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Development and validation of the attitude scale for the clinical nutrition care process of hospitalized patients for physicians

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ABSTRACT

Objective: Evaluating physicians' attitudes towards malnutrition and clinical nutrition in hospitalized patients are crucial for the implementation of optimal nutritional care process and the prevent of hospital malnutrition. The aim of this study is to develop a scale that evaluates physicians' attitudes towards malnutrition in hospitalized patients.

Methods: Based on the existing literature on clinical nutrition and the clinical experience of experts in this field, a 5-point Likert-type attitude scale consisting of 12 items was developed. Analysis was carried out using Parallel Analysis to determine the number of factors in the Exploratory factor analysis based on the Polychoric correlation matrix and Unweighted Least Squares as the factor extraction method.

Results: There are 8 items in the 1st factor (Physician duties) and 4 items in the 2nd factor (Non-Physician duties). The Cronbach Alpha and McDonald's Omega coefficients of the scale were found to be 0.72 and 0.81 respectively, from the sub-dimensions 0.78 and 0.85 for the 1st Factor, and 0.66 and 0.75 for the 2nd Factor.

Conclusion: Attitude scale for the clinical nutrition care process of hospitalized patients for physicians is an instrument with good psychometric properties that measures examination of physicians' attitudes related to clinical nutrition care process.

Keywords: attitude scale, clinical nutrition care, physicians

INTRODUCTION

Malnutrition continues to be a serious problem that can increase morbidity and mortality in hospitalized patients.[1] The prevalence of malnutrition in the hospital setting has been reported between 28% and 73%, depending on the patient population and diagnostic criteria.[2-4] The prevalence of malnutrition in hospitalized patients is significantly high not only at admission but also before discharge.[5]

In hospitalized patients, providing adequate nutritional support reduces morbidity, mortality, and health care costs.[6,7] Despite the awareness of the importance and consequences of malnutrition, progress towards providing nutritional intervention in hospitalized patients remains insufficient.[8] The multidisciplinary team approach comes to the fore in the prevention of malnutrition and optimal management of nutritional care process in hospitalized patients. Nutritional support team consisting of physicians, dietitians, nurses and pharmacists specialized

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in clinical nutrition primarily provide nutritional care.[9] In cases where physicians lack adequate training on nutrition, management of nutrition-related problems of hospitalized patients becomes more difficult.[10,11] Studies have found that physicians' knowledge on clinical nutrition is insufficient, and they are not aware of this situation and think that their knowledge is sufficient.[12,13] In contrast to these studies, even though the clinical nutrition knowledge level of medical oncology physicians is sufficient, it has been reported that there is a mismatch between physicians' knowledge, awareness and clinical practice.[14] Determining the attitudes of physicians towards malnutrition and clinical nutrition in hospitalized patients, the factors associated with this attitude and improving these attitudes as desired play an important role in the management and prevention of adult malnutrition in the hospital environment. The scales in the literature have been examined and a scale that includes the attitudes of physicians towards hospitalized patients and their own medical responsibilities has not been found. The aim of this study is to develop a scale that evaluates physicians' attitudes towards malnutrition and medical nutrition therapy in hospitalized patients.

MATERIAL AND METHODS

Sampling of the study

The study was conducted with 194 physicians selected through convenience sampling among those involved in the diagnosis and treatment processes of nutritional disorders between February 2020 and 2021. The study protocol was approved by the hospital ethic committee and was conducted in accordance with the Helsinki Declaration. Each participant was informed about the contents of the study prior to the survey and signed an informed con sent form which indicated voluntary participation in the research.

Scale Development Process

While developing the scale in the first stage, the literature on the subject was reviewed by the researchers (two physicians, one dietitian and one specialist in the field of measurement and evaluation) and previously developed scales were used during the writing process of attitude items.[15,16] Items related to the characteristics to be measured were written by taking into account the issues stated in the literature (expression, content, etc.) of the attitude level, as well as expert opinions. As a result of the examinations, the first draft form with 12 items was created in order to measure the attitude towards the clinical nutrition care process. The draft form prepared was applied to 106 assistant physicians working in inpatient services. The draft form was revised in accordance with the necessary statistical analyzes and the opinion of the measurement and evaluation specialist. Following the revision, a second draft form with 20 items was generated. The second draft form was evaluated by the same expert team and corrections were made in line with the feedback received. Afterwards, each item was examined one by one with a group of 7 physicians and the scale was finalized in terms of medical language and intelligibility. As a result of all the procedures, 12 items were included in the item pool. 7 of these items are positive and 5 of them are negative (1st,6th,7th,8th, and 12th items). A five-point Likert type scale was prepared to express the level of agreement with the items in the scale. The scale is rated in 5 categories ranging from (1) "strongly disagree" to (5) "strongly agree". After the measurement tool was applied to the study group, the score was graded by considering whether the items were positive or negative in scoring the answers. The answers given to the negative statements in the scale were recorded in the opposite direction.

