Immunosuppressant Therapy Adherence Scale for Transplant Recipients: The Study of Validity and Reliability

Organ Nakli Alıcıları için İmmunosupresif Tedaviye Uyum Ölçeği: Türkçe Geçerlik ve Güvenilirlik Çalışması

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ABSTRACT Objective: The aim of this study was to adapt for Turkish and perform the validity and reliability studies of the Immunosuppressant Therapy Adherence Scale® (ITAS®) which is developed by Chisholm et al. (2005). **Material and Methods:** This cross-sectional and methodological study included adult Turkish renal, liver, and heart transplant recipients. Data were collected using the Demographic and Clinical Characteristics Form and Turkish version of Immunosuppressant Therapy Adherence Scale®. Construct validity was tested using exploratory and confirmatory factor analyses. Convergent validity was tested by correlating Immunosuppressant Therapy Adherence Scale-Tr® to serum immunosuppressant therapy concentrations. Reliability was tested using Cronbach's alpha and item-to-total correlations. **Results:** Fifty transplant recipients were included. Root mean squared error of approximation was 0.04, standardized root mean square residual was 0.06, comparative fit index was 0.94, and goodness of fit index was 0.92. Kaiser-Meyer-Olkin was 0.62 and Bartlett's test was 27.791 ($p<0.001$). Factor loads ranged from 0.62 to 0.93. Eugene value higher than 1 was obtained and explained 73.63% of total variance. Correlation between Immunosuppressant Therapy Adherence Scale-Tr® and serum immunosuppressant therapy levels was 0.544 ($p<0.001$). Cronbach's alpha was 0.65; item-to-total correlation coefficients ranged from 0.27 to 0.69. **Conclusion:** Immunosuppressant Therapy Adherence Scale-Tr® is a valid and reliable tool to evaluate immunosuppressant therapy adherence in Turkish organ transplant recipients.

Key Words: Organ transplantation; reproducibility of results

ÖZET Amaç: Bu araştırmanın amacı Chisholm ve ark. (2005) tarafından geliştirilen İmmünsupresif Tedaviye Uyum Ölçeğini Türkçe'ye uyarlamak ve ölçeğin geçerlilik ve güvenirliliğini test etmek idi. **Gereç ve Yöntemler:** Bu kesitsel ve metodolojik çalışmaya Türk böbrek, karaciğer ve kalp nakil alıcıları dahil edilmiştir. Veriler "İmmünsupresif Tedaviye Uyum Ölçeği- Tr®" ve "Demografik ve Klinik Özellikler Formu" kullanılarak toplanmıştır. Yapı geçerliği, açıklayıcı ve doğrulayıcı faktör analizi ile test edilmiştir. İmmünsupresif Tedaviye Uyum Ölçeği Tr®- ile serum immünsupresif tedavi düzeyleri arasındaki ilişki birleşen ve ayırt eden geçerliği ile; güvenilirlik ise Cronbach alfa ve madde analizi ile sınanmıştır. **Bulgular:** Çalışmaya 50 organ nakil alıcısı dahil edilmiştir. Yaklaşık Hataların Ortalama Karekökü=0,04, Standartlaştırılmış Ortalama Karekök=0,06, Karşılaştırmalı Uyum İndeksi)=0,94, İyilik Uyum İndeksi=0,92 olarak saptanmıştır. Kaiser-Meyer-Olkin değeri 1,62, Barlett testi=27,791 ($p<0,001$) iken, faktör yüklerinin 0,62 ile 0,93 arasında değiştiği tespit edilmiştir. Öz değeri 1'in üzerinde olan bir faktör elde edildiği, bir faktörün toplam varyansın %73,63'ünü açıkladığı saptanmıştır. Ölçek puanı ile hedeflenen immünsupresif tedavi düzeyleri arasında incelenen birleşen geçerlik korelasyon katsayısı r=0,544 ($p<0,001$) olarak hesaplanmıştır. Cronbach alfa güvenilirlik katsayısı 0,65; madde-toplam korelasyon katsayısı 0,27 ile 0,69 arasında değişmektedir. **Sonuç:** İmmünsupresif Tedaviye Uyum Ölçeği-Tr® Türk organ nakil alıcılarında immünsupresif tedaviyi değerlendirmek için geçerli ve güvenilir bir araçtır.

