

Type 1 Diabetes (T1DM) in children and adolescents of immigrated families in Emilia-Romagna (Italy)

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Abstract. *Background and aim of the work:* The etiology and natural history of T1DM are still unknown but certainly both genetics and environmental factors contribute to the development of the disease. Migration studies are an important tool to better understand the role of the environment. The aim of this study was to investigate some variables in diabetic children of immigrant families living in Emilia-Romagna compared with Italian diabetic children living in the same region. *Methods:* We recruited 73 diabetic children from immigrant families and 707 Italian diabetic children. All children were cared by Pediatric Diabetes Units of Emilia-Romagna (10 centers). The investigated variables were: gender, current age, place of birth, parents' country of origin, age at diagnosis, HbA1c and insulin regimen. *Results:* No significant difference with reference to gender neither among the two ethnic groups, nor in the current mean age was observed. Mean age at diagnosis in the Italian children was lower than in immigrant patients born outside Italy -group A- (7.4 vs. 9.6, $p < 0.000$) and higher compared to those born in Italy - group B- (7.4 vs. 5.7 $p < 0.003$; A vs. B $p < 0.000$). The immigrant patients showed higher mean HbA1c than Italian patients (8.8 vs. 8.2, $p < 0.009$). *Conclusions:* A younger age at diagnosis of T1DM in immigrant children, born in Italy compared with those born in the country of origin, and with Italian patients, suggests the existence of some environmental determinants acquired with a more westernised lifestyle. Immigrant children have significantly poorer metabolic control compared with western patients. (www.actabiomedica.it)

Key words: Type 1 diabetes, children, immigrant, age at diagnosis, metabolic control

Introduction

The incidence of type 1 diabetes (T1DM) is rapidly rising in children. In 2006, the International Diabetes Federation estimated a total of 440,000 children aged 0-14 years affected by type 1 diabetes, with an annual increase of 3% per annum and 70,000 newly diagnosed cases every year. No region is exempt from T1DM. The highest prevalence of T1DM is in

South East Asia and Europe followed by North America, Eastern Mediterranean and Middle East, Africa, South and Central America, Western Pacific (1). The etiology and natural history of T1DM are still unknown, although both genetics and environmental factors contribute to the development of the disease. The geographical variation and the increasing incidence of T1DM cannot solely be explained by genetics, but environmental factors certainly influence

Table 1. Characteristics of Italian diabetic children and immigrant diabetic children

	Italian (91%)	Immigrant (9%)	p
Gender:			
M (%)	356 (50,6%)	34 (46,6%)	n.s.
F (%)	351 (49,4%)	39 (53,4%)	
Current mean age (range)	13,3 (1,5-23)	13,4 (6,15-23)	n.s.
Mean age at diagnosis (range)	7,4 (0,8-17)	7,8 (1-15,5):	n.s.
		A) Born outside Italy (52%) 9,6	p < 0,000
		B) Born in Italy (48%) 5,7	p < 0,003
			A vs. B p < 0,000
Mean HbA1C % (range)	8,2 (4,7-14,3)	8,8 (4,3-15,9)	p < 0,009

those with a genetic predisposition. Fewer than 10% of genetically susceptible subjects develop T1DM, arguing for a modifying role of the environment in the initiation or acceleration of islet autoimmunity. The contribution of the environment can also be gauged on the basis of an observed concordance for disease of only 30-40% in identical twins (2). The causes are not yet completely understood, although various factors have been proposed such as rapid growth in early childhood, early exposure to certain food constituents (e.g. cow's milk hypothesis), enterovirus infection, chemicals and reduced exposure in early childhood to infective agents that contribute to the development of a healthy immune system (the "hygiene hypothesis") (3, 4).

During the last years we observed an increased immigration from developing countries to Europe. In 2006 in Emilia-Romagna, one of the 20 regions of Italy, as in the other European countries, the number of immigrants was 6.9% of the total population, of which 21.7% were children. At the same time we observed an increase in the number of diabetic children from immigrant families attending our Pediatric Diabetes Units (Table 1).

