnosis was given. During the summer months the incidence seemed slightly lower (only 13% of the new cases were detected in June, July and August), but no significant peaks were observed.

Standardised incidence of Type 1 diabetes mellitus in children between 0–14 years showed almost identical results for Holland and Luxembourg (respectively, 10.3 and 10.2) and a much lower rate for France (3.6) [2, 4].

Discussion

The incidence of Type 1 diabetes in children of different age groups living in Luxembourg is very comparable with the incidence found in the Netherlands. A considerably lower incidence is observed in France. This suggests that environmental factors in Holland and Luxembourg are more alike compared with France [8, 9]. The influence of a different methodology cannot be excluded since our methods were compared with the Dutch study (recruitment through doctors and ascertainment through the Diabetes Association).

The difference in incidence between France and Luxembourg seems to confirm the presence of a decrease from north to south over western Europe [4, 17]. However, a recent prospective Italian study reported an incidence of 8.3 in the age group 0–19 years [18]. Since no information on the age structure of their population is given it is difficult to compare the results. The Diabetes Epidemiology Research International Group showed an inverse relationship between the incidence of Type 1 diabetes mellitus in different countries around the world and temperature; and suggested a possible relationship between different temperatures and the incidence of viral infections [19]. Although the mean annual temperature even in Northern France (Meurthe and Moselle) is slightly higher than that observed in Luxembourg (e.g. 1987, 9.3°C versus 7.9°C) further study is necessary to elucidate the importance of this observation. In previous studies a slightly higher incidence in boys has been reported [12,

19]. We observed an important male excess especially in the age group 5–14 years. Only in Scotland similar data were found (1.4:1, boys versus girls) [20]. We have no explanation for this difference. A temporal trend, clearly demonstrated in several countries, was not observed in Luxembourg [2, 10–12]. The study period was probably too short and the number of patients too small to evaluate this phenomenon. Recently, Kurtz et al. reported that the overall prevalence of Type 1 diabetes did not increase [21]. They found that the disease was detected more frequently at an earlier age. To evaluate the temporal trend as well as the differences in incidence over western Europe prospective incidence studies are necessary. As stressed by the Diabetes Epidemiology Research International Group these studies performed in different countries should be based on comparable methods and should include environmental and genetic factors in order to elucidate the role of the environment in the aetiology of Type 1 diabetes mellitus.

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