Main Points

- Determining physicians' attitudes towards malnutrition and the factors associated with these attitudes is important in the prevention of hospital malnutrition.
- The developed attitude scale is a valid and reliable instrument to measure physicians' attitudes related to clinical nutrition care process.
- Future studies may help to improve optimal nutritional care by determining the factors affecting physicians' attitudes.

Statistical Analysis

In order to examine the dimensions of the theoretical structure by using the observed variables and to reveal the factor structures, Exploratory factor analysis (EFA) was performed on the data obtained as a result of the application of the 5-point Likert-type attitude scale. Since the answers to the scale consisted of scores ranging from 1 to 5, the data obtained for each item were multiple categorical data at the ranking level, factor analysis based on the polychoric correlation matrix was performed.[17] Analysis was performed using Parallel Analysis (PA) to determine the number of factors in EFA analysis and Unweighted Least Squares (ULS)[18] as factor extraction method. The ULS method was preferred[19], since the aim of EFA is to determine the latent variables that explain the relationships between the observed variables, and it is a method frequently used in small samples.[20] Varimax rotation method, one of the factor rotation methods, was used in order to facilitate the understanding and interpretation of the factor loads obtained as a result of factor analysis. Variance inflation factor (VIF), tolerance value (TV) and conditional index (CI) values were calculated to determine whether there is a multicollinearity problem

in the data set. Tolerance value above 0.01, VIF values below 10 and CI values below 30 indicate that there is no multicollinearity problem.[21] Mahalanobis distance values were calculated to examine the multivariate extreme values. By using the chi-square test for the presence of multivariate extreme values, the significance of the Mahalanobis distance values obtained at the 0.001 level was examined.[22] In this study, since the data obtained from the observed variables of the Likert-type scale were evaluated at the ordinal scale level, there was no need to examine the multivariate normality assumption.[23,24]

After checking the assumptions for EFA, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test were performed to ensure that the data set was suitable for factor analysis.[25-28] There is a common view in the literature that the minimum size for the factor load value of an item should be 0.30, but there are also theorists who argue that this size should be 0.40.[29] In this study, the minimum magnitude for the factor load value was taken as 0.30.

The FACTOR (ver. 12.01.02) program was used for analysis of the factor structure of the NT scale. SPSS (ver. 25) was used for analyzes of Cronbach's alpha reliability and factor analysis assumptions. The analyzes of the good fit values of the factor model and McDonald's Omega reliability were performed in RStudio (Ver. 1.1.463) software with the psych (Ver. 2.1.9) package.[30]

RESULTS

A total of 194 physicians, 52.6% were women and half of the participants were working in internal clinic. The experience of physicians varies between new initiation and 36 years, with a mean of 4.5 years. Table 1 indicates maximum and minimum values between 1 and 5 for the data set with 12 variables.

Exploratory factor analysis

Evaluation of suitability of data for factor analysis

There are no missing values in the data set when the assumptions required for the EFA are examined. Since there are no significant Mahalanobis distance values at the a=0.001 level, there are no multivariate extreme values in the data set. According to the minimum and maximum values of VIF, TV and CI, the data set does not have a multicollinearity problem (Table 2).

KMO and Bartlett test are given in Table 3. The KMO coefficient was found to be 0.76. This value shows that the sample size is sufficient for factor analysis. The fact that the p value is statistically significant as a result of the Bartlett test indicates that significant factors can be obtained from the correlation matrix. EFA was continued as the data were suitable for factor analysis by providing the assumptions regarding factor analysis. The correlation values between the variables in the scale are given in Figure 1. Correlations range from 0.80 to -0.13.