In the light of these considerations we decided to carry out a diabetes migration study (5).

Materials and methods

The aim of this study was to investigate some variables (sex, age, age at diagnosis, metabolic control) in diabetic children of immigrated families living in Emilia-Romagna compared with Italian diabetic children living in the same region.

We recruited 73 diabetic children from immigrant families and 707 Italian diabetic children with DMT1. The diagnosis was done at least 1 year before the study (Figure 1). All children were cared by Pediatric Diabetes Units of Emilia-Romagna (10 centers: Bologna, Ferrara, Modena, Reggio-Emilia, Parma, Forli, Cesena, Ravenna, Rimini and Imola). We included all immigrant children, who were adopted or living with their parents and were born in Italy or in the country of origin. Children were excluded when their immigrant parents came from a country of Western Europe (Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Norway, Portugal, Spain, Sweden, Switzerland, the Netherlands and the United Kingdom), North America or Australia. Out of the immigrant families 49.3% came from North Africa, 24.7% from East Europe, 13.7% from Asia, and the other ones from Sub-Saharan Africa (5.5%), South America (4.1%) and the Middle East (2.7%)

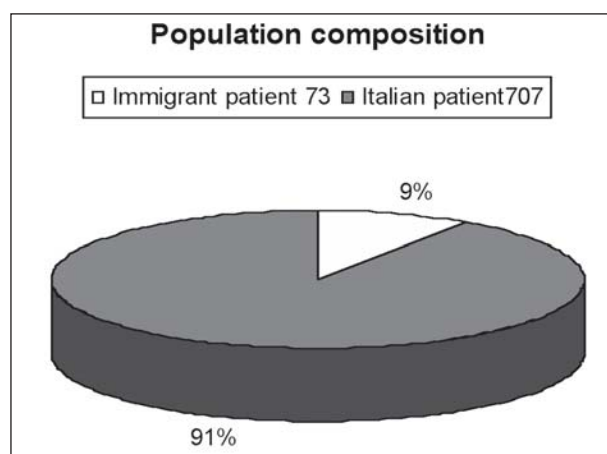


Figure 1. Total number and nationality distribution of diabetic children collected in our study

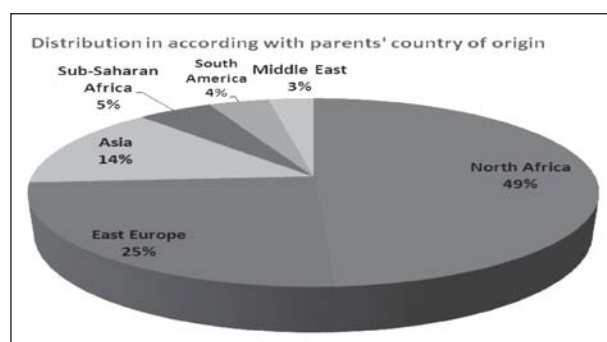


Figure 2. Origin nationality of diabetic immigrant children collected in our study

(Figure 2). Out of the immigrant children 11% had only one immigrant parent (father or mother), 89% both.

Data were collected through a questionnaire sent to all Paediatric Diabetes Units of Emilia-Romagna in December 2006. The variables investigated in diabetic immigrant children and in diabetic Italian children were: gender, current age, place of birth, parents' country of origin, age at diagnosis, glycated haemoglobin (HbA1c), and number of insulin injection per day. The characteristics of ethnic groups were described using proportions and means with range, and analysed using χ^2 test or t-test two tails as appropriate; nonparametric data were analyzed by Mann-Whitney U test. A $p < 0.01$ was accepted as statistically signifi-

cant. A multiple linear analysis was used to test the correlations between glycated haemoglobin and ethnic group, age at diagnosis of diabetes and duration of disease. Analyses were performed using SPSS.

