Clinical Nursing Research
1–15

DOI: 10.1177/1054773816662436
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The Validity and Reliability of Turkish Version of the Chemotherapy-induced Taste Alteration Scale (CiTAS)

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Abstract

The study was aimed to assess the validity and reliability of the Turkish version of the Chemotherapy-induced Taste Alteration Scale (CiTAS), and was conducted on adult patients receiving chemotherapy (N = 184) in the Chemotherapy Unit and Hematology Clinic (Outpatient) of a university hospital between December 2013 and May 2014. The results showed that the Cronbach's alpha coefficient (.869) was satisfactory. The alpha value was .89 for the Decline in Basic Taste subscale, .70 for Discomfort subscale, .82 for Phantogeusia and Parageusia subscale, and .72 for General Taste Alterations subscale. The coefficients of the relationship between test–retest reliability results were significantly high (r = .939, n = 28). The Turkish version of the CiTAS was a sufficient and suitable tool in evaluating the taste alterations associated with chemotherapy.

Keywords

chemotherapy, oncology nursing, taste alteration

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Table 1. Definitions of Taste Alterations.

Ageusia: The complete lack of taste
Parageusia: Perversion of the sense of taste
Cacogeusia: The sensation of bad taste
Phantogeusia (taste hallucination): The sensation of a nonexisting taste
Hypogeusia: The decline in taste sensitivity
Hypergeusia: An increase in taste sensitivity

Source. Fark, Hummel, Hähner, Nin, and Hummel (2013); Hong et al. (2009); and Kano and Kanda (2013).

Introduction

The incidence of cancer in Turkey is above the world average. In 2012, the age-standardized rate of cancer was 277.7 in men and 188.2 in women, respectively (100,000 people; Republic of Turkey, Ministry of Health, 2015). Chemotherapy is often used in the treatment of this disease. The chemotherapy treatments, commonly used in the cancer treatments, are effective on the development of both normal and cancer cells. Therefore, symptoms such as fatigue, nausea, vomiting, mucositis, and taste alterations are often observed in these patients (Seven, Akyüz, Sever, & Dinçer, 2013).

Affected taste perception is one of the important senses of our body. The sense of taste has a role in the food preferences of the individuals. It is selection of body tissues according to the metabolic needs (Boltong, Keast, & Aranda, 2012; Hall, 2013; Karadeniz, 2000). There are many conditions and diseases such as cancer and treatment of cancer that may adversely affect the function of the sense of taste. The drugs used in chemotherapy affect the number and structure of the taste buds that are responsible for formation of the taste. The causes are changes in the saliva and show neurotoxic effects; some taste alterations arise (Epstein & Barasch, 2010; Hong et al., 2009; Ravasco, 2005; Steinbach et al., 2009). The main chemotherapy drugs causing taste alterations are as follows: cyclophosphamide, etoposide, 5-fluorouracil, gemcitabine, methotrexate, doxorubicin, tamoxifen, leuprolide, cisplatin, carboplatin, dacarbazine, dactinomycin, daunorubicin, mecloretamina, and vincristine (Haas & McBride, 2011; Hong et al., 2009; Peregrin, 2006; Raber-Durlacher et al., 2004). Taste alterations are described in different ways in the literature (see Table 1).

Chemotherapy-induced taste alterations are observed at different rates and degrees in patients. It adversely affects them physiologically, psychologically, and socially. Therefore, the symptom of chemotherapy-induced taste alterations should be evaluated in a comprehensive manner for efficient and

accurate management of the disease (Comeau, Epstein, & Migas, 2001; Gamper et al., 2012; Grant & Kravits, 2000; Ravasco, 2005). For this purpose, objective and subjective methods are used (Kano & Kanda, 2013).

