

# Prevalence of Urinary Incontinence and Lower Urinary Tract Symptoms in School-Age Children

Ipek Ozunan Akil,<sup>1</sup> Dilek Ozmen,<sup>2</sup> Aynur Cakmakci Cetinkaya<sup>2</sup>

<sup>1</sup> Department of Pediatric Nephrology, Celal Bayar University, Izmir, Turkey.

<sup>2</sup> Department of Public Health Nursing, School of Health, Celal Bayar University, Izmir, Turkey.

**Corresponding Author:**

Ipek Ozunan Akil, MD  
Department of Pediatric Nephrology, Celal Bayar University, Izmir, Turkey.

Tel: +90 236 44 44 228 3164  
Fax: +90 236 233 80 40  
E-mail: ipekozunan@yahoo.com

Received November 2012  
Accepted January 2014

**Purpose:** To investigate the prevalence of lower urinary tract symptoms (LUTS) and urinary incontinence (UI) in elementary school aged children in Manisa.

**Materials and Methods:** Dysfunctional Voiding and Incontinence Scoring System (DVIS) which was developed in Turkey is used. A total of 416 children, 216 (51.9%) male and 200 (48.1%) female were recruited in this study.

**Results:** Mean age of children was  $10.35 \pm 2.44$  years (median 10 years). Daytime UI frequency was 6.7% (28 child), nocturnal incontinence 16.6% (69 child) and combined daytime and nocturnal incontinence 4.1% (17 child). There was no statistically significant difference in the prevalence of nocturnal and or daytime UI between male and female gender. Mean DVIS score was  $2.65 \pm 3.95$  and gender did not affect total DVIS points. The mean ages of achieving daytime bowel and bladder control were all significantly correlated with DVIS points. DVIS points were positively correlated with the history of UI of the family. Total points were increased when the father was unemployed.

**Conclusion:** UI negatively influences health related quality of life of the family and child, so it is important that awareness of the UI and symptoms of lower urinary tract dysfunction.

**Keywords:** lower urinary tract symptoms; child; urination disorders; prevalence; urinary incontinence.

## INTRODUCTION

Urinary incontinence (UI) is a common and important health problem in childhood.<sup>(1)</sup> It may cause considerable impact on health related quality of life of both the affected child and caregivers.<sup>(2,3)</sup> Nocturnal UI also has negative effects on the child's sleep quality, because they might be anxious about the risk of urination while asleep.<sup>(4)</sup>

International children's continence society (ICCS) classifies UI in the storage symptoms of bladder and it defines UI as uncontrollable leakage of urine. It can be continuous associated such as ectopic ureter or intermittent. Nocturnal enuresis (nocturnal incontinence) describes incontinence while sleeping. Daytime incontinence is incontinence during the day. The child may have both nocturnal and daytime UI.<sup>(1)</sup> Fewer than half of the patients presenting with incontinence is thought to be really mono-symptomatic nocturnal enuresis.<sup>(5)</sup> Also, there is a prominent differentiation in children between with mono-symptomatic nocturnal enuresis and who have lower urinary tract symptoms (LUTS) (non-monosymptomatic nocturnal enuresis) according to pathogenesis, clinical findings and treatment modalities.<sup>(1)</sup> Increased/decreased voiding frequency, daytime incontinence, urgency, hesitancy, straining, a weak stream, intermittency, holding maneuvers, a feeling of incomplete emptying, post-micturition dribble and genital or lower urinary tract pain are LUTS. Nevertheless, general knowledge and interest are often based on nocturnal enuresis (nocturnal incontinence). Investigations about nocturnal enuresis including pathophysiology, genetics, and prevalence are much frequent than daytime UI.<sup>(6-10)</sup>

There are a lot of data investigating the prevalence and associated factors of mono-symptomatic nocturnal enuresis in general literature and in Turkey.<sup>(1,5-13)</sup> But, lack of adequate epidemiological data on the prevalence of lower urinary tract symptoms and UI in school-aged children in Turkey led us conduct a cross-sectional study in a representative population in our region.

