

Importance of environmental risk factors for development of childhood pre-diabetes in Lithuania

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Abstract

Purpose: To study what environmental factors predict islet cell autoantibodies (ICA) seroconversion in healthy schoolchildren.

Material and methods: Sera from 3053 non-diabetic schoolchildren living in Kaunas region of Lithuania were investigated for ICA autoantibodies. ICA were measured in undiluted sera by an indirect immunofluorescence method. Data from 13 ICA positive and 90 ICA negative schoolchildren were included in the analysis. Information on environmental factors was collected via questionnaires.

Results: The ICA positive schoolchildren tended to be more frequently breastfed than ICA negative (92.3% and 87.8%, respectively, $p=0.63$). ICA negative children were more frequently exclusively breastfed during the period of first month than ICA positive children (96.2% and 83.3% respectively, $p=0.07$). Allergy to cow's milk occurred more frequently among ICA positive than among ICA negative children ($p=0.05$). Mothers of cases took medicine during pregnancy more often, than mothers of controls ($p<0.001$). ICA positive children with neonatal icterus more often were treated with phototherapy and blood transfusions ($p=0.03$). 53.8% of ICA positive children lived in homes where family members were smoking indoors while this was recorded only for 27.8% controls ($p=0.06$).

Conclusion: Certain environmental factors have earlier been identified as risk factors for development of diabetes, and we can confirm that some of these factors increase the risk of developing ICA among Lithuanian children. Intake of medicine during pregnancy and indoor smoking of family members belong to the risk factors.

Key words: pre-diabetes, schoolchildren, environmental factors, islet cell autoantibodies (ICA).

Introduction

Type 1 (insulin-dependent) diabetes is an autoimmune disease caused by the selective destruction of the insulin-producing pancreatic β -cell [1]. Islet cell autoantibodies (ICA) are markers of the ongoing β -cell damage during the asymptomatic prodromal period called pre-diabetes or pre-clinical diabetes [2]. Onset of type 1 diabetes is determined by genetic predisposition and environmental factors. The environmental risk factors generally found are short duration of breast feeding, early introduction of cow's milk and other food such as flour, eggs, meat [3-5]. Other factors such as maternal age, pregnancy period, baby infections [3] may also play a role in development of diabetes.

The aim of this study was to analyze whether risk factors related to type 1 diabetes also influence the development of childhood pre-diabetes in Lithuania.

Material and methods

Sera were collected under non-fasting conditions from 3053 non-diabetic schoolchildren living in Kaunas region of Lithuania [6]. The median age of children was 11.7, range 5.5-15 years. ICA were measured in undiluted sera by indirect immunofluorescence [7]. Data from 13 (6 boys and 7 girls) ICA positive and 90 (44 boys and 46 girls) ICA negative schoolchildren were included in the analysis. The mean age was 15.6 ± 2.1 years for ICA positive and 15.5 ± 2.2 years for ICA negative schoolchildren. The children and their parents were asked to fill questionnaires at provided the same time as blood samples were collected. The questionnaires gave information about pregnancy, neonatal period, duration of exclusive and total breast feeding, time of introduction of cow's milk, flour, meat, eggs and other solid foods. Questions regarding social factors, child infections were included as well [5].

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Figure 1. Prevalence of exclusive breastfeeding among ICA positive and ICA negative schoolchildren up to the age of 7 months

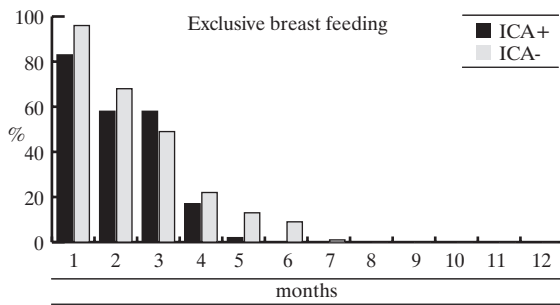
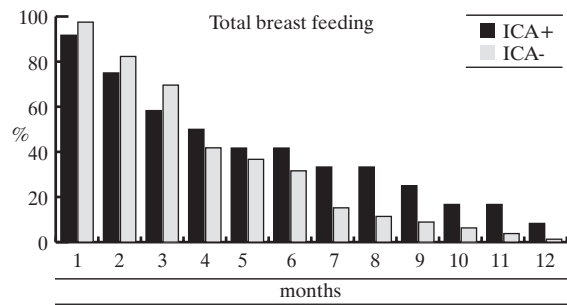


Figure 2. Prevalence of total breastfeeding among ICA positive and ICA negative schoolchildren up to the age of 12 months



Results

The ICA positive schoolchildren tended to be more frequently breastfed than ICA negative (92.3% and 87.8%, respectively, $p=0.63$). Prevalence of exclusive and total breastfeeding up to the age of 12 months is presented in Fig. 1 and 2.

Average age at introduction of cow's milk was the same in both groups (4.9 months). However cow's milk was introduced at the age of 3 months or earlier twice more frequently for cases than for control children (25% and 13.8%, respectively, $p=0.31$). Allergy to cow's milk occurred significantly more often among ICA positive than among ICA negative schoolchildren (23.1% and 6.7%, respectively, $p=0.05$).

Mothers of cases statistically significantly more often took medicine during pregnancy (61.5% and 13.3%, $p<0.001$). Icterus in neonatal period was recorded somewhat more often for cases (23.1%) than controls (14.4%), $p=0.42$. ICA positive children with icterus significantly more often were treated with phototherapy and blood transfusions than ICA negative (33% and 0%, respectively, $p=0.03$). 53.8% of ICA positive children lived at homes where family members were smoking indoors while this was recorded only for 27.8% of controls, $p=0.06$.

Discussion

Short duration of breast feeding is a well-known risk factor for type 1 diabetes [5]. Our data showed that duration of breast feeding had an impact on the development of pre-diabetes. Early introduction of cow's milk can increase the risk of type 1 diabetes mellitus [3,5]. In the present study we did not detect significant results, but cow's milk was introduced before the fourth month twofold more often in ICA positive schoolchildren than in ICA negative. However, ICA positive children had allergy to cow's milk significantly more often than ICA negative, which in fact should lead to lower consumption of cow's milk later.

Mother's infections during pregnancy period, pre-eclampsia, blood group incompatibility are factors that might release autoimmune β -cell destruction [4,8]. Our data show that mothers of ICA positive children significantly more often took medicine during pregnancy infections may initiate an immune process in pancreas. Icterus in neonatal period was recorded

more frequently between cases in our study. Treatment with phototherapy and blood transfusions could initiate the slowly progressing autoimmune process, later β -cell destruction and pre-diabetes [8]. We have obtained interesting data about smoking. The family members of 58.3% of ICA positive children were smoking indoors compared to only 27.8% of ICA negative children. Indoor and outdoor smoking, tobacco smoke exposure and its impact on children's health has been investigated in Sweden [9].

In conclusion, certain environmental factors have earlier been identified as risk factors for development of diabetes, and we can confirm that some of these factors increase the risk of developing ICA among Lithuanian children. Intake of medicine during pregnancy and indoor smoking of family members belong to the risk factors.

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