Anahtar Kelimeler: Organ transplantasyonu; sonuçların tekrarlanabilirliği

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Solid organ transplantation is an effective method to treat end-stage organ diseases. Adherence to immunosuppressant therapy (IST) is required to achieve successful health outcomes such as graft survival following solid-organ transplantation.[1] Although instructed and encouraged to adhere to IST regimens, many transplant recipients do not take IST as prescribed. Rates of IST nonadherence vary, with typical reports of greater than 50%.[2-11] Reasons for nonadherence are varied and include, but are not limited to, high costs of IST, adverse drug effects, confusion regarding dosing schedule, psychiatric disorders, beliefs that IST is not effective, health care and work related problems, traveling away from home, and changes in recommended doses of therapy.[4,11-15] Although various methods have been used to assess nonadherence, no one measure is currently considered the gold standard.[16] To implement strategic interventions targeting IST nonadherence in practice-based settings, measures of nonadherence are needed that are valid and reliable as well as inexpensive, practical, and easily administered.[17] Based on this impetus, Chisholm et al. developed the Immuno suppressant Therapy Adherence Scale® (ITAS®) in a U.S.-based study (the instrument is written in English). This is the first valid and reliable adherence scale to evaluate IST adherence after solid-organ transplantation.[8,16] Beneficial features of the ITAS® include that it: has a low number of items, is easy to understand, takes only a few minutes to complete, is inexpensive, and allows a detailed evaluation of IST adherence. Since its initial publication, the ITAS® has been used successfully in multiple studies and has undergone additional psychometric evaluation in U.S. populations.[15,17-20]

To our knowledge, a valid and reliable scale to evaluate IST adherence is not available in Turkish. Compared to developing a new scale, adapting an existing scale is not only logical and economical, but it allows comparisons to data collected with different versions of the same scale.[21]

OBJECTIVE

The aim of this study was to adapt for Turkish and perfom the validity and reliability studies of the Immunosuppressant Therapy Adherence Scale® (ITAS®) which is developed by Chisholm et al. (2005). The Turkish version of the ITAS® will facilitate measurement of IST nonadherence in Turkish solid-organ transplant recipients and will contribute to the development of interventions to improve adherence.

MATERIAL AND METHODS

STUDY DESIGN, SAMPLE AND SETTING

This study employed a methodological design and was performed in the outpatient clinics of Liver Transplantation, Nephrology and Cardiovascular Surgery in a University Hospital, in Turkey.

Study inclusion criteria were as follows: volunteering to participate; had renal, liver, or heart transplantation due to acute or chronic organ failure; at least three months post- transplant; 18 years of age or older; received IST such as cyclosporine or tacrolimus; able to take medications independently; able to speak Turkish; and lacked medical or cognitive impairment.

As recommended for validity and reliability studies, the sample size was ten times the number of items in the scale.[22] The study included adult 50 Turkish renal (n:26), liver (n:21), and heart transplant (n:3) recipients. Transplant recipients were randomly selected to participate in the study.

ETHICAL CONSIDERATIONS

Ethical approval was obtained from the Non-Interventional Clinical Research Evaluation Committee of a University. Written permission to conduct the study was obtained from the Health Directorate of a University Hospital. Please note, all versions of the ITAS® are copyrighted; permission to use the ITAS® in this study was granted by Marie Chisholm-Burns. Additionally, written informed consent was obtained from all participants in accordance with the Declaration of Helsinki.

INSTRUMENTS AND DATA COLLECTION PROCEDURES

The study data were collected by using a questionnaire and ITAS®. The questionnaire was prepared using international studies and the investigators'

experience. The questionnaire form consisted of three open-ended questions and eight multiple-choice items divided into two areas of enquiry: the first part included five questions about socio-demographic characteristics (age, gender, education, marital status, income) and the second part, with seven questions, was about clinical features (type of organ transplant, return to work after transplantation, time since transplantation, donor type, Immunosuppressant Regimen, serum creatinine (SCr) levels (in renal transplant recipients only) and serum IST concentrations.

The ITAS® was developed to address the need for a reliable and valid measure of IST adherence in solid-organ transplant recipients.[8,17] The ITAS® is composed of four questions regarding IST-taking behavior in the prior three months. There are four response categories: 0%, 1%-20%, 21%-50%, and greater than 50%. Composite scores range from 0 to 12, with higher scores indicating better adherence.[8]

Data were collected by researchers during face-to-face interviews conducted between June and August 2012. The data collection for all questions lasted an average of 5-10 minutes for each participant. Questions about socio-demographic features were answered by transplant recipients and clinical characteristics data were obtained from hospital records.

Items of the Turkish version of the ITAS® (ITAS-Tr®; described later) were read by the researchers, and answers supplied by recipients were recorded.

The convergent validity of the ITAS® was originally assessed by correlating the composite scale score to other measures of adherence (i.e., refill records and serum IST concentrations).[8] Nomological validity was assessed by correlating composite scores to clinical outcomes (graft rejection and increased SCr). Reliability was tested with Cronbach's alpha coefficient. In the convergent validity analysis, the correlation coefficient between ITAS® score and IST refill records was 0.57 ($p<0.01$), and the correlation coefficient between ITAS® score and serum IST concentrations was 0.52 ($p<0.01$).) In the nomological validity analysis, ITAS® scores were negatively, significantly correlated to rejection episodes and SCr values (in renal transplant recipients only), $r = -0.25$ and $r = -0.32$ respectively ($p<0.05$). Cronbach's alpha was 0.81 ($p<0.05$).[8] Thus, the ITAS® was considered a valid and reliable measure of IST adherence. Additional validity and reliability testing of the ITAS® provided further support of the instrument's psychometrics. In this analysis, Cronbach's alpha was 0.87 and the Guttman split-half coefficient was 0.90.[17] Construct validity of the ITAS® was demonstrated through significant associations with two theoretically linked constructs, social support and resilience.[17]