## MATERIALS AND METHODS

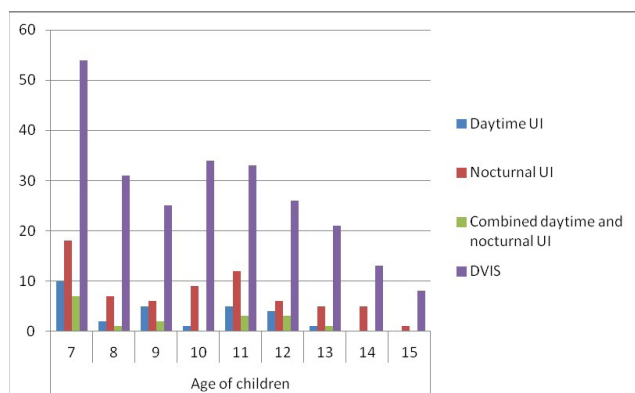
This is a cross-sectional study planned in the center of the province of Manisa including children with the age of 7-15 years. According to data from in the center of Manisa province of 11 family health center registered by Household As-

essment Sheets (Forms) in 2010, there were 41648 children aged between 7 and 15 years. The sample size was calculated as 381 in Epi Info 2000 program with a margin of error of 95% confidence interval (CI) and with 0.05 error share (based on the expected prevalence of 50%). The survey sample of children admitting family health centers were detected with stratified sampling method according to the number registered in 7-15 age children. Sampling within each family health center, children were randomly selected from household detection plugs. Creating the sample, the plugs were randomly selected from in a row lined up according to the districts. Registered 7-15 age children in these randomly selected plugs were included in the study. If the plug does not have registration for children in this age group, by selecting a new chip sampling was completed with 416 children. Celal Bayar University hospital ethical committee approved the study. Written permission for the conduct of the study in family health centers was obtained from the Directorate of Health in Manisa. Informed consent was obtained from parents of children participating in the study. The data was collected from home visits using face to face interview technique between 1 March 2011 to 30 May 2011. As the data collection tool two forms were used. The first one was Information Form developed by researchers and, the second form was Dysfunctional Voiding and Incontinence Scoring System (DVIS) which was developed by Department of Pediatric Urology Unit of Hacettepe University.<sup>(14)</sup> DVIS contains 14 questions including daytime symptoms related urination, night symptoms, voiding habits, bowel habits and quality of life of children. High DVIS scores indicate increased risk of disease severity.

Additionally, we used socio-demographic information form that we developed. It has 28 questions that describe some properties of the child and family, family's socioeconomic, training status and micturition habits.

### Statistical Analysis

The statistical analysis of data was performed using the statistical package for the social science (SPSS Inc, Chicago, Illinois, USA) version 15.0. To assess the data points and percentage distributions, Pearson chi-square test, Student's t test and one way ANOVA variance analysis were used. The Cronbach alpha for intrinsic factors of DVIS was 0.77 for this study.



**Figure.** Prevalence of nocturnal urinary incontinence (UI), daytime UI and Dysfunctional Voiding and Incontinence Scoring System (DVIS) points according to ages.

## RESULTS

There were 416 children in the study, 216 (51.9%) of them were boys and 200 (48.1%) were girls. Mean age of children was  $10.35 \pm 2.44$  years (median 10 years). The majority (70.4%) of the families were defined themselves as moderate income families and 8.4% of them did not have any social security.

In this study, 56.2% (234) of children described at least one symptom of lower urinary tract dysfunction. Mean DVIS score was  $2.65 \pm 3.95$  (min: 0, max: 27, median: 1). Of study families 22.6% stated that LUTS were negatively affected their quality of life. LUTS were not found related with gender. Cronbach's alpha coefficient of the scale for this study was 0.7401. Table 1 shows the prevalence of LUTS according to the gender in the study group.

The mean ages of achieving daytime bowel and bladder control, family history for UI, sleep arousal, age and whether the father has a job or not were all significantly correlated with DVIS points (Table 2). Consanguineous marriage, the age of mother during pregnancy, the age of father, time of birth, birth weight, breastfeeding, labor (vaginal or operational), the order of siblings, family's education level were not in relation to UI. Availability of toilet training, the age of toilet training, punishment during toilet training were not statistically correlated with DVIS points.