Table 1. Descriptive statistics for the data set

Variables	Number of Observations	Number of missing values	Min value	Max value	Mode value	Median value	Skewness	Kurtosis
V1	194	0	1	5	5	4	-0.560	-0.815
V2	194	0	1	5	5	4	-1.000	0.356
V3	194	0	1	5	4	4	-0.811	0.006
V4	194	0	1	5	5	4	-1.113	0.540
V5	194	0	1	5	3	4	-0.381	-0.634
V6	194	0	1	5	5	4	-0.737	-0.616
V7	194	0	1	5	3	3	-0.037	-1.183
V8	194	0	1	5	5	4	-0.662	-0.736
V9	194	0	1	5	3	3	0.097	-1.000
V10	194	0	1	5	4	4	-0.747	-0.122
V11	194	0	1	5	3	3	-0.145	-0.755
V12	194	0	1	5	4	4	-0.566	-0.761

Table 2. Results on multicollinearity

VIF min	VIF max	TV min	TV max	CI min	CI max
1.13	2.27	0.44	0.88	1	24.28

Table 3. Data suitability for factor analysis		
Kaiser-Mayer-Olkin (KMO)		0.763
Bartlett's Test	Chi-square value	957.216
	df	66
	p	0.000010 <0.05

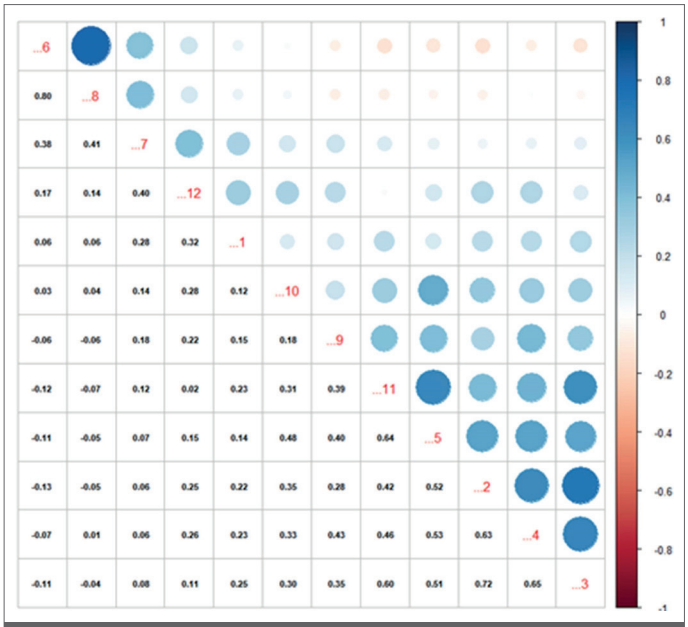

Figure 1. Correlation matrix between variables

Examination of the construct validity of the scale

Determining the number of factors

As a result of the factor analysis, it was decided to use the Varimax orthogonal rotation technique because the factor loadings of the items that loaded more than one factor were close and the items could not be separated into factors exactly. According to Parallel Analysis Based on Minimum Rank Factor Analysis recommended number of factors was obtained as 2 (Table 4). There are 3 variables with an eigenvalue above 1 for the 12-item scale. Eigenvalues and variance explanation rates for the scale are given in Table 5. The first variable (eigenvalue 4.018) explained 33.5% of the variance, the second variable (eigenvalue 2.285) explained 19% of the variance, while the third variable (eigenvalue 1.122) explained 9% of the variance. The first and second variables explain 52.5% of the variance in the attitude scale. The contribution of the third variable to the explained variance is less important than the first and second factors. After the factor analysis, the Scree Plot of the 12-item scale is shown in Figure 2. When Figure 2 is examined, it is understood that the components with high acceleration and rapid declines are the factors numbered 1 and 2, and the graph takes a horizontal appearance from factor number 3. As a result of the analyzes carried out to determine the number of factors, it was decided that the number of significant factors included in the scale should be two.

Determination of factor variables

The distribution of the 12 items in the attitude scale according to the factors and their factor loads are given in Table 6. The factor loads of the items that make up the scale vary between 0.306 and 0.853. First factor consists of 8 items (3, 4, 2, 5, 11, 9, 10, 1) while second factor

Table 4. Parallel analysis results			
Variable	**Real-data % of variance**	**Mean of random % of variance**	**95 percentile of random % of variance**
1	38.436*	17.092	19.557
2	20.373*	15.095	16.846
3	10.413	13.426	14.774
4	7.809	11.939	13.082
5	7.285	10.451	11.684
6	4.719	8.925	9.990
7	3.565	7.497	8.629
8	2.632	6.072	7.327
9	2.048	4.619	5.925
10	1.840	3.172	4.525
11	0.882	1.713	3.156
*Advised number of dimensions: 2			

