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 socio-economic 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 systematic 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%.
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 night.

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

| Risk factor                                      | No (1,516) | Yes (648) | p-value |
|--------------------------------------------------|------------|-----------|---------|
| 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                                      | No (1,516) | Yes (648) | p-value |
|--------------------------------------------------|------------|-----------|---------|
| 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 (6.0)  | 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  |
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-
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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