

# Validity and reliability of Persian translated version of Pediatric Lower Urinary Tract Scoring System Questionnaire for Iranian children

Nakysa Hooman<sup>1</sup>

*Department of Pediatric Nephrology, Ali-Asghar Children Hospital, Pediatric Transplantation and Dialysis Research Center (PTDRC), Iran University of Medical Sciences, Tehran, Iran.*

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## Abstract

**Background:** Pediatric lower urinary tract scoring system (PLUTSS) is a questionnaire contains items for assessment of wetting episodes, voiding frequency and pattern. It is used for screening and evaluation of the response of children with lower urinary tract symptoms to therapy. We studied the validity and reliability of Persian translated version of this questionnaire among Iranian children.

**Methods:** One hundred and ninety-seven children aged 5-15 years with urinary tract infection, voiding dysfunction, enuresis were enrolled in this study. Thirty-three healthy age-matched children without urinary complaint were considered as controls. PLUTSS questionnaire was filled out for all children. Sonography was performed to rule out urogenital abnormalities. Internal consistency, test-retest reliability, and validity of the questionnaire were assessed using Cronbach's alpha, intra-class correlation coefficient, and ANOVA test respectively. ROC curve was used to define cut-point and its validity in discrimination between groups. P-value < 0.05 was considered significant.

**Results:** The means for PLUTSS items were 6.8 ( $\pm 5.4$ ) for voiding dysfunction, 14.4( $\pm 5$ ) for enuresis, 10.5( $\pm 7.8$ ) for recurrent and 8.9( $\pm 6$ ) for single urinary tract infection, and 1.9( $\pm 1.8$ ) for controls ( $p < 0.001$ ). Cronbach's alpha for the 14 items of questionnaire was 0.74. The intraclass coefficient correlation for assessing test-retest reliability was 0.82 ( $p < 0.001$ ). ROC curve showed cut point of 5 for differing case from controls with sensitivity of 97.0 and specificity of 74.9( $p < 0.001$ ).

**Conclusions:** Persian translated PLUTSS has a proper validity and reliability as an instrument for screening children with urinary tract symptoms but some questions need to be changed in some way to be understandable by our culture.

**Keywords:** Pediatrics, Questionnaires, Reproducibility of Results, Urination disorders.

## Introduction

Pediatric Lower Urinary Tract Scoring System (PLUTSS) is a standard questionnaire that applies for screening of the children with bladder dysfunction (1,2,3). Application of this simple instrument has been evaluated in other studies (1-5). The items of the questionnaire were first used by the International Reflux Study in children (1)

and then were modified by Farhat and Akbal (2,3). A 24 -month follow up of children with vesicoureteral reflux (VUR) showed that the final score dropped significantly and it was associated with improvement of VUR (4). This scoring system has been suggested as a tool for follow up of response to treatment. The aim of this study was to evaluate the validity of Persian translated version of the PLUTSS.

1. (Corresponding author) Associate professor, Department of Pediatric Nephrology, Ali-Asghar Children Hospital, Pediatric Transplantation and Dialysis Research Center (PTDRC), Iran University of Medical Sciences, Tehran, Iran.  
nhooman@tums.ac.ir, nakisa45@yahoo.com

## Methods

Between March 2008 and March 2011, 197 children (141 female and 56 male) aged 5-15 years with history of voiding symptoms for at least three months, enuresis, urinary tract infection, and 33 healthy children (12 female and 21 male) were entered into the study after taking consent from the parents. The study was approved by ethical committee of Iran University of Medical Sciences (IUMS) and followed by the institution's Review Board for Human Subjects guidelines. It was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and revised in Tokyo 2008. Inclusion criteria were the history of recurrent urinary tract infection, enuresis or incontinence, and age of more than five years. Children with neurogenic bladder or history of pelvic and urogenital surgery were excluded from the study. Recurrent urinary tract infections (UTI) were defined as the history of at least two episodes of upper urinary tract infection or more than two episodes of lower urinary tract infection (6). Enuresis was defined as bed-wetting in the absence of day time incontinence (7). Control group was selected from those who brought to the general outpatient clinic for routine check up and they had no history of renal disease, UTI or incontinence.

**Questionnaires:** PLUTSS (2-4) is a standard questionnaire contains 14 items about wetting episodes, urinary frequency, voiding pattern, and one question about quality of life.

