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Research Article

Validity and Reliability of the Turkish Version of the Thirst Distress Scale in Patients on Hemodialysis

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SUMMARY

Purpose: Thirst has been reported as an important source of distress for patients on hemodialysis. However, there is no instrument available that assesses thirst distress of Turkish patients on hemodialysis. Therefore, the aim of this study was to examine the psychometric properties of the Turkish version of the Thirst Distress Scale (TDS-T) for patients on hemodialysis.

Methods: This study was conducted methodologically. A convenience sample of 142 Turkish patients on hemodialysis participated in this study. Data were collected by using a questionnaire, the TDS-T and a visual analogue scale for thirst intensity. The analysis of data included descriptive statistics, the one-sample Kolmogorov-Smirnov test, Kruskal-Wallis test, Mann-Whitney *U* test, correlation coefficients and psychometric tests.

Results: The TDS-T demonstrated acceptable internal consistency (Cronbach's alpha coefficient = .81), good test-retest reliability (intraclass correlation coefficient = .88), and correlations with interdialytic weight gain values and thirst intensity scores (measured by visual analogue scale) indicating concurrent and convergent validity, respectively. Construct validity was supported by known-group comparisons. The results revealed a one-component structure of the instrument.

Conclusions: The psychometric properties of the TDS-T were consistent with those reported in the original study. The TDS-T was found to be a valid and reliable tool for evaluating thirst distress in patients on hemodialysis.

Introduction

The incidence and prevalence of end-stage renal disease is increasing worldwide and in Turkey (Turkish Society of Nephrology, 2012; Zhang & Rothenbacher, 2008). In Turkey, approximately 60,000 people have end-stage renal disease, according to the 2011 report from the Registry of Nephrology, Dialysis and Transplantation. Hemodialysis (HD) is the most commonly used renal replacement therapy method in this patient population with a rate of 82.3%. Cardiovascular diseases are the leading cause of death (54.4%) among patients on HD (Turkish Society of Nephrology, 2012).

The success of HD treatment is closely linked to the treatment adherence of patients. However, adherence to fluid restrictions is very difficult for patients on HD (Kara, Caglar, & Kilic, 2007). Results indicate that excessive thirst leads to excessive intake of water (Mistiaen, 2001; Welch, 2002). Understanding patients' thirst sensation may help determine the best ways for prevention and management of this symptom. On the other hand, a valid and reliable instrument is needed to correctly assess thirst. In Turkey, there is no valid and reliable instrument to evaluate thirst distress in patients on HD. In this study, we examined the psychometric properties of the Thirst Distress Scale (TDS) in Turkish patients on HD.

Theoretical framework

The Symptom Management Theory (SMT) provided the theoretical framework for this study (Humphreys et al., 2008). The faculty and students at the University of California, San Francisco, School of Nursing developed the original Symptom Management Model (Larson et al., 1994). This model was subsequently revised by Dodd et al. (2001). The SMT is the further revised version of the Symptom Management Model. This theory includes three dimensions: symptom experience, symptom management strategies, and symptom status outcomes. Each dimension is interrelated to the others (Humphreys et al., 2008). A symptom is defined as "a

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subjective experience reflecting changes in the biopsychosocial functioning, sensations, or cognition of an individual" (Dodd et al., 2001, p. 669). The concept of symptom experience consists of an individual's perception of symptoms, evaluation of the meaning of symptoms and response to symptoms. Symptoms have four dimensions: the timing (duration & frequency), intensity (strength), level of distress perceived, and quality (Lenz, Pugh, Milligan, Gift, & Suppe, 1997; Rhodes & Watson, 1987). According to the SMT, personal, environmental, and health-related or illness-related variables can affect the symptom experience of individuals (Humphreys et al., 2008).

In this study, we focused on the symptom experience dimension of the SMT and evaluated thirst distress. Symptom distress is defined as "the degree or amount of physical or mental upset, anguish or suffering experienced from a specific symptom" (Rhodes & Watson, 1987, p. 243). In other words, symptom distress refers to the extent to which a person is bothered by a symptom (Lenz et al., 1997). Decreasing symptom distress is important because of its effect on adherence to treatment recommendations and quality of life (Dodd et al., 2001; Humphreys et al., 2008).

Thirst and HD

Thirst is defined as a sensation of dryness in the mouth and throat associated with a desire for liquids (Greenleaf, 1992). There is limited information in the literature about thirst in patients on HD. Several factors influence thirst including fluid restriction, reduced salivary secretion, biochemical and biological changes, hormonal abnormalities, and medication use, but how this symptom occurs is not known accurately yet (Bots et al., 2004, 2005; Sung et al., 2005, 2006; Zwiech & Bruzda-Zwiech, 2013). Thirst is one of the most powerful stimulus to drinking liquids and often leads to higher interdialytic weight gain (IWG) in patients (Bots et al., 2004). Excessive IWG also increases the risk of cardiovascular morbidity and mortality and reduces quality of life. Therefore, thirst is one important source of distress for patients and their families (Bots et al., 2005; Welch, 2002).

