

Dysfunctional voiding in children with asthma

Ozge Uysal Soyer,¹ Betul Kilincoglu,² Mine Fedakar Senyucel,³ Mustafa Kemal Aslan,³ Murat Cakmak,⁴ Yildiz Dallar,² Tutku Soyer³

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¹Department of Pediatric Allergy, Hacettepe University, School of Medicine, Ankara, Turkey

²Department of Pediatrics, Ministry of Health, Ankara Education and Research Hospital, Ankara, Turkey

³Department of Pediatric Surgery, Kirikkale University, School of Medicine, Kirikkale, Turkey

⁴Department of Pediatric Surgery, Ankara University, School of Medicine, Ankara, Turkey

Correspondence to

Dr Ozge Uysal Soyer, Department of Pediatrics Allergy, Hacettepe University, School of Medicine, Ankara 06100, Turkey; ozgeusoy@gmail.com

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ABSTRACT

A prospective study was performed to evaluate the prevalence of suspected dysfunctional voiding (DV) and associated risk factors in children with asthma. The DV is defined as any voiding symptoms and/or urinary incontinence. Children (4–10-year-old) with asthma (n=178) and healthy subjects (n=197) were enrolled. DV and Incontinence Scoring System were administered. Demographic features and asthma related characteristics were recorded. Suspected DV was noted in 19 (27.9%) of patients with asthma and 5 (6.6%) of healthy subjects in children younger than 6 years of age (p=0.001). In this patient group, asthma increased the risk of suspected DV (OR=5.7 (95% CI 1.988 to 16.344)). Children with asthma older than 6 years of age had similar prevalence of suspected DV but they had higher frequency of voiding and urgency. Asthma is associated with higher DV symptom scores in younger children who have already completed toilet training and with some of DV symptoms such as frequency and urgency in older children.

INTRODUCTION

Dysfunctional voiding (DV) is a common clinical problem and accounts for nearly 40% of paediatric urological visits. The term DV is used to define any child with voiding symptoms and/or urinary incontinence.

Asthma is a chronic inflammatory disease characterised by variable airway obstruction and recurrent symptoms.¹ Increased intra-abdominal pressure due to chronic cough and dyspnoea may be associated with asthma. Our clinical observation suggests that children with asthma may have higher existence of voiding symptoms. Since prevalence and risk factors for DV in children with asthma have not been investigated previously, we performed a prospective study to define the prevalence of suspected DV in children with asthma and its determinants.

METHODS

Children with asthma aged 4–10 years were recruited from the paediatric allergy department. The diagnosis of asthma was made with a history of intermittent wheezing, and/or reversible airway obstruction as defined by at least a 12% improvement in forced expiratory volume in one second following bronchodilator administration.¹ Healthy subjects were enrolled from paediatric outpatient clinics without a history of atopic diseases as confirmed by the International Study of Asthma and Allergies in Childhood questionnaire.

We used a survey concerning demographic features (age, gender, parents' education level and history of urinary tract infection) for children with

What is already known on this topic

- Dysfunctional voiding may be a comorbid condition accompanying diverse chronic diseases during childhood.

What this study adds

- The paediatricians dealing with asthma should take into consideration the risk of dysfunctional voiding symptoms in children with asthma to prevent complications.
- Asthma is associated with higher DV symptom scores in younger children.

asthma and healthy controls. We noted asthma control parameters (scheduled and unscheduled visits due to asthma, emergency department visits and hospitalisation due to asthma in the last year) in the patient group. Children with asthma and their parents filled the Turkish version of the Childhood Asthma Control Test (C-ACT). A C-ACT score of 19 or lower indicated inadequately controlled asthma. The physician also assessed the level of asthma control as 'controlled', 'partly controlled' or 'uncontrolled' based on clinical control parameters as suggested by the Global Initiative for Asthma Guideline.¹

All children were administered the Turkish version of the DV and Incontinence Scoring System (DVISS).² Children with a DVISS score greater than 8.5 were diagnosed as 'suspected DV'. The study was approved by the Local Ethics Committee and written informed consent was obtained from parents.

Statistical analysis

The results were analysed with SPSS V.15.0 (SPSS, Inc, Chicago, Illinois, USA). Differences between children with asthma and healthy subjects were compared by Student's t test or Mann-Whitney U test or χ^2 test as appropriate. Variables with a p value of less than 0.25 in univariate analysis were examined in the multivariate logistic regression models. The size of the effect of each of the risk factors was measured using the OR and 95% CI. A value of $p \leq 0.05$ was considered statistically significant.

RESULTS

We collected data from 178 children with asthma and 197 healthy children. The demographic features of children are summarised in table 1.

