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Reliability and Validity of the Scale of Knowledge and Behaviors Related To Food Additives

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Abstract

Introduction: Food additive is an important reason for health risk. The hazards that most people were concerned about in relation to food additives were the risks of developing allergy, cancer and disturbing the hormone balance. The aim of this study was to develop and assess the validity and reliability of the scale of knowledge and behaviors related to food additives.

Methods: This study had a methodological design. The population of this study consisted of mothers with 1- to 12- year-old children in Ağrı, Turkey. A convenience sample was recruited from the mothers attending two primary health care centres in the town. The sample size was determined to be 413 mothers by conducting power analysis. Data were collected using a questionnaire including demographic characteristics and the scale of knowledge and behaviors related to food additives. The researchers visited the primary healthcare center and conducted interviews with the mothers. The questionnaire took 15-20 min to complete and could be understood by people with minimal reading ability. Pearson's product-moment correlation, factor analysis and internal consistency reliability were used to determine the validity and reliability of the tool.

Results: Factor analysis showed that two factors were the behavior related food additive subscale and the knowledge related food additive subscale. The two factors together explained 53.7% of the variance. Internal consistency reliability of the whole questionnaire was 0.74.

Conclusions: The scale of knowledge and behaviors related to food additives is very important because it provides standardized data for mother's knowledge and behavior regarding a child's health for food additives. The tool predicted mother's feeding behavior about their children above and beyond existing measures of eating pathology. The tool is a sound tool for identifying eating patterns.

INTRODUCTION

Food additives are substances used in food with a technological function to preserve or to obtain a certain consistency or appearance. Food additive is an important reason for health risk. The hazards that most people were concerned about in relation to food additives were the risks of developing allergy (75%) and disturbing the hormone balance (70%). Risks of developing cancer and environmental impacts due to food additives concerned just as about 60%. Fertility problems, obesity, and hyper activity in relation to food additive intake concerned about 40% [1]. Food additives were considered moderately dangerous in general with 60.6% saying they are harmful. Within additives, preservatives and stabilizers are perceived more dangerous while synthetic colours and calorie-free sweeteners are considered somewhat less dangerous. However, according to the results of objective risk assessments, food additives are among the least hazardous food safety factors indicating that consumers exaggerate the risk of additives- even that of the ones of more favourable judgment [2]. For this reason, understanding children's eating attitudes and behavior is important in terms of children's health. Evidence also indicates that dietary habits acquired in childhood persist through to adulthood [3][Tarnavölgyi, 2009 #2]. In addition, one research indicated that there was a role for childhood nutrition on adult health [4]. Parents provide food environments for their children's early experiences with food and eating. Several studies have shown that a child's eating behavior is strongly influenced by the family environment. The family eating environments include par-

ents' own eating behaviors and child-feeding practices. Results of research on behavioral mediators of familial patterns indicate that parents' own eating behaviors and their parenting practices influence the development of children's eating behaviors [5].

Mothers are of particular interest on children's eating behavior, as they have been shown to spend significantly more time than fathers in direct interactions with their children across several familial situations, including mealtimes [6]. A tool to measure mother's knowledge and behaviors related to food additives has not been developed before. This scale is important and available in the subject because it measures mother's knowledge and behaviors related to food additives [7, 8]. The tool predicted mother's feeding behavior about their children above and beyond existing measures of eating pathology. The tool is a sound tool for identifying eating patterns. The present study was unique because it reported the reliability and validity of the scale of mother's knowledge and behaviors related to food additives. A final unique feature of this study will form the basis of subsequent studies in this field. It is possible that this scale can be adapted to all the available communities. For diverse communities, it is important to know mother's knowledge and behaviors related to food additives since children's health and their status improve in the family [7, 8]. The scale of mother's knowledge and behaviors related to food additives can be used for children of different populations. This study aimed to describe the development of the scale of mother's knowledge and behaviors related to food additives. This scale was specifically designed to meet psychometric criteria while assessing mother's knowledge and behaviors related to food additives. The aim of the study was to describe psychometric properties of the scale of the knowledge and behaviors related to food additives in mothers and also to assess the validity and reliability of this scale.

