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Prevalence of Daytime Urinary Incontinence and Related Risk Factors in Primary School Children in Turkey

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Purpose: Urinary incontinence is one of the major urinary symptoms in children and adolescents and can lead to major distress for the affected children and their parents. In accordance with the definitions of the Standardization Committee of the International Children's Continence Society, daytime urinary incontinence (DUI) is uncontrollable leakage of urine during the day. The aim of this cross-sectional study was to investigate the prevalence and associated risk factors of DUI in Turkish primary school children.

Materials and Methods: The questionnaire, which covered sociodemographic variables and the voiding habits of the children, was completed by the parents of 2,353 children who were attending primary school in Denizli, a developing city of Turkey. The children's voiding habits were evaluated by use of the Dysfunctional Voiding and Incontinence Symptoms Score, which is a validated questionnaire. Children with a history of neurological or urological diseases were excluded.

Results: The participation rate was 91.9% (2,164 people). The overall prevalence of DUI was 8.0%. The incidence of DUI tended to decrease with increasing age and was not significantly different between genders (boys, 8.8%; girls, 7.3%; p=0.062). Age, maternal education level, family history of daytime wetting, settlement (urban/rural), history of constipation, urinary tract infection, and urgency were independent risk factors of DUI.

Conclusions: Our findings showed that DUI is a common health problem in primary school children. In an effort to increase awareness of children's voiding problems and the risk factors for urinary dysfunction in the population, educational programs and larger school-based screening should be carried out, especially in regions with low socioeconomic status.

Keywords: *Child; Diurnal enuresis; Prevalence; Risk factors; Urination disorders*

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INTRODUCTION

Urinary incontinence is one of the major urinary symptoms in children and adolescents and can lead to major distress for the affected children and their parents. Normal daytime control of bladder function matures between 2 and 3 years of age, whereas nighttime control is normally achieved between 3 and 7 years of age [1]. In accordance with the definitions of the Standardization Committee of the International Children's Continence Society (ICCS), daytime urinary incontinence (DUI) is uncontrollable leakage of urine during the day [2]. Daytime wetting (also referred to as di-

urnal enuresis) is also defined in the *Diagnostic and Statistical Manual for Mental Disorders*, *Fourth Edition*, as an involuntary voiding of urine during the day, with a severity of at least twice a week, in children >5 years of age in the absence of congenital or acquired defects of the central nervous system [3]. The prevalence of daytime wetting ranges from 2% to 20% [1,4-7].

The aim of this study was to investigate the prevalence and associated risk factors of DUI among primary school children living in Denizli, which is a developing city of Turkey, by use of a validated questionnaire.

MATERIALS AND METHODS

This cross-sectional study was performed between October and May 2005 in Denizli and was approved by the ethics committee of Pamukkale University School of Medicine and Denizli Province Directorate of National Education. Denizli is a socioeconomically developing city of Turkey.

The target population for the survey was 2,353 primary school children who were attending grades 1 through 8. The schools were randomly selected, 8 from Denizli city center and 6 from the rural regions of Denizli, by means of systemic sampling. Children with present or past neurological or urological disorders were excluded.

We used the Dysfunctional Voiding and Incontinence Symptoms Score Questionnaire to collect information about the children's voiding habits and a self-prepared questionnaire to get information about perinatal risk factors and sociodemographic and socioeconomic variables. The Dysfunctional Voiding and Incontinence Symptoms Score Questionnaire was validated by Akbal et al. [8] and contains 13 questions about daytime symptoms, nighttime symptoms, voiding habits, and bowel habits and 1 question about quality of life.

At the beginning of the survey, all the schoolteachers and students were informed about the study by the residents of Pamukkale University School of Medicine Department of Urology and Department of Public Health. An envelope that contained a written informed consent letter and the questionnaires were distributed to each child by the schoolteachers to reach the children's parents. Data were obtained by using these self-administered questionnaires, which were completed by the children and their parents. To maximize the response rate, each school was visited twice at weekly intervals by the same residents. DUI was defined as episodes of involuntary leakage of urine with or without nighttime wetting in the 6 months before receipt of the survey.

All data were analyzed by using the SPSS ver. 11.0 (SPSS Inc., Chicago, IL, USA). Frequency, percentage, mean, and standard deviation were used as descriptive statistics and the chi-square test was used as an analytical statistical method. Multiple logistic regression analysis (Backward LR) was performed to identify the independent risk factors. A p-value <0.05 was considered as statistically significant.

