

A lower prevalence of atopy symptoms in children with type 1 diabetes mellitus

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Summary

Background The Th1/Th2 concept is a model to understand the pathophysiology of certain diseases. Atopic diseases (asthma, eczema and hayfever) are characterized by a chronic inflammatory reaction that is dominated by Th2 cells, and type 1 diabetes mellitus (DM) is Th1 cell dominated. Because it is known that Th1 and Th2 cells reciprocally counteract each other, it can be speculated that the prevalence of Th2-mediated disease is lower in patients with Th1-mediated disease.

Objective To compare the prevalence of atopic diseases between children with DM and age-matched controls.

Methods Parents of children with DM were requested by Dutch paediatricians to complete the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire on the prevalence of atopic diseases. A control group was derived from a Dutch cross-sectional survey (the ISAAC2 study).

Results We received 555 completed questionnaires, which is estimated to be 25% of the total number of Dutch children with DM. The control group consisted of 777 children. After age-matching, the questionnaires of 188 DM patients were used. Symptoms of asthma, hayfever and eczema were reported less in the group of children with DM compared with the control group (wheeze last year, OR 0.796, 95% CI 0.408–1.554; hayfever symptoms last year, OR 0.642, 95% CI 0.369–1.118; eczema symptoms last year, OR 0.693, 95% CI 0.430–1.115).

Conclusion The lower prevalence of asthma, hayfever and eczema symptoms in DM patients compared with age-matched controls, although not statistically significant, is consistent with the Th1/Th2 concept.

Keywords asthma, children, diabetes mellitus, eczema, hayfever, Th1 cells, Th2 cells

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Introduction

Atopic diseases, such as asthma, eczema and hayfever, are frequently observed in children. T lymphocytes, and especially T helper cells (Th cells), play an important role in the pathophysiology of atopic diseases. Th1 and Th2 cells can be recognized by the pattern of cytokines they produce. Th1 cells specifically produce interferon-gamma and interleukin-2 (IL-2), and are mainly involved in intracellular infections and auto-immune diseases [1,2]. Th2 cell-derived cytokines are IL-4 and IL-10, which are associated with extra-cellular infections and atopic diseases [3–5]. Th1 and Th2 cells reciprocally inhibit each other by production of their specific cytokines. As a consequence, it can be hypothesized that a lower prevalence of atopic disease can be expected in patients with Th1-mediated disease. Indeed, a lower prevalence of allergic diseases was found in adults with rheumatic arthritis or multiple sclerosis [6,7]. Because type 1 diabetes mellitus (DM) is also known to be

a Th1-mediated disease, we investigated the prevalence and severity of asthma, hayfever and eczema symptoms in Dutch children with DM compared with an age-matched control population.

Methods

We investigated the prevalence of atopic disease using the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. The ISAAC questionnaire was developed to provide a valid and standard method for non-invasive measurement of prevalence and severity of atopic diseases [8,9]. The ISAAC questionnaire consists of true/false questions concerning the presence of atopic symptoms (e.g. 'Has your child had wheezing or whistling in the chest at any time in the past?'). Parents of children with DM were requested by Dutch paediatricians to complete the Dutch ISAAC questionnaire. Except for age, no covariate data were obtained in this population of DM patients. A control group was derived from a cross-sectional survey (the ISAAC2 study). The Dutch ISAAC2 study was conducted among 7–12 year-old children living in various areas in the Netherlands, some of whom were exposed to traffic

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Table 1. Prevalence of atopy symptoms in children with DM and controls

	Diabetes mellitus (total group)	Diabetes mellitus (age-matched)	Controls
Number	555	188	781
Asthma questions			
Wheezing ever in life	17.1	16.5	22.5
Wheeze last year	7.4	5.9	7.4
Wheeze with exercise	6.0	4.3	6.6
Rhinitis questions			
Nose symptoms ever	21.4	18.7	23.1
Nose symptoms last year	18.1	13.9	18.5
Eczema questions			
Skin rash ever in life	13.0	12.6	17.7
Skin rash last year	9.6	8.8	13.1

or aircraft exhaust. For the purpose of comparison, we selected control children who lived in unexposed sites, with an area distribution similar to the children with DM.

Results

In the DM group, we received 555 completed questionnaires, which is estimated to be 25% of the total number of Dutch children with DM. The age range was 1–19 years. All children with DM younger than 7 and older than 12 years were excluded from the statistical comparisons as the control group consisted of children between 7 and 12 only. The prevalence of symptoms was not much different between DM children within and outside of this age range. The control group consisted of 781 children. The prevalences of atopic symptoms are shown in Table 1.

Symptoms of asthma, hayfever and eczema were reported less in children with DM compared with the control group. We restricted statistical comparison to children of the same age (7–12). Age-adjusted odds ratios were: wheeze last year, OR 0.796, 95% CI 0.408–1.554; hayfever symptoms last year, OR 0.642, 95% CI 0.369–1.118; eczema symptoms last year, OR 0.693, 95% CI 0.430–1.115.

Discussion

We investigated the prevalence of atopic diseases in children with DM compared with age-matched controls. We found that symptoms of asthma, hayfever and eczema were reported less in children with DM compared with the age-matched control group, although this difference did not reach statistical significance. This finding may support the Th1/Th2 concept [2].

The results of this study are consistent with a previously performed study in children with type 1 diabetes mellitus [10]. In this study, a lower prevalence of asthma was reported compared with controls. In contrast to our findings, no difference in prevalence of atopic disease between children with DM and age-matched controls was reported by Stromberg et al. [11] They concluded that an increased environmental load (e.g. allergens) in recent decades, expressed by an increase in total prevalence of atopic diseases, may have exceeded moderate differences between children with DM and age-matched controls. The reason

for the inconsistency between the results reported by Stromberg and the present study remain unclear.

Clearly, the presence of DM does not completely inhibit atopic responses, as some children had both DM and atopic disease. In patients with multiple sclerosis, 4% had symptoms of atopic disease [7]. Therefore, the presence of a Th1-mediated disease may only in part lower the prevalence of atopic diseases, and this effect may be different for various Th1-mediated diseases. The variation in the prevalence of atopy in children with DM may partly be explained by variation in variables such as (passive) smoking, having pets and social-economic status. These variables are known to influence the development of atopic disease. The results from this study could not be corrected for these variables.

This study shows a lower prevalence of atopic diseases in children with DM compared with controls and may support the Th1/Th2 model. Although firm conclusions cannot be drawn from this study, the results may indicate a potential route for treatment of asthma and type 1 diabetes mellitus.

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