METHODS

Design

This study was performed with a psychometric design in 2012. The study was conducted at two phases; at first, content analysis was performed by a panel of specialists; and, second, pretesting and psychometric testing was performed (factor analysis, a reliability coefficient, and inter-item correlations).

Population

The population of this study consisted of mothers in Ağrı, Turkey. A convenience sample was recruited from mothers with 1- to 12- year-old children attending two primary healthcare centres in the town. The sample size was determined to be 413 mothers by conducting power analysis. The power analysis was based on an alpha of 0.01, power of 0.99, and assumed effect size of 0.30 for the sample size estimation.

Knowledge and Behaviors Related Food Additive Scale

The scale of knowledge and behaviors related food additives was measured by means of "Knowledge and Behaviors Related to Food Additives" prepared by the researchers. The scale was constructed through a review of the literature [7, 8]. We did not use any other existing instruments or adapt items from other scales in the literature. A pool of items was generated from the literature and the experts were asked to identify any additional issues they felt should be included in the questionnaire. It is suggested that content validity should be measured. Therefore, content validity measures the comprehensiveness and representativeness of the content of a scale. Thus, a content validity index was used for this study. According to Polit and Beck, a content validity index higher than 80% is considered indicative of good content validity [9]. Experts in area of pediatric nursing, nutrition and family health reviewed the instrument, and they did not make any recommendation. The scale included the knowledge of food additives; the questions regarding the behaviors related to food additives. The list of 21 information and behaviors related to food additive items was used and considered as the scale of the knowledge and behaviors related to food additives in the present study. The scale consisted of 21 items on a 4-point score with the following coding: neutral (0), disagree (1), somewhat agree (2), and strongly agree (3). The scoring was based on the participants' self-assessment of their own knowledge. The maximum score of the scale was 63 and minimum score was zero (0). The thirteenth item is scored reverse. Evaluation of the score of the scale was made by totalling the sum points. High point expresses helpful knowledge and behaviors related to food additives. These scores were empirically determined.

Procedure and Data Collection

Data were collected using a questionnaire including demographic characteristics and the scale of knowledge and behaviors related to food additives. The researchers visited the primary healthcare center two days (Monday and Tuesday) in every week and conducted interviews with the mothers. The researchers introduced the questionnaire to the participants and explained the material covered. Then, the participants read the questionnaire and marked their answers on the sheets. The questionnaire took 15-20 min to complete and could be understood by people with minimal reading ability. The questionnaire was given to the mothers in a separate quiet room of the primary health-care center. All of the participants completed the questionnaire.

Ethical Considerations

Permission to undertake this study was gained from the ethical committee at the Atatürk University and informed consent was obtained from each participant (ethical code: 2010.6.1/2). The patients were informed about the purpose of the study. The participants were assured of their right to refuse to participate or to withdraw from the study at any stage.

Data Analysis

The statistics software was used in statistical analysis. Pearson's product-moment correlation was used to determine scores of the correlations between the items and the total scale. Factor analysis was used to establish the construct of the scale and factor loadings of items of the scale. Cronbach's alpha was calculated to find internal consistency reliability.

Table 1: Characteristics of Participating Mothers (n = 413)

Characteristics	N	%
Age range (years)		
18-24	20	4.8
25-34	235	56.9
35-44	125	30.3
45 or more	33	8.0
Mother's Education Level		
Primary school	171	41.4
Secondary school	61	14.8
High school	111	26.9
University degree	70	16.9
The number of person in family		
3	61	14.8
4	126	30.5
5	83	20.1
6	68	16.5
7 or more	75	18.2
Number of children		
1	71	17.2
2	135	32.7
3	87	21.1
4 or more	120	29.1
Number of 1-12 age children		
1	154	37.3
2	173	41.9
3	64	15.5
4 or more	22	5.3

RESULTS

Participant Characteristics

The demographic characteristics of the participants are shown in Table 1. The majority of the participants (56.9%) were at the age range of 25-34 years. The majority of the mothers (41.4%) graduated from primary school, and 32.7% of the participants have two children. Family size of the majority of the participants was four persons.