Previous studies report that 39–95% of patients on HD experience thirst, depending on the methods used to determine the presence of symptom (Bots et al., 2004; Curtin, Bultman, Thomas-Hawkins, Walters, & Schatell, 2002; Dominic, Ramachandran, Somiah, Mani, & Dominic, 1996; Virga et al., 1998). Current literature suggests that thirst may be assessed separately or together with other symptoms of renal failure. A self-reporting method is thought to be the most appropriate, because thirst is a subjective feeling (Zwiech & Bruzda-Zwiech, 2013). Several instruments with dichotomous (yes/no) or continuous item response format are available for the measurement of thirst in patients on HD. Unfortunately, few of these have published details regarding the instruments' psychometric properties (Bots et al., 2004; Welch, 2002). To better assess thirst in patients, Bots et al. (2004) developed the 7-item Dialysis Thirst Inventory with a 5-point Likert scale, ranging from *never* (1) to *very often* (5) experiencing thirst. However, the development process of the Dialysis Thirst Inventory was not explained. Other than its the internal consistency (Cronbach's alpha coefficient = .87) and construct validity (one-factor model), the psychometric properties of the scale were not reported in their study (Bots et al., 2004).

Welch (2002) wanted to develop an instrument that would completely measure thirst in patients on HD. The Symptom Management Model (Larson et al., 1994) was used as the theoretical construct in the process of the instrument development. The dimensions of thirst were determined according to this model: duration, frequency, distress, and intensity. However, because the use of the visual analogue scale (VAS) for assessment of thirst intensity is recommended (Sung et al., 2005; Yang, Yates, Chin, & Kao, 2010), the instrument did not include thirst intensity. Firstly, conceptual definitions for the three dimensions of thirst were provided as follows: (a) thirst distress: "The degree to which a person is bothered by thirst or its associated discomfort"; (b) thirst duration: "The length of time that thirst is experienced by the person per episode"; and (c) thirst frequency: "How often during a day thirst is experienced by the person" (Welch, 2002, p. 338). Original items were developed for each of the three dimensions based on interviews with 10 patients on HD, a literature review and the conceptual definitions of dimensions. Content validity of the instrument was established through a panel of nine experts and revisions were made accordingly. Then, the validity and reliability of the scale was investigated in a sample of 247 American patients on HD with a mean age of 59 years (SD = 14.8, range: 20–91) by Welch (2002). All items in the duration (3 items) and frequency subscales (16 items) and 6 of the 12 items in the distress subscale were deleted from the scale after item analysis because of low average inter-item correlations. The resulting 6-item scale was called as the TDS. The researcher reported satisfactory internal consistency (Cronbach's alpha coefficients = .78) and support for construct validity. A principal component analysis revealed a single-component structure, explaining 48.0% of the variance in the original study. All component loadings were greater than .40 (range: .59–.81). Thus, the TDS is the only tool that has been tested statistically in terms of validity and reliability for measuring thirst distress; however, the known-group validity and test-retest reliability of the scale have not been investigated (Welch, 2002). Although the TDS was used as a data collection instrument in the studies conducted in Canada and Italy (Jacob & Locking-Cusolito, 2004; Porcu, Fanton, & Zampieron, 2007), to our knowledge, its psychometric properties were not tested.

Currently, there is no instrument available that evaluates thirst distress of Turkish patients on HD. Therefore, the purpose of this study was to examine the validity and reliability of the Turkish version of the Thirst Distress Scale (TDS-T) in this patient group. The results of this study will provide better understanding of thirst distress of Turkish patients on HD and will contribute to the planning and implementation of appropriate intervention strategies for the prevention and control of thirst distress.

Methods

Study design

This study used a methodological design.

Setting and sample

One hundred sixty-six patients from two HD centers in a large city in central Turkey were included in this study. The inclusion criteria for the patients were as follows: (a) aged 18 years and older; (b) on maintenance HD three times every week for 4 hours per session; and (c) able to communicate in Turkish. Medical records were reviewed for past medical history and comorbidities before the study began. In line with previous studies (Bots et al., 2005; Porcu et al., 2007; Sung et al., 2006), patients who had clinically diagnosed psychiatric, cognitive or comorbid terminal illness and those who were clinically unstable were excluded from the study. All participants fulfilling the inclusion criteria and willing to participate were enrolled for the study. A convenience sample of 142 patients participated in the study (participation rate at 85.5%), which exceeded the recommended criterion of at least 5–10 participants per item of an instrument for determining the factor structure (Tinsley & Tinsley, 1987).

Ethical consideration

The approval of the hospital ethical committee was obtained for the study. In addition, the study received permission from the medical directors of the related HD centers. Informed consent was obtained from each patient prior to study participation.