STATISTICAL ANALYSIS

Data were analyzed with Statistical Package for Social Sciences 15.0 (SPSS, Inc., Chicago, IL, USA) and LISREL 8 (Scientific Software International, Skokie, IL, USA). Descriptive statistics (mean, standard deviation, frequency distributions and percentages) were used to analyze demographic and clinical characteristics. One-sample Kolmogorov-Smirnov test was used to determine whether data were normally distributed. Pearson's r correlation, Mann-Whitney U test and Kruskal Wallis analysis of variance were used to determine the association between the ITAS-Tr® composite score and recipient characteristics. Internal consistency (reliability) of the scale was tested with Cronbach's alpha and item-to-total correlations. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to determine the construct validity of the ITAS-Tr®.[23] EFA was used to examine the underlying factor structure of the scale. The CFA tested how the structure of the instrument responded to adaptation. Fit statistics and fit indices in the model were examined without making any restrictions or adding any new associations. To explain the model in the CFA, Structural Equation Modeling (SEM) examined causal relations between the factor structure of the scale and the variables creating that structure.[24] When the Chi-square test result is divided by degrees of freedom, a value of 2 or below indicates the model is a good index.[25] Convergent validity was assessed using Spearman rho correlations between the ITAS- Tr® and serum IST concentrations.

RESULTS

SAMPLE CHARACTERISTICS

Of 52 recipients who were randomly selected to participate, 50 (96.2%) were enrolled in the study. Mean recipient age was 45.54 years ± 14.44. More than half of recipients had renal transplants (52%), were male (52%), were primary school graduates (54%), were married (72%), had an income equal to their expenses (56%), and worked after transplantation (64%). Sixty percent of recipients received grafts from living donors (Table 1).

TABLE 1: Distribution of the participants' socio-demographic and clinical characteristics (n = 50)

Characteristics	n	%
Socio-demographic		
Mean age ± SD (45.54 ± 14.44) (Range 19.00-67.00) years		
Gender		
Female	24	(48)
Male	26	(52)
Education		
Literate[a]	3	(6)
Primary School	27	(54)
High School	11	(22)
University/Higher Education	9	(18)
Marital Status		
Married	36	(72)
Single	14	(28)
Income		
Higher than expenses	4	(8)
Equal to expenses	28	(56)
Lower than expenses	18	(36)
Clinical		
Type of Transplant		
Renal	26	(52)
Liver	21	(42)
Donor Type		
Living	30	(60)
Deceased	20	(40)
Time Post-transplant		
> 2 years	34	(68)
<2 years	16	(32)
Returned to Work Post-transplant?		
Yes	32	(64)
No	18	(36)
Immunosuppressant Regimen		
Cyclosporine, corticosteroid, MMF	6	(12)
Cyclosporine, MMF	4	(8)
Tacrolimus	10	(20)
Tacrolimus, corticosteroid, MMF	5	(10)
Tacrolimus, MMF	4	(8)
Tacrolimus, corticosteroid, EC-MPA	4	(8)
Other combinations of IST	17	(34)
Serum IST		
Concentrations[b] within target levels	26	(52)
Sub-target levels	18	(36)
Missing	6	(12)

[a]Literate: Participants who are able to read but did not graduate from any level of school. EC-MPA: enteric-coated mycophenolic acid; IST: Immunosuppressant Therapy; MMF: Mycophenolate Mofetil.

[b]Target cyclosporine levels: 100- 400 ng/ml; Target Tacrolimus levels: 5-17 ng/ml.

LANGUAGE EQUIVALENCE OF IMMUNOSUPPRESSANT THERAPY ADHERENCE SCALE

To adapt the ITAS® for this study, it was first translated to Turkish. It was then translated into English by two linguists with an excellent command of both Turkish and English. These versions were merged into a single instrument. The resultant Turkish version of the ITAS® (ITAS-Tr®) was translated back into English by a third linguist who was not familiar with the original English version of the instrument. When the back-translated version of the ITAS-Tr® was compared with the original ITAS®, it was found to be similar and no additional changes were made.

VALIDITY OF THE ITAS-TR®

Content Validity

Following translation of the ITAS® into Turkish, the adapted version of the instrument was sent to seven experts (three professors of nephrology, a professor of cardiovascular surgery, two associate professors of general surgery, and two transplant nurses) to assess content validity. The experts examined the scale to determine whether it was suitable for the Turkish culture. In accordance with the experts' recommendations, the phrase "how often" in each item was changed to "how many times" in the Turkish version. Item 2 of the translated version, "how often have you neglected/been careless with taking your medications for prevention of organ rejection in the last three months," was considered too similar to item.[1]

As a result, the item was changed as follows: "how many times have you made mistakes in time and/or doses of your medications for prevention of organ rejections in the last three months?". Additionally, Item 3 ("how often have you stopped your medications for prevention of organ rejections in the

last three months because you have felt bad?") was changed to "how many times have you not taken your medications for prevention of organ rejection in the last three months because you felt bad?".

