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Prevalence of lower urinary tract symptoms in individuals with Down syndrome☆

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Abstract *Objectives:* Down syndrome (DS), which is caused by the trisomy of chromosome 21, is the most frequent of all genetic syndromes. The current study aims to estimate the prevalence of lower urinary tract symptoms (LUTS) in individuals with DS buy using the Dysfunctional Voiding Symptom Score (DVSS) and correlate with functional constipation, age, and gender, as well as determine the most sensitive and specific factors associated with LUTS.
Methods: LUTS was assessed in individuals with DS using a cross-sectional study through the application of a validated and adapted version of the DVSS for the Brazilian population. The presence of functional constipation was evaluated according to the Rome III criteria.
Results: Of the 114 individuals assessed, 84 were included in the study (median age 16 ± 5.0 years, 66.7% female). The prevalence of LUTS was 27.3%. The symptoms were more frequent in males (OR 3.0, 95% CI 1.1—8.3, $p = 0.03$) and in individuals younger than 10 years of age (OR 5.2, 95% CI 1.8—14, $p = 0.001$). Functional constipation was observed in 50% of subjects. It was detected in 95.65% of the individuals with LUTS and 32.78% without LUTS (OR 45.1, 95% CI 5.66—301, $p = 0.001$). The symptom listed in question 8 ("push to pee") was the most specific indicator. When present, this symptom indicated a higher probability of LUTS (LR+ = 6.3), while the symptom listed in question 4 ("push for bowel movements to come out") showed high

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sensitivity and, when absent, indicated a lower probability of LUTS (LR− = 0.1).
Conclusions: LUTS was more prevalent in young males with DS and appeared to improve with age. Functional constipation was strongly associated with LUTS. These findings will contribute to raising the awareness of professionals involved in the follow-up of individuals with DS regarding the clinical manifestations and the need for a standardized investigation of LUTS.

Introduction

Down syndrome (DS), which is caused by the trisomy of chromosome 21, is the most frequent of all genetic syndromes [1], with a life expectancy of approximately 60 years [2]. The prevalence of 1 per 1000 live births is directly influenced by the age of the mother [3]. Individuals with DS have a well-established increased risk of congenital abnormalities [4,5], constituting the most prevalent genetic cause of intellectual disability [2]. They have an average developmental delay of 4 years, and more often have emotional and behavioral problems (8—23%) than children from the general population [6].

The investigation of urological abnormalities in individuals with DS is not yet well established. Several related studies indicate an elevated prevalence of abnormalities, such as renal agenesis, hydronephrosis, ureteropelvic junction obstruction, posterior urethral valves, hypospadias and lower urinary tract symptoms (LUTS) [4,7—12].

LUTS are classified according to their relation to the voiding and/or storage phase of bladder function, and if it there is coexistence with functional constipation it is named bladder bowel dysfunction (BBD) [13,14]. There is great concern in the diagnosis and administration of early treatment to prevent urinary tract infections and lesions of the upper urinary tract [13]. This concern is also relevant in individuals with DS. Nevertheless, additional difficulties arise in diagnosing LUTS in children with DS since their caregivers often assume that such situations arise as a consequence of their delayed psychomotor development [6,15].

LUTS affect both the child and the family socially, emotionally, and behaviorally. This places the child at risk for social isolation, peer conflict, and teasing [16].

The current study aims to estimate the prevalence of LUTS in individuals with DS and the correlations of these symptoms with functional constipation, age, and gender using the Dysfunctional Voiding Symptom Score (DVSS) [17] adapted and validated for the Brazilian population by Calado et al. [18].

Patients and methods

This cross-sectional study was carried out from February 2010 to March 2012, during which 114 individuals with DS who were regularly attending a specialized clinic for DS were assessed.

The exclusion criteria were current urogenital disorder, untreated hypothyroidism, current use of medications known to interfere in bladder or sphincter function, and those that were still using diapers. We chose to stratify the sample into individuals 10 years old or younger and individuals older than 10 years of age because the DVSS is for children younger than 10 years of age.

The interview for the application of the DVSS was conducted in a private environment (physician's office).

The DVSS [17] includes 10 quantitative and qualitative urological variables assessed by age-appropriate questions for children and has been used widely with confirmed reliability and validity as an objective instrument to grade voiding disorder in children. Each subject, with the help of their parents, answered the 10 questions of the validated Brazilian language version of the Dysfunctional Voiding Score Symptom questionnaire [18].

The first 10 questions of the DVSS assess daytime incontinence, volume of urine leakage, urinary frequency, holding maneuvers, bowel habit, urgency, voiding frequency, straining voiding, and dysuria, which are each scored on a scale of 0—3 (0 almost never, 1 less than half the time, 2 about half the time and 3 almost every time). In question 10, the answers were dichotomic: yes for a score of 3 and no for a score of 0. The individuals or their parents were asked if they had experienced any stressful situations in the previous month. The cut-off values to indicate the presence of LUTS were >6 for females and >9 for males. To our knowledge, this is the first study applying the DVSS in individuals with DS.

All of the included patients were submitted to non-invasive urodynamics. Renal and bladder ultrasound evaluating urological abnormalities and post-voiding residual, uroflowmetry were performed, and a voiding diary was kept. The cut-off value for post-void residual urine was classed as elevated if it was 10% greater than the expect bladder capacity for the age of the child.

The presence of functional constipation was evaluated according to the Rome III criteria [19].

To evaluate present or past urinary tract infection (UTI) or bacteriuria, urine cultures were performed in all patients, and all of the individuals responsible for the patients were asked if their child had experienced any episodes of UTI.

The data were expressed as the mean ± standard deviation (SD), median, and interquartile ranges, or absolute values and fractions. The Student *t* test or the Mann—Whitney test was used to compare continuous variables, while the categorical variables were compared using the Fisher exact test. Pearson's correlation analysis was used to describe the associations. The odds ratio was used to describe the magnitude of the association between the absence or presence of LUTS and gender and age. The positive predictive value (PPV) and negative predictive value (NPV) were determined for the group of 10 questions of the DVSS as a means to evaluate the most sensitive and/