Instruments

Demographic and disease-related variables

A questionnaire form including demographic and disease characteristics was designed by the researchers reviewing the related literature (Bots et al., 2004; Sung et al., 2006; Welch, 2002). Demographic variables included age, gender, marital status, education level, employment status, smoking history and the presence of a caregiver. Participants were asked to report the strategies used to reduce fluid intake and control thirst since the last dialysis. Data on disease-related variables (diabetes history, time on HD, medications prescribed at the time of data collection, prior posttreatment weight, actual pretreatment weight) were collected from medical records. Medications with potential effects on salivary hypofunction (including antihypertensives, anticholinergics, antihistamines, antidepressants, bronchodilators, and diuretics) were identified (Scully & Bagan-Sebastian, 2004), and use of these medications was categorized as putatively xerogenic medication use. The IWG was calculated from the difference between pretreatment weight and posttreatment weight from the prior HD session.

Thirst intensity

Thirst intensity refers to "the severity, strength, or amount of thirst" (Welch, 2002). VAS was used to measure thirst intensity. Patients were requested to rate their thirst since the last dialysis on a 10-cm VAS, with 0 indicating no thirst and 10 indicating the worst possible thirst. VAS scores of patients were assessed in both the continuous format (ordinal numerical scale) and a categorical format. The VAS scores were classified based on the study by Yang et al. (2010) as follows: mild (0–3), moderate (4–6) and severe (7–10).

Thirst distress

The TDS was used to measure patients' thirst related discomfort since the last dialysis. The TDS is a 6-item instrument composed of one dimension. It is a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The possible range of total score is 6–30, with higher scores indicating more thirst distress. The reported overall Cronbach's alpha coefficient for the TDS is .78 (Welch, 2002).

Procedure

The permission to translate and use the instrument was obtained electronically from Professor Janet L. Welch on December 3rd, 2008. Two bilingual (Turkish & English) experts translated the TDS independently from English to Turkish. One of them was a registered nurse and the other was a psychologist. A third bilingual expert reviewed the two Turkish translated versions and created another version. Then, this version was back-translated by two bilingual experts (both medical doctors) who had not read the original version. Thereafter the two back-translated versions were reviewed and combined into one by a native English speaker who works as an official translator. Finally, the three versions (original, translated and back-translated) were assessed by a panel of three bilingual experts in the field (Gjersing, Caplehorn, & Clausen, 2010). Minor modifications were recommended by the panel to enhance comprehension and clarity. The following changes were made: (a) the item "My mouth feels bone-dry when I am thirsty" was changed to "My mouth feels really dry when I am thirsty", and (b) "When I drink less, my thirst gets worse" was changed to "When I drink less, I am more thirsty."

Prior to the study, we examined content validity for each item and the overall TDS-T by using a panel of experts, comprising six independent experts (one language professional, one nephrologist, and four registered nurses). We calculated the content validity index (CVI). To determine the item CVI, the experts were asked independently to rate both the clarity (understandability) and relevance (appropriateness) of each item on a scale of 4 points (1 = *not clear/relevant*, 2 = *somewhat clear/relevant*, 3 = *quite clear/relevant*, and 4 = *highly clear/relevant*). The item CVIs for clarity and relevance were separately computed as the number of experts giving a rating of either 3 or 4 divided by the number of experts rating the item. Then, the mean CVIs for clarity and relevance were also computed by summing the CVIs for all items and dividing this sum by the total number of items. An item CVI of at least .78 for 6–10 experts and a mean CVI of .90 are considered to indicate good content validity (Lynn, 1986). Our results indicated that the item CVI for both clarity and relevance ranged from .83 to 1.0, the mean CVI for the overall scale was .94 and the content validity for TDS-T was supported. To check the clarity, readability and ease of application of all items on the scale, the TDS-T was piloted among 30 patients with characteristics similar to the sample group. All patients in the pilot test period indicated that all statements on the scale were understandable. The data of these participants were excluded from the study.

Data collection

Because patients on HD had high IWG in the first HD session of the week (Monday & Tuesday schedules), this study was conducted during the midweek HD session (Wednesday & Thursday schedules). Data were collected by face-to-face structured interviews and medical records between November 2010 and January 2011 were used. The interviews lasted for about 15 minutes during HD. The TDS-T was applied again to 42 patients who were included in the study group and were willing to re-participate 2 weeks after the first application for test-retest reliability measurement. Re-evaluation of variable characteristics within a short time on at least 30 participants who participated in the first measurement is recommended (Savaşır & Şahin, 1997; Şencan, 2005).

Data analysis

Data analysis was performed using the SPSS for Windows (version 16.0; SPSS Inc., Chicago, IL, USA). Descriptive statistics (*M*, medians, *SD*, frequency distributions, percentages) were carried out. Normal distribution was evaluated with the one-sample Kolmogorov-Smirnov test. The Cronbach's alpha coefficient was used to evaluate internal consistency of the TDS-T and the paired samples *t* test and intraclass correlation coefficient (ICC; average measure) were used to examine the test-retest reliability. Item-to-total correlations were determined using Pearson's correlation coefficient.