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Table 1 The demographic features

	Children with asthma (n=178)	Healthy children (n=197)	p Value
Age (years)	6.83±1.7	6.75±1.6	NS*
Gender (male)	99 (55.3%)	116 (59.5%)	NS†
Family history for atopic disease	81 (45.5%)	30 (15.4%)	<0.001†
Mother (high school-university)	38 (22.1%)	55 (28.2%)	NS†
Father (high school-university)	54 (31.6%)	91 (46.7%)	<0.05†
History of urinary tract infection	53 (29.8%)	54 (27.4%)	NS†
Urinary tract disease**	9 (5.1%)	8 (4%)	NS†
Atopy	85 (48%)	—	—
Allergic rhinitis	49 (27.4%)	—	—
Unscheduled visits due to asthma/last year	2 (1–3)	—	—
Emergency department visits/last year	97 (54.5%)	—	—
Hospitalisation/ last year	56 (31.5%)	—	—
C-ACT score≤19‡	44 (25.3%)	—	—
Asthma control level			
Controlled	97 (54.2%)	—	—
Partly controlled	41 (23.8%)	—	—
Uncontrolled	34 (19.8%)	—	—
Asthma severity			
Mild intermittent	54 (30.3%)	—	—
Mild persistent	90 (50.6%)	—	—
Moderate persistent	24 (13.5%)	—	—
Severe persistent	8 (4.5%)	—	—
Asthma medications			
Short acting beta agonists	61 (34.3%)	—	—
Montelukast	18 (10.2%)	—	—
Inhaled steroids	70 (39.3%)	—	—
Inhaled steroids+montelukast	6 (3.4%)	—	—
Inhaled steroids+LABA	15 (8.4%)	—	—
Inhaled steroids+LABA+montelukast	8 (4.4%)	—	—

*Student's t test. p Values less than 0.05 are marked in bold.

† χ^2 .

‡Childhood asthma control test.

Urinary tract disease: Renal stone disease, incomplete duplex system.

C-ACT, Childhood Asthma Control Test; LABA, Long acting β agonist; NS, Non significant.

Sixty-eight of patients with asthma were younger than 6 years of age and 110 of them were older than 6 years of age. Children younger than 6 years of age with asthma (41%) had higher prevalence of enuresis nocturna (EN) than healthy children (15.8%) ($p=0.001$). In children younger than 6 years of age, suspected DV was diagnosed in 19 (27.9%) patients with asthma and 5 (6.6%) healthy subjects ($p=0.001$) (table 2). Logistic regression analysis for suspected DV in children younger than 6 years of age included gender, education level of parents, history of urinary tract infection, history of urinary tract disease and asthma, and revealed that asthma increased the risk of diagnosis of suspected DV (OR=5.7 (95% CI 1.988 to 16.344, $p=0.001$)).

Children with asthma older than 6 years of age had similar prevalence of suspected DV and EN symptoms ($p>0.05$) compared with healthy children but they had higher frequency of voiding (>7 times/day) (29 (26.4%) and 17 (13.9%), $p=0.018$) and had higher prevalence of urgency (36 (32.7%) and 25 (20.5%), $p=0.035$) (table 2).

In children with asthma (younger and/or older than 6 years of age), logistic regression analysis for risk factors for suspected DV concerned asthma control parameters, level of asthma control ('uncontrolled' vs 'partly controlled and controlled'), gender, atopy, type of atopy (perennial vs seasonal, presence of house dust mite sensitivity), serum IgE levels, peripheral eosinophil per cents, C-ACT score (score≤19) and anti-inflammatory

drug use. However, there was no association of suspected DV with any of the risk factors we analysed in children with asthma.

DISCUSSION

Asthma is a common chronic disease of airways characterised by chronic cough and wheezing. In this study, we demonstrated an association between asthma and DV symptoms in children with asthma who required further investigation especially in children younger than 6 years of age.

Incontinence results when intra-abdominal pressure is higher than urethral pressure. Patients with asthma may have increased intra-abdominal pressure as a result of increased pressure gradient between thorax and abdomen. In Canadian adults aged 30 years or older, asthma increased the risk of urinary incontinence (OR=1.35 (95% CI 1.00 to 1.95, $p<0.05$)).³ However, Shariat *et al*,⁴ reported no difference in prevalence of stress urinary incontinence in patients with chronic cough due to allergic rhinitis, sinusitis or asthma in comparison with subjects without chronic cough. In our study, the prevalence of daytime incontinence was similar in children with asthma and healthy children but prevalence of EN was higher in children with asthma younger than 6 years of age when compared with healthy controls.