The objective methods used in the evaluation of taste alterations are the whole mouth taste test, regional taste test and taste recognition test, electrogustometry, chemical gustometry, filter paper method, positron emission tomography, and magnetic resonance imaging. The intensity of the taste alterations and detection of basic tastes are evaluated using these objective methods. Unfortunately, the implementation of objective methods results in time and financial losses, and they require special knowledge and skills (Boltong & Keast, 2012; Epstein & Barasch, 2010; Kano & Kanda, 2013; Malaty & Malaty, 2013; Mann, 2002).

Taste alteration is a subjective symptom. However, there is no such a subjective assessment tool used as a standard for the measurement of chemotherapy-induced taste alterations in Turkey. The current assessment tools are used only for the status of chemotherapy-induced taste alterations and the intensity of this situation. Therefore, the use of Chemotherapy-Induced Taste Alteration Scale (CiTAS), which is an easy scale to use and does not require a lot of time, is being planned in our country after completing the validity and reliability studies. Decline in the sensitivity of basic tastes, general taste alterations, phantogeusia and parageusia, subdimensions of the disease, and the taste sensitivity of the patients are evaluated more comprehensively by CiTAS. The conditions of the patients to see whether they experience any decline in the sensitivity of the salty, sweet, bitter, sour, and umami (the predominant taste in foods containing L-glutamate, the fifth basic taste type) tastes; their taste alterations; and disorders are presented through the subdimensions of the scale (Kano & Kanda, 2013).

This scale is used to determine reduction in the sense of basic tastes, taste alterations (reduced, wrong, or lost sense of taste),and evaluate the relationship between these changes and symptoms (nausea, vomiting, and loss of appetite). This scale will help us in the planning of nursing interventions required for the regulation of the nutritional environment, selection, and preparation process of food. These initiatives will provide adequate and balanced nutrition for individuals and allow then to reach the appropriate body mass index. Reaching the appropriate body mass index is expected to contribute to improved quality of life with coping with the symptoms developing with treatment. The information obtained by the use of CiTAS will make important contribution to performing the training/consultancy roles of nurses related to the symptom control (Sozeri & Kutluturkan, 2015). The methodological study was conducted to test the reliability and validity of CiTAS in Turkish society.

Method

Participants

The Turkish adaptation of CiTAS was conducted with 184 people. In the validity and reliability studies, the sample size required to perform the multivariate analyses such as the factor analysis should be 5 to 10 times larger than the number of items of the scale (Buyukozturk, 2002).

The criteria to be included in the study are determined as follows: "being at 18 or older than 18, being conscious, experiencing chemotherapy-induced taste alterations, undergoing at least one course of chemotherapy, and being literate." The patients received also radiotherapy with chemotherapy were excluded from the study.

Data Collection Tools—Data Instruments

The data were obtained by using "Patient Characteristics Identification Form" and "CiTAS."

The Patient Characteristics Identification Form

The form has been developed by researchers based on the literature (Hong et al., 2009; Kano & Kanda, 2013; Ravasco, 2005; Rehwaldt et al., 2009; Zabernigg et al., 2010). The form consists of two parts. In the first part, there are 16 questions related to personal characteristics (age, gender, education level, state of having a chronic disease, oral mucosal wound/dryness, and habits such as smoking, alcohol, oral care). In the second part, there are eight questions related to disease-oriented features (such as clinical diagnosis and duration, disease stage, treatment protocol, and status of chemotherapy).

CiTAS

The scale was developed by Taro Kano and Kiyoko Kanda to assess the chemotherapy-induced taste alterations in 2013. CiTAS has four subscales under three headings. Chemotherapy-induced taste alterations of subscales are given below (see Table 2).

CiTAS is a 5-point Likert-type scale. The first six items of CiTAS are regarding the taste sensitivity status of the patients graded as follows: *taste normally* (1), *slightly difficult to taste* (2), *somewhat difficult to taste* (3), *quite difficult to taste* (4), and *unable to taste at all* (5). The items (between 7 and 18) in the scale were graded as follows: *no* (1), *slightly* (2), *somewhat* (3), *quite* (4), and *very* (5). The calculation of the scores received from subscales

Table 2. Chemotherapy-Induced Taste Alterations of Subscales.