RESULTS

1. Response rate

We collected data from 2,164 children, 1,037 boys (47.9%) and 1,127 girls (52.1%), for a response rate 91.9%. The mean age of the students was 10.1 years (range, 7 to 14 years; median, 10 years). Of these children, 1,124 (51.9%) were living in the urban regions and 1,040 (48.1%) were living in the rural regions.

2. Prevalence of DUI

The overall prevalence of DUI was 8.0% (n=134). A higher percentage of boys than girls seemed to experience daytime wetting (8.8% [n=70] vs. 7.3% [n=64], respectively), but the difference was not statistically significant (p=0.062). Without gender bias, the highest prevalence was predicted among children aged 7 years, and the prevalence decreased with increasing age (Fig. 1).

3. Frequency and amount of DUI

Of the children with daytime wetting, 57.8% (n=77) were wetting sometimes (less than once a day), 26.6% (n=36) were wetting 1 or 2 times per day, and 15.6% (n=21) were wetting always (more than twice a day). When we assessed the amount of DUI, 40.1% of the children (n=54) were wetting their underwear, 37.3% (n=50) were wetting their pants only, and 22.5% (n=30) were soaking wet their pants.

4. Types of DUI

Urge incontinence was observed in 58.7% of the children (n=79) with daytime wetting. Twenty-six percent of the children (n=35) with daytime wetting were wetting while laughing, sneezing, or coughing and 15.3% (n=21) were wetting unconsciously.

In most children, nighttime wetting accompanied the DUI. Of the children with daytime wetting, 33.2% (n=45) had also wetting at nighttime. The prevalence of monosymptomatic enuresis nocturna was 14.1%.

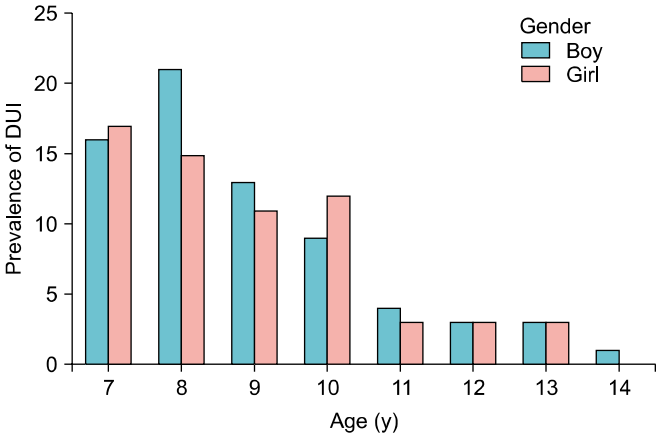

FIG. 1. Prevalence of daytime urinary incontinence (DUI) according to age and gender.

5. Associated risk factors for DUI

DUI was significantly associated with nighttime wetting (p=0.000), increasing daytime frequency (p=0.015), history of urinary tract infection (UTI) (p=0.003), constipation (p=0.008), hesitancy ($p<0.001$), straining ($p<0.001$), intermittency ($p<0.001$), feeling of incomplete emptying ($p<0.001$), holding maneuvers ($p<0.001$), low school success (p=0.003), absence of health insurance ($p<0.001$), low education level of the parents ($p<0.001$), low family income ($p<0.001$), and unemployment of the father ($p<0.001$). There was no relationship between DUI and low birth weight, prematurity, or maternal unemployment (Tables 1, 2).

After adjustment of the data for age, gender, maternal education level, family history of DUI, family income, settlement, and history of urgency, constipation, UTI, and daytime frequency, logistic regression analyses revealed that the risk factors associated with DUI in our population were early age (odds ratio [OR], 0.7; 95% confidence interval [CI], 0.6–0.8; p=0.000), low maternal education level (OR, 5.1; 95% CI, 1.2–21.1; p=0.026), positive family history of DUI (OR, 4.1; 95% CI, 2.3–7.3; p=0.000), living in a rural region (OR, 2.3; 95% CI, 1.4–3.9; p=0.002), presence of urgency (OR, 2.0; 95% CI, 1.1–3.3; p=0.013), constipation (OR, 2.6; 95% CI, 1.3–5.1; p=0.005), and history of UTI (OR, 2.1; 95% CI, 1.1–4.1; p=0.026) (Table 3).

DISCUSSION

Several questionnaires have been developed to help to diagnose behavioral problems, diuresis, and micturition patterns [9-11]. In this survey, we used the Dysfunctional Voiding and Incontinence Scoring System to collect information on voiding problems in children. The parents filled out the questionnaires without receiving any help from the investigator. This statistically validated functional voiding problems symptom score is composed of 14 items regarding daytime symptoms, nighttime symptoms, voiding habits, bowel habits, and quality of life [8]. It was easy to understand and answer the questions. In our survey, the response rate to the questionnaire was 91.9%.

