ORIGINAL ARTICLE

Reliability and validity of the Toileting Behaviors–Women's Elimination Behaviors scale in a Turkish pregnant population

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Abstract

Introduction and hypothesis Toileting behaviors are related to lower urinary tract symptoms and bladder dysfunction and are an important factor affecting bladder health. The aim of this study was to translate the Toileting Behaviors–Women's Elimination Behaviors (TB–WEB) Scale into Turkish and to validate its internal consistency, test–retest reliability, and construct and criterion validity for use in Turkish pregnant women.

Method The research was conducted with 226 pregnant women who presented to the antenatal outpatient clinics of a university hospital in Türkiye for antenatal follow-up. Data were collected using a sociodemographic questionnaire prepared by the researchers and the TB–WEB Scale. Descriptive data were analyzed using numbers, percentage and mean values, whereas psychometric analysis of the scale was performed using semantic equivalence, content validity, explanatory and confirmatory factor analysis, Cronbach's α, item–total correlation, and test–retest analysis.

Results The scale consisted of 20 items and five subscales. The content validity index of the items was found to be 93%. Cronbach's α coefficient was found to be 0.77 for the whole scale; 0.60 for the place preference for voiding subscale; 0.73 for the premature voiding subscale; 0.84 for the delayed voiding subscale; 0.83 for the straining voiding subscale; and 0.88 for the position preference for voiding subscale. The scale mediates 62% of the total variance. Confirmatory factor analysis found that item factor loadings varied between 0.31 and 0.99 and root mean square error of approximation (RMSEA) value was found 0.078.

Conclusion The Turkish version of the TB–WEB Scale is a valid and reliable instrument in evaluating women's toileting behaviors during pregnancy.

Keywords Toileting behaviors · Pregnant women · Validity · Reliability

Introduction

Lower urinary tract symptoms (LUTS) is a generic term that covers various dysfunctions of the bladder, pelvic floor, or specific pathological conditions (such as bladder infection) [1]. LUTS include conditions such as frequency, nocturia, urgency, dysuria, urinary incontinence (UI), straining voiding, and terminal dribbling [2]. A number of anatomical, physiological, and hormonal changes in the lower urinary system during pregnancy are thought to be responsible for LUTS [3]. Anzaku et al. conducted a study with 459 women before pregnancy and found the prevalence of LUTS to be 52.9%. They reported that this rate increased 1.7 times during pregnancy [4]. The prevalence of LUTS in pregnancy by trimester has been reported to be 59.5% in the first trimester, 61% in the second trimester, and 81% in the third trimester [5]. Of all LUTS, UI, in particular, is known to usually develop during pregnancy and/or the postpartum period [6].

The Prevention of Lower Urinary Tract Symptoms (PLUS) Research Consortium has introduced the concept of "bladder health," the prevention of LUTS, and bladder health promotion. Most of the research related to LUTS has focused on underlying pathological condition, disease mechanisms, or the efficacy of treatments, but has done little for the prevention of LUTS and bladder health promotion [1, 7]. Unhealthy toileting behaviors such as delayed voiding, voiding without desire or unwillingness to void, and

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hovering over the toilet to void have been associated with the development and worsening of LUTS [8]. Wang and Palmer conducted a conceptual analysis of toileting behaviors in women, and defined women's toileting behaviors related to urinary elimination as voluntary actions related to the physiological event of emptying the bladder, which comprises specific attributes, including voiding place, voiding time, voiding position, and voiding style, also influenced by interpersonal, social, environmental, and cultural factors. Based on the results of that study, they developed the Toileting Behaviors–Women's Elimination Behaviors (TB–WEB) Scale [9].

The fact that natural processes such as pregnancy and childbirth can be risk factors for LUTS reveals the need for nursing practices for women's preventive health care during these periods and evidence-based studies [3, 10]. The onset of symptoms and toileting behaviors should be examined to understand LUTS [9]. Although LUTS are prevalent in pregnant women, little is known about routine bladder habits in this population. Given that physical and hormonal changes in pregnancy may lead to conditions such as frequency, nocturia, UI, and change in the center of gravity/posture; determining unhealthy toileting behaviors in pregnant women may allow health professionals to provide counseling and education for the prevention of LUTS. Although the validity and reliability of the Turkish version of the TB–WEB Scale has been established for use in female nurses, it has not been investigated whether the scale is a valid and reliable instrument for the pregnant population. Thus, the researchers of this study contacted the authors of the original scale (Wang and Palmer) to seek their permission before investigating the validity and reliability of the scale in pregnant women. The authors provided permission along with suggestions, based on which this study was designed to investigate the validity and reliability of the Turkish version of the scale for use in pregnant women. Our study was thus motivated by the hypothesis that establishing the validity and reliability of the TB–WEB Scale for Turkish pregnant women would allow health care professionals to use the scale for the pregnant population.