Subscales	Items	Definitions
Decline in Basic Taste	2-6	The status of sensing the bitter, sweet, salty, sour, and umami taste
Discomfort	13-18	The relationship between taste alterations and nausea-vomiting, experiencing alterations in the sense of smell, having difficulty to eat hot/oily/meat, and the reduced appetite
Phantogeusia and Parageusia	10-12	The status of individuals based on their experiences of phantogeusia and parageusia
General Taste Alterations	1, 7-9	The condition of individuals regarding their experiences of ageusia, cacogeusia, and hypogeusia.

Source. Kano and Kanda (2013).

is obtained by dividing the sum of all scores of each subscale into the number of the items placed in the same subscale. The maximum score is 5 points, while the minimum score is 1 point that can be received from the subscales. The increase in the score shows that the intensity of taste alterations and discomfort are also increased. CiTAS was applied to patients receiving chemotherapy after 7 to 10 days. CiTAS lasted for 10 to 15 min.

Data Collection

The data of the research were collected between December 2013 and May 2014 by the researcher. The adaptation of the scale was carried out with language validity, content validity, construct validity, internal consistency reliability, and test–retest reliability into Turkish.

Procedures

Validity

For validity, content validity and construct validity were analyzed. A method that includes five main steps composed of the phases has been applied to the construct validity (Brislin, Lonner, & Thorndike, 1973). First, four specialists, who are taking care of oncology patients and have a good level of English, have translated the scale into Turkish. Second, the scale was arranged as a single text based on feedbacks obtained from four experts; CiTAS has been examined by a Turkish language and literature specialist in terms of its compliance to Turkish and regulated in

accordance with recommendations. Third, the scale text obtained was translated back into English again by a different person who is also dealing with oncology patients and good at both English and Turkish. Following, the items of the scale were compared with the items of the original scale. Finally, comments were received from the seven experts, and the resulting scale was sent to one of the authors who developed the original scale and its validity has been examined. The language validity of the scale was completed after updating the scale in accordance with the feedbacks and recommendations. As the taste of umami is not very well known in our country according to the patients and experts, examples with more intense taste were used. The opinions of seven specialists were obtained for the content validity. The content validity ratio (CVR) and content validity index (CVI) were calculated. The exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to determine the construct validity. EFA was conducted using principal components analysis and a varimax rotation to estimate the total variance explained. Many fit indexes are used to evaluate the validity in CFA (Figure 1).

Reliability

Cronbach's alpha value was calculated for internal consistency reliability. After 2 weeks, CiTAS was applied on 28 patients again for test–retest reliability.

Data Analysis

The data were evaluated using SPSS 20 (SPSS, Inc., Chicago, IL, USA) statistical software. The verification of the structure obtained with CFA was provided by LISREL software program. In the evaluation of the data, the variables based on sociodemographic and disease characteristics were expressed as numbers and percentages.

The Ethical Aspect of the Research

We obtained permission to adapt to Turkish from Taro Kano.

Ethical approval was obtained from ethical committee. The study was conducted in accordance with the Declaration of Helsinki and based on the voluntary principle. The patients included in the study were informed about the aim of the study and confidentiality of their personal information, and their consents were obtained.

