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Psychometric validity and reliability of the Turkish version of the questionnaire for urinary incontinence diagnosis in women with urinary incontinence

Emrullah Akay[1*], Osman Murat Güler[1], Hilal Künkül Bayraktar[1], Alime Dilayda Uzun Gül[1] and Alper Türkoğlu[1]

Abstract

Background The aim of this study was to evaluate the psychometric validity and reliability of the Turkish version of the Questionnaire for Urinary Incontinence Diagnosis (QUID), which was developed for women with urinary incontinence.

Methods This cross-sectional, methodological study included 600 female participants aged 18 years and above with Turkish reading and writing skills. Psychometric methods comprised correlation analysis, internal consistency (Cronbach's alpha), test–retest reliability, and receiver operating characteristic (ROC) curve analysis. The QUID, King's Health Questionnaire (KHQ), and Incontinence Severity Index (ISI) were administered consecutively to assess construct validity and diagnostic performance. Statistical significance was set at $p < 0.05$.

Results The Turkish version of the QUID demonstrated high validity and reliability in distinguishing stress and urge urinary incontinence. The QUID scores were significantly positively correlated with the KHQ and ISI scores, indicating consistency with the established measures ($p < 0.05$). The test–retest reliability analysis confirmed that the QUID scale provided consistent results over time, with high internal consistency reflected by a Cronbach's alpha coefficient of 0.858, which suggests the questionnaire's stability and reliability for repeated measurements. Additionally, receiver operating characteristic (ROC) curve analyses revealed area under the curve (AUC) values ranging from 0.886 to 0.996 for each subscale, highlighting the high discriminative power of the QUID in distinguishing different types of urinary incontinence effectively.

Conclusions The results of this study indicate that the Turkish version of the QUID is a reliable and valid tool for diagnosing urinary incontinence in clinical practice and may contribute positively to patients' quality of life by providing an accurate diagnosis.

Trial registration Not applicable.

Keywords Urinary incontinence, Psychometric evaluation, QUID questionnaire, Turkish validity and reliability, Test-retest reliability

*Correspondence:
Emrullah Akay
emreakaydr@hotmail.com

[1]Department of Obstetrics and Gynecology Basaksehir Cam and Sakura City Hospital, Başakşehir Mahallesi, Olimpiyat Bulvarı Yolu, No:2 L, Istanbul 34480, Turkey

Background

Urinary incontinence (UI) is a major health concern that significantly impairs women's quality of life. For instance, a recent study from the United States reported a UI prevalence of 61.8% in adult women, with higher rates among those with elevated body mass index and coexisting anxiety or depression [1]. In Turkey, a cohort study revealed a UI prevalence of 50.3%, with stress urinary incontinence emerging as the most common subtype (34.8%) [2]. Additionally, a cross-sectional study among Turkish residents confirmed that UI considerably diminishes quality of life [3]. These findings highlight the profound psychosocial and physical burdens associated with UI and underscore the need for reliable and culturally adapted diagnostic tools [4].

The Questionnaire for Urinary Incontinence Diagnosis (QUID) has become prominent in clinical practice due to its ability to distinguish between stress and urge incontinence [5, 6]. However, given that linguistic and cultural variations can influence an instrument's psychometric properties, it is imperative to perform a thorough cultural adaptation before implementing any tool in a new population [7]. This adaptation process typically involves forward translation, synthesis, backward translation, and expert committee review to ensure semantic, idiomatic, experiential, and conceptual equivalence [8].

In Turkey, validated instruments such as the King's Health Questionnaire (KHQ) and the Incontinence Severity Index (ISI) are widely used. The Turkish adaptation of the KHQ—originally developed by Kelleher and colleagues—has been extensively applied following its translation by Kaya and colleagues [9, 10]. Similarly, the ISI, which classifies UI based on responses to two items, was developed by Sandvik and colleagues, with its Turkish version validated by Uyar Hazar and Şirin [11, 12]. Despite the availability of these tools, no study to date has validated the QUID for the Turkish-speaking female population.

This study aims to develop a Turkish version of the QUID and evaluate its psychometric properties, including content validity, construct validity, internal consistency, and test–retest reliability. We hypothesize that the Turkish adaptation of the QUID will exhibit high reliability—demonstrated by strong Cronbach's alpha values and robust test–retest consistency—and excellent validity, as evidenced by its correlations with established measures such as the KHQ and ISI. Ultimately, this work seeks to introduce a dependable diagnostic tool that will enhance the assessment and management of urinary incontinence among Turkish-speaking women.