Table 5. Explained eigenvalues and variance distributions			
Variable	**Eigenvalue**	**Proportion of Variance**	**Cumulative Proportion of Variance**
1	4.018	0.335	0.335
2	2.285	0.190	0.525
3	1.122	0.093	
4	0.900	0.075	
5	0.860	0.072	
6	0.763	0.064	
7	0.562	0.047	
8	0.429	0.036	
9	0.343	0.029	
10	0.333	0.028	
11	0.199	0.017	
12	0.185	0.015	

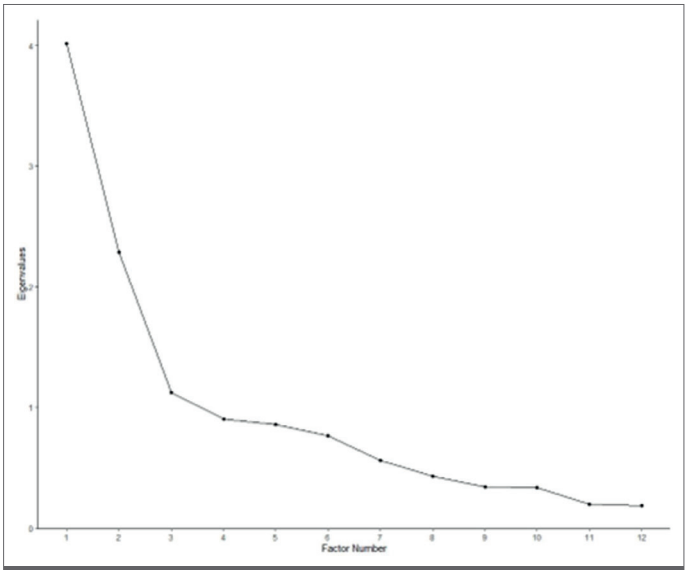

Figure 2. Scree plot graph

consist of 4 items (6, 8, 7, 12). Classifications of the items contained in the factors were deemed appropriate as "Physician Duties" for the items in Factor 1, and "Non-physician Duties" for the items in Factor 2.

Examining the reliability level of the scale

The internal consistency coefficient for the attitude scale and its sub-dimensions is given in Table 7. The Cronbach Alpha coefficient for the 1st and 2nd Factors was obtained as 0.78 and 0.66, and the Omega coefficient as 0.85 and 0.75. While the Cronbach Alpha coefficient for the attitude scale was 0.72, the McDonald's Omega coefficient was found to be 0.81.

Table 6. Factor loads and distribution of the Attitude Scale		
Item No	**Factor Load**	
	Factor 1	**Factor 2**
M3	0.801	
M4	0.761	
M2	0.750	
M5	0.741	
M11	0.688	
M9	0.497	
M10	0.468	
M1	0.306	
M6		0.853
M8		0.823
M7		0.550
M12		0.335

Goodness of fit statistics

In order to determine the level of fit of the model obtained as a result of exploratory factor analysis, the fit values of the model are given in Table 8. Root Mean Square Error of Approximation (RMSEA) 0.071; Goodness of Fit Index (GFI) 0.975; Non-Normed Fit Index (NNFI) 0.948; Comparative Fit Index (CFI) 0.966; Adjusted Goodness of Fit Index (AGFI) 0.962; Root Mean Square of Residuals (RMSR) 0.069; Weighted Root Mean Square Residual (WRMR) was found to be 0.066.

Table 7. Internal consistency coefficients of the Attitude Scale			
	Cronbach Alpha	**Omega**	**No. of items**
Factor 1 (Physician Duties)	0.78	0.85	8
Factor 2 (Non-physician Duties)	0.66	0.75	4
Attitude Scale	0.72	0.81	12

Table 8. Attitude Scale model fit values			
Fit Measures	**Acceptable fit values**	**Good fit values**	**Fit values of the model**
RMSEA	0.05≤RMSEA ≤0.08	0.00≤RMSEA≤0.05	0.071
GFI	0.90 ≤ GFI ≤ 0.95	0.95 ≤ GFI ≤ 1.00	0.975
NNFI	0.90 ≤ NNFI ≤ 0.95	0.95 ≤ NNFI ≤ 1.00	0.948
CFI	0.90 ≤ CFI ≤ 0.95	0.95 ≤ CFI ≤ 1.00	0.966
AGFI	0.85 ≤ AGFI ≤ 0.90	0.95 ≤ AGFI ≤ 1.00	0.962
RMSR	-	RMSR ≤ 0.072 (Kelley's criterion)	0.069
WRMR	-	WRMR ≤ 1.00	0.066

DISCUSSION

With this research, a valid and reliable scale was developed based on scientific studies and in consultation with medical professionals, dietitians and specialists to evaluate physician attitudes towards the clinical nutrition care process of hospitalized patients.