PLUTSS was translated to Persian language by a Persian speaking pediatric nephrologist who was familiar with medical terms and English language. The Translated version was read by two epidemiologist and community medicine specialist and then re-checked with its original English scoring system and the accuracy of translation was approved. In order to confirm that the translated phrases can be understood, the questionnaire was distributed among

twenty families form different levels of education and socio-economic background. The questionnaire was filled-out twice in two separate days, once by a physician and then by a parent. Then the questionnaire was filled out for the second time with one week apart for twenty-four children. Evaluation of feasibility was assessed by answer rate, and missing/non-unique response rate. To assess test-retest reliability, 24 families filled out the questionnaire twice at an interval of one week. For evaluating the validity of discrimination between subjects, we used five groups of children with history of UTI (single and recurrent), enuresis, voiding dysfunction, and healthy children (8). A Ziemens Sonoline G40 sonography system was used for all patients with two 7.5-10 MHz linear and 5 MHz convex probes (9-11). A conventional kidney bladder sonography was performed in all children in order to rule out any urological abnormalities.

**Statistical analysis:** Considering type one error of 0.05, power of 0.8, number of items equal to 14, Cronbach's alpha required equal to 0.5, testing null hypothesis against alpha of 0, delta of 2, sample size was estimated 40 in each group. The data was presented as mean  $\pm$  SD and frequency. Internal consistency was determined by Cronbach's alpha. Cronbach's alpha of more than 0.7 was accepted. Intra-class correlation coefficients were calculated to analysis test-retest analysis reliability (11). ANOVA was used to assess the differences between three groups. Chi-square and odd ratio (OR) was used for 2x2 tables, and likelihood ratios for any row by any column table. P-value < 0.05 was considered significant.

## Results

A total of 197 children (62 recurrent UTI, 49 single UTI, 33 Voiding dysfunctions, and 53 enuresis) who came to the outpatient clinic were enrolled in the study, and 33 age and sex-matched healthy children who were brought to the clinic for routine

Table 1. Number (percent) of positive responses to each question in each group.

	RUTI	SUTI	Voiding dysfunction	enuresis	Control	P-value (LR)
Q1	31(51.7)	23(46.9)	11(35.5)	21(41.2)	2(5.4)	<0.001 (28.2)
Q2	31(51.7)	26(53.1)	11(35.5)	24(47)	3(8.1)	<0.001(27.1)
Q3	22(36.7)	21(42.9)	4(12.9)	50(98)	1(2.7)	<0.001(122.9)
Q4	23(38.3)	22(44.9)	5(16.1)	51(100)	1(2.7)	<0.001(129.6)
Q5	28(46.7)	27(55.1)	13(41.9)	29(56.9)	11(29.7)	NS(8)
Q6	12(20)	4(8.2)	6(19.4)	2(3.9)	0	0.001(18.3)
Q7	14(23.3)	9(18.4)	13(41.9)	7(13.7)	4(10.8)	0.01(11.7)
Q8	15(25)	11(22.4)	12(38.7)	11(21.6)	2(5.4)	0.01(12.6)
Q9	38(63.3)	25(51)	18(58.1)	31(60.8)	6(16.2)	<0.001(25.7)
Q10	32(53.3)	18(36.7)	8(25.8)	20(39.2)	4(10.8)	0.001(21.5)
Q11	29(48.3)	19(38.8)	6(19.4)	16(31.4)	3(8.1)	<0.001(22.6)
Q12	21(35)	16(32.7)	12(38.7)	12(23.5)	7(18.9)	NS(5.3)
Q13	13(21.7)	3(6.1)	4(12.9)	2(3.9)	0	0.001(18.6)
Q14	38(63.3)	21(42.9)	12(38.7)	33(64.7)	1(3)	<0.001(52)

Q= Question; RUTI= Recurrent Urinary Tract Infection, SUTI= Single Urinary Tract Infection

check-up were selected as controls. From 228 filled-out PLUTSS questionnaires by parents, six questionnaires were not returned by the parents and were excluded. Other questionnaires were fully filled-out and no question remained unanswered.

We found that the questions related to incontinency were misunderstood by parents of children with diurnal enuresis. Therefore, we added the words “awake” to questions number 1 and 2 and “sleep” to questions number 3 and 4. For children with enuresis, some Iranian parents awake the child during the night and take him/her to the toilet. For this reason, we added this item to the question number 4 and scored it as “the soaked sheet”.

Regarding voiding frequency, some parents said that it was depend on the intake of fluid; so we added the word “in average”.

