

CLINICAL AND PUBLIC HEALTH SIGNIFICANCE OF CHILDHOOD TYPE 1 DIABETES

Type 1 diabetes is one of the most common endocrine and metabolic conditions in childhood. Treatment is life-saving and lifelong, it is painful and time-consuming, it interferes with daily life, requires self-discipline and a balanced diet.

Many children and adolescents are unable to cope emotionally with their diabetes, diabetes causes them embarrassment, results in discrimination and limits social relationships. It may impact on school performance, on family functioning and it can lead to family disruption and divorce.

Parents experience financial burden, they may have to reduce their working hours or give up work entirely in order to care for the child. The financial burden may be enhanced by the expenses of new treatment and monitoring modalities such as insulin pumps and continuous, real time (interstitial) glucose monitoring, the cost-effectiveness of which are less well-documented as compared to adults with type 1 diabetes.

MAPPING THE GLOBAL TRENDS IN INCIDENCE OF TYPE 1 DIABETES

Two international collaborative projects, the Diabetes Mondiale study (DiaMond) and the Europe and Diabetes study (EURODIAB) began in the 1980s and have been instrumental in monitoring trends in incidence through the establishment of population-based regional or national registries using standardized definitions, data collection forms and methods for validation.

GLOBAL VARIATION IN INCIDENCE

The first important result of the establishment of the international (and national/regional) registries was the recognition of the extremely wide global variation in the incidence of childhood type 1 diabetes. The overall standardized incidence varies from 0.1/100 000 per year in the Zunyi region within China to more than 40/100 000 per year in Finland¹. This represents an approximately 400-fold variation in incidence in the over 100 populations/countries studied².

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Europe has by far the most complete and reliable data. Many countries have registries that either are nationwide or cover several different parts of the country. European countries show the broadest range of incidence rates. The incidence rate is highest in populations in Europe or in populations of European origin (e.g., USA, Canada, Australia, and New Zealand)¹.

In Europe, a north-south gradient has been described^{3,4}, with Sardinia as an outlier being 3000 km south of Finland and having a similarly high incidence rate.

- *Africa*. Published rates are available only in very few countries in Africa. Furthermore, tropical and malnutrition diabetes may account for a proportion of cases. The incidence in this region is generally low.
- *Eastern Mediterranean and Middle East*. The incidence varies between 1/100 000 per year (Pakistan) and 8/100 000 per year (Egypt)².
- *North America*. Rates for only a few countries are available, but these provide estimates for the three largest countries. USA (16.1/100 000 per year) and Canada (21.7/100 000 per year) have incidence rates similar to Northern Europe, but the incidence in Mexico is low (1.5/100 000 per year)².
- *South and Central America*. The incidence in this region is generally low except for some South American countries, e.g., Argentina (6.8/100 000 per year) and Uruguay (8.3/100 000 per year)².
- *Southeast Asia*. Only two countries, India and Mauritius, have published rates. Two sources for India are available, both from Urban Madras, and therefore not representative of the country as a whole. The first study showed an incidence rate of 4.2/100 000 per year, and the rate in the second study was more than double as compared with that in the first². The incidence in Mauritius was low (1.4/100 000 per year)².
- *Western Pacific*. With the exception of Australia and New Zealand, the incidence in this region is uniformly low. China, the world's most populous country, has one of the lowest incidence rates in the world¹.

Detailed tabulation of the worldwide incidence rates can be found in the IDF ATLAS² and DIAMOND report¹.

The explanation for the wide disparities in incidence between populations and ethnic groups could be the differences in the distribution of genetic susceptibility markers, differences in the distribution of environmental disease determinants, or the combination of both.

WITHIN-COUNTRY VARIATION IN INCIDENCE

In many countries having data from more than two registries, a marked within-country variation in incidence has been reported. The variation in incidence in the four Italian regions participating in EURODIAB was more than fivefold⁴. This large difference was mainly because of the very high incidence in the Mediterranean

TABLE 1. The incidence of childhood type 1 diabetes in Spain (per 100 000 per year)^{5,6}

Navarra	9.5
Catalonia	11.5
Galicia	17.6
Castilla-León	22.1
Ciudad Real	26.0
La Palma island	31.6

island of Sardinia as opposed to other mainland Italian regions. The important within-country differences in incidence have been reported for other countries as well. In Spain, the variation in incidence among the regions are more than threefold^{5,6} (table 1).

AGE-SPECIFIC INCIDENCE

In general, the incidence increases with age, the incidence peak is at puberty with the associated gender effect¹. The pooled data of the DIAMOND group have demonstrated that the 5 to 9-yr olds had 1.62 (95% confidence intervals 1.57-1.66) times higher risk, and the 10 to 14-yr olds had 1.94 (1.89-1.98) times higher risk as compared with the 0 to 4-yr olds¹. After the pubertal years, the incidence rate significantly drops in young women but remains relatively high in young adult males up to the 29-35 yr of age⁷.

SEX-SPECIFIC INCIDENCE

Unlike the other common autoimmune diseases of childhood such as thyrotoxicosis and Hashimoto's thyroiditis, which affect mainly girls, type 1 childhood diabetes does not show a female bias. The overall sex ratio is roughly equal in children. A minor male excess in incidence have been reported in Europe and in populations of European origin and a slight female excess in populations of African or Asian origin¹. There is a weak association between male sex and high incidence: populations with an incidence higher than 23/100 000 year have a male excess and populations with an incidence lower than 4.5/100 000 per year have a female excess. In contrast to children, however, male excess is a constant finding in type 1 diabetes populations of European origin 15-40 yr of age⁷.

INCREASING INCIDENCE AMONG THE YOUNG

The incidence of childhood onset type 1 diabetes is increasing in many countries in the world. There are clear indications of geographic differences in trends but the overall annual increase is estimated around 3%. There is some indication that incidence is increasing more steeply in some of the low prevalence countries

such as those in Central and Eastern Europe. Moreover, several European studies have suggested that in relative terms, increases are greatest in young children⁸.

The clinical implications of a decreasing age at diagnosis are severalfold. Diagnosis may be delayed or missed because of the subtle and misleading symptoms. Ambulatory initiation of treatment may not be possible leading to more costly hospitalisation. Presentation ketoacidosis is more frequent as compared to older age groups and these children face long prepubertal years with hyperglycemia with the risk of early development of micro- and macrovascular complications.

Conflict of interest

The author declares he has not conflict of interest.

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