Evaluations of the expert opinions were made using the content validity index. Polit and Beck recommended using the content validity index in studies to reveal the distribution of experts' responses and the distribution of responses to each item.[26] A four-point Likert scale was used to evaluate the scores assigned for each item: 1 = not valid, 2 = partly valid, 3 = valid, and 4 = highly valid. The item content validity index (I-CVI) was calculated for the items, and the scale content validity index (S-CVI) was calculated for the scale as a whole. The I-CVI and S-CVI were both 0.96.

Piloting Study

Following content validity analysis, the ITAS-Tr® was pilot tested among 10 Turkish transplant recipients. As recommended in the literature, the sample size in the pilot study was two and a half times the number of items in the scale.[27] In accordance with feedback from recipients, a few minor revisions were made to make the items clearer. For example, the linking word "and" was changed to "and/or." Data obtained in the pilot were not included in this study.

Construct Validity

Regarding construct validity, in the CFA, the minimum fit function Chi-square (2) was 0.50, the degrees of freedom (df) was 2,2/df was 0.25, and the root mean squared error of approximation (RMSEA) was 0.04. The standardized root mean square residual (S-RMR) was 0.06, the comparative fit index was 0.94, and the goodness of fit index was 0.92. In the EFA, Kaiser-Meyer-Olkin test (0.62) and Bartlett's test of sphericity (=27.791) were significant ($p<0.001$). Eugene value higher than 1 was obtained and explained 73.63% of the total variance. Factor loads of the items ranged from 0.62 to 0.93 (Table 2).

Convergent Validity

In the convergent validity analysis, there was a significant, positive correlation between ITAS-Tr® score and serum IST concentrations (rs= 0.544; p=0.004; Figure 1).

RELIABILITY OF THE ITAS-TR®

In the reliability assessment, item-to-total correlation coefficients ranged between 0.27 and 0.69. Cronbach's alpha coefficient was 0.65 (Table 3).

ASSOCIATIONS BETWEEN SELECTED RECIPIENT CHARACTERISTICS AND THE ITAS-TR®

As noted in Table 2, ITAS-Tr® scores signifi cantly differed based on gender (p=0.022), time post-transplant (p=0.028), and serum IST levels (p=0.029). In other words, females, those less than two years post-transplant, and those within target serum IST (cyclosporine or tacrolimus) concentration levels had higher scores on the ITAS-Tr® compared to males, those greater than two years

TABLE 2: Results of the Exploratory Factor Analysis of the ITAS-Tr®

Items	Factor loads
Item 1. How many times did you not take your medications for prevention of organ rejection in the last three months because you forgot about it?	0.62
Item 2. How many times have you made mistakes in time and/or doses of your medications for prevention of organ rejections in the last three months?	0.70
Item 3. How many times have you not taken your medications for prevention of organ rejection in the last three months because you felt bad?	0.67
Item 4. How many times have you not taken your medications for prevention of organ rejection due to conditions not related to you (medical report and pharmacy, etc.)?	0.93
	Statistics
Total variance	73.63%
Kaiser-Meyer-Olkin test	0.62
Bartlett's test	27.791
p value	< 0.001

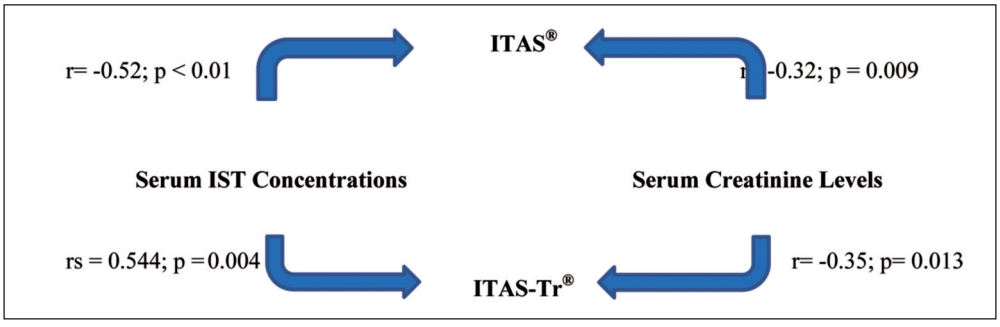

FIGURE 1: . Comparison of ITAS® and ITAS-Tr® on Correlations with Serum IST Concentrations and Serum Creatinine Levels The figure displays a comparison of the the results of the correlational analysis between the original version of the ITAS® [8] and the ITAS-Tr®, respectively, and the following variables:(1) serum immunosuppressant therapy (IST) concentrations; and (2) serum creatinine levels (in renal transplant recipients only).

post-transplant, and those with sub- target serum concentrations. There was a significant negative correlation between ITAS- Tr® score and age (r = -0.334; p=0.018) and SCr levels (renal transplant recipients only; r_S =-0.350; p=0.013), suggesting younger adults and those with lower SCr levels were more adherent compared to older adults and those with higher SCr levels. ITAS-Tr® scores did not significantly vary based on marital status or type of transplant (Table 4).