Methods

Study design

This methodological study was designed to evaluate the psychometric properties (validity and reliability) of the Turkish version of the QUID questionnaire in women diagnosed with urinary incontinence (UI). To achieve this goal, we applied a multistep research approach:

1. **Translation and Cultural Adaptation**: We translated the QUID into Turkish following internationally recognized guidelines and conducted pilot testing to ensure language clarity.
2. **Validity Assessments**: Content validity was established through expert reviews that confirmed each item accurately measured the relevant aspects of urinary incontinence, while construct validity was evaluated by examining the degree to which the QUID items represented the theoretical constructs of stress and urge UI, achieved by correlating QUID scores with those from the KHQ and ISI.
3. **Reliability Measures**: Internal consistency was evaluated using Cronbach's alpha to determine whether all items measured the same underlying construct, while test–retest reliability was assessed by readministering the QUID to a subset of participants one month later to verify score stability.
4. **Comparison with Other Instruments**: We compared QUID results to the validated KHQ and ISI for convergent validity, thereby assessing whether QUID effectively distinguished stress and urge UI in a manner consistent with existing measures.

By systematically evaluating these parameters, we aimed to address three fundamental research questions:

1. **Content and Construct Validity**: Did the Turkish version of the QUID demonstrate adequate content validity, construct validity, and internal consistency?
2. **Test–Retest Reliability**: Did it yield consistent results over time?
3. **Convergent Validity**: Did it show significant correlation with other validated UI instruments, including the KHQ and ISI?

Ultimately, this stepwise approach allowed us to determine whether the Turkish QUID could serve as a valid and reliable diagnostic tool in clinical practice, in line with international standards for instrument development and validation.

Participant selection

Inclusion criteria

Women aged 18 years or older were included to ensure legal and ethical appropriateness, while adequate

Turkish reading and writing skills enabled participants to understand and accurately complete the questionnaires. Additionally, only those in generally good health, as determined by a brief health history (self-report) and review of relevant medical records, were selected to minimize potential confounding from severe comorbidities. A diagnosis of stress, urge, or mixed urinary incontinence at a urogynecology clinic was also required to target the population for whom the QUID was intended.

Exclusion criteria

Individuals with severe urological or neurological disorders (e.g., bladder cancer, multiple sclerosis, or Parkinson's disease) were excluded, as these conditions could confound the typical presentation of urinary incontinence. Additionally, those with a history of pelvic surgery or childbirth within the last six months were not included, given that postoperative or postpartum status might temporarily alter urinary function. Finally, participants who refused or were unable to provide informed consent were not enrolled, in line with ethical standards for voluntary participation.

Data collection methods and study process

A total of 1,303 women were interviewed face to face, and three validated questionnaires (QUID, KHQ, and ISI) were administered consecutively to each participant. All participants were recruited by a specialist physician at the urogynecology clinic, regardless of whether they had a prior diagnosis of stress, urge, or mixed urinary incontinence. Forty-five questions in total were presented, and each participant completed the questionnaires in a private room to ensure unbiased and accurate responses.

After confirming that all responses were fully completed, 400 cases and 200 controls meeting the inclusion criteria were selected for analysis. To evaluate test–retest reliability, the QUID questionnaire was readministered to 100 participants from the case group one month later. The study was conducted from July 24, 2024, to September 20, 2024, with an average of 15 questionnaires completed daily. Test–retest data collection was finalized on November 1, 2024. Demographic and clinical characteristics, as well as the frequency and severity of urinary incontinence, were recorded and subsequently analyzed.

Translation processes

The translation and cultural adaptation of the QUID questionnaire into Turkish followed a multistep approach based on established international guidelines for patient-reported outcome (PRO) measures. Specifically, we adhered to recommendations by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Task Force [13]. Our process included the following key steps:

1. **Forward translation** The original QUID was translated into Turkish by a specialist fluent in both English and Turkish, focusing on linguistic clarity and conceptual equivalence.
2. **Medical review translation** A physician working in the United Kingdom reviewed and refined the initial translation to ensure clinical accuracy and consistency of medical terminology.
3. **Expert review** Both translators and additional experts (including clinical and linguistic professionals) discussed any discrepancies in the translations. This collaborative review led to a single, finalized Turkish version that reconciled all identified differences.
4. **Back-Translation** The finalized Turkish version was then back-translated into English by an independent translator. This step served to verify conceptual equivalence with the original QUID and confirm that no critical nuances were lost or altered.

By following these guidelines, we aimed to ensure that the Turkish version of the QUID accurately reflected linguistic and cultural nuances, preserving the validity and reliability of the instrument for Turkish-speaking populations (Additional file 1).

Pilot testing

Following the initial forward- and back-translation steps, we conducted a small-scale pilot test of the pre-final Turkish QUID with 20 Turkish-speaking women (aged 18–60 years) who met the study's general inclusion criteria. These participants completed the questionnaire in a private setting and were asked to comment on any items they found unclear, culturally inappropriate, or difficult to interpret. Their feedback primarily related to minor wording preferences, and no major semantic or conceptual discrepancies were reported. Based on these observations, we made slight revisions to ensure better clarity and flow. This pilot test allowed us to confirm that the translated items were well understood before proceeding to the main validation phase.

During the adaptation process, Item 5 underwent a minor wording change to more accurately convey urgency symptoms; the original and revised Turkish versions can be found in an appendix (Additional File 2). This modification more directly reflected the urgency symptom described in the original English text, ensuring better cultural and linguistic alignment without altering the core meaning of the item.