Incontinence (urinary incontinence) is defined as uncontrollable leakage of urine. It can be continuous or intermittent. Continuous incontinence means constant urine leakage associated with congenital malformations, such as ectopic ureter or iatrogenic damage of the external urethral sphincter. Intermittent incontinence refers to discrete amounts of urine leakage that occur during the day or at

Table 1. Risk factors for daytime urinary incontinence (DUI) concerning voiding and bowel habits

Risk factor	DUI (n=2,164), n (%)		p-value
	No	Yes	
History of nighttime wetting	370 (15.0)	45 (33.2)	<0.001
History of daytime frequency (>7 times/d)	106 (5.2)	22 (16.4)	0.015
History of urinary tract infection	193 (9.5)	21 (15.3)	0.002
History of constipation	147 (7.2)	20 (14.9)	0.008
History of hesitancy	37 (1.8)	34 (25.4)	<0.001
History of straining	41 (2.0)	43 (32.1)	<0.001
History of intermittency	113 (5.6)	36 (27.0)	<0.001
History of feeling of incomplete emptying	143 (7.0)	30 (22.6)	<0.001
History of urgency	356 (17.5)	23 (17.3)	<0.001
Holding maneuvers	251 (12.4)	32 (24.1)	<0.001

Table 2. Risk factors for daytime urinary incontinence (DUI) concerning sociodemographic variables

Risk factor	DUI (n=2,164), n (%)		p-value
	Yes	No	
Living in a rural region	122 (6.0)	12 (9.0)	0.261
Low school success	108 (5.3)	26 (19.7)	0.003
Multiple siblings	123 (6.1)	11 (8.1)	0.045
Low birth weight	125 (6.2)	9 (7.1)	0.375
Prematurity	124 (6.1)	10 (7.2)	0.381
Presence of health insurance	122 (0.6)	12 (9.0)	<0.001
Low maternal education level	98 (4.8)	36 (26.7)	<0.001
Maternal unemployment	123 (6.1)	11 (8.2)	0.251
Low paternal education level	107 (5.3)	27 (20.0)	<0.001
Paternal unemployment	105 (5.2)	29 (21.5)	<0.001
Low family income	111 (5.5)	23 (17.3)	<0.001
Positive family history for DUI	105 (5.2)	29 (21.9)	<0.001

Table 3. Logistic regression analysis of risk factors for daytime urinary incontinence (DUI)

Risk factor	OR	95% CI	p-value
Early age	0.7	0.6–0.8	0.000
Male gender	NS	-	-
Low maternal education level	5.1	1.2–21.1	0.026
Positive family history for DUI	4.1	2.3–7.3	0.000
Low family income	NS	-	-
Living in a rural region	2.3	1.4–3.9	0.002
History of urgency	2.0	1.1–3.3	0.013
History of constipation	2.6	1.3–5.1	0.005
History of urinary tract infection	2.1	1.1–4.1	0.026
History of daytime frequency	NS	-	-

OR: odds ratio; CI: confidence interval; NS: not significant.

night after 5 years of age. Any type of wetting episode that occurs in discrete amounts during sleep is called enuresis. DUI is, of course, incontinence during the day [2]. DUI in children is thought to be one of the most common developmental disorders and also one of the most bothersome problems among affected children and their parents [12]. Previous studies from different countries about this problem have used various terminology and questionnaires, so that the prevalence range is very large. The overall prevalence of DUI in primary school children was reported to be 4.4% to 19.2% in different European countries and 2.1% to 6.3% in different Asian countries [4,7,10,12,13]. In previous studies reported from different Turkish provinces, the prevalence of DUI was reported to be between 0.5% and 4.3% [14-18]. In our study, the overall prevalence of DUI in the primary school children in Denizli province was 8.0%. Although the present study did not reflect the overall prevalence of the country because of the low sample size, it was worthwhile to determine the distribution of the disease in different parts of our country.

In the present study, the prevalence of DUI was higher in boys than in girls but this difference was not statistically significant. However, the prevalence did gradually decrease with age. Previous studies showed that the prevalence of DUI is generally higher among girls than boys and declines with age [4,7,19]. However, in Japanese primary school children, the overall prevalence of DUI was almost the same in the two sexes and gradually decreased with age [12]. According to these studies, we can say that DUI tends to resolve spontaneously in primary school children. Therefore, physicians should consider follow-up as a choice of treatment before using medicines in this population.