Daytime UI frequency was 6.7% (28 child), nocturnal incontinence 16.6% (69 child) and combined daytime and nocturnal incontinence 4.1% (17 child). There was no statistically

significant difference between male and female gender according to nocturnal and or daytime incontinence (Table 3). The highest prevalence was 7 years for both nocturnal UI and daytime UI (24.3% and 13.5%, respectively) and the prevalence was decreased with increasing age. When total DVIS points evaluated according to the age, it was decreased while the age was increased.

## DISCUSSION

It is very well known that lower urinary tract dysfunctions are associated with recurrent urinary tract infections (UTI), vesicoureteral reflux (VUR) and permanent kidney damage.<sup>(15)</sup> The relationship between the degree of renal scar and detrusor pressures were reported in literature.<sup>(16)</sup> Also, detrusor-sphincter dyssynergia is more associated VUR and UTI in comparison with only bladder instability.<sup>(17)</sup> All type of lower urinary tract dysfunctions present some symptoms and findings of LUTS mainly increased/decreased voiding frequency, daytime incontinence, urgency, and holding maneuvers. Among them, nocturnal incontinence has greater emphasis than daytime incontinence and the other symptoms for the families and families generally do not know their child's voiding and defecation patterns except nocturnal incontinence. Sometimes, incontinence is interpreted as resolves with time by both families and health workers. In our country, urological problems comprised the largest group (50.7%) for the underlying etiologies of end stage renal failure in childhood. These were mainly vesicoureteral reflux (18.5%), neurogenic bladder (15.2%) and chronic pyelonephritis (2.2%).<sup>(18)</sup> Many of these children may have LUTS. Unfortunately, lower urinary tract dysfunction is frequently diagnosed following established renal damage. So, we wanted to know the prevalence of LUTS in children elementary school aged children (7-15 years) in our city.

We have used DVIS form which has a validation form in Turkish.<sup>(14)</sup> In this scoring system, 8.5 points and higher values have 90% sensitivity and 90% specificity in determining the voiding dysfunction with a CI of 96.2%. Mean DVIS score was  $2.65 \pm 3.95$  in our study and 38 (9.1%) children received equal or greater than 8.5 points indicating lower urinary tract dysfunction. We informed these children and their families about the importance of their complaints and to apply to a pediatric nephro-urological outpatient clinic for treatment and associat-

**Table 1.** Description of symptoms in study group and its distribution according to the gender.

LUTS	Male (n = 216) No. (%)*	Female (n = 200) No. (%)*	Total No. (%)**	P***
Voiding number (More than 7 per day)				
Yes	193 (53.6)	167 (46.4)	360 (86.5)	.081
No	23 (41.1)	33 (58.9)	56 (13.5)	
Strain during voiding				
Yes	208 (52.1)	191 (47.9)	399 (95.9)	.682
No	8 (47.1)	9 (52.9)	17 (4.1)	
Pain during voiding				
Yes	207 (53.1)	183 (46.9)	390 (93.8)	.068
No	9 (34.6)	17 (65.4)	26 (6.3)	
Intermittently voiding				
Yes	209 (52.4)	190 (47.6)	399 (95.9)	.365
No	7 (41.2)	10 (58.8)	17 (4.1)	
Needs to go back voiding soon after finishes his/her pee				
Yes	205 (53.2)	180 (46.8)	385 (92.5)	.057
No	11 (35.5)	20 (64.5)	31 (7.5)	
Sudden feeling of having to urinate immediately				
Yes	152 (53.3)	133 (46.7)	285 (68.5)	.396
No	64 (48.9)	67 (51.1)	131 (31.5)	
Holding manoeuvres				
Yes	179 (53.3)	157 (46.7)	336 (80.8)	.258
No	37 (46.3)	43 (53.8)	80 (19.2)	
Wets on the way to the toilet				
Yes	196 (53.4)	171 (46.6)	367 (88.2)	.098
No	20 (40.8)	29 (59.2)	49 (11.8)	
Constipation				
Yes	196 (53.6)	170 (46.4)	366 (88.0)	.072
No	20 (40.0)	30 (60.0)	50 (12.0)	

**Key:** LUTS, lower urinary tract symptoms.

\*Percentage of row.