Questionnaires and assessment

QUID (Questionnaire for urinary incontinence diagnosis)

The QUID was originally developed by Bradley et al. [4] to distinguish between stress and urge urinary incontinence

(UI) in women. It consists of six items—three addressing stress UI symptoms and three addressing urge UI symptoms. In a subsequent study, the instrument was validated, demonstrating its reliability and responsiveness to change in various clinical settings [5].

Reliability and validity of the original QUID

- Internal Consistency: The original QUID showed good internal consistency (Cronbach's alpha values above 0.80).
- Test–Retest Reliability: When women filled out the questionnaire at two different times, their scores remained stable if their symptoms did not change.
- Convergent Validity: The QUID correlated well with other established urinary incontinence measures, indicating that it effectively measured the types of UI it targeted.
- Responsiveness to Change: Studies showed that the QUID accurately tracked changes in UI symptoms over time, making it useful for monitoring treatment outcomes.

Turkish Adaptation In the current study, the QUID was translated and culturally adapted for Turkish-speaking women in accordance with established guidelines. We assessed content validity to ensure clarity and accuracy of the translated items, construct validity by examining the correlations of the QUID with two validated instruments (the King's Health Questionnaire and the Incontinence Severity Index), and reliability through internal consistency (Cronbach's alpha) and test–retest analyses.

King's health questionnaire (KHQ)

The KHQ, originally developed by Kelleher et al. [10], is designed to evaluate the multifaceted impact of urinary incontinence on women's quality of life. It consists of 32 items covering domains such as role limitations, physical limitations, social limitations, personal relationships, emotions, and sleep/energy, along with an 11-item symptom severity scale. In this study, we utilized the Turkish-validated version of the KHQ, as confirmed by Kaya et al. [9], to assess the quality of life in women experiencing urinary incontinence.

Reliability and validity of the original KHQ

- Internal Consistency: The original KHQ showed good internal consistency (generally Cronbach's alpha ≥ 0.70) across its subscales.
- Test–Retest Reliability: Participants' scores remained stable over short intervals when their condition did not change, indicating consistency.
- Construct Validity: The KHQ correlated well with other established measures of urinary symptoms and quality of life, demonstrating that it effectively assessed the intended concepts.
- Responsiveness: It has proven sensitive to clinical changes over time, making it valuable for monitoring treatment outcomes in women with UI.

Incontinence severity index (ISI)

The ISI, developed by Sandvik et al. [12], is a brief and practical tool designed to assess the severity of urinary incontinence. It consists of two questions evaluating the frequency and amount of urine leakage. Responses are scored, and the total score categorizes incontinence severity as mild, moderate, severe, or very severe. The scale has been adapted into Turkish, and its validity and reliability were confirmed by Uyar Hazar and Şirin [11].

Reliability and validity of the original ISI

- Internal Consistency: The ISI demonstrated acceptable internal consistency, suggesting that its items reliably measured UI severity.
- Test–Retest Reliability: When re-administered over short intervals, the ISI produced stable scores if the participants' incontinence status had not changed.
- Criterion Validity: In its original development, the ISI was compared with objective measures such as the 48-hour pad-weighing test, showing strong correlation and supporting its accuracy in gauging the amount of urine loss.
- Use in Epidemiological Surveys: The ISI has also been validated in large population studies, confirming its applicability for both clinical assessment and broader research settings.

Sample size

A post hoc power analysis conducted via G*Power software included a sample size of 400 cases and 200 controls, with t tests for means: difference between two independent means (two groups), effect size (d) = 0.50, alpha (α) = 0.05. The power of the study was calculated as 1.000, indicating a 100% probability of detecting a true difference.

In the analysis performed for test-retest reliability, t tests were used for means: difference between two dependent means (matched pairs), effect size (d) = 0.5, alpha (α) = 0.05, and a sample size of 100; the power value was found to be 0.99. This indicates a 99% probability of detecting a true difference, demonstrating the reliability of the measurements.

Statistical methods

Descriptive statistics for the data included the mean, standard deviation, median, minimum, maximum, frequency, and ratio values. Kolmogorov–Smirnov and Shapiro–Wilk tests were used to assess distribution; Mann–Whitney U and Wilcoxon tests were applied for data that were not normally distributed. The chi-square test was used to analyze categorical independent data, and Spearman correlation analysis was used to assess relationships between variables. ROC analysis was conducted to determine the discriminatory power of QUID scores between groups. All analyses were performed via SPSS 28.0 software, with $p < 0.05$ considered the level of significance. Test-retest reliability was assessed using the Wilcoxon signed-rank test to compare the initial and follow-up QUID scores.

Ethical approval and study duration

This study was conducted in the Department of Obstetrics and Gynecology at the T.C. Ministry of Health Basaksehir Cam and Sakura City Hospital. The research was approved by the Clinical Research Ethics Committee of Basaksehir Cam and Sakura City Hospital (No: E-96317027-514.10-251396527, Subject: KAEK/24.07.2024.73). nd was carried out in accordance with the Declaration of Helsinki.

