

# Principal component analysis and internal reliability of the Polish version of MESA and UDI-6 questionnaires

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## ABSTRACT

**Objectives:** Urinary incontinence (UI) can affect up to 50% of the population of women over the age of 50. In order to objectively assess discomfort in women with UI prior to initiating treatment and monitoring the outcomes of the treatment, validated questionnaires need to be used to examine the impact of UI on health-related quality of life (HR-QoL). The Urogenital Distress Inventory — Short Form (UDI-6) and the Medical Epidemiologic and Social Aspects of Ageing (MESA) questionnaires are used typically.

Assessment of the Polish translation of the MESA and UDI-6 questionnaires.

**Material and methods:** 155 patients with symptoms of UI were enrolled. Each of the patients completed the MESA and UDI questionnaires prior to being examined. The final diagnosis was made after diagnostic tests were carried out in the patients.

**Results:** Principle component analysis showed division of the Polish versions of the questionnaires into domains identical to the original version. Analyses of internal consistency reliability revealed high internal consistency for the MESA questionnaire (0.90) and a low reliability of the UDI-6 questionnaire (0.44).

**Conclusions:** The Polish version of the MESA questionnaire was demonstrated to be a clinically useful diagnostic tool in the studied population, UDI-6 did not reach a sufficiently high reliability in the study group to be recommended as a diagnostic tool.

**Key words:** urinary incontinence; UDI-6; MESA; health-related quality of life

Ginekologia Polska 2020; 91, 1: 13–16

## INTRODUCTION

Urinary incontinence (UI) can occur in as many as 40–50% of women after the age of 40, and the incidence increases with age [1]. There are four main types of urinary incontinence: urge incontinence due to an overactive bladder (OAB), stress incontinence (SI) due to poor closure of the bladder, overflow incontinence due to either poor bladder contraction or blockage of the urethra and mixed urinary incontinence which aggregate symptoms of OAB and SI. Women with UI are more likely to suffer from depression, and report a reduced enjoyment of sexual activity [2]. Affected

women also receive lower scores in health-related quality of life (HRQoL) questionnaires [2], which enable researchers to test the impact of urinary incontinence symptoms on a patient's physical, mental and social functioning. These questionnaires are extremely important in the classification of women suffering from UI in order to provide the best treatment and to establish follow-up measures. A large number of HRQoL questionnaires developed for the assessment of patients with urinary incontinence are described in the literature, however, these tools are usually originally developed in English. To reach the target patient's, the origi-

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nal questionnaire should be translated into the patient's language. After completing the translation of a questionnaire, its validity needs to be assessed objectively.

The Medical, Epidemiologic, and Social aspects of Ageing (MESA) questionnaire is a research tool published over 20 years ago [3], but has not yet been validated in Polish. The score obtained in the questionnaire reflects the severity of the patient's ailments, and the impact of these ailments on their quality of life. Numerous studies, the results of which have been published, have demonstrated the value of the MESA questionnaire in assessing both in the diagnosis of UI and the effectiveness of UI and urinary urgency treatment [4]. The MESA questionnaire consists of two parts: the first part contains six questions and is related to UI, the second part contains nine questions and is related to stress UI. The patient evaluates the severity of the symptoms on a four-point scale.

An additional tool for assessing the impact of UI on women is the UDI (Urogenital Distress Inventory) questionnaire. The UDI-6 (Urogenital Distress Inventory — Short Form) questionnaire is a shortened version of the 19-element UDI. The shortened version is less time-consuming for the patient while maintaining the informative value for a clinician. The questionnaire consists of six questions examining three domains: IS — irritative symptoms (questions 1 and 2), SS — stress symptoms (questions 3 and 4), OS — obstructive/discomfort (questions 5 and 6), and each question is assessed by the patient on a four-point scale. The literature shows that these parameters correlate with data from other measures including voiding diaries, urodynamic examination, and sanitary tests, and change as a result of treatment [5].

