Translation and validation of the Korean version of acute cystitis symptom score

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Purpose: Acute Cystitis Symptom Score (ACSS) is a simple self-reporting questionnaire initially developed in Uzbek language to help diagnose acute uncomplicated cystitis (AUC). The purpose of this study was to translate the ACSS to Korean and validate the Korean version of ACSS using Korean-speaking women.

Materials and Methods: The original version of ACSS in Uzbek was translated into the target (Korean) version according to internationally accepted guidelines for the translation and cultural adaptation. Cognitive interviews were then conducted for five women with symptoms of AUC and five women without AUC who were native speakers of the Korean language to investigate the clarity, understandability, and acceptability of the translation. The final Korean version of the ACSS was tested in 50 women (31 AUC patients and 19 controls) for clinical validation.

Results: Reliability test for 9 questions (6 questions about typical symptoms of AUC, and 3 questions on quality of life) showed high values (Cronbach’s alpha=0.853). The sum score of typical symptoms showed the highest balance for diagnostic sensitivity and specificity (area under the ROC curve=0.935). Sensitivity and specificity to predict AUC were 90.3% and 89.5% at cut-off score 6 of the typical domain.

Conclusions: The Korean version of the ACSS showed high levels of reliability and validity, similar to other validated versions in different languages. It will play an important role in practice and/or clinical research for diagnosis and treatment efficacy monitoring of Korean-speaking women suffering from AUC.

Keywords: Cystitis; Questionnaire; Urinary tract infection

INTRODUCTION

Urinary tract infection (UTI) is the most common bacterial infection in general practice [1-3]. Almost half of all women have at least one episode of UTI during their lifetime [4]. Acute uncomplicated cystitis (AUC) accounts for the greatest number of UTIs, particularly in young sexually active women. AUC is usually diagnosed based on clinical symptoms and laboratory findings including pyuria or a positive urine culture in primary health care.

However, depending on types of hospitals, laboratory evaluation could not be performed. Thus, physicians are...
asked to prescribe empirical antibiotics based on only complaints of patients in the absence of urine culture and sensitivity data. Fortunately, the probability of AUC in a woman with dysuria, urinary frequency, or hematuria is reported to be about 50%. Specific combinations of symptoms raise the probability to be more than 90% [5]. Therefore, questionnaires and symptom scores can be used to assess the diagnosis and severity of AUC more accurately.

Acute Cystitis Symptom Score (ACSS) is a simple self-reporting questionnaire initially developed in Uzbek language to help diagnose AUC in primary healthcare settings [6]. ACSS questionnaire consists of an 18-item self-reporting questionnaire (6 questions about typical symptoms of AUC, 4 questions regarding differential diagnoses, 3 questions on quality of life [QoL], and 5 questions on additional conditions that might affect therapy). It was further translated into Russian [7], German [8], Hungarian [9], Italian [10], American English version [11], and so on (http://www.acssworld) and validated. Therefore, we aimed to develop a Korean version of the ACSS and validate it using Korean-speaking women.

MATERIALS AND METHODS

1. Translation and linguistic validation

Translation of original version (Uzbek) into the target version (Korean) was performed according to internationally accepted guidelines for the translation and cultural adaptation [12-14]. Forward translation of the Uzbek version of the ACSS into Korean language was carried out by two independent professional translators. Translations were then reconciled by the translators and the authors. A preliminary Korean version of ACSS was translated back into Uzbek language and reconciled by another Uzbek-speaking bilingual staff of the hospital to confirm proper forward translation of the ACSS. After comparison with the Uzbek version, quality control, and discussion by the authors, a complete Korean version of the ACSS questionnaire was obtained. Cognitive interviews were then conducted by five women with symptoms of AUC and five women without AUC who were native speakers of the Korean language to investigate the clarity, understandability, and acceptability of the translation. Participants were asked to comment on their understanding of each item and suggest alternative formulations in the case of problematic wording. All comments of participants were discussed between the translators and the authors. The final Korean version of the ACSS questionnaire was obtained.

2. Clinical validation

Korean speaking women aged over 18 years with any lower urinary tract symptoms from May to August 2021 were included. Patients who had major psychiatric disorder or neurological disorder were excluded from this study. All respondents underwent routine clinical investigations such as urinalysis and urine culture of a mid-stream urine sample. These participants were divided into two groups (AUC patients or controls) according to the physician’s diagnosis based on presence or absence of typical symptoms, pyuria, and bacteriuria at the time of questionnaire completion. The URiSCAN Super Plus, fully automated urine analyzer (YD Diagnostics, Yongin, Korea), was used for urine reagent strip tests. UF-1000i flow cytometer (Sysmex Medical Electronics Co, Kobe, Japan) was used for counting total white blood cells and red blood cells. Pyuria was defined as 10 or more white blood cells/HPF and hematuria is defined as the presence of at least 5 red blood cells/HPF. Patients with bacteriuria ≥10^5 CFU/mL were considered microbiologically significant.

3. Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS version 20.0 for Windows; IBM Corp., Armonk, NY, USA). Data are presented as mean±standard deviation or percentage according to the distribution of parameters. Mann–Whitney’s U-test and Student’s t-test were used for comparative analysis between AUC patients or controls. Reliability of the questionnaire was estimated by calculating internal consistency using Cronbach’s alpha. To determine the validity of the questionnaire, predictive ability of the ACSS was measured by calculating sensitivity and specificity. Based on previous investigations, a sum score of 6 of typical symptoms was used as cut-off value for discriminating respondents into AUC patients and controls [6-11]. A p-value of <0.05 was considered statistically significant.

4. Ethical approval

This study was conducted at Bucheon St. Mary’s Hospital in Korea. It was performed in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was received from each patient prior to their participation in this study. This study was approved by the Institutional Review Board of the Catholic University of Korea (approval number: HC21QISI0029; 16 April, 2021).

RESULTS

1. Translation and linguistic validation

The final Korean version of the ACSS used in this study
Korean ACSS study

for diagnosis of AUC in women is presented in Fig. 1.

2. Clinical validation

1) Demographic data and baseline characteristics

Clinical validation for the Korean version of the ACSS was performed using 50 Korean-speaking women presenting with or without symptoms of AUC at the outpatient clinic. Although there was no standard sample size for the validity or reliability analysis of the questionnaire, more than 30 patients were planned to be recruited to confirm the normal distribution of AUC patients. Considering that about two-thirds of patients were actually diagnosed as AUC in the examination for lower urinary tract symptoms, a total of 50 subjects were recruited. The mean age of these 50 patients was 54.4±15.5 years (range, 19–83 y). Thirty-one (62.0%) patients had proven AUC (AUC patients). Among these patients, the most common uropathogen was Escherichia coli (n=23). Four patients of them had UTIs with extended-spectrum β-lactamase producing organisms. There were no pregnant women among subjects. Detailed self-reporting questionnaire data for the Korean version of the ACSS, including the severity of typical symptoms, differential symptoms, and the QoL are shown in Table 1.
## Table 1. Self-reporting questionnaire data for the Korean version of the ACSS