The content validity was determined by the CVI. Then, exploratory factor analysis was used to determine the factor structure of the TDS-T. Kaiser-Meyer-Olkin measure, Bartlett's test of sphericity and a scree plot were also used to test the appropriateness of factor analysis. To identify the component loadings of the scale, the principal component analysis was conducted. Spearman's rho correlation coefficient was computed to investigate the concurrent validity of the TDS-T with the patients' IWG values and the

convergent validity with the VAS scores. Correlations greater than .70 were described as strong, whereas correlations less than .40 were described as weak (Fowler, Jarvis, & Chevannes, 2002). Known-group validity was established by comparing the TDS-T scores between patients grouped according to thirst intensity. The intensity of thirst measured by VAS was categorized into three levels: mild (0–3), moderate (4–6) and severe (7–10) (Yang et al., 2010). These thirst intensity groups were compared using analysis of the Kruskal-Wallis test followed by the Mann-Whitney *U* test. To avoid an accumulation of errors due to multiple comparison, a Bonferroni adjustment was made for three comparisons and differences were considered significant if *p* was less than .016 (.05 divided by 3). It was hypothesized that patients in the "severe intensity group" would have the worse (higher) TDS-T scores. Known-group validity was also examined by comparing differences in the TDS-T scores between patients who reported use of the fluid management strategies versus those who did not report the use of these strategies. The Mann-Whitney *U* test for the comparison of two independent groups was conducted. The Bonferroni adjustment was not used because of the small number of comparisons (Field, 2005; Green & Salkind, 2008). We hypothesized that users of the fluid management strategies would have the better (lower) TDS-T scores compared with those of the nonusers. A *p* less than .05 was accepted as statistically significant.

Results

Participant characteristics

The mean age of participants was 52.70 years ($SD = 15.41$, range: 18–81) and the median time on HD was 51 months ($M = 62.41$, $SD = 56.85$, range: 2–348). The mean IWG was 2.27 kg ($SD = 0.93$, range: 0.5–4.7). The majority of the patients were men (57.7%), married (76.8%), had completed primary education (90.1%), were not working (72.5%) and had a caregiver (69.7%). Twenty-one patients (14.8%) were current smokers and 25 (17.6%) had diabetes. In this study, almost one-third of the patients (29.6%) were prescribed putatively xerogenic medications. The mean VAS score for thirst intensity was 5.71 cm ($SD = 2.43$, range: 0–10). Thirty-eight percent of the patients complained of severe thirst with a VAS score of 7 or greater (Table 1). As shown in Table 2, the most frequently used strategy for fluid management was avoiding salty foods (77.5%), followed by limiting salt on food (76.8%).

Validity analysis

Construct validity

The construct validity was tested using exploratory factor analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy of .78 and the Bartlett's test of sphericity significance level ($\chi^2 = 419.47$, $df = 15$, $p < .001$) suggested that the data were appropriate for factor analysis. For the construct validity, the principal component analysis was computed. The principal component analysis showed two components with eigenvalues of over 1.0, explaining 72.4% of the cumulative variance in the study. The first component had an eigenvalue of 3.3, explaining 43.6% of the total variance. The eigenvalue of the second component was 1.1 and explained 28.8% of the total variance. We noticed that the eigenvalue of the first component was three times higher than that of the second component and the first component explained more than 40% of the total variance (Lord, 1980; Şencan, 2005). The scree plot analysis did not clearly indicate how many components existed (1 vs. 2 components). One component was consistent with the theoretical structure of the instrument, which is one way to decide how many components to extract (Ferketich & Muller, 1990). Therefore, only one component was extracted for the scale, which explained 54.6% of the variance with an eigenvalue of 3.3; the solutions could not be rotated. As shown in Table 3, all of the component loadings for the TDS-T were positive and above .40, ranging from .42 to .90. The component loading is recommended to be at least .40 in order to decide whether an item is related to the conceptual structure (Şencan, 2005). Item 3 had the highest component loading (.90), followed by item 1 (.86).

Table 1 *Comparison of the TDS-T Scores by Thirst Intensity (N = 142)*

Intensity of thirst	*n* (%)	TDS-T		
		M ± *SD*	χ^{2a}	*p*
Mild	32 (22.5)	18.31 ± 4.29	23.61	<.001*
Moderate	56 (39.5)	19.54 ± 3.74		
Severe	54 (38.0)	22.33 ± 3.89		

Note. TDS-T = Turkish version of the Thirst Distress Scale.
*Statistically significant differences between mild-severe and between moderate-severe, $p < .016$ by Mann-Whitney *U* test with Bonferroni adjustment for multiple comparisons.
[a] Kruskal–Wallis test.