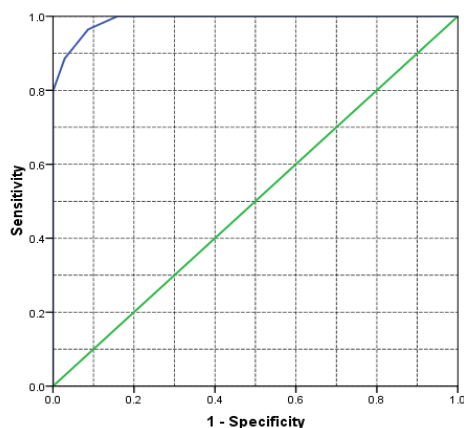


Fig.1. ROC Curve for case and control groups.

Many families did not understand the translation of the word “cross leg” and asked for more explanation; therefore, we changed the word to the” holding pee” or “use pressure to hold pee”. To the question number 13 about the everyday defecation we added the term of hard stool and painful defecation as well.

Table 1 shows the rate of positive response to every question in each domain. The mean scores were 6.8 ( $\pm 5.4$ SD) in voiding dysfunction, 14.4( $\pm 5$ SD) in enuresis, 10.5 ( $\pm 7.8$ SD) in RUTI, 8.9( $\pm 6$ SD) in SUTI, and 1.9 ( $\pm 1.8$ ) in controls (one-way ANOVA;  $p < 0.001$ ).

Cronbach’s alpha for the 14 items of questionnaire was 0.74. The questionnaire was filled-out twice in 24 children. The mean PLUTSS for the first round was 9.66 ( $\pm 7.3$ ) and the second round was 10.66 ( $\pm 7.4$ ) ( $p > 0.05$ ). The intraclass coefficient correlation for assessing test-retest reliability of the PLUTSS was 0.82 ( $p < 0.001$ ). Table 2 showed the ROC curve analysis and Spearman correlation coefficient of individual questions. We found the sensitivity of 92.3 (95% C.I.: 84- 97.1), specificity of 96.3 (95% C.I.: 91.5- 98.8), positive predictive value of 93.5 (95% C.I.: 89.5-97.6), and negative predictive value of 95.6 (95% C.I.: 91.1-100) for cut-point of five by receiver operative characteristic curve for discrimination between cases and controls (Fig. 1). Figure 2 shows the final version of

Table 2. ROC curve analysis of each question in 221 children, and test-retest reliability of questionnaire in 24 children.

	AUC N=221 <sup>§</sup>	p	95% Confidence Interval	SCC N=24 <sup>#</sup>	p
Question1	0.70	<0.001	0.62-0.78	0.43	0.17
Question2	0.70	<0.001	0.63-0.79	0.55	0.06
Question3	0.74	<0.001	0.67-0.81	0.92	<0.001
Question4	0.75	<0.001	0.67-0.82	0.67	0.018
Question5	0.59	.104	0.49-0.69	0.42	0.19
frequency	0.62	.030	0.53-0.71	-	-
Question6	0.56	.242	0.47-0.66	0.67	0.016
Question7	0.55	.325	0.45-0.65	-0.26	0.42
Question8	0.60	.075	0.50-0.69	0.53	0.07
Question9	0.70	<0.001	0.61-0.79	0.35	0.26
Question10	0.64	.008	0.55-0.74	0.57	0.049
Question11	0.64	.011	0.55-0.73	0.26	0.42
Question12	0.55	.352	0.45-0.65	-	-
Question13	0.56	.306	0.46-0.65	0.78	0.003
Question14	0.75	<0.001	0.68-0.83	0.43	0.17

AUC= Area Under the Curve, SCC= Spearman's Rho correlation coefficient,<sup>§</sup> ROC curve analysis of whole of cases.

<sup>#</sup> test-re-test reliability in 24 children.

Persian translated PLUTSS questionnaire.

### Discussion

We found good validity and test-retest reliability for PLUTSS. PLUTSS is a questionnaire for screening children with voiding symptoms or incontinency. Farhat et al validated it for discriminating normal children from those with voiding dysfunction and found cut point of 6 for girls and 9 for boys (2). It has been used as an instrument for predicting the improvement of vesicoureteral reflux (5). Mota et al used this questionnaire as an instrument for screening voiding dysfunction in Brazilian population and found 20-22% of children suffered of enuresis or voiding dysfunction while half of them sought medical consult (13). Dogan et al used PLUTSS as a non-invasive tool for screening asymptomatic children in primary school. Using cut point of less than nine, they found ninety percent had normal PLUTSS. Comparing to uroflowmetry and bladder wall thickness they found higher sensitivity and specificity for PLUTSS (14). Another questionnaire has been suggested for dysfunctional elimination syndrome contained 15 items (15). We evaluated the Persian translated version of PLUTSS among children with voiding symptoms and healthy children (9-11). The