| Questionnaire               | Total (n=50) | Controls (n=19) | AUC patients (n=31) | p-value* |
|-----------------------------|--------------|-----------------|---------------------|----------|
| **Age (y)**                 | 54.4±15.5    | 51.5±16.4       | 56.2±14.8           | 0.669    |
| **Typical symptoms**        |              |                 |                     |          |
| 1. Urinary frequency        |              |                 |                     |          |
| 0 (None)                    | 4 (8.0)      | 4 (21.1)        | 0 (0.0)             | <0.001   |
| 1 (Mild)                    | 17 (34.0)    | 8 (42.1)        | 9 (29.0)            |          |
| 2 (Moderate)                | 18 (36.0)    | 7 (36.8)        | 11 (35.5)           |          |
| 3 (Severe)                  | 11 (22.0)    | 0 (0.0)         | 11 (35.5)           |          |
| 2. Urinary urgency          |              |                 |                     |          |
| 0 (None)                    | 8 (16.0)     | 5 (26.3)        | 3 (9.7)             | 0.002    |
| 1 (Mild)                    | 21 (42.0)    | 11 (57.9)       | 10 (32.3)           |          |
| 2 (Moderate)                | 14 (28.0)    | 3 (15.8)        | 11 (35.5)           |          |
| 3 (Severe)                  | 7 (14.0)     | 0 (0.0)         | 7 (22.6)            |          |
| 3. Dysuria                  |              |                 |                     |          |
| 0 (None)                    | 18 (36.0)    | 12 (63.2)       | 6 (19.4)            | <0.001   |
| 1 (Mild)                    | 14 (28.0)    | 7 (36.8)        | 7 (22.6)            |          |
| 2 (Moderate)                | 11 (22.0)    | 0 (0.0)         | 11 (35.5)           |          |
| 3 (Severe)                  | 7 (14.0)     | 0 (0.0)         | 7 (22.6)            |          |
| 4. Incomplete bladder emptying |          |                 |                     |          |
| 0 (None)                    | 11 (22.0)    | 8 (42.1)        | 3 (9.7)             | <0.001   |
| 1 (Mild)                    | 24 (48.0)    | 10 (52.6)       | 14 (45.2)           |          |
| 2 (Moderate)                | 8 (16.0)     | 1 (5.3)         | 7 (22.6)            |          |
| 3 (Severe)                  | 7 (14.0)     | 0 (0.0)         | 7 (22.6)            |          |
| 5. Pain in lower abdomen    |              |                 |                     |          |
| 0 (None)                    | 19 (38.0)    | 11 (57.9)       | 8 (25.8)            | 0.004    |
| 1 (Mild)                    | 18 (36.0)    | 7 (36.8)        | 11 (35.5)           |          |
| 2 (Moderate)                | 10 (20.0)    | 1 (5.3)         | 9 (29.0)            |          |
| 3 (Severe)                  | 3 (6.0)      | 0 (0.0)         | 3 (9.7)             |          |
| 6. Hematuria                |              |                 |                     |          |
| 0 (None)                    | 34 (68.0)    | 16 (84.2)       | 18 (58.1)           | 0.018    |
| 1 (Mild)                    | 8 (16.0)     | 3 (15.8)        | 5 (16.1)            |          |
| 2 (Moderate)                | 4 (8.0)      | 0 (0.0)         | 4 (12.9)            |          |
| 3 (Severe)                  | 4 (8.0)      | 0 (0.0)         | 4 (12.9)            |          |
| **Differential symptoms**   |              |                 |                     |          |
| 7. Flank pain               |              |                 |                     |          |
| 0 (None)                    | 36 (72.0)    | 15 (78.9)       | 21 (67.7)           | 0.480    |
| 1 (Mild)                    | 6 (12.0)     | 2 (10.5)        | 4 (12.9)            |          |
| 2 (Moderate)                | 6 (12.0)     | 1 (5.3)         | 5 (16.1)            |          |
| 3 (Severe)                  | 2 (4.0)      | 1 (5.3)         | 1 (3.2)             |          |
| 8. Abnormal vaginal discharge |          |                 |                     |          |
| 0 (None)                    | 36 (72.0)    | 15 (78.9)       | 21 (67.7)           | 0.378    |
| 1 (Mild)                    | 11 (22.0)    | 3 (15.8)        | 8 (25.8)            |          |
| 2 (Moderate)                | 1 (2.0)      | 1 (5.3)         | 0 (0.0)             |          |
| 3 (Severe)                  | 2 (4.0)      | 0 (0.0)         | 2 (6.5)             |          |
| 9. Urethral discharge       |              |                 |                     |          |
| 0 (None)                    | 40 (80.0)    | 16 (84.2)       | 24 (77.4)           | 0.229    |
| 1 (Mild)                    | 6 (12.0)     | 3 (15.8)        | 3 (9.7)             |          |
| 2 (Moderate)                | 2 (4.0)      | 0 (0.0)         | 2 (6.5)             |          |
| 3 (Severe)                  | 2 (4.0)      | 0 (0.0)         | 2 (6.5)             |          |
| 10. High body temperature   |              |                 |                     |          |
| 0 (None)                    | 45 (90.0)    | 19 (100.0)      | 26 (83.9)           | 0.067    |
| 1 (Mild)                    | 5 (10.0)     | 0 (0.0)         | 5 (16.1)            |          |
| 2 (Moderate)                | 0 (0.0)      | 0 (0.0)         | 0 (0.0)             |          |
| 3 (Severe)                  | 0 (0.0)      | 0 (0.0)         | 0 (0.0)             |          |
| **Quality of life**         |              |                 |                     |          |
| 11. Discomfort because of symptoms |        |                 |                     |          |
| 0 (None)                    | 2 (4.0)      | 1 (5.3)         | 1 (3.2)             | 0.027    |
| 1 (Mild)                    | 31 (62.0)    | 15 (78.9)       | 16 (51.6)           |          |
| 2 (Moderate)                | 13 (26.0)    | 3 (15.8)        | 10 (32.3)           |          |
| 3 (Severe)                  | 4 (8.0)      | 0 (0.0)         | 4 (12.9)            |          |
2) Reliability and validity

Reliability test for 9 questions (6 questions about typical symptoms of AUC, and 3 questions on QoL) showed high values (Cronbach’s alpha=0.853). Cronbach’s alpha of the entire questionnaire including 4 questions of differential diagnoses was 0.823.

Fig. 2 showed the receiver operating characteristic (ROC) curves of the individual typical symptoms and the sum score of the typical symptoms. Among them, the sum score of typical symptoms showed the highest balance for diagnostic sensitivity and specificity (area under the ROC curve=0.935). Fig. 3 showed the ROC curves of the sum score of the typical symptoms, the sum score of QoL, and the sum score of the typical symptoms and QoL. Similarly in this analysis, the sum score of typical symptoms showed the best balance between sensitivity and specificity. Sensitivity and specificity to predict AUC were 90.3% and 89.5%, respectively, at cut-off score 6 of typical domain. The sum score of the typical symptoms, the sum score of QoL, and the sum score of the typical symptoms and QoL between AUC patients and controls are presented in Fig. 4.