Content Validity

The scale, consisting of 21 items, was judged by the expert panel on relevance and phrasing of the instrument items. Four experts reviewed the instrument, and they did not make any recommendation. Then, instrument's items were discussed again by the panel members until agreement on content was reached. Nine items were exacted at the early round. Then, a twenty-one scale was applied to 25 mothers for testing readability and apprehensibility of the items. Thus, face validity was evaluated. Twenty one items in the scale were adequate for assessing (self-assessment) knowledge and the behavior of mothers with 1- to12- year-old children. Content validity index was used. The mean score of the content validity index based on the experts' rating was 3.58/4 (89.5%) in the final version.

Internal Consistency

The instruments completed by 413 mothers were used for the analyses. Cronbach's alpha of the knowledge subscale was 0.70; the alpha of the behavior subscale was 0.64. The scale of knowledge and behaviors related to food additives had an overall coefficient alpha of 0.74 (Table 2). The item-total correlations ranged from 0.14 to 0.65, but indicated a nonunidimensional scale. The corrected item total correlations were acceptable.

Table 2: Factor Loadings, Cronbach's Alpha and Item-Total Correlations of Items of the Scale

Scale's items	Factors		Item-total correlations
	Behaviour		Knowledge
Knowledge related to Food Additives			
1. I have knowledgeable enough about food additives		.524**	.778
2. I know what food additives		.650**	.788
3. I know the intended use of food additives		.609**	.746
4. I know the harmful food additives		.486**	.705
5. I know losses of food additives		.602**	.521
6. I would like to get information about the dangers and food additive		.556**	.667
7. I pay attention to things written on the label of the products to be understood		.315***	.563
Behaviors related to Food Additives			
8. I pay attention to nutrients added daily diet	.589	.593**	
9. I avoid the purchase and consumption of foods that I do not know the contents of their nutrients	.655	.547**	
10. I read food label information in shopping	.720	.499**	
11. I know what it means to those involved in the table of contents on the label	.496	.433**	
12. It does not matter whether or not the additives are natural food additives.	.578	.263**	
13. I am interested in knowing the content of the food products (reverse scoring)	.381	.146**	
14. I would not choose foods that contain high food additives	.417	.430**	
15. I find a high proportion of food additives	410	.547**	
16. After learning about the use of foods with high additives, I would not continue to use	.379	.231**	
17. One of my family survived from health problem due to food additives and this issue affects my attitude and behaviour about this topic	.821	.147**	
18. I believe that my child 1-12 years old is nourished food additive	.741	.307**	
19. I check my child on ready-made food	.506	.401**	
20. My child consumes more food added nutrients	.645	.162**	
21. I am afraid losses of food additives	.386	.366**	
Eigenvalue	2.6		2.5
Variance	31.49	53.74	22.55
Cronbach's alpha	0.64	0.74	0.70

* P < 0.05

** P < 0.01

Construct Validity

The Kaiser–Meyer–Olkin was 0.83 with a P < 0.001, indicating that the sample was large enough to perform a satisfactory factor analysis and that the sample size was sufficient for psychometric testing of a 21-item questionnaire. The first step of the factor analysis was a principal component analysis revealing two factors with an eigenvalue of higher than 1. The two factors together explained 53.7% of the variance. Internal consistency reliability of the whole questionnaire was 0.74. For the first factor, with an alpha of 0.64, factor loadings were found for items, which deal primarily with the "behavior subscale". This factor explained 31.5% of the variance. The loadings of the second factor (α = 0.70) were found which refer to the "knowledge subscale", which assesses knowledge related to food additives. For this factor, the explained variance was 22.5%. Factor loadings of all items were adequate and factor loading of the items ranged from 0.37 to 0.82 in the current study. Acceptable factor loading is 0.30 point. Table 2 shows principal component analysis, followed by varimax rotation factor loadings of items of the scale. Any items were not removed from final version of the scale.