\*\* Percentage of column.

\*\*\*Pearson chi-square test.

ed morbidities. As interesting, a large number of children were found to be affected with this scoring system in at least in one question in our study. Whereas, Vaz and colleagues described as affected children number was 21.8 % children (161 in 739) in their study groups.<sup>(19)</sup>

LUTS such as urgency, frequent daytime voiding, nocturia and urge-incontinence were found significantly associated with childhood urinary symptoms in adult females.<sup>(20)</sup> In our study, DVIS points were positively correlated with the presence of family history of UI. This finding preoccupied us that the proper diagnosis and treatment of lower urinary tract dysfunctions

were very important in childhood. This study also revealed that DVIS points were associated with the age of children (Figure), father's job, sleep arousal of the children and the time of urinary and bowel control. It is generally accepted that daytime UI depends more weakly on socioeconomic and stressful events than nocturnal UI, however we found total DVIS points were increased when the father was unemployed.<sup>(21)</sup> Delaying in bowel and bladder control may be related with lower urinary tract dysfunction. In this study, increasing of the mean ages of achieving of daytime bladder and bowel control were all associated with increased DVIS points.

**Table 2.** Dysfunctional Voiding and Incontinence Scoring System points and associated factors.

Variables	Number	Mean ± SD	p
Age of children			
< 10 years	217	3.32 ± 4.41	.000*
> 10 years	199	1.92 ± 3.23	
Unemployed father			
Yes	94	2.51 ± 3.79	.042*
Unemployed and/or retired	312	3.81 ± 5.07	
Urinary incontinence in family			
Yes	73	5.46 ± 6.09	.000*
No	341	2.06 ± 3.02	
Sleep arousal			
Sensitive sleep (a)	42	3.21 ± 4.95	.001**
Normal (b)	309	2.25 ± 3.45	a = b > c
Deep sleep (c)	65	4.21 ± 4.99	
Time of urinary control			
< 2 year	242	2.1 ± 3.23	
> 2 year	166	3.27 ± 4.57	.005*
Time of bowel control			
< 2 year	228	2.15 ± 3.29	
> 2 year	179	3.16 ± 4.5	.012*

\* Student's *t* test.

\*\* One way ANOVA test.

In literature, there are several different results for the prevalence of daytime UI in childhood; it varies from 2.1% to 30.7%.<sup>(22-25)</sup> Lee and colleagues reported the prevalence of daytime UI as 2.1% in 7-12 aged 12570 Korean children (the boys had 1.3%, girls 0.8%).<sup>(23)</sup> Sureshkumar and colleagues found the prevalence of daytime UI as 19.2% with a slight girl predominance (boys had 16% and girls 21.8%).<sup>(22)</sup> From our country, Toktamis and colleagues reported overall prevalence of daytime UI was 2.6%, with a tendency to decrease with increasing age and with no difference between genders.<sup>(19)</sup> In another study, prevalence of daytime UI was reported as 8.3%, and there was no statistical difference between the girls and the boys however the girls slightly more had daytime UI (7.2% and 9.5%, respectively).<sup>(25)</sup> Our study revealed that daytime UI was 6.7%, and the gender did not affect the frequency (the boys had 6.9% and girls 6.5%). Daytime UI prevalence is decreasing with the child's age increases as in agreement with the other studies (Figure).

The overall nocturnal UI prevalence was 16.6%, marked

nocturnal UI was 4.3% (more than 2 per week) in our study group. We did not find gender difference for nocturnal UI. Nocturnal UI prevalence was decreasing with age as expected (Figure). Guner and colleagues reported that overall prevalence of nocturnal UI as 14.9%. They reported that no difference in prevalence of nocturnal UI between boys and girls (14.3% vs. 16.8%).<sup>(25)</sup> In Ozkan and colleagues' study the prevalence of whole enuresis was 12.9% and the prevalence of prominent enuresis (at least weekly) was 9.8%. They revealed that nocturnal UI is more prevalent in boys (male to female ratio 1.6) and the prevalence rates declined by age without gender bias.<sup>(11)</sup> Our results are consistent with the literature and nocturnal UI is more prevalent health problem in childhood in our country.