DISCUSSION

The diagnosis of AUC is usually based on clinical symptoms and laboratory findings including pyuria or a positive urine culture in primary health care. However, as recommended in various guidelines, an accurate diagnosis of AUC needs to focus on a history of lower urinary tract symptoms (dysuria, frequency, and urgency) and the absence of vaginal discharge or irritation [15]. In addition, depending on types of hospitals, laboratory evaluation could not be performed. Physicians in primary care clinics are often asked to prescribe empirical antibiotics only based on complaints of patients in the absence of urine culture and sensitivity data. Under such health care environments, questionnaires and symptom scores can be used to perform the correct diagnosis of AUC.

Previously, the Urinary Tract Infection Symptoms Assessment (UTISA) questionnaire from Bayer Health Care Pharmaceuticals Global Health Economics and Outcome Research, a 14-item self-reporting questionnaire about the
severity and bothersomeness of seven key uncomplicated UTI symptoms [16], has been translated into Korean with linguistic validation. However, statistical information such as predictive and discriminative ability were not evaluated [17]. Thus, it is still not widely used in practice or clinical research in Korea. On the other hand, the ACSS has been translated and validated into various languages.

The ACSS questionnaire was initially developed in Russian and Uzbek language [6]. In a combined analysis for both versions, Cronbach’s alpha for reliability of the ACSS was 0.89. Sensitivity and specificity to predict AUC were 94% and 90%, respectively, at cut-off score of 6 for ‘Typical’ domain. Cronbach’s alpha for the Russian version of the questionnaire was 0.86 and the area under the curve in the ROC analysis was 0.96. Symptom scores were positively correlated with laboratory results [7]. In European countries, Cronbach’s alpha for the German ACSS was 0.87. A cut-off score of 6 for the ‘Typical’ domain significantly predicted AUC with a sensitivity of 94.7% and a specificity of 82.4% [8]. The Hungarian version also showed high levels of reliability and validity with sensitivity and specificity of 90% and 97%, respectively, at cut-off score of 6 for the ‘Typical’ domain [9]. The Italian version of the ACSS reported a sensitivity of 92.5% and a specificity of 97.8% at a cut-off score of 6 for the domain of typical symptoms [10]. Recently, the American-English ACSS showed excellent results of psychometric parameters and diagnostic values in clinical validation [11]. Our results are also consistent with validation results of ACSS in other languages. The Korean version of the ACSS showed high levels of reliability and predictive ability. And the sum score of typical symptoms show the highest balance for diagnostic sensitivity and specificity. However, the individual typical symptoms such as urinary urgency, pain in lower abdomen, and hematuria showed low levels of reliability and predictive ability (area under the ROC curve=0.744, 0.725, and 0.651, respectively).

The shortcomings of the study are (1) performed in a single center, and (2) in a limited number of patients (n=31) and controls (n=19). For all typical symptoms and QoL items, however, a significant difference could be found between patients and controls. Nevertheless, confirmation of the results in a larger multicenter study would be desirable. Finally, the original ACSS was composed of a diagnostic part (part A) and a follow-up part (part B). The follow-up part included a domain of ‘dynamics’ with five questions about changes of symptoms in addition to the same questions as those in the diagnostic part [18]. Therefore, further studies are needed to investigate applicability of the ACSS as a practical questionnaire for patient-reported outcome assessment in Korea.

CONCLUSIONS

In this study, a Korean version of the ACSS was tested in 50 women (31 AUC patients and 19 controls). It showed high levels of reliability and validity, similar to other validated versions of the ACSS in different languages. Thus, it will play an important role in practice and/or clinical research for the diagnosis and treatment efficacy monitoring of Korean-speaking women suffering from AUC.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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AUTHORS’ CONTRIBUTIONS

Research conception and design: Jin Bong Choi, Hyun-Sop Choe, and Seung-Ju Lee. Data acquisition: Jin Bong Choi, Kang Jun Cho, and Kyu Hun Han. Statistical analysis: Jin Bong Choi. Data analysis and interpretation: Jin Bong Choi, Jakhongir F. Alidjanov, Adrian M. E. Pilatz, Florian M. E. Wagenlehner, and Kurt G. Naber. Drafting of the manuscript: Jin Bong Choi and Seung-Ju Lee. Critical revision of the manuscript: Jakhongir F. Alidjanov, Adrian M. E. Pilatz, Florian M. E. Wagenlehner, and Kurt G. Naber. Obtaining funding: Seung-Ju Lee. Administrative, technical, or material support: Hyun-Sop Choe and Seung-Ju Lee. Supervision: Jakhongir F. Alidjanov, Adrian M. E. Pilatz, Florian M. E. Wagenlehner, and Kurt G. Naber. Approval of the final manuscript: Seung-Ju Lee.

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