Materials and methods

Study type and setting

The study was conducted using a descriptive, cross-sectional and methodological design between September 2021 and July 2022 in the obstetrics outpatient clinics of a university hospital. The data were collected through face-to-face interviews.

Study population

The study population consisted of pregnant women who presented to obstetrics outpatient clinics for antenatal follow-up. Participants were pregnant women who could speak, read, and write in Turkish; were 18 years of age and over; had had no urinary tract infection in the last month; had not received treatment for a diagnosed psychiatric disease. The literature suggests that the sample size should be 5–10 times the number of items in a measurement instrument, with the following sample sizes for psychometric studies: ≥1,000 perfect, 500–1,000 very good, and 200–500 good [11]. According to DeVellis, a sample size of over 200 is considered adequate to perform exploratory factor analysis (EFA) [12]. Therefore, we contacted 240 pregnant women, expecting a drop-out rate of 10%. After removing 14 missing data, 226 participants provided acceptable data to determine the sample size for the factor analysis.

Ethics approval

This study was approved by the Ethics Committee for Non-Invasive Studies of a University (2021/25-12 GOA). Then, participants received information about the purpose of the study, provided written informed consent, and the scale was administered to them.

Instruments

The study data were collected using the "Personal Characteristics Form" and the TB–WEB Scale. The personal characteristics form prepared by the researchers in line with the literature contains questions on age, education level, employment status, number of pregnancies, number and form of births, and the presence of chronic diseases [5, 8, 13, 14].

Toileting Behaviors–Women's Elimination Behaviors Scale

The TB–WEB Scale was developed to assess women's toileting behaviors. The scale, which was analyzed for validity and reliability by Wang and Palmer, consists of a total of 20 questions [9]. The Toileting Behaviors Scale consists of five subscales: place preference for voiding (four items—I1,I2, I3, I4), premature voiding (five items—I5, I6, I7, I8, I9), delayed voiding (five items—I10, I11, I12, I13, I18), straining voiding (four items—I14, I15, I16, I17), position preference for voiding (two items—I19, I20). The items are rated on a five-point scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always. Items 19 and 20 are rated using 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always (as presented in the chart sent by Palmer, one of the authors of the original scale.) Internal consistency reliability

for the five subscales was found to vary between 0.70 and 0.88. The scale has no cut-off point. Higher scores from the scale indicate unhealthy toileting behaviors.

Translation of the instrument

To evaluate the content validity of the scale, the original English version of the TB–WEB Scale was translated into Turkish by two faculty members from the gynecological nursing department, one instructor from the gynecological nursing department, and one English lecturer. The researchers analyzed the translations of the scale and created a common Turkish version. The resulting Turkish version was reviewed by a Turkish teacher for language accuracy and clarity. At the next stage, the text was back translated into English by a faculty member whose native language was Turkish, who had lived abroad, and who had obtained her doctoral degree abroad, who had received detailed information on the scale and the study, but did not see the original version of the scale, as well as by two other persons who had lived and studied abroad. The scale, which was back translated into English, was translated back into Turkish by a faculty member. This version was semantically analyzed against the original version and then was finalized.

Test–retest

To analyze the test–retest reliability of the adapted Turkish version of the TB–WEB Scale, 30 subjects who had also participated in the initial test received the scale a second time when they presented to the obstetrics outpatient clinic for follow-up 2 weeks later. The test–retest measurements performed 2 weeks apart were analyzed using Pearson Product Moment Correlation and t test. Correlation between the scores obtained from the test and retest of the TB–WEB Scale and its subscales was assessed using Pearson correlation analysis, which found that the test–retest scores of the scale and its five subscales had a reliability coefficient that varied between 0.72 and 0.98, with a positive, very strong, and statistically significant correlation ($p<0.05$; Table 1). Participants' mean scores

from the test and retest were compared using the dependent samples t test, which found no statistically significant difference between the mean scores ($p>0.05$; Table 1).

Data collection process

Permission was obtained from Prof. Mary H. Palmer to analyze the validity and reliability of the scale for pregnant women in Türkiye. The study received ethics committee approval and institutional permission. Pregnant women who met the inclusion criteria were informed about the purpose of the study, and provided written and verbal informed consent. The data were collected through direct interviews. A total of 226 pregnant women responded to the scale.