TABLE 3: Item-to-Total Correlations and Cronbach's alpha Coefficient of the ITAS-Tr®

ITAS-Tr®	Item-to-total correlations (r)	Cronbach's alpha when item is deleted	Cronbach's Alpha
Item 1	0.69*	0.35	0.65
Item 2	0.40*	0.59	
Item 3	0.39*	0.59	
Item 4	0.27*	0.65	

*p < 0.05

TABLE 4: Associations between Selected Recipient Characteristics and the ITAS-Tr®

Characterics	Mean ± SD	p value
Gender		0.022*
Female	11.08±0.92	
Male	10.07 ± 1.67	
Marital Status		0.893
Married	10.69 ± 1.06	
Single	10.21 ± 2.15	
Time Post-transplant		0.028*
<2 years	11.25 ± 0.68	
>2 years	10,23 ± 1,59	
Type of Transplant		0.745
Liver	10.61 ± 1.11	
Renal	10.57 ± 1.65	
Heart	10.0 ± 2.0	
Serum IST		0.029*
Concentrations[a]	11.0 ± 1.05	
Within target levels	9.94 ± 1.76	

*p<0,05. IST: Immunosuppressant therapy.

DISCUSSION

Over 3900 renal, liver, and heart transplants are performed each year in Turkey. Although practical IST adherence measures are needed for use in the clinic setting, a valid and reliable scale to evaluate IST adherence was not available in Turkish prior to this study. Thus, the objective of the current study was to translate the ITAS® into Turkish and conduct an analysis of the adapted instrument's validity and reliability.

LANGUAGE EQUIVALENCE OF IMMUNSUPRESSANT THERAPY ADHERENCE SCALE

Translators' knowledge and experience have a great influence on translation. Therefore, people who have a good command of both languages and who know cultures of both languages should be selected. Translation of a scale from its original version to the target language and its back-translation are the most commonly used methods.[22,28] For this reason, the scale was translated into Turkish by two people who know both languages and cultures well, and its back-translation was made by one other people who know both languages and cultures well and who have not seen the scale before. The back- translation was compared with the original ITAS by the authors of this paper, and it was found

to be compatible with the original scale. Therefore, no changes were made in the Turkish version.

VALIDITY OF THE ITAS-TR®

Content Validity

Following translation of the ITAS® into Turkish, the adapted version of the instrument was sent to seven experts to assess content validity. The experts examined the scale to determine whether it was suitable for the Turkish culture. In accordance with the experts' recommendations, the changes were made in the Turkish version.

Also, content validity requires that experts decide whether the items of a scale represent the construct planned to be measured, and create a scale including meaningful items.[26] It is recommended that expert opinion regarding content validity should be requested from three specialists on minimum and 10 specialists on maximum.[26] In this study, the content validity of the scale was tested by requesting a total of seven experts. CVI was used to determine whether the experts agreed. It is computed in two ways: I-CVI and S-CVI. I-CVI is determined for each item and should be greater than 0.78. S-CVI is determined for all the items combined of a scale and should be greater than 0.80.[26] I-CVI and S-CVI values of the ITAS® were found 0.96. Both I-CVI and S-CVI are acceptable.[23] The values showed an agreement about the items of the ITAS® among experts.

Construct Validity

We assessed the construct validity of the ITAS-Tr® using EFA and CFA. In the EFA, factor loads indicate the relationships between items and factors, and are used to remove items from a scale. In practice, it is usually recommended that items with factor loads of 0.40 or less should be deleted.[22] Since the factor loads of the ITAS-Tr® items ranged from 0.62 to 0.93, none were deleted. Additionally, it has been recommended that construct validity of scales adapted to another language and culture be examined with CFA to determine whether the factor structure of the adapted version is appropriate.[24] Given that RMSEA and S-RMR should be lower than 0.08, the findings indicating an RMSEA of 0.04 and a S-RMR of 0.06 demonstrated good fit of the model.[25] The comparative fit index and goodness of fit index were both greater than 0.90, which also indicates good fit of the model.[25] Based on the results of the CFA, the ITAS-Tr® has acceptable construct validity.[29,30]

Convergent Validity

Convergent validity refers to evidence of a significant relationship between an instrument and another measure of the same construct. To determine convergent validity in the current study, we calculated the correlation coefficient between the ITAS-Tr® and serum IST concentrations as another measure of adherence. The significant, positive correlation of 0.544 was indicative of the convergent validity of the ITAS-Tr®, and was consistent with the correlation noted by Chisholm et al. between the original version of the ITAS® and serum IST concentrations (r=0.52).[8] Refer to Figure 1.