filled-out questionnaires revealed that some items regarding daytime incontinence and enuresis needed to be more clarified because the patients with daytime enuresis without incontinency responded positively to the first two questions. Additionally, the children with holding maneuver could not respond to the translated question regarding cross leg correctly. ROC curve showed high area under the curve for discrimination of normal children from those with voiding symptoms. The optimum cut point for Iranian children, both girls and boys, were five that was a little lower than those suggested by Farhat earlier (2). Even this cut point had not changed by age groups. It was interesting that many normal children did not evacuate bowel everyday but it did not mean constipation; even though some children with elimination syndrome evacuate bowel everyday but had hard stool with painful defecation. Therefore, the question number 12 regarding the bowel movement had low AUC (0.55).

Despite that Akbal et al suggested voiding frequency of less or more than 7 time per day, we found a higher AUC(0.62) by grouping the cases to less than 4, 5 to 7, and higher than seven times per day (3). The concepts of straining and feeling pain during voiding were two other questions

نام خانوادگی :	سن :	جنس :	تاریخ پرکردن فرم:
پرسشنامه مربوط به نحوه ادرار کردن : در طی ماه گذشته کدام یک از علائم فوق را کودک داشته است ؟ لطفا با کمک کودک خود به تمامی سوالات فوق با زدن علامت X پاسخ دهید.			
۱	آیا کودک شما در طول روز که بیدار است خود را خیس می کند؟	خیر	گاهی اوقات ۱-۲ بار در روز همیشه
۲	در طول روز که بیدار است چقدر خود را خیس می کند ؟	هرگز	فقط لباس زیر نم می زند شلوار نم می زند شلوار کاملا خیس می شود
۳	آیا کودک در طول خواب (شب یا روز) خود را خیس می کند؟	خیر	۱-۲ شب در هفته ۳-۵ شب در هفته ۶-۷ شب در هفته
۴	در طول خواب ( شب یا روز) چقدر خود را خیس می کند؟	هرگز	فقط ملحفه نم می زند ملحفه کاملا خیس می شود کودک را در هنگام خواب بیدار کرده به توالت می برید
۵	کودک شما به طور متوسط چند بار در روز ادرار می کند؟		کمتر از ۴ بار در روز ۵-۷ بار در روز بیش از ۷ بار در روز
۶	آیا کودک در حین ادرار کردن زور می زند یا سخت ادرار می کند؟	خیر	بله مطمئن نیستم
۷	آیا ادرار کودک در حین ادرار کردن قطع و وصل می شود؟	خیر	بله مطمئن نیستم
۸	آیا کودک به محض ادرار کردن ، مجددا احساس ادرار دارد یا خود را خیس می کند؟	خیر	بله مطمئن نیستم
۹	آیا کودک شما ناگهان احساس ادرار کردن فوری دارد؟	خیر	بله مطمئن نیستم
۱۰	آیا کودک شما زمانی که ادرار دارد به خود فشار می آورد یا پا به پا می شود تا ادرار نکند ؟	خیر	بله مطمئن نیستم
۱۱	آیا کودک در راه توالت خود را خیس می کند؟	خیر	بله مطمئن نیستم
۱۲	آیا کودک هر روز دفع مدفوع نرم و بدون درد دارد؟	خیر	بله مطمئن نیستم
۱۳	آیا کودک حین ادرار کردن احساس درد دارد؟	خیر	بله مطمئن نیستم
۱۴	این مسئله بر خانواده ، اجتماع و یا مدرسه وی اثر گذاشته است ؟	خیر	تا حدودی بله ، اثر گذاشته شدیدا اثر گذاشته
			۰ ۱ ۲ ۳

Fig. 2. Final version of Persian Translated PLUTSS questionnaire.

that some parents respond with uncertainty; therefore, it seems more reasonable to ask children to fill-out the questionnaire by the assistance of their parents.

There is still no consensus regarding which questionnaire to be used for as a screening tool for evaluation of symptoms and to monitor the response to therapy. In our country, other studies in order to evaluate validity of the questionnaire in larger population and different cultures are recommended.

### Conclusion

Persian translated PLUTSS has a proper validity and reliability as an instrument for screening children with urinary tract symptoms but some questions need to be changed in some way in order to be understood in our language.

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