Statistical analysis

The study data were analyzed using SPSS 21.0 software suite (SPSS Inc., Chicago, IL, USA) and SPSS Amos (Analysis of Moment Structures) 6.0 software. Consistency of the scale over time was analyzed using the test–retest method to calculate Pearson's correlation coefficient, internal consistency was analyzed using Pearson's product–moment correlation coefficient for item–total correlation, and internal consistency coefficient was found based on Cronbach's α reliability coefficient calculation. In analyzing content validity, experts' opinions were analyzed using Lawshe's method and construct validity was analyzed using EFA and confirmatory factor analysis (CFA).

Results

Participants

The mean age of the pregnant women included in the study was 29.25 ± 5.22 (minimum: 18, maximum: 44), and the education level was university and above (42.7%). Over half of the participants did not work (57.5%), their income equaled their expenditures (56.6%), and 89.4%

Table 1 Comparison and correlation of test and retest scores of the Toileting Behaviors–Women's Elimination Behaviors (TB–WEB) Scale and its subscales ($n = 30$)

Scale and subscales	First measurement, mean ± SD	Second measurement, mean ± SD	t	p	r	p
TB–WEB Scale (total)	52.76 ± 6.62	52.60 ± 6.68	0.778	0.338	0.983	0.000
Place preference for voiding	17.40 ± 2.20	17.26 ± 2.27	1.682	0.103	0.982	0.000
Premature voiding	8.56 ± 3.57	9.06 ± 3.19	−1.525	0.138	0.980	0.000
Delayed voiding	11.16 ± 3.53	11.03 ± 3.35	0.812	0.423	0.967	0.000
Straining voiding	7.63 ± 3.12	7.93 ± 2.99	1.875	0.058	0.972	0.000
Position preference for voiding	8.00 ± 0.78	7.93 ± 0.58	0.528	0.601	0.725	0.003

t Paired Samples t test, r Pearson correlation test

had social security. The mean number of pregnancies of the women was 2.07 ± 1.26 (minimum: 1, maximum: 8), the mean number of births was 0.81 ± 0.94 (min: 0, max: 5), the current gestational age was 30.78 ± 8.23 (minimum: 6, maximum: 40), and the mean body mass index was 29.10 ± 5.24 (minimum: 17.48, maximum: 52.74). 53.1% of the participants had previously given birth, 49.2% had had vaginal delivery, 33.2% had a chronic disease, of whom 31.4% used medication regularly, and very few (2.7%) of them had undergone gynecological surgery. 11.9% of the women smoked, none of them used alcohol, 37.6% of them had experienced leakage of urine during pregnancy, and 1.3% had leakage of stools during pregnancy. In the study, 42.5% of the pregnant women included voided once an hour, and very few (4.9%) had no nocturia. Over half of the pregnant women (66.8%) had no knowledge about Kegel exercises, 1.3% stated that they performed Kegel exercises regularly, and 16.4% performed Kegel exercises occasionally.

Content analysis

Once the semantic validity was established, the Turkish version of the scale was shared with 11 experts to seek their input on content validity. The experts were asked to rate each item for relevance on a scale between 1 and 4 (1: not relevant, 2: somewhat relevant, 3: quite relevant, 4: highly relevant). In the item analysis, 91% of the items in the TB–WEB Scale received 3–4 points. Differences among the experts were analyzed using Lawshe's method and the data obtained from the experts were assessed using the Content Validity Index. As a result, the items were found to have a content validity index of 93%. The resulting scale based on experts' consensus was pretested in 20 subjects who were not included in the research sample, leading to corrections where needed.

Item analysis

Analysis of item–total correlation for the 20 items of the TB–WEB Scale found that the reliability coefficient varied between 0.31 and 0.55, and item scores and total scale scores had a statistically significant positive correlation ($p<0.001$; Table 2).

Analysis of each subscale of the TB–WEB Scale for item–subscale total correlation found a reliability coefficient (Pearson's correlation) of $r=0.51$ to .81 for the five items in the Place Preference Voiding subscale; $r=0.66$ to 0.76 for the two items in the Premature Voiding subscale; $r=0.80$ to 0.89 for the seven items in the Delayed Voiding subscale; $r=0.51$ to 0.87 for the six items in the Straining Voiding subscale; $r=0.94$ to 0.95 for the two items in the Position Preference for Voiding subscale, and a statistically significant positive correlation coefficient for all items ($p<0.001$; Table 2).