In our study, 58% of the children were wetting themselves once or twice per day and 40% of them were dampening their underwear. Bakker et al. [4] showed that the degree of wetting clearly increases with the frequency of DUI. Sureshkumar et al. [6] investigated the disaggregated spectrum of DUI by the frequency and amount of daytime incontinence, and the results indicated that there is poor overall concordance between frequency and amount of DUI. However, we did not assess the relationship between the frequency and amount of DUI.

Urgency refers to the sudden and unexpected experience of an immediate need to void [2]. Hoebeke et al. [20] performed 1,000 video-urodynamic studies in children with nonneurogenic bladder sphincter dysfunction and found that urge syndrome was the most frequent urinary dysfunction (58%). Kajiwara et al. [12] reported that more than 90% of children with DUI had urge incontinence. Another study showed that the prevalence of overactive bladder (OAB) was 16.6% in 5- to 13-year-old Korean children [21]. Our study showed that 58% of the children with DUI had urge incontinence. Urge incontinence is a result of detrusor overactivity (DO), and urodynamic study should be performed for the diagnosis of DO. Thus, when parents or teachers recognize urge incontinence in a child, they should follow-up with a urologist for the diagnosis and treatment of OAB.

Stress incontinence is the leakage of small amounts of urine during exertion or with increased intraabdominal pressure caused by various reasons [2]. Kajiwara et al. [12] showed that 4.6% of all children with wetting were wetting themselves only during coughing, sneezing, or laughing without urgency. Swithinbank et al. [19] reported that 127 of 1,176 children (10.8%) aged 11 to 12 years old had daytime wetting caused by coughing, laughing, or physical exercise. In our survey, our results were higher than the reports in the literature. According to our survey, 26% of the children with DUI had stress incontinence (n=18 girls and n=17 boys, p=0.600).

Recent studies have demonstrated that children with enuresis are known to void more often than do normal children, and increased daytime urinary frequency occurs in 20% to 30% of children with DUI [22]. Kajiwara et al. [12] showed in their survey that children with DUI voided significantly more often than did children without DUI and frequent voiding was found in 26.8% of children with DUI. However, Hansen et al. [23] did not find any correlation between frequency and daytime and nighttime wetting. However, the same study revealed that micturition symptoms (does not reach toilet, hurry to toilet, prolonged voiding, poor stream, staccato urine flow, able to void again im-

mediately, and straining) in children with daytime wetting differed significantly from the symptoms of continent children. Sureshkumar et al. [6] found that holding postures, frequency, and urgency had an impact on DUI. Swithinbank et al reported a relationship between urgency and DUI [24].

The genitourinary and gastrointestinal tracts share the same embryological origin (endoderm), anatomical space (pelvis), and innervation (sacral pelvic plexus). These two systems are interdependent and conditions that affect one may affect the other [5]. Koff et al. [25] demonstrated that constipation and bowel distension may lead to deformation of the bladder, which in turn may lead to hyperactivity of the detrusor and thus to urinary incontinence, i.e., the "dyselimination syndrome". In our study, both the univariate and multivariate analyses showed that constipation was significantly related to DUI. Our results seem to support this theory. Recent studies also reported that children with constipation had higher prevalence rates of urinary incontinence than did children without constipation [5,12,26]. However, Sureshkumar et al. [6] did not find any relationship between constipation and DUI.

Corresponding with the other studies, in the univariate analysis, the factors that were significantly related to DUI were low school success of the child, having multiple siblings, absence of health insurance, low parenteral education level, paternal unemployment status, low family income, and positive family history for DUI. In the multivariate analysis, early age, living in a rural region, low maternal education level, low family income, and positive family history for DUI were independent risk factors for DUI. However, male gender and low family income were not related with DUI [6,14,27].

The etiology of UTI, especially recurrent UTI, is often unknown; however, urodynamic disturbances with high bladder pressure or emptying difficulties are predisposing factors. It is well known that in children with UTI, especially in girls, there is a correlation with daytime wetting, which suggests that either daytime wetting is a consequence of the inflammation in the bladder or a primary dysfunction in the bladder predisposes to UTI [23]. The relationship between DUI and UTI was shown previously in the literature [4,12,23]. Our study showed that, in the univariate analysis, all the voiding symptoms and history of UTI were significantly associated with DUI, and in the multivariate analysis, history of urgency and UTI were independent risk factors for DUI.

CONCLUSIONS

The prevalence of DUI in Turkish children has a concordance with recent reports in the literature. DUI has a tendency to resolve spontaneously in these children with increasing age. However, some of these children may have abnormal voiding and bowel habits. In an effort to increase awareness of voiding problems in children and risk factors for urinary dysfunction in the population, educational programs and larger school-based screening should be carried out, especially in regions of low socioeconomic status.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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