### Objectives

The objective of this study is to validate the Polish translation of two questionnaires examining health-related quality of life — UDI-6 (Urogenital Distress Inventory-Short Form) and MESA (Medical Epidemiologic and Social Aspects of Ageing).

### MATERIAL AND METHODS

The study involved 155 Polish-speaking patients with UI problems who were tested for UI in the urodynamic laboratory at the Urology Department of Saint Raphael's Hospital in Czerwona Góra, Chełm, Poland. All patients underwent urodynamic testing using Medtronic's Duet Logic G2. The results of the urodynamic tests were interpreted based on the definitions and units established by the International Continence Society (ISC). Based on the urodynamic tests, the patients were classified into one of five the groups: stress urinary incontinence (SUI), urge urinary incontinence (UUI), overactive bladder without urinary incontinence (OAB), mixed urinary incontinence (MUI) and patients without

a urodynamic diagnosis of urinary incontinence (no UI). Each patient completed the UDI — 6 and MESA questionnaires before being tested. The questionnaires were previously translated by two independent translators into Polish and translated back into English by a native speaker, then the questionnaires were completed by 6 patients with SUI. After talking to the patients, there were no major problems with understanding the content. The final version was chosen by the authors. To assess the structure of the questionnaires, we performed a principal component analysis (PCA). Individual groups of urodynamic diagnoses in terms of demographic parameters were compared using the Kruskal-Wallis test due to the lack of fulfilment of assumptions with a distribution close to normal or equal variance, and the qualitative data were compared using the Pearson's chi-squared test. We considered  $p < 0.05$  to be a statistically significant difference. In order to assess internal consistency reliability, we calculated the Cronbach's alpha coefficient. We determined the internal consistency reliability to be acceptable for a result  $> 0.7$ . We performed statistical analysis using Statistica 13.1 (*StatSoft Polska*) and R (version 3.4.4).

### RESULTS

One hundred fifty-five female patients participated in the study. The average age of the respondents was 55.2 [standard deviation (SD) = 11 years], the youngest patient was 19 years old and the oldest 82 years old. The age distribution in the study group was similar to the normal distribution ( $p = 0.11$  in the Shapiro-Wilk test). 69% of the patients in the study were postmenopausal. Based on the urodynamic examination, the percentage of definitive diagnoses was as follows: 24.5% no UI, 49.6% SUI, 13.5% MUI, 5.8% UUI, and 6.45% of the patients were diagnosed with OAB without UI. There was no statistically significant difference between the average age of the patients in the individual groups ( $p = 0.35$ ). Patient demographics are shown in Table 1.

Kaiser-Meyer-Olkin measure of sampling adequacy was 0.92 for MESA and 0.56 for UDI-6 questionnaire, indicating that PCA is suitable for the datasets. Bartlett's test of sphericity ( $p < 0.005$ ) for both questionnaires showed that the correlation between specific questions in questionnaire was sufficiently large for PCA.

Results of the PCA for MESA showed that 2 components had eigenvalues greater than 1, based on Kaiser's criterion we rejected rest of components. The first principal component included questions about SUI (questions 7–15), which explained 48.6% of the total variance of the questionnaire. The second component included questions about UUI, explaining 19.42% of the total variance. The cumulative percentage of the explained variance in relation to the separated factor loadings was 68%. Due to the results of the above analysis,

**Table 1 Demographic characteristics of patients in groups**

Parameter	Study group (n = 155)					
	SUI (n = 77)	MUI (n = 21)	UUI (n = 9)	OAB (n = 10)	no UI (n = 38)	
Age (mean ± SD)	56.21 ± 10.41	56.76 ± 8.95	57.33 ± 6.52	52.80 ± 16.59	52.34 ± 12.31	p=0.35
Postmenopausal, n (%)	57 (74.03%)	18 (85.71%)	7 (77.78%)	5 (50%)	20 (52.63%)	p=0.03