Table 2 Toileting Behaviors–Women's Elimination Behaviors (TB–WEB) Scale Subscales Item—Subscale Total Score Correlations ($n=226$)

Subscales and items	Item–Subscale total score correlation		Item–total score correlation		Cronbach's α
	r	p	r	p	α
Place preference for voiding					
Item 1	0.51	0.000	0.48	0.000	
Item 2	0.78	0.000	0.33	0.000	
Item 3	0.48	0.000	0.32	0.000	0.60
Item 4	0.81	0.000	0.35	0.000	
Premature voiding					
Item 5	0.72	0.000	0.37	0.000	
Item 6	0.76	0.000	0.42	0.000	
Item 7	0.70	0.000	0.34	0.000	0.73
Item 8	0.69	0.000	0.31	0.000	
Item 9	0.66	0.000	0.36	0.000	
Delayed voiding					
Item 10	0.89	0.000	0.44	0.000	
Item 11	0.86	0.000	0.42	0.000	0.84
Item 12	0.82	0.000	0.36	0.000	
Item 18	0.80	0.000	0.33	0.000	
Straining voiding					
Item 13	0.51	0.000	0.34	0.000	
Item 14	0.81	0.000	0.55	0.000	
Item 15	0.87	0.000	0.55	0.000	0.83
Item 16	0.85	0.000	0.49	0.000	
Item 17	0.81	0.000	0.48	0.000	
Position preference for voiding					
Item 19	0.95	0.000	0.34	0.000	0.88
Item 20	0.94	0.000	0.33	0.000	

Internal consistency reliability coefficient

Analysis of the internal consistency of the TB–WEB Scale found that the Cronbach's α reliability coefficient was α=0.60 for the Place Preference for Voiding subscale; α=0.73 for the Premature Voiding subscale; α=0.84 for the Delayed Voiding subscale; α=0.83 for the Straining Voiding subscale; α=0.88 for the Position Preference for voiding subscale (Table 2), and α=0.77 for the whole scale.

Construct validity

The construct validity of the TB–WEB Scale was initially assessed using EFA. The construct validity of the 20-item TB–WEB Scale was tested using factor analysis with observations at least 5–10 times the number of items ($n=226$). Furthermore, the suitability of the data for factor analysis was assessed using the Kaiser–Meyer–Olkin (KMO) test and equality of variances was analyzed using the Bartlett test.

The KMO coefficient was found to be 0.74, and the Chi-squared value from the Bartlett test ($X^2 = 1,714.011$; df = 190; $p=0.000$) was highly significant ($p<0.001$), which meant that the data were suitable and sufficient for factor analysis. These analyses yielded a five-factor model for the 20-item TB–WEB Scale and its subscales with an eigenvalue above 1.00 that mediated 62% of the total variance (Tables 3, 4).

The items remained as in the original scale and the factors were named as follows:

1. Place Preference for Voiding subscale: this factor group consists of a total of four items, namely items 1, 2, 3, and 4.
2. Premature Voiding subscale: this factor group consists of five items, namely items 5, 6, 7, 8, and 9.
3. Delayed Voiding subscale: this factor group consists of four items, namely items 10, 11, 12, and 18.
4. Straining Voiding subscale: this factor group consists of a total of five items, namely items 13, 14, 15, 16, and 17.
5. Position Preference for Voiding subscale: this factor group consists of two items, namely items 19 and 20.

The fit of factors for construct validity was verified using five-factor CFA as in EFA. The five-factor CFA found the following fit indices: Chi-squared = 373.678 ($p=0.000$), degree of freedom = 149 (Chi-squared = 373.678; df = 149, Chi-squared/df = 2.50), root mean square error of approximation = 0.041 ($p<0.05$, standardized root mean square residual = 0.062; comparative fit index = 0.96, non-normed fit index = 0.88, goodness-of-fit index = 0.91, adjusted goodness-of-fit index = 0.96. Factor loadings from CFA of all items were found to vary between 0.31 and 0.99. The resulting CFA diagram is given in Fig. 1.