Table 2 *Descriptive Statistics of Fluid Management Strategies Used and Comparison of the TDS-T Scores by Fluid Management Strategies (N = 142)*

Variables	*n* (%)	TDS-T		
		M ± *SD*	*z*[a]	*p*
Avoid salty food				
Yes	110 (77.5)	19.99 ± 4.13	−2.19	.028
No	32 (22.5)	21.47 ± 4.45		
Limit salt on food				
Yes	109 (76.8)	20.22 ± 4.12	−0.84	.402
No	33 (23.2)	20.67 ± 4.64		
Take meds with meal fluid				
Yes	59 (41.5)	19.90 ± 4.51	−0.96	.337
No	83 (58.5)	20.63 ± 4.02		
Space liquids				
Yes	44 (31.0)	19.27 ± 4.00	−2.08	.037
No	98 (69.0)	20.80 ± 4.26		
Measure amount drank				
Yes	35 (24.6)	18.94 ± 3.76	−2.65	.008
No	107 (75.4)	20.78 ± 4.29		
Measure daily fluid into pitcher				
Yes	21 (14.8)	18.48 ± 4.43	−2.01	.044
No	121 (85.2)	20.64 ± 4.13		
Stay out of hot sun				
Yes	98 (69.0)	20.03 ± 3.97	−1.41	.159
No	44 (31.0)	20.98 ± 4.75		

Note. TDS-T = Turkish version of the Thirst Distress Scale.
[a] Mann-Whitney *U* test (Bonferroni adjustment was not used for these comparisons).

Table 3 *Item Means, Standard Deviations, Corrected Item–Total Correlation (CITC), Cronbach's Alpha if Item Deleted (CAID) and Component Loading for the TDS-T (N = 142)*

No.	Item	*M* ± *SD*	CITC	CAID[a]	Component loading[a]
1	My thirst causes me discomfort.	3.56 ± 0.97	.70	.75	.86
2	My thirst bothers me a lot.	3.47 ± 1.01	.67	.76	.85
3	I am very uncomfortable when I am thirsty.	3.45 ± 0.91	.78	.74	.90
4	My mouth feels really dry when I am thirsty.	3.61 ± 0.97	.66	.76	.76
5	My saliva is very thick when I am thirsty.	3.14 ± 1.03	.38	.83	.50
6	When I drink less, I am more thirsty.	3.08 ± 1.01	.31	.84	.42

Note. TDS-T = Turkish version of the Thirst Distress Scale.
[a] Component loadings were computed using principal components analysis.

Concurrent criterion-related validity

The correlation between the TDS-T scores and IWG values was tested for concurrent validity. The TDS-T scores were weakly positively correlated with the IWG values ($r = .20$, $p < .05$).

Convergent validity

In order to investigate the convergent validity, the correlation between the TDS-T and VAS scores was calculated. The TDS-T scores correlated moderately positively with the VAS scores ($r = .41$, $p < .001$).

Known-group validity

The Kruskal-Wallis test showed a significant difference among the thirst intensity groups ($\chi^2 = 23{,}61$, $p < .001$) (Table 1). The Mann-Whitney *U* test with Bonferroni adjustment for multiple comparisons demonstrated no significant difference in the TDS-T scores between patients with mild thirst and those with moderate thirst ($z = -1.70$, $p = .090$). Patients with severe thirst had significantly higher TDS-T scores than those with mild ($z = -3.31$, $p = .001$) and moderate thirst ($z = -2.73$, $p = .006$). Furthermore, the Mann-Whitney *U* test demonstrated statistically significant differences in the TDS-T scores between the users and nonusers of the specific fluid management strategies. The TDS-T scores were significantly lower in patients who avoided salty foods ($z = -2.19$; $p = .028$), spaced liquids ($z = -2.08$; $p = .037$), measured the amount drank ($z = -2.65$; $p = .008$), and those who measured daily fluid intake using pitcher than in other patients ($z = -2.01$; $p = .044$) (Table 2).

Reliability analysis

The Cronbach's alpha coefficient of the scale was .81, which exceeded the recommended level of .70 (Nunnally, 1978). As shown in Table 3, all corrected item-total correlations were positive and above .30 (Nunnally & Bernstein, 1994), which ranged from .31 to .78. The deletion of item 5 resulted in only a .02 increase in the overall Cronbach's alpha coefficient (.83) of the scale. With the deletion of item 6, the alpha coefficient for the scale improved only from .81 to .84. We therefore did not exclude any item from the original scale (Table 3). Test-retest reliability was high based on the ICC for the TDS-T ($r = .88$, $p < .001$). The paired samples *t* test demonstrated that there was no difference between test and retest scores of the TDS-T ($p > .05$) (Table 4).

Descriptive analysis of the study instrument

The mean TDS-T score of the patients was 20.32 ($SD = 4.23$), ranging from 11 to 30 (Table 4). Descriptive statistics for each item of the TDS-T are presented in Table 3. The most frequently identified distress was "My mouth feels really dry when I am thirsty" (item 4, $M = 3.61$, $SD = 0.97$). The least frequently identified distress was also "When I drink less, I am more thirsty" (item 6, $M = 3.08$, $SD = 1.01$).