Official permission for the validation of the Turkish version of the QUID test was obtained via email from its original developer, Bradley C.S.

Results

Demographic and clinical characteristics

No significant differences were found between the case and control groups in terms of age or educational status ($p > 0.05$). Similarly, no significant differences were observed between the groups in terms of gravidity or parity ($p > 0.05$). These results indicate that demographic variables did not significantly affect the case and control groups, demonstrating a homogeneous distribution between the two groups.

However, the cesarean section rate and number of cesarean deliveries were significantly lower in the case group than in the control group ($p < 0.05$). On the other hand, the rate and number of vaginal deliveries were significantly greater in the case group than in the control group ($p < 0.05$). This finding suggests that vaginal delivery may be associated with the development of stress and urge urinary incontinence. In addition, no significant differences were found between the groups in terms of postmenopausal status or hysterectomy rates ($p > 0.05$), indicating similar distributions of these clinical characteristics in both groups (Table 1).

Scale analysis

The minimum, maximum, median, and mean ± standard deviation scores for the KHQ, ISI, and QUID scales are presented. These scales assess overall health perception, role and physical limitations, social limitations, personal relationships, sleep and energy levels, symptom severity, and related aspects. The data were used to evaluate the

Table 1 Demographic and clinical characteristics of the participants

		Control Group (n:200)				Case Group (n:400)				*p*	
		Average.±ss/n-%			Median	Average.±ss/n-%			Median		
Age		42.8	±	9.3	43.0	44.3	±	9.7	44.0	0.156	m
Education Status	Illiterate	8		4.0%		29		7.3%		0.104	X^2
	Literate	23		11.5%		41		10.3%			
	Primary school	69		34.5%		158		39.5%			
	Secondary school	43		21.5%		78		19.5%			
	High school	41		20.5%		69		17.3%			
	University	16		8.0%		25		6.3%			
Gravidity		3.3	±	1.6	3.0	3.1	±	1.5	3.0	0.478	m
Parity		2.7	±	1.3	3.0	2.7	±	1.3	3.0	0.810	m
Cesarean Section	(-)	30		15.0%		269		67.3%		***0.000***	X^2
	(+)	170		85.0%		131		32.8%			
Number of Cesarean Sections		2.8	±	1.3	3.0	1.8	±	0.9	2.0	***0.000***	m
Vaginal Delivery	(-)	134		67.0%		82		20.5%		***0.000***	X^2
	(+)	66		33.0%		318		79.5%			
Number of Vaginal Delivery		1.9	±	0.8	2.0	2.6	±	1.2	2.0	***0.000***	m
Postmenopausal Status	(-)	126		63.0%		282		70.5%		0.063	X^2
	(+)	74		37.0%		118		29.5%			
Hysterectomy	(-)	183		91.5%		373		93.3%		0.438	X^2
	(+)	17		8.5%		27		6.8%			

[m] Mann-whitney u test / [X^2] Ki-kare test

Table 2 Summary of scores for KHQ, ISI, and QUID scales

	Min-Mak	Median	Average.±ss/n-%
King's Health Questionnaire (KHQ)			
General health perception	2.0–9.0	6.0	6.1 ± 1.4
Role Limitation	2.0–8.0	6.0	5.9 ± 1.9
Physical Limitation	2.0–8.0	6.0	5.8 ± 1.9
Social Limitation	2.0–8.0	5.0	5.0 ± 2.0
Personal Relationship	0.0–12.0	6.0	6.2 ± 3.3
Emotional problems	2.0–12.0	8.0	8.0 ± 2.8
Sleep and energy disturbances	2.0–12.0	5.0	4.7 ± 2.0
Severity Measures	5.0–20.0	15.0	14.3 ± 4.1
Symptom Severity	0.0–33.0	14.0	15.1 ± 7.7
Total Score	25.0–115.0	72.0	71.0 ± 21.7
Incontinence Severity Index (ISI)			
Urinary Frequency	1.0–7.0	3.0	3.3 ± 0.9
Urine Volume	1.0–5.0	2.0	2.1 ± 0.9
Total Score	0.0–10.0	5.0	5.4 ± 1.5
Questionnaire for Urinary Incontinence Diagnosis (QUID)			
Leaking When Coughing or Sneezing	0.0–5.0	2.0	2.1 ± 2.0
Leaking When Bending or Lifting an Object	0.0–5.0	1.0	1.5 ± 1.8
Leaking When Walking, Running, or Exercising	0.0–5.0	1.0	1.6 ± 1.8
Leaking when undressing before going to the toilet	0.0–5.0	2.0	1.9 ± 1.9
Leaking Before Reaching the Toilet When There Is a Strong and Uncomfortable Need to Urinate	0.0–5.0	2.0	2.1 ± 2.0
Sudden or Strong Urge to Urinate Requiring Immediate Bathroom Access	0.0–5.0	2.0	2.2 ± 2.0
Total Score	0.0–30.0	11.0	11.4 ± 10.2