RELIABILITY OF THE ITAS-TR®

Cronbach's alpha strongly reflects the reliability of a scale by providing evidence of the homogeneity of scale items. Tavakol and Dennick note that a minimum acceptable value for Cronbach's alpha has not been determined in the literature, citing values from various reports ranging from 0.7 to 0.95.[31] Given this range, the Cronbach's alpha coefficient for the ITAS-Tr® was approaching acceptability at 0.65. This is less than the Cronbach's alpha of the ITAS® found in its original assessment or a later psychometric reevaluation, 0.81 and 0.87, respectively, and suggests some refinement of the ITAS-Tr® may be needed to improve reliability.[8,17]

Providing stronger support for the reliability of the ITAS-Tr® is the item-to-total score assessment. The item-to-total score correlation yields the discriminatory index of an item and examines to what extent each item of a scale is related to the total score of the scale. The higher the correlation coefficient for each item, the more effective that item is in measuring the given target behavior.[32,33] High item-to-total correlations provide evidence that items of a scale measure the same characteristic. It is recommended that items with low and/or negative correlations be deleted.[27] Since the item-to-

total score correlations for the ITAS-Tr® ranged from 0.27 to 0.69, no items were deleted. Consistent with the results of the current study, the item-to-total correlations of the original scale ranged between 0.26 and 0.79.[8]

ASSOCIATIONS BETWEEN SELECTED RECIPIENT CHARACTERISTICS AND THE ITAS-TR®

In the assessment of recipient characteristics, IST adherence was significantly higher in females compared to males (p=0.022). The lower rate of adherence among male recipients was consistent with previous studies.[34-36] For example, in a prospective study of renal transplant recipients, Denhaerynck et al. noted a greater rate of IST nonadherence among male renal transplant recipients compared to female recipients. Additionally, in the current study, adherence was lower in recipients who were greater than two years post-transplant compared to those less than two years post-transplant (p=0.028). This finding was also consistent with prior studies and suggests transplant recipients may become less vigilant over time regarding adherence.[8,15,34,37,38] Regarding age, we found that level of IST adherence decreased as age increased, indicating older adults were more likely to be less adherent. This finding is supported by previous studies that found older transplant recipients were more likely to be less adherent than younger recipients.[8,15,38] These cumulative results suggest older transplant recipients may be more vulnerable to nonadherence for several reasons including forgetfulness, cognitive impairment, and reduced access to health care. Additionally, IST adherence was high in recipients who had target serum IST levels, while it was lower in recipients with increased serum creatinine levels. This suggests the ITAS-Tr® has clinical value as it relates to measuring IST adherence.

STUDY LIMITATIONS

The sample size in the current study was not large compared to the samples who participated in previous psychometric assessments of the original version of the ITAS®, which may contribute to differences between the studies. However, this study's sample size met the standards for factor analysis as described by Tavşanal, and the results support the use of the ITAS-Tr® in this population.[22] Additionally, the convergent validity of the ITAS-Tr® was assessed using only one other adherence measure, serum IST concentrations. Although generally considered a valid measure of adherence, serum IST concentrations may be influenced by factors other than adherence. Therefore, future validation studies of the ITAS-Tr®

TABLO 5: İmmunsupresif Tedaviye Uyum Ölçeği Türkçe Versiyonu (İTUÖ).

Bu ölçek sizin nakil sonrası organ reddinizi önleyecek ilaç tedavisine (immunsupresif tedavinize) uyumunuzu değerlendirmek için oluşturulmuştur. Ölçekte dört soru bulunmaktadır. Her soru son üç ay içinde organ reddinizi önleyecek ilaçlarınızı (immunsupresif tedavinizi) almayı kaç kez ve neden unuttuğunuzu değerlendirecektir. Her bir sorunun doğru ya da yanlış yanıtı yoktur. Sizin için uygun olan seçeneği işaretleyiniz.

	Kaç kez	% 3 puan	%1-20 2 puan	%21-50 1 puan	>%50 0 puan
1. Son 3 ay içerisinde organ reddinizi önleyecek ilaçlarınızı unuttuğunuz için kaç kez alamadınız?	.....				
2. Son 3 ay içerisinde organ reddinizi önleyecek ilaçlarınızı alırken dozunda ve/veya saatinde kaç kez yanlışlık yaptınız?	.....				
3. Son 3 ay içerisinde organ reddinizi önleyecek ilaçlarınızı yan etkileri nedeniyle kendinizi kötü hissetmenizden dolayı kaç kez almadınız?	.....				
4. Son 3 ay içerisinde organ reddinizi önleyecek ilaçlarınızı sizin dışınızda bir nedenden dolayı (rapor, eczane…vb) kaç kez alamadınız?	.....				