Table 3 Factor structure of the Toileting Behaviors–Women's Elimination Behaviors Scale

Items	Place preference for voiding	Premature voiding	Delayed voiding	Straining voiding	Position preference for voiding
1. When I use public toilets, I worry about how clean they are	0.527				
2. I try to avoid using public toilets	0.782				
3. I try to empty my bladder before leaving my home	0.614				
5. When I am away from my home, I try to hold my urine until I get home	0.668				
5. When I am at my home, I empty my bladder even when I do not feel the need to urinate		0.629			
6. When I am away from my home, I empty my bladder even when I do not feel the need to urinate		0.802			
7. When I am at someone else's (family, friend) home, I empty my bladder even when I do not feel the need to urinate		0.750			
8. When I am in a public place (stores, work, restaurant), I empty my bladder even when I do not feel the need to urinate		0.788			
9. I empty my bladder without feeling a need to urinate, but do so "just in case"		0.580			
10. I will delay emptying my bladder when I am busy			0.902		
11. I wait to empty my bladder until I feel I cannot hold my urine any longer			0.894		
12. I wait too long (strong need to urinate or actual leakage) when I have to empty my bladder at work			0.818		
13. I do not intentionally empty my bladder completely when I urinate				0.407	
14. I push down (strain/tighten my abdominal muscles) to begin urinating				0.845	
15. I push down (strain/tighten my abdominal muscles) to keep the urine flowing during the urinating process				0.879	
16. I push down (strain/tighten my abdominal muscles) in order to empty my bladder				0.870	
17. I push down (strain/tighten my abdominal muscles) to make the bladder empty faster				0.840	
18. I empty my bladder completely when I urinate			0.720		
19. I sit on the toilet seat to urinate at home					0.933
20. I sit on the toilet seat to urinate away from home					0.920

Table 4 Eigenvalues and explained variance values of the Toileting Behaviors–Women's Elimination Behaviors Scale

Subscales	Percentage of variance	Eigenvalues
Place preference for voiding	17.051	3.410
Premature voiding	13.877	2.775
Delayed voiding	12.509	2.502
Straining voiding	10.278	2.056
Position preference for voiding	8.077	1.605
Total variance explained	61.743	

Discussion

This study analyzed the validity and reliability of the TB–WEBS and found that the Turkish version of the scale had good psychometric properties for use in the pregnant population.

Reliability analysis of the TB–WEB Scale was performed using test–retest, internal consistency and item analysis. Test–retest reliability is the ability of a measurement instrument to yield consistent results in different applications over time. Correlation analysis for the scores obtained from the test and retest found that the TB–WEB Scale and its five subscales had a positive, strong, and highly statistically significant correlation. Furthermore, there was no significant difference between the mean scores obtained from the two paired tests conducted 2 weeks apart. Test–retest reliability analysis is recommended for continuous measurements [15]. This study found no statistically significant difference between the subscales, which indicates stability over time. Another result supporting the reliability of the scale is that the internal consistency coefficient is statistically significant. The internal consistency of the scale was analyzed using Cronbach's α technique, which is suitable for Likert scales. The higher the α coefficient of a scale, the more internally consistent its items. It also means that items measure the elements of the same underlying construct. The α coefficient, scored between 0 and 1, is calculated by taking the average covariance and dividing it by the average total variance of the items and shows whether the questions in a scale make up a whole to explain a homogeneous construct [16]. The analysis of internal consistency for the TB–WEB Scale found a satisfactory Cronbach's α reliability coefficient for all of the five subscales.

If the items in a scale are of equal weight and in the form of independent units, the correlation coefficient between each item and total scores is expected to be high. The higher the correlation coefficient, the higher the relation of that item to the measured element. Although there is no standard cut-off below which the item–total correlation coefficient would be judged to have insufficient reliability, the overall rule is that correlations should not be negative and should be higher than 0.25 or 0.30 [17]. The higher the correlation coefficient, the better the reliability of the items [16]. Analysis of item reliability for the TB–WEB Scale found that the correlation of all items with subscale scores and the total score was above 30, as suggested in the literature. This result means that all items measure the same attitude [17].

Analysis of content validity showed a high degree of agreement among experts on the items (93%), in line with the original version of the scale. The high degree of agreement among experts is an important indicator for the content validity of the scale [18]. In conclusion, it can be said that the scale has good semantic properties and content validity.