Short research report

Table 2 Voiding parameters in children

	Children <6 years of age			Children ≥6 years of age		
	Children with asthma (n=68)	Healthy children (n=76)	p Value	Children with asthma (n=110)	Healthy children (n=121)	p Value
Suspected DV (DVISS>8.5)	19 (27.9%)	5 (6.6%)	0.001*	10 (9.1%)	8 (6.6%)	NS*
Daytime wetting	16 (23.5%)	12 (15.8%)	>0.05*	9 (8.2%)	14 (11.5%)	NS*
Enuresis nocturna	28 (41%)	12 (15.8%)	0.001*	21 (19.1%)	20 (16.4%)	NS*
Voiding >7 times/day	32 (47.1%)	9 (11.8%)	<0.001*	29 (26.4%)	17 (13.9%)	0.018*
Too quick to finish voiding	34 (50%)	45 (59.2%)	>0.05*	49 (44.5%)	87 (71.3%)	<0.001*
Straining during voiding	5 (7.4%)	5 (6.6%)	>0.05*	6 (5.5%)	2 (2.5%)	NS*
Pain during voiding	3 (4.4%)	5 (6.6%)	>0.05*	6 (5.5%)	4 (3.3%)	NS*
Recurrent need for voiding	8 (11.4%)	4 (5.3%)	>0.05*	7 (6.4%)	6 (4.6%)	NS*
Sudden feeling of voiding	29 (42.6%)	13 (17.1%)	0.001*	36 (32.7%)	25 (20.5%)	0.035*
Holding by crossing legs	34 (50%)	21 (27.6%)	0.006*	33 (30%)	25 (20.5%)	NS*
Wetting on the way to toilet	21 (30.9%)	10 (13.2%)	0.01*	11 (10%)	11 (9%)	NS*
Missing bowel movement everyday	22 (32.4%)	3 (3.9%)	<0.001*	29 (26.4%)	10 (8.2%)	<0.001*

* χ^2 test. p Values less than 0.05 are marked in bold.

DV, dysfunctional voiding; DVISS, DV and Incontinence Scoring System; NS, Non-significant.

Coyne *et al.*⁵ have shown in a cross-sectional, population-based study that asthma is one of the most common comorbid conditions for lower urinary tract symptoms and assessed as a risk factor for DV symptoms in adults. In our study, children with asthma younger than 6 years of age had higher prevalence of suspected DV but in older children, we were not able to demonstrate a similar finding. These results suggest that presence of asthma contributes to higher DV symptom scores in children who had already completed their toilet training. However, among all DV symptoms, only higher prevalence of frequency and urgency were observed in older children. It is difficult to make a firm conclusion about the underlying pathophysiology of DV symptoms in children with asthma. In order to define a clear relationship, further urological investigations are required.

We hypothesised that there might be increased DV symptoms in children with uncontrolled asthma since repeated coughing and forced expirations may place further stress on the pelvic floor. We evaluated asthma related risk factors for DV; however, none of the surveyed parameters such as asthma control parameters, asthma control levels and severity were related to DV in asthma.

Screening of DV with a symptoms-scoring system obtained by a questionnaire is a simple, time-saving and widely used approach in clinical settings.² Invasive techniques such as urodynamics are required for definitive diagnosis of DV and are reserved for selected patients.² Therefore, we assessed DV symptoms with DVISS in this descriptive study which is one of our limitations. The data collected in this study were mainly based on information reported by the parents.

In conclusion, asthma and DV are common clinical entities during childhood. Asthma may increase DV symptoms in children. Paediatricians and paediatric allergy specialists should be aware of this condition and may use DVISS to decide the need

for urology consultation. The early diagnosis and appropriate treatment of DV will prevent complications including upper urinary tract infections, vesicoureteral reflux and even renal failure.

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Contributors OUS participated in the development of the protocol and analytical framework of the study, outcome assessment and prepared the manuscript and had primary responsibility for patient screening in her study centre. TS participated in the development of the protocol and analytical framework of the study, outcome assessment and prepared the manuscript. MC had primary responsibility for outcome assessment and data analysis, and prepared the manuscript with OUS and TS. BK, MFS, MKA and YD supervised the design and execution of the study, contributed to preparation of the manuscript, and had primary responsibility for patient screening in their study centres.

Competing interests None.

Ethics approval Ethics Committee of Ministry of Health, Ankara Education and Research Hospital.

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Addendum: Dysfunctional voiding and incontinence scoring system.

Does your child wet during the day?	No	Sometimes	1-2 times/day	Always
How wet is your child during the day	Damp underwear	Damp pants only		Pants soaking wet
Does your child wet during the night?	No	1-2 nights/week	3-5 nights/week	6-7 nights/week
How wet is your child during the night?	Damp underwear	Damp bed sheet only		Bed sheets soaking wet
How many times does your child void?	1-7/day		More	
My child is too quick to finish his/her pee	No		Yes	
My child strains during void	No		Yes	
My child feels pain during voiding	No		Yes	
My child voids intermittently	No		Yes	
My child needs to go back voiding soon after finishes his/her pee.	No		Yes	
My child has a sudden feeling of having to urinate immediately	No		Yes	
My child holds by crossing his/her legs	No		Yes	
My child wets on the way to the toilet	No		Yes	
My child misses his/her bowel movement everyday	No		Yes	
QUALITY OF LIFE				
If your child experiences symptoms mentioned above, does it affect his/her family, social or school life?	No	Sometimes	Yes effects	Seriously effects