Table 3 QUID score analysis

	Control Group (n:200)				Case Group (n:400)				*p*	
	Average.±ss/n-%			Median	Average.±ss/n-%			Median		
Item 1	0.03	±	0.16	0.00	3.19	±	1.54	3.00	***0.000***	[m]
Item 2	0.02	±	0.16	0.00	2.25	±	1.74	2.00	***0.000***	[m]
Item 3	0.03	±	0.19	0.00	2.38	±	1.75	2.00	***0.000***	[m]
Item 4	0.02	±	0.16	0.00	2.85	±	1.70	3.00	***0.000***	[m]
Item 5	0.01	±	0.10	0.00	3.09	±	1.67	3.00	***0.000***	[m]
Item 6	0.03	±	0.19	0.00	3.24	±	1.59	4.00	***0.000***	[m]
Total Score	0.12	±	0.45	0.00	16.99	±	7.80	17.00	***0.000***	[m]

[m] Mann-whitney u test / [X^2] Ki-kare test

impact of urinary incontinence on participants' general health (Table 2).

QUID score analysis

The analysis of the QUID scores revealed that all the subitems and the total score in the case group were significantly higher than those in the control group ($p < 0.05$) (Table 3). These findings indicate that the severity of incontinence symptoms in the case group was more pronounced than that in the control group, and these symptoms were accurately assessed via the QUID questionnaire.

Correlation analyses

Correlation analyses between the QUID scores and the KHQ and ISI scores revealed significant ($p < 0.05$) positive correlations for all the subitems and the total score (Table 4). The high correlation between QUID scores and the KHQ and ISI scores indicates that the QUID questionnaire is consistent with other valid scales for evaluating stress and urge incontinence symptoms and accurately measures similar symptoms via different assessment tools. This finding supports the general validity and reliability of the QUID questionnaire, as corroborated by other clinical measurement tools.

Correlations between the KHQ and ISI scores and the QUID score were also observed. Significant positive correlations were found in both cases. Specifically, the correlation coefficient between the KHQ and QUID total scores was 0.705 ($p < 0.05$); this finding indicates that these two questionnaires assess similar constructs and yield consistent results. Similarly, the correlation coefficient between the ISI score and QUID score was 0.607

Table 4 Correlation analysis between QUID score and KHQ and ISI scores

		KHQ Total Score	ISI Total Score
QUID Score			
Item 1	r	0.370	0.385
	p	***0.000***	***0.000***
Item 2	r	0.532	0.408
	p	***0.000***	***0.000***
Item 3	r	0.553	0.434
	p	***0.000***	***0.000***
Item 4	r	0.605	0.554
	p	***0.000***	***0.000***
Item 5	r	0.642	0.583
	p	***0.000***	***0.000***
Item 6	r	0.628	0.534
	p	***0.000***	***0.000***
Total Score	r	0.705	0.607
	p	***0.000***	***0.000***

Spearman Correlation

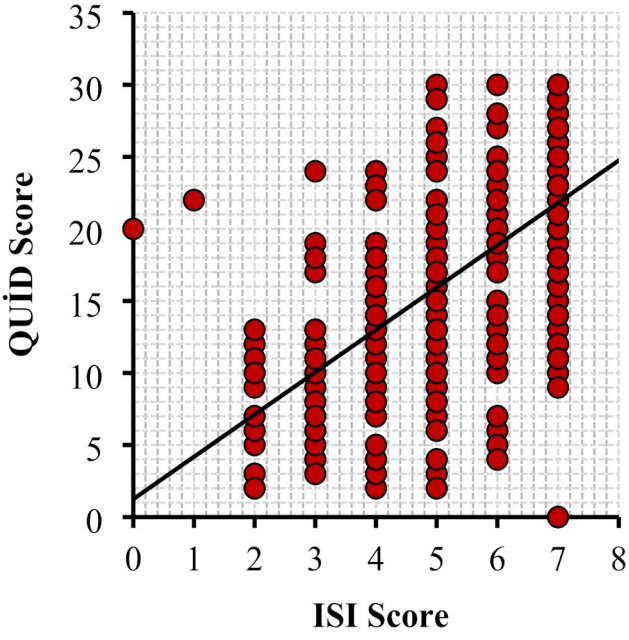

Fig. 1 Correlation between ISI score and QUID score

($p < 0.05$), indicating that the ISI score is also in agreement with the QUID score (Figs. 1 and 2).