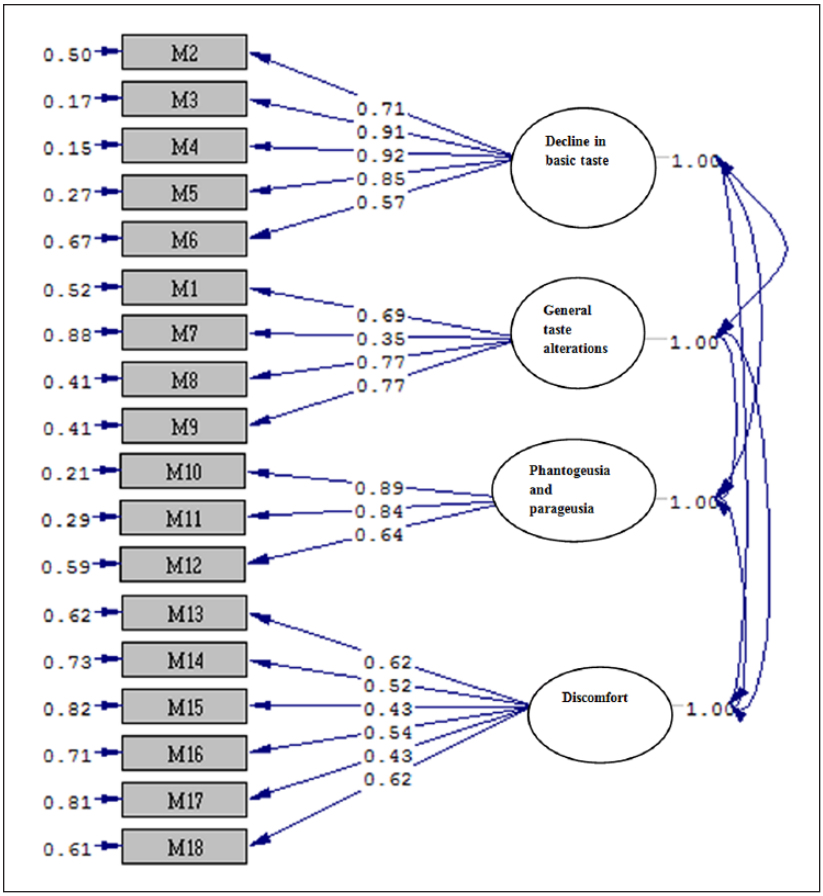

Figure 1. CiTAS confirmatory factor analysis.
Note. CiTAS = Chemotherapy-induced Taste Alteration Scale.
M= Item.

Results

Participants' Characteristics

The average age of the patients was 55.5 ± 11.8, where 57.1% were female. Twenty-five percent of the patients were diagnosed with breast cancer, whereas 22.8% were diagnosed with colorectal cancer and 13.6% were diagnosed with lung cancer. Approximately 38% of the patients (37.5%) were in

Clinical Stage II; 15.8% of the patients received taxol + herceptin, and 14.1% received gemcitabine + cisplatin chemotherapy protocols. Approximately half of the patients of them (52.2%) were nonsmokers, 41.3% were smokers but quitted, and 90.2% were not users of alcohol. Fifty-three percent of patients brushed their tooth, and 21.7% performed both tooth brushing and mouth wash oral care.

Validity and Reliability

Expert opinion was taken to determine the content validity of CiTAS. In the evaluation of expert opinions, the CVR was used for each item. The CVI was created by taking the average of the CVR obtained. The CVI is used for status of the experts to see whether they find these items suitable (Polit & Beck, 2006; Yurdugul, 2005). In this study, the values of the CVR and CVI were found as 1.

In EFA, the CiTAS construct validity phase, the relevance of the number of samples for the factor analysis was evaluated using Kaiser–Meyer–Olkin (KMO) coefficient and Bartlett's sphericity test. The higher value of KMO (greater than 0.50) or significant result of Bartlett test shows that the number of the samples is suitable for the factor analysis (Yurdugul, 2005). In this study, as the value of KMO is 0.801 and the result of Bartlett's sphericity test was significant, the number of samples is sufficient for the factor analysis. The four-factor structure of CiTAS showed explaining 60.73% of the total variance. The minimum factor loading coefficient of 0.30 was accepted for retaining an item in a scale (Burns & Grove, 2009). In this study, the factor loadings of items were found 0.314 to 0.891.