Fig. 1 Toileting Behaviors–Women's Elimination Behaviors Scale five-factor confirmatory factor analysis diagram
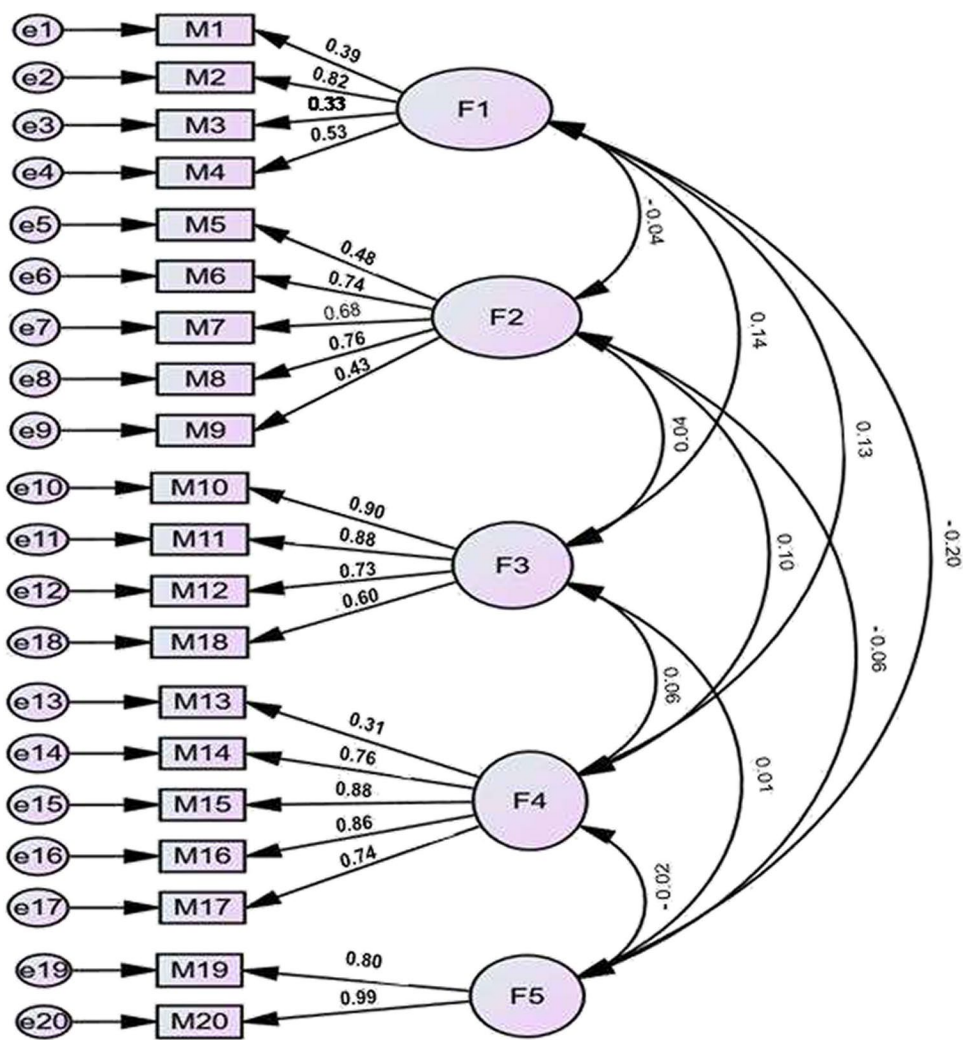
When the scale was adapted to the Turkish language, construct validity was analyzed using EFA. The factor loading coefficient in deciding which subscale the items should be in was 0.30. As in the original version, the scale consists of 20 items, and the factor loadings of the items range from 0.40 to 0.93. The analyses yielded a five-factor construct with eigenvalues greater than 1. Furthermore, the five factors were found to mediate 61.743% of the total variance. As stated in the literature, a rate of total variance of 50% and higher means that items are acceptable [19]. In EFA, the adequacy of a sample is determined using the KMO value [17]. KMO values of 0.90 to 1.00 are said to be marvelous; 0.80 to 0.89 meritorious; 0.70 to 0.79 middling; 0.60 to 0.69 mediocre; 0.50 to 0.59 miserable; and below 0.50 unacceptable [20]. EFA performed in this study found a KMO of 0.74, meaning that the sample was suitable for factor analysis, and a highly significant result from Barltett's test ($p<0.000$) means that the correlation matrix of the items in the scale is suitable for factor analysis.

Conclusions

The results of this study showed that the Turkish TB–WEB Scale has sufficient validity and reliability for use in the pregnant population. Internal consistency coefficients and validity scores are consistent with those obtained for the original version. These results suggest that the TB–WEB Scale is an easy, understandable, valid, and reliable measurement instrument that can be used to measure unhealthy toileting behaviors in pregnant women. This instrument can allow clinicians and researchers working in the field of women's health, including nurses, midwives, and physicians, to objectively assess women's toileting behaviors during pregnancy.

Declarations

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