**Table 2. Medians, IQR — interquartile range, sums of points in questionnaire domains**

Questionnaire	Domain	SUI		MUI		UUI		OAB		no UI	
		median	IQR	median	IQR	median	IQR	median	IQR	median	IQR
MESA	MESA-UUI	7.00	10.00	10.00	4.00	13.00	6.00	12.00	10.00	8.00	8.00
	MESA-SUI	19.00	8.00	21.00	8.00	14.00	13.00	10.00	13.00	13.50	12.00
	MESA-sum	25.00	15.00	32.00	9.00	24.00	13.00	22.50	25.00	19.00	13.00
UDI-6	UDI-6IS	3.00	4.00	4.00	2.00	5.00	2.00	4.00	1.00	4.00	3.00
	UDI-6SS	5.00	2.00	4.00	1.00	4.00	2.00	3.50	3.00	3.00	3.00
	UDI-6OS	2.00	3.00	2.00	1.00	3.00	2.00	4.00	4.00	3.00	1.00
	UDI-6 sum	9.00	5.00	10.00	3.00	11.00	3.00	10.50	4.00	10.00	4.00

which confirm the specific structure of the questionnaire (consisting of two parts, one of which (6 questions) concerns UUI and the other (9 questions) concerning SUI), we calculated the internal consistency reliability separately for each part as well as for the questionnaire as a whole. The internal consistency reliability in each case was high. Cronbach's alpha was 0.9 in the case of UUI, 0.92 in the case of SUI and 0.90 in the case of the whole questionnaire. We also compared the scores obtained in the questionnaire for the individual groups of urodynamic diagnoses. We obtained a statistically significant difference in the total score between the patients with SUI and UUI in the first part of the questionnaire - questions 1-6 (median = 7 vs 13,  $p = 0.0014$ ), as well as in the part on SUI — questions 7-15 (median = 19 vs 14,  $p = 0.00001$ ).

In the dataset obtained from the UDI-6 questionnaire, PCA extracts three principal components based on Kaiser's criterion. The first component includes questions 1 and 2 about the symptoms of overreactive bladder, and explains 31.12% of the total variance. The second component contains questions 3 and 4, largely about SUI symptoms, and explains 29.7% of the total variance. The third component (questions 5 and 6) with questions about signs of discomfort from the lower urinary tract explains 14.73% of the total variance. Question No. 6 was the only question characterized by a low correlation with the corresponding main component ( $r = 0.24$ ). Based on the above analysis, we calculated the internal consistency reliability coefficient for each of the three dimensions. Cronbach's alpha was 0.61 for questions 1 and 2, 0.60 for questions 3 and 4, and 0.39 for questions 5 and 6. Cronbach's alpha for the entire questionnaire was 0.44. We did not observe a statistically significant differ-

ence between the groups of urodynamic diagnoses and the number of points obtained in the questionnaire (Tab. 2).

## DISCUSSION

Condition-specific health-related quality of life questionnaires are helpful tools in clinical practice. They provide a subjective assessment of the impact of a disease on a patient's quality of life, and help assess the effectiveness of treatment. In their recommendations from 2017 [6], the European Association of Urology (EAU) suggest using validated questionnaires assessing the quality of life for examining patients for whom standardization of assessment is necessary. Questionnaires translated into a new language should be re-validated for the target population. This allows researchers to assess whether the translation of the questionnaire is linguistically appropriate, has an equivalent structure, and works in new cultural conditions. After proper assessment, validated questionnaires make it possible to compare results between different countries/language groups. We have not found any reports in the literature concerning the validation of the MESA questionnaire in Polish language conditions. The results we obtained undoubtedly indicate its usefulness. The PCA mathematically reflects its language structure, and our findings showed high internal consistency reliability both in individual parts and as a whole. In addition, the summary results obtained in the individual parts differed in patients with UUI and SUI.