CFA is used to give information about the construct validity, and it was applied to evaluate the construct validity of CiTAS (Dimitrov, 2010). The most commonly used methods are chi-square goodness (χ^2), root mean square error of approximation (RMSEA), comparative fit index (CFI), nonnormed fit index (NNFI), normed fit index (NFI), and goodness-of-fit index (GFI) (Cole, 1987; Sumer, 2000). The values in the ranges of $\chi^2 / d < 3$, $0 < \text{RMSEA} < 0.05$, $0.97 \leq \text{NNFI} \leq 1$, $0.97 \leq \text{CFI} \leq 1$, $0.95 \leq \text{GFI} \leq 1$, and $0.95 \leq \text{NFI} \leq 1$ show the perfect fit, whereas $4 < \chi^2 / d < 5$, $0.05 < \text{RMSEA} < 0.08$, $0.95 \leq \text{NNFI} \leq 0.97$, $0.95 \leq \text{CFI} \leq 0.97$, $0.90 \leq \text{GFI} \leq 0.95$, and $0.90 \leq \text{NFI} \leq 0.95$ show the acceptable fit values (Kline, 2005; Sümer, 2000). The items with *t* value, which are statically insignificant, were examined in CFA. As a result of this evaluation, the *t*-values of all items were found as significant. The fit indexes are $\chi^2 = 299.25$, $\chi^2 / SD = 2.32$, RMSEA = 0.085, CFI = 0.94, NNFI = 0.93, and NFI = 0.90. Considering the coefficients presenting the relationship between factors and variables of the model that show the factorial

Table 3. Regression and *t*-Values of CiTAS.

Items	Regression values	*t* values
1. Have difficulty tasting food	.69	9.94
2. Have difficulty tasting sweetness	.71	10.77
3. Have difficulty tasting saltiness	.91	15.84
4. Have difficulty tasting sourness	.92	16.12
5. Have difficulty tasting bitterness	.85	14.21
6. Have difficulty tasting *umami* (Savoriness: It is like a brothy taste or the taste brought out by adding MSG)	.57	8.23
7. Unable to perceive the smell or flavor of food	.35	4.47
8. Everything tastes bad	.77	11.46
9. Food does not taste as it should	.77	11.41
10. Have a bitter taste in the mouth	.89	14.04
11. Have a bad taste in the mouth	.84	13.01
12. Everything tastes bitter	.64	9.10
13. Feel nauseated or queasy	.62	8.07
14. Bothered by the smell of food	.52	6.58
15. Have difficulty eating hot food	.43	5.26
16. Have difficulty eating oily food	.54	6.80
17. Have difficulty eating meat	.43	5.36
18. Have a reduced appetite	.62	8.08

Note. CiTAS = Chemotherapy-induced Taste Alteration Scale; MSG = monosodium glutamate.

structure of the scale, it has been observed that all the coefficients are at a high level. Considering the fit statistics calculated with CFA, the four-factor structure of the scale is fitted with the data collected in general. In the scale, *t* value was investigated to see whether standardized analysis values of each item regarding CFA analysis in the scale are significant or not. The *t*-values found are ranged between 4.47 and 16.12. The *t*-values calculated were found to be significant for all items, $p < .01$ (Table 3).

The Cronbach's alpha value of the scale was .869. The alpha value of the scale for decline in the taste was .89, whereas it was .70 for discomfort, .82 for phantogeusia and parageusia, and .72 for taste alterations, respectively. Inadequate reliability coefficient should be close to 1 in a Likert-type scale. According to these results, the reliability of the scale used for this study was quite high (Tezbasaran, 1996). The coefficients of the relationship between CiTAS and test–retest results were quite high (Table 4). Based on this result, the reliability of test–retest has been provided.

Table 4. The Reliability of CiTAS Test–Retest.