ROC curve analyses and diagnostic performance

In the ROC curve analysis, the area under the curve (AUC) values for each subitem were found to be between 0.886 and 0.996. These results demonstrate that the QUID questionnaire can provide high accuracy in distinguishing between groups. Specifically, the AUC value for the "leakage during coughing or sneezing" subdomain was 0.971 (95% CI: 0.957–0.984), indicating the very high efficacy of the QUID in detecting stress-type

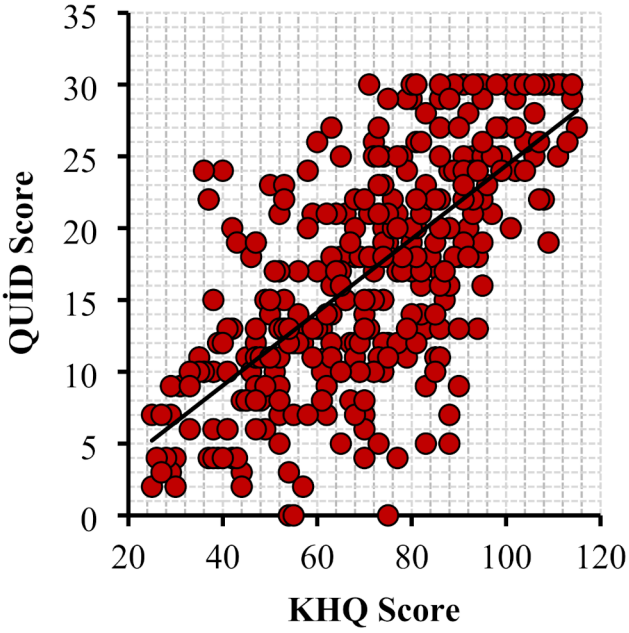

Fig. 2 Correlation between KHQScore and QUID score

incontinence (Table 5; Fig. 3). Similarly, high AUC values were observed for all the subitems. These findings support the effectiveness of QUID as a screening tool for detecting stress and urge incontinence symptoms.

Test-Retest reliability

Test-retest reliability The test-retest reliability analysis revealed no significant differences between the first and second measurements ($p > 0.05$) (Table 5), indicating that the QUID questionnaire provides consistent results over time and is a reliable measurement tool. The high reliability observed in the test–retest analysis supports the use of QUID in repeated clinical applications. The Wilcoxon signed-rank test revealed no significant differences between the initial measurement and the test repetition ($p > 0.05$), indicating high reliability of the QUID questionnaire.

The QUID questionnaire also demonstrated significant ($p < 0.05$) positive correlations between its scores and the Khq and ISI scores (Table 6). These findings further support the reliability of the QUID questionnaire as a consistent measurement tool.

Internal consistency

The internal consistency of the QUID questionnaire was 0.858 according to Cronbach's alpha coefficient. This value indicates that all subdomains of the questionnaire are in harmony with each other and demonstrate high internal consistency. This high Cronbach's alpha coefficient reinforces the discriminative power and consistency of the QUID across different types of incontinence being measured.

Table 5 Test-retest reliability results of the QUID questionnaire

	Initial Measurement				Test Repetition				*p*	
	Average.±ss			Median	Average.±ss			Median		
QUID Score										
Item 1	3.1	±	1.5	3.0	3.1	±	1.4	3.0	0.896	[w]
Item 2	2.3	±	1.7	2.0	2.3	±	1.7	2.0	0.835	[w]
Item 3	2.5	±	1.6	2.5	2.4	±	1.7	2.0	0.208	[w]
Item 4	2.6	±	1.7	2.5	2.6	±	1.6	3.0	0.710	[w]
Item 5	3.0	±	1.7	3.0	3.0	±	1.6	3.0	0.473	[w]
Item 6	3.1	±	1.5	3.0	3.1	±	1.5	3.0	0.558	[w]
Total Score	16.6	±	7.6	15.0	16.6	±	7.1	16.0	0.951	[w]