ICCS consensus states that a normal urinary frequency is between four and seven times per day. The numbers out of these values may point the lower urinary tract dysfunction.<sup>(1)</sup> In our study, frequent voiding (more than 7) prevalence was 13.5%. There was no gender difference for frequent void-

**Table 3.** Prevalence of urinary incontinence types in children and distribution according to the gender.

Variables	Male (n = 216) No. (%)	Female (n = 200) No. (%)	Total No. (%)*	p*
Daytime UI				
Yes	15 (6.9)	13 (6.5)	28 (6.7)	.857
No	201 (93.1)	187 (93.5)	388 (93.3)	
Nocturnal UI				
Yes	35 (16.2)	34 (17.0)	69 (16.6)	.827
No	181 (83.8)	166 (83.0)	347 (83.4)	
Combined daytime and nocturnal UI				
Yes	8 (3.7)	9 (4.5)	17 (4.1)	.682
No	208 (86.3)	191 (95.5)	399 (95.9)	

**Key:** UI, urinary incontinence.

\*Pearson chi-square test.

ing. Holding maneuver symptoms were detected in %19.2. Although we did not observe a difference for holding maneuvers between genders, Vaz and colleagues reported same ratios but girl predominance for this symptom.<sup>(19)</sup> So, urinary frequency and holding maneuvers should paid attention in clinical practice.

Lower urinary tract dysfunction symptoms were reported more frequent among girls than boys by Vaz and colleagues.<sup>(19)</sup> However, we could not observe difference between genders for LUTS. We thought that each society may have different characteristic properties so the problems may vary from one to another.

Loening-Baucke has found constipation prevalence as 22.6% in 4-17 aged children.<sup>(26)</sup> Vaz and colleagues were reported constipation prevalence in their group as 30.7%.<sup>(19)</sup> There was a close relationship between constipation and lower urinary tract dysfunction. Treatment of constipation was yielded in dissolution of daytime UI in 89% and nighttime UI in 63% of patients.<sup>(27)</sup> Constipation was detected less from the other studies, as 12% in our study population. We found that constipation was more prevalent in children with nocturnal incontinence, but it was not statistically significant, and we did not found relationship between daytime UI and constipation in our group.

## CONCLUSION

As a result, this study points out that UI and LUTS are not uncommon in school aged children, especially in younger

group, however, gender does not affect incontinence and general LUTS. When it was thought that UI negatively influences health related quality of life of family, the importance of the awareness of the problem and therapy come forward.

## REFERENCES

1. Nevéus T, von Gontard A, Hoebeke P, et al. The standardization of terminology of lower urinary tract function in children and adolescents: report from the Standardization Committee of the International Children's Continence Society. *J Urol.* 2006;176:314-24.
2. Hagglof B, Andren O, Bergstrom E, Marklund L, Wendelius M. Self-esteem in children with nocturnal enuresis and urinary incontinence: improvement of self-esteem after treatment. *Eur Urol.* 1998;33:16-9.
3. Egemen A, Akil I, Canda E, Ozyurt BC, Eser E. An evaluation of quality of life of mothers of children with enuresis nocturna. *Pediatr Nephrol.* 2008;23:93-8.
4. Gozmen S, Keskin S, Akil I. Enuresis nocturna and sleep quality. *Pediatr Nephrol.* 2008;23:1293-6.
5. Neveus T, Eggert P, Evans J, et al. Evaluation of and treatment for monosymptomatic enuresis: a standardization document from the International Children's Continence Society. *International Children's Continence Society. J Urol.* 2010;183:441-7.
6. Robson LM, Leung A, Van Hoe R. Primary and secondary nocturnal enuresis: Similarities and presentation. *Pediatrics.* 2005;115:956-9.
7. Butler RJ, Redfern EJ, Holland P. Children's notions about enuresis and the implications for treatment. *Scand J Urol Nephrol.* 1994; Suppl 163:39-47.
8. Balat A, Alasehirli B, Oguzkan S, Gungor M. Nitric oxide synthetase gene polymorphisms in children with primary nocturnal enuresis: a preliminary study. *Ren Fail.* 2007;29:79-83.
9. Schaumburg HL, Kapilin U, Blasvaer C, et al. Hereditary phenotypes in nocturnal enuresis. *BJU Int.* 2008;102:816-21.