The factor analysis applied to the attitude scale was carried out based on the polychoric correlation matrix, since it is an ordinal scale with 5 categories. The Unweighted Least Squares method, which is preferred in small samples, was used to determine the latent variables that explain the relationships between the observed variables as a factor extraction method in factor analysis.[19] The two-factor model obtained for the attitude scale as a result of factor analysis explains 52.5% of the total variance. While 8 items of the 12-item scale with factor loads ranging from 0.80 to 0.31 constitute Factor 1 (Physician Duties), 4 items with factor loads ranging from 0.85 to 0.33 constitute Factor 2 (Non-Physician Duties). Providing clinical nutrition is a multidisciplinary team effort where each health professional has different duties, authorities and responsibilities.[9] For this reason, the two-factor model in the attitude scale was named as "Physician Duties" and "Non-Physician Duties". Regarding the reliability of the scale, The Cronbach Alpha and Omega coefficients were obtained as 0.72 and 0.81 respectively, 0.78 and 0.85 for the 1st factor, and 0.66 and 0.75 for the 2nd factor, indicating that the reliability level of the scale was sufficient. Good fit index values (RMSEA-0.07, GFI-0.97, NNFI-0.95, CFI-0.97, AGFI-0.96, RMSR-0.07, WRMR-0.07) for the model-data fit of the scale were obtained in the reference range. These values of model fit indicate acceptable and good fit values are within the reference range.[31-33] Our exploratory and confirmatory analyses show the strength of the scale items and the usability of the scale in assessing physicians' attitudes towards the clinical nutrition care process.

In conclusion, the validity and reliability of the 12-item attitude scale, which was developed to evaluate the attitudes of physicians towards the clinical nutrition care process in hospitalized patients, was provided at a sufficient level in line with the findings obtained. Future studies are recommended to examine attitudes of physicians towards clinic nutrition by making adaptations of the attitude scale to different languages and cultures. Also, determining the factors affecting the attitudes of physicians and the barriers to medical nutrition therapy can help develop optimal nutritional care.

Ethical approval: The study was approved by the Karadeniz Technical University Scientific Research Ethics Committee (2019/229 / November, 2019).

Informed consent: Written informed consent was obtained from all patients who participated in this study.

Author contributions: Concept and Design – HU, BD; Supervision – HU; Data Collection and/or Processing – HU, KK, IN; Analysis and/or Interpretation – GK, BD; Literature Search – MK; Writing Manuscript – HU, GK, MK; Critical Review – HU.

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Supplementary Table 1

Klinik beslenme bakım sürecine yönelik tutum ölçeği	**Kesinlikle Katılmıyorum (1)**	**Katılmıyorum (2)**	**Kararsızım (3)**	**Katılıyorum (4)**	**Kesinlikle Katılıyorum (5)**
Hastaneye yatışı yapılan hastanın malnütrisyon değerlendirmesini yapmayı kendi görevim olarak görmem.					
Endikasyonu olan hastanın nütrisyon tedavisini düzenlemek benim görevimdir.					
Yatışı yapılan hastada nütrisyonel durum değerlendirmesi yapmayı kendi görevim olarak görürüm.					
Hastamda yetersiz nütrisyon destek tedavisi sonucu komplikasyon gelişirse sorumluluk hissederim.					
Hastanın yatışı süresince haftada bir nütrisyonel durum değerlendirmesini yapmak isterim.					
Hekim dışı sağlık personelinden, hastanın nütrisyonel durum değerlendirmesi için danışmanlık almak istemem.					
Hastanın malnütrisyon durumunu hasta kayıtlarına işlemeyi kendi görevim olarak görmem.					
Hekim dışı sağlık personelinden hastanın malnütrisyon tedavisi için danışmanlık almak istemem.					
Hastaneye yatış endikasyonu kalmamış malnütrisyonu olan hastayı taburcu etmek istemem.					
Malnütrisyonu olan hastayı taburculuk sonrası değerlendirmek üzere bir ay sonra kontrole çağırılması gerektiğini düşünürüm.					
Yeni yatan hastanın malnütrisyon durumunu değerlendirmek önceliklerim arasındadır.					
Hastanın taburculuk sonrası malnütrisyon durumu ile ilgili önerilerimi hasta-hasta yakınlarıyla paylaşmayı kendi görevim olarak görmem.					