[w] Wilcoxon test

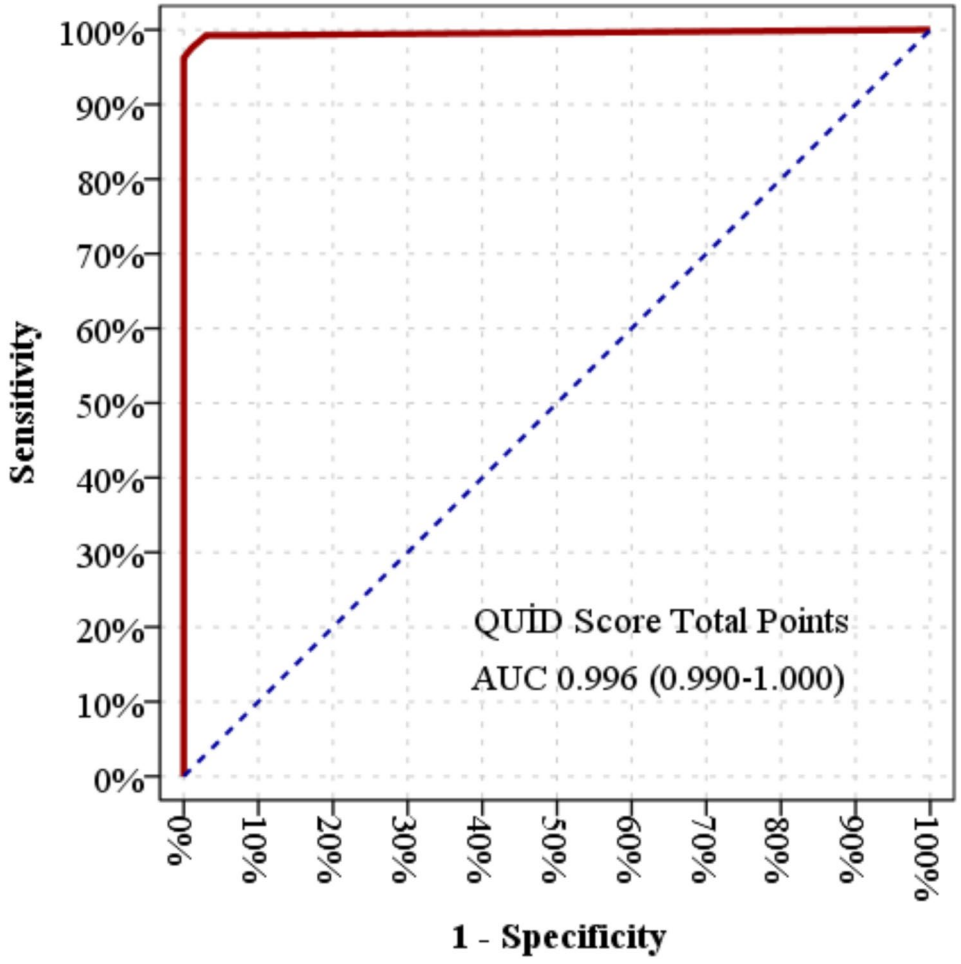

Fig. 3 ROC curve for QUID score (AUC: 0.996, 95% CI: 0.990-1.000)

Discussion

In this study, the psychometric properties of the Turkish version of the QUID, which was developed to distinguish between stress and urge types of UI in women, were comprehensively evaluated. Our findings indicate that the Turkish version of the QUID scale has high validity and reliability in distinguishing between stress and urge types and therefore can be used as a reliable diagnostic tool in clinical practice in Turkey. These results are consistent with the high reliability and validity results obtained from adaptation studies of QUID in various languages, including English, Brazilian Portuguese, German, Thai, Spanish, Chinese, and Malay [5, 14–19]. This strongly supports the success of QUID in terms of cultural adaptation and its applicability across different populations.

Table 6 Correlation results between QUID questionnaire test-replay reliability and KHQand ISI scores

Test Repetition		KHQScore Total Score	ISI Score Total Score
QUID Score			
Item 1	r	0.371	0.259
	p	***0.000***	***0.009***
Item 2	r	0.492	0.504
	p	***0.000***	***0.000***
Item 3	r	0.391	0.419
	p	***0.000***	***0.000***
Item 4	r	0.618	0.585
	p	***0.000***	***0.000***
Item 5	r	0.574	0.535
	p	***0.000***	***0.000***
Item 6	r	0.505	0.549
	p	***0.000***	***0.000***
Total Score	r	0.640	0.616
	p	***0.000***	***0.000***

Spearman Correlation

Comparison of demographic and clinical characteristics

In our study, no significant differences were found between the case and control groups in terms of age, educational status, gravidity, or parity ($p > 0.05$). These results demonstrate that QUID scores can be evaluated independently of these demographic characteristics. Similarly, Brandt et al. reported that demographic characteristics did not significantly affect QUID scores [15]. However, in our study, the cesarean section rate and the number of cesarean deliveries were lower in the case group than in the control group, whereas the vaginal delivery rate was higher in the case group. This finding is consistent with the literature suggesting that vaginal delivery may increase the risk of stress and urge urinary incontinence [20]. Identifying vaginal delivery as a risk factor for incontinence underscores the importance of QUID in this patient group.

QUID score and comparison with the literature

The significantly higher QUID scores for all subitems in the case group than in the control group ($p < 0.05$) indicate that stress and urge incontinence symptoms were more pronounced in this group. Other studies have also shown that the QUID scale has high validity and power for assessing symptom severity [5]. A study conducted in Brazil reported that the culturally adapted version of the QUID had similar diagnostic accuracy and could reliably assess urinary incontinence [21]. There is also a study protocol examining the usability of the Malay version of the QUID for evaluating urinary incontinence in women in Selangor, Malaysia [19]. Additionally, the Spanish version of the QUID has demonstrated high validity in terms of internal consistency and reliability, and the Chinese version has been reported as a valid tool for diagnosing urinary incontinence in Chinese women [17, 18]. The ability to use QUID effectively as a screening tool for stress and urge urinary incontinence by untrained healthcare workers in low-resource settings highlights the importance of its widespread use [22]. These findings strongly emphasize that QUID is a reliable and valid diagnostic tool at the international level.