In our study, we showed the preservation of the original three-dimensional structure of the UDI — 6 questionnaire in the Polish translation. The internal consistency reliability for the first and second dimensions measured by Cron-

bach's alpha is acceptable, but unacceptable for the third dimension. The third dimension includes questions about difficulty emptying the bladder and pain in the lower abdomen and perineum. Answers to these questions correlated with each other only slightly in our study group. This may indicate a low usefulness of the questionnaire among a heterogeneous group of patients. It is worth noting that Cronbach's alpha in the third dimension of the questionnaire was acceptable (0.62) after performing calculations in a subgroup of patients with UUI, however, the reliability of the entire questionnaire in this group was not greater. We found one report validating the UDI-6 questionnaire in the Polish language conditions in the literature [7]. This research demonstrates a high reliability of the questionnaire in the authors' translation, except for patients diagnosed with MUI.

### CONCLUSIONS

The Polish version of the MESA questionnaire is a useful diagnostic tool in the study population. The authors' translation of UDI-6 has not proven to be a sufficiently reliable diagnostic in our study sample, and cannot be recommended as a diagnostic tool in the group of women with UI.

### REFERENCES:

1. Minassian VA, Yan X, Lichtenfeld MJ, et al. The iceberg of health care utilization in women with urinary incontinence. *Int Urogynecol J.* 2012;23(8): 1087, doi: [10.1007/s00192-012-1743-x](https://doi.org/10.1007/s00192-012-1743-x), indexed in Pubmed: [22527544](https://pubmed.ncbi.nlm.nih.gov/22527544/).
2. Coyne KS, Sexton CC, Irwin DE, et al. The impact of overactive bladder, incontinence and other lower urinary tract symptoms on quality of life, work productivity, sexuality and emotional well-being in men and women: results from the EPIC study. *BJU Int.* 2008; 101(11): 1388, doi: [10.1111/j.1464-410X.2008.07601.x](https://doi.org/10.1111/j.1464-410X.2008.07601.x), indexed in Pubmed: [18454794](https://pubmed.ncbi.nlm.nih.gov/18454794/).
3. Diokno AC, Brown MB, Brock BM, et al. Clinical and cystometric characteristics of continent and incontinent noninstitutionalized elderly. *J Urol.* 1988; 140(3): 557–567, doi: [10.1016/s0022-5347\(17\)41720-4](https://doi.org/10.1016/s0022-5347(17)41720-4), indexed in Pubmed: [3411676](https://pubmed.ncbi.nlm.nih.gov/3411676/).
4. Diokno AC, Catipay JRC, Steinert BW. Office assessment of patient outcome of pharmacologic therapy for urge incontinence. *Int Urogynecol J Pelvic Floor Dysfunct.* 2002; 13(5): 334–338, doi: [10.1007/s001920200073](https://doi.org/10.1007/s001920200073), indexed in Pubmed: [12355297](https://pubmed.ncbi.nlm.nih.gov/12355297/).
5. Uebersax JS, Wyman JF, Shumaker SA, et al. Short forms to assess life quality and symptom distress for urinary incontinence in women: the Incontinence Impact Questionnaire and the Urogenital Distress Inventory. Continence Program for Women Research Group. *Neurourol Urodyn.* 1995; 14(2): 131–139, doi: [10.1002/nau.1930140206](https://doi.org/10.1002/nau.1930140206), indexed in Pubmed: [7780440](https://pubmed.ncbi.nlm.nih.gov/7780440/).
6. Nambiar A, Bosch R, Cruz F, et al. EAU Guidelines on Assessment and Nonsurgical Management of Urinary Incontinence. *European Urology.* 2018; 73(4): 596–609, doi: [10.1016/j.eururo.2017.12.031](https://doi.org/10.1016/j.eururo.2017.12.031).
7. Skorupska KA, Miotla P, Kubik-Komar A, et al. Development and validation of the Polish version of the Urogenital Distress Inventory short form and the Incontinence Impact Questionnaire short form. *Eur J Obstet Gynecol Reprod Biol.* 2017; 215: 171–174, doi: [10.1016/j.ejogrb.2017.06.024](https://doi.org/10.1016/j.ejogrb.2017.06.024), indexed in Pubmed: [28633095](https://pubmed.ncbi.nlm.nih.gov/28633095/).