Ölçeğin Değerlendirmesi: Son üç ay içinde tedavinin İST' sini (immunsupresif tedavisini) hiç aksatmayan nakil hastasına 3 puan (hiç unutmayan), son üç ay içinde İST'sine uyumsuzluğu %1-20 olan alıcıya 2 puan, son üç ay içinde İST'sine uyumsuzluğu %21-50 olan alıcıya 1 puan, son üç ay içinde İST'sine uyumsuzluğu >50 olan nakil hastasına 0 puan verilir. Ölçek sonucunda elde edilen puanlar 0 ile 12 puan arasında değişmektedir. Ölçek puanın artması uyumun da arttığını göstermektedir.

should consider employing additional measures of adherence in validity testing when available and applicable. It is also important to note that, similar to the original ITAS® study which included participants from multiple transplant populations, three different transplant recipient groups (renal, liver and heart) were included in this study's sample.[8] Although this may have increased variability and decreased specificity, the study findings also suggest a broad application of the ITAS-Tr® across transplant populations.

CONCLUSION

Given the findings of this study, it can be concluded that the ITAS-Tr® is a valid and reliable tool to evaluate IST adherence in Turkish organ transplant recipients (Table 5). The instrument can be used for evaluation of IST adherence in clinical practice due to its practicality and validity. The ITAS-Tr® can also be used by health professionals to evaluate effects of programs/interventions targeting potential barriers to IST adherence such as those measured by the instrument (e.g., forgetfulness, confusion over how to take medication).

Nursing education and interventions has an important role in immunosuppressant therapy adherence. Nurses should offer the education given on discharge repeatedly and teach the patients reminder methods effectively, all of which can decrease medication nonadherence.

Disclosure

Özgül Karayurt, the corresponding author of the study, coordinated the research process, organized the manuscript structure, analyzed the data and wrote the manuscript. BM, collected the data, and wrote the manuscript, C-BM and ASC wrote and edited of the language of the manuscript.

Conflict of interest

No conflict of interest has been declared by the authors.

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REFERENCES

1. Flattery MP, Dale C. Solid organ transplantation: the evaluation process. In: Ohler L, Cupples SA, eds. Core Curriculum for Transplant Nurses. 1st ed. Washington: Mosby Elseiver; 2008. p.1-25.
2. Lieber SR, Volk ML. Non-adherence and graft failure in adult liver transplant recipients. Dig Dis Sci 2013;58(3):824-34.
3. Gorevski E, Succop P, Sachdeva J, Cavanaugh TM, Volek P, Heaton P, et al. Is there an association between immunosuppressant therapy medication adherence and depression, quality of life and personality traits in the kidney and liver transplant population? Patient Prefer Adherence 2013;16(7):301-7.
4. Burra P, Germani G, Gnoato F, Lazzaro S, Russo FP, Cillo U, et al. Adherence in liver transplant recipients. Liver Transpl 2011; 17(7):760-70.
5. Denhaerynck K, Burkhalter F, Schäfer-Keller P, Steiger J, Bock A, De Geest S. Clinical consequences of non adherence to immunosuppressive medication in kidney transplant patients. Transpl Int 2009;22(4):441-6.
6. O'Carroll RE, McGregor LM, Swanson V, Masterton G, Hayes PC. Adherence to medication after liver transplantation in Scotland: a pilot study. Liver Transpl 2006;12(2):1862-8.
7. Chisholm MA. Issues of adherence to immunosuppressant therapy after solid-organ transplantation. Drugs 2002;62(4):567-75.
8. Chisholm MA, Lance CE, Williamson GM, Mulloy LL. Development and validation of the immunosuppressant therapy adherence instrument (ITAS). Patient Educ Couns 2005; 59(1):13-20.
9. Stilley CS, Dimartini AF, de Vera ME, Flynn WB, King J, Sereika S, et al. Individual and environmental correlates and predictors of early adherence and outcomes after liver transplantation. Prog Transplant 2010;20(1):58-66.
10. Cukor D, Newville H, Jindal R. Depression and immunosuppressive medication adherence in kidney transplant patients. Gen Hosp Psychiatry 2008;30(4):386-7.
11. Gheith OA, El-Saadany SA, Abuo Donia SA, Salem YM. Compliance of kidney transplant patients to the recommended lifestyle behaviours: single centre experience. Int J Nurs Pract 2008;14(5):398-407.
12. Gordon EJ, Prohaska TR, Gallant MP, Siminoff LA. Adherence to immunosuppression: a prospective diary study. Transplant Proc 2007;39(10):3081-5.
13. Fredericks EM, Magee JC, Opipari-Arrigan L, Shieck V, Well A, Lopez MJ. Adherence and health-related quality of life in adolescent liver transplant recipients. Pediatr Transplant 2008; 12(3):289-99.
14. Schäfer-Keller S, Steiger J, Bock A, Denhaerynck K, De Geest S. Diagnostic accuracy of measurement methods to assess non-adherence to immunosuppressive drugs in kidney transplant recipients. Am J Transplant 2008;8(3):616-26.
15. Chisholm MA, Lance CE, Mulloy LL. Patient factors associated with adherence to immunosuppressant therapy in renal transplant recipients. Am J Health-Syst Pharm 2005; 62(17):1775-81.