		Correlation of test–retest				
		Decline in basic taste (2)	General taste alterations (2)	Phantogeusia and parageusia (2)	Discomfort (2)	Total (2)
Decline in basic taste (1)	*r*	.919				
	p	.000				
	n	28				
General taste alterations (1)	*r*		.945			
	p		.000			
	n		28			
Phantogeusia and parageusia (1)	*r*			.925		
	p			.000		
	n			28		
Discomfort (1)	*r*				.860	
	p				.000	
	n				28	
Total (1)	*r*					.939
	p					.000
	n					28

Note. CiTAS = Chemotherapy-induced Taste Alteration Scale.
(1)= The first application of the scale on patients; (2)= The second application of the scale on patients.

Discussion

Chemotherapy-induced taste alterations emerge very often. The subjective measuring instruments are needed to present the problems experienced by individuals.

For this purpose, the validity and reliability of the original form of CiTAS for Turkish society have been examined. The content validity of CiTAS was assessed with the CVR and CVI. In the content validity, the minimum values for the CVR are reduced as long as the number of the experts increases. The CVR is developed to see whether the item is statically significant or not. As a matter of easiness in the calculations, a total of seven experts with a significance level of $p = .05$ show that the items with a CVR value greater than 0.99 provide the content validity. If the CVI value of the item is higher than 0.80, it is sufficient in terms of content validity. In this study, CVI and CVR values were obtained as 1. These values indicate that CiTAS provides the content validity (Yurdugul, 2005).

The Cronbach's alpha coefficient was calculated to assess the reliability of CiTAS. The Cronbach's alpha, which is in fact a reliability index value, gives information about consistency of the items of the scale with each other and their status of representing the hypothetical variable at the background (Cakmur, 2012). Kano and Kanda (2013) found the Cronbach's alpha coefficient value as .902. The positive result was shown to be .80 to .86 for four subscales (Kano & Kanda, 2013). Cronbach's alpha values of CiTAS indicate that the validity of the Turkish version is very high (Altunısık, Coskun, Bayraktaroglu, & Yıldırım, 2010). The similarity of the values compared with the values of the original scale supports the reliability of the scale. Another method used to evaluate the reliability of CiTAS is the reliability of test–retest. In the reliability of test–retest, the correlation between the scores of a scale is considered after implementing the scale to the same group 2 times at regular intervals (Buyukozturk, 2011). In this study, CiTAS was applied to the same 28 patients after 2 weeks. Considering the reliability of test–retest, the correlation coefficients between the reliability results of the test–retest were found quite high ($r = .939$, $n = 28$; Table 4). In a study conducted by Kano and Kanda, the correlation coefficients between the reliability results of the test–retest were found as $r = .94$ ($p < .001$). These results indicate that CiTAS was valid and reliable in both studies.

The validity and reliability results of CiTAS developed by Kano and Kanda (2013) are consistent with the results of this study. There is no other study in the literature to compare the validity and reliability of results related to CiTAS. In both studies, the scale was determined to be a valid and reliable evaluation tool. As the taste of umami is not well known in our country, it should be described very well. There is no other difference with the original

form. The advantage of presenting the symptoms based on own complaints of the individuals is highlighted in both studies. In both studies, the number of patients who took test–retest was low.

Limitations of the Study

With this scale, the condition of the patients regarding chemotherapy-induced hypergeusia taste alterations cannot be evaluated. Because of that patients were supposed to fill the scale face to face and they come once in 3 weeks for treatment, the scale was reapplied on only 28 patients after 2 weeks for test–retest.

Conclusion

The importance of this study was to determine that the CiTAS scale is a valid and reliable tool in measuring taste alterations in Turkish chemotherapy patients. The implications of this study are that this will positively influence nursing practice in assessing taste alterations. In addition, the CiTAS may assist in evaluating the pharmacological/nonpharmacological interventions directed at taste alterations. Further research on implementation of the scale in Turkish chemotherapy sites may support the importance of the use of a consistent and accurate tool (CiTAS) in assessing taste alterations.

Author Contributions

Elif Sozeri designed the study, collected the data, analyzed the data, and assisted with writing the paper. Sevinc Kutluturkan designed the study, supervised the data collection, analyzed the data, and wrote the paper. Both the authors approved the final paper.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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Author Biographies

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