10. Butler RJ, Heron J. The prevalence of infrequent bedwetting and nocturnal enuresis in childhood. *Scand J Urol Nephrol*. 2008;42:257-64.
11. Ozkan KU, Garipardic M, Toktamis A, Karabiber H, Sahinkanat T. Enuresis prevalence and accompanying factors in schoolchildren: a questionnaire study from southeast Anatolia. *Urol Int*. 2004;73:149-55.
12. Inan M, Tokuc B, Aydiner CY, Aksu B, Oner N, Basaran UN. Personal characteristics of enuretic children: an epidemiological study from South-East Europe. *Urol Int*. 2008;81:47-53.
13. Shadpour P, Shieh morteza M. Enuresis persisting into adulthood. *Urol J*. 2006;3:117-29.
14. Akbal C, Genc Y, Burgu B, Ozden E, Tekgul S. Dysfunctional voiding and incontinence scoring system: quantitative evaluation of incontinence symptoms in pediatric population. *J Urol*. 2005;173:969-73.
15. Naseer S, Steinhardt GF. New renal scars in children with urinary tract infections, vesicoureteral reflux and voiding dysfunction: a prospective evaluation. *J Urol*. 1997;158:566-8.
16. Acar B, Arıkan Fİ, Germiyanoglu C, Dallar Y. Influence of high pressure on vesicoureteral reflux and its resolution. *Urol Int*. 2009;82:77-80.
17. Rubben I, Goepel M, van Gool JD. Non-neurogenic bladder dysfunction and vesicoureteral reflux in children. *Urologe A*. 2011;50:551-6.
18. Bek K, Akman S, Bilge I, et al. Chronic kidney disease in children in Turkey. *Pediatr Nephrol*. 2009;24:797-806.
19. Vaz GT, Vasconcelos MM, Oliveira EA, et al. Prevalence of lower urinary tract symptoms in school-age children. *Pediatr Nephrol*. 2012;27:597-603.
20. Fitzgerald MP, Thom DH, Wassel-Fyr C, et al. Reproductive Risks for Incontinence Study at Kaiser Research Group. Childhood urinary symptoms predict adult overactive bladder symptoms. *J Urol*. 2006;175:989-93.
21. Toktamis A, Demirel Y, Ozkan KU, Garipardic M, Gözüküçük A, Nur N. Prevalence and associated factors of day wetting and combined day and night wetting. *Urol Int*. 2008;81:54-9.
22. Sureshkumar P, Craig JC, Roy LP, Knight JF. Daytime urinary incontinence in primary school children: a population-based survey. *J Pediatr*. 2000;137:814-8.
23. Lee SD, Sohn DW, Lee JZ, Park NC, Chung MK. An epidemiological study of enuresis in Korean children. *BJU Int*. 2000;85:869-73.
24. Söderstrom U, Hoelcke M, Alenius L, Soderling AC, Hjern A. Urinary and fecal incontinence in primary school children: a population-based survey. *Acta Paediatr*. 2004;93:386-9.
25. Gunes A, Gunes G, Acik Y, Akilli A. The epidemiology and factors associated with nocturnal enuresis among boarding and daytime school children in southeast of Turkey: a cross sectional study. *BMC Public Health*. 2009;9:357.
26. Loening-Baucke V. Prevalence rates for constipation and faecal and urinary incontinence. *Arch Dis Child*. 2007;92:486-9.
27. Loening-Baucke V. Urinary incontinence and urinary tract infection and their resolution with treatment of chronic constipation of childhood. *Pediatrics*. 1997;100:228-32.