16. Abbott K. Medication compliance in transplantation. Am J Transplant 2007;7(12):2647-9.
17. Wilks SE, Spivey CA, Chisholm-Burns MA. Psychometric re-evaluation of the immunosuppressant therapy adherence scale among solid-organ transplant recipients. J Eval Clin Pract 2010;16(1):64-8.
18. Tsapepas D, Langone A, Chan L, Wiland A, McCague K, Chisholm-Burns M. A longitudinal assessment of adherence with immunosuppressant therapy following kidney transplantation from the Mycophenolic Acid Obsevational Renal Transplant (MORE) study. Ann Transplant 2014;17(19):174-81.
19. Weng FL, Chandwani S, Kurtyka KM, Zacker C, Chisholm-Burns M, Demissie K. Prevalence and correlates of medication non-adherence among kidney transplant recipients more than 6 months post-transplant: a cross-sectional study. BMC Nephrol 2013;14:261-71.
20. Sankaranarayanan J, Collier D, Furasek A, Reardon T, Smith LM, McCartan M, et al. Rurality and other factors associated with adherence to immunosuppressant medications in community-dwelling solid-organ transplant recipients. Res Social Admin Pharm 2012; 8(3):228-39.
21. Jamieson S. Likert scales: how to (ab) use them. Med Educ 2004;38(12):1217-8.
22. Tavşanel E. [Basic concepts related to measurement]. Data analysis. Tutumların Ölçülmesi ve SPSS ile Veri Analizi. 1. Baskı. Ankara: Atlas Yayınevi; 2002. p.46-51.
23. Schreiber JB, Nora A, Stage FK, Barlow EA, King J. Reporting structural equation modeling and confirmatory factor analysis results: a review. J Educ Res 2006;99(6):323-38.
24. DiStefano C. The impact of categorization with confirmatory factor analysis. Structural Equation Modeling 2002;9(3):327-46.
25. Özabacı N. [The Turkish adaptation of the relationship quality scale: a validity and reliability study]. Education and Science 2011; 36(162):159-67.
26. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Res Nurs Health 2006;29(5):489-97.
27. Büyüköztürk Ş. [Factor analysis: basic concepts and the use of scale development]. Educational Administration of Theory and Practice 2002;32:470-83.
28. Ercan İ, Kan İ. [Reliability and validity in the scales]. Journal of Uludag University Medical Faculty 2004;30(3):211-6.
29. Daşdan Ada EN, Aşçı FH, Kazak Çetinkalp FZ, Altiparmak ME. [Validity and reliability of situational motivation scale for physical education class environment]. SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi 2012; X(1):7-12.
30. Baykal Ü, Harmancı AK, Eşkin F, Altuntaş S, Sökmen S. [Student satisfaction scale-short form" validity-reliability study]. Journal of Anatolian Nursing and Health Sciences 2011; 14(4):60-8.
31. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ 2011;2:53-5.
32. Baykul Y. [Reliability]. Eğitimde ve Psikolojide Ölçme: Klasik Test Teorisi ve Uygulaması. 1. Baskı. Ankara: ÖSYM Yayınları; 2000. p.141-95.
33. Chisholm MA, Kwong WJ, Spivey CA. Associations of characteristics of renal transplant recipents with clinicians' perceptions of adherence to immunosuppressant therapy. Transplantation 2007;84(9):1145-50.
34. Denhaerynck K, Steiger J, Bock A, Schäfer-Keller P, Köfer S, Thannberger N, et al. Prevalence and risk factors of non-adherence with immunosuppressive medication in kidney transplant patients. Am J Transplant 2007; 7(1):108-16.
35. Rosenberger J, Geckova AM, van Dijk J, Nagyova I, Roland R, van den Heuvel WJ, et al. Prevalence and characteristics of noncompliant behaviour and its risk factors in kidney transplant recipients. Transpl Int 2005; 18(9):1072-8.
36. Dharancy S, Giral M, Tetaz R, Fatras M, Dubel L, Pageaux GP. Adherence with immunosuppressive treatment after transplantation: results from the French trial PREDICT. Clin Transplant 2012;26(3):E293-9.
37. Rodrigue JR, Nelson DR, Hanto DW, Reed AI, Curry MP. Patient-reported immunosuppression nonadherence 6 to 24 months after liver transplant: association with pretrasplant pychological factors and perceptions of health status change. Prog Transplant 2013;23(4): 319-28.
38. Chisholm MA, Williamson GM, Lance CE, Mulloy LL. Predicting adherence to immunosuppressant therapy: a prospective analysis of the theory of planned behavior. Nephrol Dial Transplant 2007;22(8):2339-48.