Discussion

This is the first methodological study to examine the psychometric properties of the TDS in Turkish patients on HD. The results provide support for the validity and reliability of the instrument.

Table 4 *Comparison of TDS-T Test-Retest Scores and Correlation (N = 142)*

	1st interview $M \pm SD$	2nd interview $M \pm SD$	t[a]	p	ICC (95% CI)
TDS-T	20.32 ± 4.23	20.07 ± 3.45	−1.03	.307	.88 (.77–.93)*

Note. TDS-T = Turkish version of the Thirst Distress Scale; ICC = intraclass correlation coefficient, average measure; CI = confidence interval.
*$p < .001$ (2-tailed).
[a] Paired *t* test.

In this study, the content validity was supported through the ratings of six experts (mean CVI = .94; item CVI = .83–1.0). Our findings confirmed the single-component structure of the original version. The concurrent validity of the TDS-T was indicated by positive correlation with the IWG values. On the other hand, the correlation between the TDS-T scores and IWG values were low, since IWG is not only related to thirst distress. Different studies revealed that there are many factors affecting this relationship such as age, blood glucose level, sweating, willpower to refrain from drinking and social drinking (Kara et al., 2007; Lindley, 2009; Mistiaen, 2001). Although a similar, weak correlation was reported by Welch (2002), Jacob and Locking-Cusolito (2004) found no relationship between these two variables. However, the sample size in their study was relatively small ($n = 20$) (Jacob & Locking-Cusolito, 2004).

In accordance with our expectations, the TDS-T scores were positively significantly correlated with the VAS scores. This finding showed that higher thirst distress was associated with higher thirst intensity. According to the SMT, symptom distress is related to symptom intensity (Humphreys et al., 2008; Lenz et al., 1997). Thus, the results provided support for the theoretical framework. Our findings were similar to those of the original study (Welch, 2002). Pien et al. (2011) stated that "convergent validity is the degree to which concepts that should be related theoretically are interrelated in reality" (p. 2230). This significant correlation between the TDS-T and VAS scores suggested adequate convergent validity.

Known-group validity is a method that supports construct validity and "estimates how well the questionnaire discriminates between groups" (Alexander et al., 2005, p. 8). Known-group validity was demonstrated by significant differences in the mean TDS-T scores among patients with different thirst intensity. In our study, patients with severe thirst had higher TDS-T scores than those with mild and moderate thirst. This result was in line with expectations, since thirst distress is known to change with the intensity of thirst (Welch, 2002). In addition, known-group validity was confirmed by significant differences in the mean TDS-T scores by use of the fluid management strategies. Our findings suggest that the participants who avoided eating salty foods, spaced liquids, measured the amount drank and those who measured daily fluid intake using pitcher had lower thirst distress than those who did not. The results were consistent with the SMT's predictions that symptom experience and symptom management strategies are associated with each other (Humphreys et al., 2008). Similarly, other studies reported that some strategies that reduce fluid intake and control thirst were perceived as more effective than others by patients on HD (Jacob & Locking-Cusolito, 2004; Welch & Davis, 2000). The lack of an effect of avoiding exposure to hot temperatures on thirst distress in our study could be due to the period of data collection (November & January). It is essential that nurses be aware of the effectiveness of strategies used to reduce fluid intake and control thirst by individuals.

The TDS-T demonstrated acceptable internal consistency (Cronbach's alpha coefficient = .81). This finding was consistent with that of the original study (Cronbach's alpha conefficient = .78) (Welch, 2002). In addition, the TDS-T had good test-retest reliability with a 2-week interval (ICC = .88). None of the previous studies assessed the test-retest reliability of the TDS; therefore, no comparison was made. In our study, test-retest reliability indicated that the TDS-T scores were fairly stable over time.

The mean TDS-T score was 20.32, which is relatively higher than results obtained in the United States ($M = 17.1$, $SD = 4.2$) (Welch, 2002), and Canada ($M = 13.85$, $SD = 2.37$) (Jacob & Locking-Cusolito, 2004). This may be partly related to varying sample characteristics, or differences in methodology, sample size and settings. In addition, the mean TDS-T score was relatively above the

midpoint (18) of the scale. Our findings are important in demonstrating that thirst was a symptom of high intensity that is very bothersome and difficult to tolerate in patients on HD. Interventions should, therefore, be designed to reduce thirst.

The results of this study need to be considered in light of its potential limitations. Firstly, this study was carried out at two HD centers in a large city in central Turkey. The results came from a sample that represents only a part of the population. As such, the results of this study cannot be generalized to the entire population of patients on HD. Future studies should examine the psychometric properties of the scale with a more diverse sample. Secondly, as a characteristic of patients on HD, we saw a wide age range and extreme HD duration in the study group, as in previous studies (Bots et al., 2004; Porcu et al, 2007; Welch, 2002). The scale values can be partially affected by the age variable in studies but it does not seem practical to develop different scales for different age groups. Lastly, in this study, we investigated the psychometric properties of the scale that was developed for evaluating thirst distress only. Future studies are needed to develop an instrument for evaluating all dimensions of thirst (duration, frequency, distress, & intensity) in patients on HD.