DISCUSSION

The objective of this study was to develop and assess the validity and the reliability of the scale of knowledge and behaviors related to food additives. The population of this study was mothers with 1- to 12- year-old children in Turkey. Factor analysis revealed that two factors were the behavior related food additive subscale and knowledge related food additive subscale. Internal consistency reliability of the whole questionnaire was 0.74. The scale had validity and reliability for Turkish mothers. The results can be generalized to Turkish population.

Content Validity

The scale of knowledge and behaviors related to food additives has been developed following a rigorous methodology and is currently undergoing psychometric validation to assess its reliability and validity in women. The content validation session aimed at obtaining judgmental evidence concerning the adequacy of the items. An instrument is considered to be content valid when the items reflect the process and the

specified objectives as determined by expert opinion [6, 9, 10]. Twenty one items in the scale were adequate for assessing the knowledge and behaviors of mothers with 1- to12-year-old children. The content validity index was used. The mean score of the content validity index based on the experts' rating was 3.58/4 (89.5%) in the final version. According to Polit and Beck, a content validity index higher than 80% is considered indicative of good content validity [9].

Internal Consistency

The internal consistency for all items of the scale was satisfactory, with a coefficient of 0.74. Cronbach's alpha of the knowledge subscale was 0.70; the alpha of the behavior subscale was 0.64.

It is known that Cronbach's alpha of 0.40-0.59 is low reliability, 0.60-0.79 is reliability, 0.80 or more is high reliability [11, 12]. However, George and Mallery [13] stated that an alpha of 0.60-0.65 may be questionable reliability, and if the alpha coefficient is 0.65-0.70, it may be acceptable at a minimal level. Also, it is stated that the alpha coefficient must be 0.70 or more [14, 15]. In addition, a reliability of 0.70 is considered acceptable for a newly developed instrument [16]. Consistent with the reliability information, it is said that the alpha coefficients of the scale and its subscales are at acceptable levels in this study. Item-total correlations were examined for internal consistency of the scale, and equal weight of each item in the scale was estimated or not. Item-total correlations determine that each item in the scale carry or not be added facture [17]. In the study, the item-total correlations ranged from 0.14 to 0.65 of the scale. According to Munro [18], item total correlation values are at acceptable level. So, it is assumed that the item total correlations of the scale are at the satisfactory level in this study.

Construct Validity

Factor analysis was used for construct validity of the scale. The sample size was considered to be sufficient for factor analysis. Factor analysis with varimax rotation indicated that, with regard to the content, two factors could be discerned: Behaviors Related to Food Additives and Knowledge Related to Food Additives. The two factors together explained 53.7% of the variance. Factor loadings of all items were adequate and factor loading of the items ranged from 0.37 to 0.82 in the current study. It is stated that factor loadings 0.30 or above would be sufficient [19]. Consistent with given data about reliability information, factor loading of the scale's items are sufficient in the study.

CONCLUSIONS

This study established the reliability and validity of the scale in this sample of Turkish mothers. The scale of the present study is very important because it provides standardized data of mother's knowledge and behaviors regarding their children's health for food additives. To ensure the quality of adapted instruments, international norms were followed. The application of a methodology accepted by the scientific literature makes available the comparison of the data obtained in different languages. In Turkey, the results of this study have to be taken into consideration in the related areas of this issue. This scale should be further evaluated with a large enough sample size in different regions of Turkey and in diverse cultures. The scale can be used to measure outcomes in an intervention study. This scale can be used for further validation and also the usage of the scale will be available at outcome research. Using this scale can help nurses and other health care providers in educating mothers about food additives. Nurses and other health care providers can provide education to mothers regarding the healthy feeding of their children, as these would determine the parental knowledge or behavior related to food additives, and parental practices and attitudes regarding child feeding.

Limitation

The findings must be interpreted cautiously because of the study limitations. The sample reflects only one area of Turkey and therefore cannot be generalized to all mothers in Turkey. Future studies should include samples from different regions in Turkey.

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CONFLICTS OF INTEREST

No conflict of interest has been declared by the authors.

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ETHICAL CONSIDERATION

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AUTHOR CONTRIBUTIONS

BE was responsible for the study conception and design; the data analysis; the drafting of the manuscript; critical revisions

to the paper for important intellectual content; statistical expertise; supervised the study.
EE performed the data collection;

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