Correlation analyses and comparisons with the literature

In the validity and reliability study of the Turkish version of the KHQ, high internal consistency (Cronbach's alpha coefficient: 0.68–0.93) and test-retest reliability (intraclass correlation coefficient: 0.69–0.94) were found [23]. The Turkish version of the ISI has also been proven to be valid and reliable in determining the severity of urinary incontinence in women in studies conducted with the Turkish population [11]. In our study, significant positive correlations were found between QUID scores and KHQ and ISI scores ($p < 0.05$). These findings indicate that QUID is highly related to other valid scales and provides a valid measurement. A validation and cultural adaptation study of the Brazilian Portuguese version of the QUID by de Araujo et al. demonstrated that the QUID can be used as a reliable and valid diagnostic tool in different cultural contexts [14]. Additionally, significant correlations between QUID and KHQ scores were found in the German version [15]. This consistency is important, as it shows that QUID retains its validity across different cultures.

ROC curve analyses and diagnostic performance

AUC values between 0.886 and 0.996 for each subdomain in the ROC curve analysis indicate that QUID provides high discriminative ability between groups. Similarly, the original development study reported high AUC values and strong discriminatory power in detecting stress-type incontinence [4]. The high AUC values found in different cultural adaptations of the QUID further indicate the universal diagnostic strength of this questionnaire.

The test–retest reliability and internal consistency

(QUID) scores were high, with no significant differences between the first and second measurements. Similarly, high test–retest reliability and high intraclass correlation coefficients have been reported for QUID [4]. These findings demonstrate that QUID maintains its consistency over time and is a reliable tool. The Cronbach's alpha coefficient for the internal consistency of the QUID scale was 0.858, indicating that the subdomains of the questionnaire consistently measure their intended constructs. This value is consistent with the internal consistency results reported for the German version, demonstrating that QUID provides consistent results across different cultural and linguistic adaptations [15]. These results

support the widespread use of QUID as a consistent and reliable diagnostic tool.

Conclusions

This study demonstrated that the Turkish version of QUID is a valid and reliable tool for distinguishing stress and urge types of urinary incontinence. The findings suggest that QUID can be effectively used as a diagnostic tool in various clinical and cultural settings, facilitating diagnostic processes and positively contributing to patients' quality of life. Therefore, the widespread use of QUID in clinical practice is encouraged at both national and international levels. However, further validation studies are necessary to reinforce these findings.

Strengths and limitations

Strengths

This study, which included a robust sample of 600 participants in Turkey, provided a comprehensive evaluation of the QUID's validity and reliability. The translation and cultural adaptation process was conducted using a rigorous, multi-step methodology in accordance with international standards (ISPOR), ensuring the conceptual equivalence of the Turkish version of the instrument. QUID scores demonstrated robust construct validity, as evidenced by significant positive correlations with established measures such as the King's Health Questionnaire (KHQ) and the Incontinence Severity Index (ISI). Furthermore, test–retest assessments confirmed the high reliability of the tool, underscoring its stability over time.

Limitations

Several limitations should be considered when interpreting the findings of this study. First, the sample consisted exclusively of Turkish-speaking, literate women, which restricts the generalizability of the results to populations with varying educational backgrounds or speakers of other languages. Additionally, although the overall sample size was robust, it may not have been sufficient to detect subtle differences across various subgroups. Second, the cross-sectional design of the study precluded an evaluation of the QUID's responsiveness to treatment; while the validity and reliability of the Turkish version were thoroughly assessed, its ability to capture treatment-related changes remains unexamined. Future prospective studies incorporating both pre-treatment and post-treatment assessments are warranted to address this gap. Finally, since participants were recruited from a single tertiary hospital and represented specific sociodemographic characteristics, the applicability of the findings to other regions of Turkey or to more diverse socioeconomic groups may be limited.

Considering these points, this study confirms that the Turkish version of the QUID has strong validity and reliability for diagnostic purposes. Future research should focus on expanding its applicability to diverse populations and assessing its longitudinal performance in follow-up studies.

Abbreviations

AUC	Area under the curve
CI	Confidence interval
ISI	Incontinence Severity Index
KHQ	King's Health Questionnaire
QUID	Questionnaire for Urinary Incontinence Diagnosis
ROC	Receiver operating characteristic
UI	Urinary incontinence

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

Primary Corresponding Author: Emrullah Akay - Responsible for all correspondence and submission processes. Conducted data collection, analysis, and manuscript writing. Other Contributing Authors: Osman Murat Güler - Assisted in statistical analysis and data interpretation. Contributed to and reviewed the scientific content of the manuscript. Hilal Künkül Bayraktar - Contributed to literature review and data collection. Assisted in the editing and revision of the manuscript. Alime Dilayda Uzun Gül - Contributed to data analysis and interpretation of the results. Also ensured the scientific accuracy of the manuscript. Alper Türkoğlu - Responsible for the preparation of figures and tables, supporting the manuscript with visuals, and presenting the data. Reviewed the manuscript and provided feedback.

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Data availability

Data Availability Statement: The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request. No publicly available repository or accession number is provided, as data access is restricted to reasonable inquiries for privacy reasons.

Declarations

Informed consent

Informed consent was obtained from all subjects involved in the study.

Competing interests

The authors declare no competing interests.

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