Conclusions

Psychometric analysis of the TDS-T indicates high reliability and good content, construct, concurrent, convergent and known-group validity. The psychometric properties of the TDS-T are consistent with those reported in the original study. In conclusion, our study suggests that the TDS-T is a reliable, valid, practical and useful instrument for identifying patients on HD with thirst distress. Such identification would allow interventions to be considered to decrease their thirst distress. As thirst adversely affects patients, nurses should be aware of the importance of assessing patients' thirst distress. A better understanding of patients' thirst distress may increase the efficiency of the treatment and help patients reach better health outcomes.

Conflict of interest

The author declares no conflicts of interest.

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References

Alexander, M., Berger, W., Buchholz, P., Walt, J., Burk, C., Lee, J., et al. (2005). The reliability, validity, and preliminary responsiveness of the Eye Allergy Patient Impact Questionnaire (EAPIQ). *Health and Quality of Life Outcomes, 3*, 67. http://dx.doi.org/10.1186/1477-7525-3-67

Bots, C. P., Brand, H. S., Veerman, E. C., Korevaar, J. C., Valentijn-Benz, M., Bezemer, P. D., et al. (2005). Chewing gum and a saliva substitute alleviate thirst and xerostomia in patients on haemodialysis. *Nephrology Dialysis Transplantation, 20*(3), 578–584. http://dx.doi.org/10.1093/ndt/gfh675

Bots, C. P., Brand, H. S., Veerman, E. C., Valentijn-Benz, M., Van Amerongen, B. M., Valentijn, R. M., et al. (2004). Interdialytic weight gain in patients on hemodialysis is associated with dry mouth and thirst. *Kidney International, 66*(4), 1662–1668. http://dx.doi.org/10.1111/j.1523-1755.2004.00933.x

Curtin, R. B., Bultman, D. C., Thomas-Hawkins, C., Walters, B. A., & Schatell, D. (2002). Hemodialysis patients' symptom experiences: effects on physical and mental functioning. *Nephrology Nursing Journal, 29*(6), 562, 567–574; discussion 575, 598.

Dodd, M., Janson, S., Facione, N., Faucett, J., Froelicher, E. S., Humphreys, J., et al. (2001). Advancing the science of symptom management. *Journal of Advanced Nursing, 33*(5), 668–676. http://dx.doi.org/10.1046/j.1365-2648.2001.01697.x

Dominic, S. C., Ramachandran, S., Somiah, S., Mani, K., & Dominic, S. S. (1996). Quenching the thirst in dialysis patients. *Nephron, 73*(4), 597–600.

Ferketich, S., & Muller, M. (1990). Factor analysis revisited. *Nursing Research, 39*(1), 59–62. http://dx.doi.org/10.1097/00006199-199001000-00012

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). London, England: Sage Publications.

Fowler, J., Jarvis, P., & Chevannes, M. (2002). *Practical statistics for nursing and health care*. West Sussex, England: John Wiley & Sons.

Gjersing, L., Caplehorn, J. R., & Clausen, T. (2010). Cross-cultural adaptation of research instruments: language, setting, time and statistical considerations. *BMC Medical Research Methodology, 10*, 13. http://dx.doi.org/10.1186/1471-2288-10-13

Green, S. B., & Salkind, N. J. (2008). *Using SPSS for Windows and Macintosh: analyzing and understanding data* (5th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Greenleaf, J. E. (1992). Problem: thirst, drinking behavior, and involuntary dehydration. *Medicine and Science in Sports and Exercise, 24*(6), 645–656.

Humphreys, J., Lee, K. A., Carrieri-Kohlman, V., Puntillo, K., Faucett, J., Janson, S., et al. (2008). Theory of symptom management. In M. J. Smith, & P. R. Liehr (Eds.), *Middle range theory for nursing* (2nd ed.). (pp. 145–154) New York: Springer Publishing Company.

Jacob, S., & Locking-Cusolito, H. (2004). Thirst distress and interdialytic weight gain: how do they relate? *CANNT Journal, 14*(3), 33–37.

Kara, B., Caglar, K., & Kilic, S. (2007). Nonadherence with diet and fluid restrictions and perceived social support in patients receiving hemodialysis. *Journal of Nursing Scholarship, 39*(3), 243–248. http://dx.doi.org/10.1111/j.1547-5069.2007.00175.x

Larson, P. J., Carrieri-Kohlman, V., Dodd, M. J., Douglas, M., Faucett, J., Froelicher, E., et al. (1994). A model for symptom management. *Image Journal of Nursing Scholarship, 26*(4), 272–276.

Lenz, E. R., Pugh, L. C., Milligan, R. A., Gift, A., & Suppe, F. (1997). The middle-range theory of unpleasant symptoms: an update. *Advances in Nursing Science, 19*(3), 14–27.