The study was performed after informed consent of Diabetic Associations involved in survey and in accordance to Helsinki Declaration (6).

Results

The results are shown in Table 1. In the whole diabetic group 91% were Italian and 9% were immigrant. No significant difference with reference to gender neither among the two ethnic groups, nor in the current mean age was observed.

Out of the immigrant patients 52% were born outside Italy (group A) and 48% were born in Italy (group B).

Mean age at diagnosis in Italian children was 7.4 years (0.8-17), higher than in children of group B ($p < 0.003$) and lower compared to those of group A ($p < 0.000$). In particular at onset of T1DM immigrant children born in Italy were younger than those born in their countries of origin and that had immigrated after birth (mean age 5.7 vs. 9.6 years, $p < 0.000$).

All patients used almost three insulin injections per day. The majority of patients received 4 insulin injections per day (71.2% of the Italian population versus 50% of the immigrant population). The remaining patients were treated at least with 3 insulin injection per day: 21.9% of the Italian population versus 43.7% of the immigrant population. Six percent of patients were treated with subcutaneous insulin pump infusion with five insulin injections per day: no statistical differences were observed between the Italian and immigrant group.

The immigrant patients showed a higher percentage of HbA1c than the Italian patients (8.8 vs. 8.2, $p < 0.009$).

The multiple linear regression analysis showed that the age at diagnosis and disease duration significantly influenced the HbA1c value in both groups ($p = 0.001$ and 0.000 respectively); and confirm that the Italian group had a better HbA1c than the immigrant group ($p = 0.000$).

Discussion

The younger age at diagnosis of T1DM in immigrant children born in Italy compared to Italian children and those born in developing countries is reported by other authors (7). These findings suggest that environmental determinants hasten the onset of type 1 diabetes in immigrant children born in a more developed country like Italy. A younger age at diagnosis of T1DM is generally considered as a marker suggesting a more aggressive impact of the environment on susceptible individuals (4). Furthermore other migration studies show an increasing incidence rate of T1DM after immigration (8, 9). This condition suggests the possible presence of environmental determinants due to a more westernized lifestyle, probably exercising their action during pregnancy or first years of life in Italy. Some authors suggest that frequent infectious diseases, parasite infestation and intestinal biota in the country of origin may be protective against T1DM (10, 11).

Another important outcome of our study is that the immigrant children have significantly poorer metabolic control compared with Italian patients. Other authors found the same findings (12, 13). Having a different ethnic background is often described as being a risk factor for poor metabolic control (14, 15), but whether the risk is represented by the ethnicity itself or in combination with other factor remains unclear. According to some studies the risk factor for a bad metabolic control is associated with a poorer quality of life (13). Moreover, ethnic-minority parents more often report problems in their relationship with the health care professionals and they have different beliefs about health and health care compared to native-born parents. Mutual understanding and consequently compliance is often poor in consultations with ethnic-minority parents than with native-born parents (16). Some Authors suggest that limited educational background, insufficient skills regarding language, different cultural health beliefs, as well as a frequently marginalized social position may represent serious barriers to achieve good metabolic control. Education of immigrants with diabetes should be adjusted to make allowances for limited schooling and professional education in many families, and needs to include basic knowledge of the religion, cultural background

and perceptions of health and sickness of individual patients. Speaking a language in an intelligible way does not necessarily mean that a person is able to understand concept such as anatomy and physiology, and professional interpreters should be used in diabetes education with these groups (12).

Conclusion

Our investigation confirms the findings already reported in the literature:

1. A younger age at diagnosis of T1DM in immigrant children, born in Italy compared with those born in the country of origin, and with Italian patients, suggests the existence of some environmental determinants acquired with a more westernised lifestyle.
2. Immigrant children show significantly poorer metabolic control compared with western patients.
3. The metabolic control in immigrant patients was worst compared to Italian diabetic children and was no related to the number of insulin injection per day. Therefore a strict patient surveillance is needed associated to educational diabetic programmas.

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