Lindley, E. J. (2009). Reducing sodium intake in hemodialysis patients. *Seminars in Dialysis, 22*(3), 260–263. http://dx.doi.org/10.1111/j.1525-139X.2009.00570.x

Lord, F. M. (1980). *Applications of item response theory to practical testing problems*. Hillsdale, NJ: Lawrence Erlbaum Associates Publishers.

Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research, 35*(6), 382–385.

Mistiaen, P. (2001). Thirst, interdialytic weight gain, and thirst-interventions in hemodialysis patients: a literature review. *Nephrology Nursing Journal, 28*(6), 601–604, 610–613; quiz 614–615.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

Pien, L. C., Chu, H., Chen, W. C., Chang, Y. S., Liao, Y. M., Chen, C. H., et al. (2011). Reliability and validity of a Chinese version of the multidimensional fatigue symptom inventory-short form (MFSI-SF-C). *Journal of Clinical Nursing, 20*(15–16), 2224–2232. http://dx.doi.org/10.1111/j.1365-2702.2010.03691.x

Porcu, M., Fanton, E., & Zampieron, A. (2007). Thirst distress and interdialytic weight gain: a study on a sample of haemodialysis patients. *Journal of Renal Care, 33*(4), 179–181.

Rhodes, V. A., & Watson, P. M. (1987). Symptom distress—the concept: past and present. *Seminars in Oncology Nursing, 3*(4), 242–247.

Savaşır, I., & Şahin, H. N. (1997). *Bilişsel davranışçı terapilerde değerlendirme: Sık kullanılan ölçekler [Evaluation of cognitive behavioral therapies: frequently used tools]*. Ankara, Turkey: Türk Psikologlar Derneği Yayınları. pp. 46–50, 123–129.

Scully, C., & Bagan-Sebastian, J. V. (2004). Adverse drug reactions in the orofacial region. *Critical Reviews in Oral Biology and Medicine, 15*(4), 221–239.

Şencan, H. (2005). *Sosyal ve davranışsal ölçümlerde güvenilirlik ve geçerlilik [Reliability and validity in social and behavioral measurements]* (pp. 105–421). Ankara, Turkey: Seçkin Yayıncılık.

Sung, J. M., Kuo, S. C., Guo, H. R., Chuang, S. F., Lee, S. Y., & Huang, J. J. (2005). Decreased salivary flow rate as a dipsogenic factor in hemodialysis patients: evidence from an observational study and a pilocarpine clinical trial. *Journal of the American Society of Nephrology, 16*(11), 3418–3429. http://dx.doi.org/10.1681/ASN.2005040346

Sung, J. M., Kuo, S. C., Guo, H. R., Chuang, S. F., Lee, S. Y., & Huang, J. J. (2006). The role of oral dryness in interdialytic weight gain by diabetic and non-diabetic haemodialysis patients. *Nephrology Dialysis Transplantation, 21*(9), 2521–2528. http://dx.doi.org/10.1093/ndt/gfl236

Tinsley, H. E., & Tinsley, D. J. (1987). Uses of factor analysis in counselling psychological research. *Journal of Counseling Psychology, 34*(4), 414–424.

Turkish Society of Nephrology. (2012). Renal replacement therapy in Turkey: general considerations. Hemodialysis. In G. Süleymanlar, M. R. Altıparmak, N. Seyahi, & S. Trabulus (Eds.), *Registry of the nephrology, dialysis and transplantation in Turkey, registry 2011* (pp. 3–19). İstanbul, Turkey: Yorum Danışmanlık.

Virga, G., Mastrosimone, S., Amici, G., Munaretto, G., Gastaldon, F., & Bonadonna, A. (1998). Symptoms in hemodialysis patients and their relationship with biochemical and demographic parameters. *The International Journal of Artificial Organs, 21*(12), 788–793.

Welch, J. L. (2002). Development of the thirst distress scale. *Nephrology Nursing Journal, 29*(4), 337–341. discussion 343.

Welch, J. L., & Davis, J. (2000). Self-care strategies to reduce fluid intake and control thirst in hemodialysis patients. *Nephrology Nursing Journal, 27*(4), 393–395.

Yang, L. Y., Yates, P., Chin, C. C., & Kao, T. K. (2010). Effect of acupressure on thirst in hemodialysis patients. *Kidney and Blood Pressure Research, 33*(4), 260–265. http://dx.doi.org/10.1159/000317933

Zhang, Q. L., & Rothenbacher, D. (2008). Prevalence of chronic kidney disease in population-based studies: systematic review. *BMC Public Health, 8*, 117. http://dx.doi.org/10.1186/1471-2458-8-117

Zwiech, R., & Bruzda-Zwiech, A. (2013). The dual blockade of the renin-angiotensin system in hemodialysis patients requires decreased dialysate sodium concentration. *International Urology and Nephrology, 45*(5), 1365–1372. http://dx.doi.org/10.1007/s11255-012-0320-z