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VALIDITY AND RELIABILITY STUDY OF THE TURKISH VERSION OF THE EYE CARE CLINICAL COMPETENCE QUESTIONNAIRE RELATED TO EYE CARE OF INTENSIVE CARE PATIENTS BY NURSES

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Abstract

Aim: This methodological study was conducted to determine the validity and reliability of the Turkish version of the Eye Care Clinical Competence Questionnaire, which evaluates the clinical competence of nurses regarding eye care in intensive care patients. **Design:** A methodological study. **Methods:** The study included 175 nurses working in the ICUs of the hospitals where the study was conducted. **Results:** Following factor analysis, based on the tetrachoric correlation matrix for the information sub-dimension, eight items were excluded from the questionnaire. As a result of the confirmatory factor analysis conducted for the questionnaire, the error variance value of item 26 was removed from the questionnaire. The final questionnaire adapted for the Turkish cultural context consisted of 26 items. Cronbach's alpha value for the attitude sub-dimension was 0.87; the Cronbach alpha value for the application sub-dimension was 0.85, and the Cronbach alpha value for the questionnaire as a whole was 0.84. **Conclusion:** It was found that the Turkish version of the Eye Care Clinical Competence Questionnaire was a valid and reliable measurement tool. This measurement tool can be used in studies to evaluate the clinical competence of intensive care nurses regarding eye care.

Keywords: eye care, intensive care patients, nursing, questionnaire, reliability, validity.

Introduction

Patients who are in a coma and need respiratory support in the intensive care unit (ICU) are extremely sensitive to various comorbidities, such as pressure ulcers, sepsis, aspiration pneumonia, and keratopathy (Alghamdi et al., 2018; Vyas et al., 2018). In addition, patients hospitalized in ICUs are generally treated with neuromuscular blockers, sedatives, and muscle relaxant agents due to the symptoms they experience. Relaxation of the eye muscles in patients with a decreased level of consciousness results in an inability to close the eyes completely, together with decreased blink reflex and tear production. This can result in various ocular problems, such as increased corneal exposure, dry eye, chemosis, and keratopathy (Alansari et al., 2015; Dawson, 2005). Eye complications are reported to develop in 42% to 60% of intensive care patients (Alghamdi et al., 2018).

It is not possible to fully close the eyes in 20.8% to 75% of intensive care patients under sedation, and

keratopathy develops in 3.6% to 60% (Ebadi et al., 2017; Vyas et al., 2018). Exposure keratopathy is usually caused by inadequate closure of the eyelid, resulting in dryness of the lower half of the cornea. Keratopathy which develops in intensive care patients is usually bilateral, and can lead to infective keratitis unless adequate and effective eye care is provided (Demirel et al., 2014; Vyas et al., 2018).

Although there are only a few studies on the eye problems of intensive care patients, corneal abrasions are reported to have the potential to develop within a short period, i.e., from 48 hours to a week (Ezra et al., 2004; Sarıtaş & Fırat, 2017). The most commonly encountered eye complications in these patients are reported to be exposure keropathy (3.6%–60%), chemosis (9%–80%), and microbial keratitis (Grixti et al., 2012).

It is easier to prevent potential eye complications in intensive care patients than to treat them; however, such prevention is possible with effective eye care. Eye care is often overlooked in these patients, as respiratory and circulatory system complications are considered to be more pressing. Nevertheless, intensive care nurses have important responsibilities

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in this regard (Saritaş & Fırat, 2017). Girgin et al. (2009) have reported that nurses provided eye care to 83.3% of intensive care patients, whereas Saritaş and Fırat (2017) found that 70% of nurses were trained in eye care, and that 60% provided eye care to patients. The most effective method for preventing the aforementioned ocular complications is the use of eye care procedures by intensive care nurses (Alansari et al., 2015).

Evaluating nurses' competence in providing standard eye care is a basic essential for improving the quality of eye care. Procedures related to eye care for intensive care patients are based on similar standards all over the world. The use of standard forms in the evaluation of nurses' knowledge, skills, and practices related to eye care is important in terms of objective assessment. In a review of the literature, we did not discover a valid and reliable Turkish measurement tool for assessing the eye care knowledge and skills of nurses.

Aim

The aim of this study was to evaluate the validity and reliability of the Turkish version of the Eye Care Clinical Competence Questionnaire, developed by Ebadi et al. to evaluate the clinical competence of nurses regarding eye care in intensive care patients (Ebadi et al., 2017).

Methods

Design

A methodological study.

Sample

The study was conducted with nurses working in the intensive care units (ICUs) of a state hospital, and in the Application and Research Hospitals of two universities, between 30 May and 30 August, 2019. The sampling frame consisted of 190 nurses working in the ICUs of the hospitals where the study was conducted. Nurses working in intensive care units between the dates of the study, having at least one year of nursing experience, and volunteering to participate were included in the study. However, nurses who did not meet the research criteria were excluded from the study, leaving a total sample of 175 nurses.

To create two data sets for factor analysis in questionnaire validity and reliability studies, it is recommended that the sample size be five to ten times greater than the number of questionnaire items, and seven to eight times greater than the number of variables (Alpar, 2016). Thus, for our 35-item questionnaire, the minimum sample size was met.

Data collection

The “Personal descriptive form”, consisting of questions related to the descriptive characteristics of the nurses, and the “Eye Care Clinical Competence Questionnaire” were used to collect the data.

Personal descriptive form

This form was prepared by the investigators following a literature review, and included nine questions on the socio-demographic and professional characteristics of the nurses, such as: age, gender, educational status, the intensive care unit where they worked, duration of professional experience, etc. (Demirel et al., 2014; Ebadi et al., 2017; Vyas et al., 2018).

Eye care clinical competence questionnaire in ICU

The Eye Care Clinical Competence Questionnaire was developed by Ebadi et al. (2017) to evaluate the eye care-related clinical competence of nurses working in intensive care units, and consists of 35 items. The questionnaire has three sub-dimensions: knowledge, attitude, and practice. The first 18 items of the questionnaire are multiple-choice, and are intended to measure the knowledge of nurses on eye care, with correct answers receiving one point, and incorrect answers zero points. The 19th–25th items of the questionnaire measure the attitudes of nurses to the risk of eye diseases in unconscious patients undergoing mechanical ventilation, and consists of seven questions. Each item is marked according to a five-point scale: “very low” (1 point); “low” (2 points); “average” (3 points); “high” (4 points); and “very high” (5 points). The practice sub-dimension, which is the last section of the questionnaire, includes the 26th–35th items, and consists of ten questions. This section includes statements on how nurses perform eye care and is marked according to the following frequency scale: “always” (5 points); “generally” (4 points); “sometimes” (3 points); “rarely” (2 points); and “never” (1 point). The highest possible score is 103, and the lowest is 17. A high score from a questionnaire sub-dimension indicates good clinical competence related to that sub-dimension. High scores for the questionnaire as a whole indicate good clinical competence of nurses in terms of knowledge, attitude, and practice related to the eye care of intensive care patients (Ebadi et al., 2017).

Conducting the study

Permission to undertake a Turkish adaptation of the Eye Care Clinical Competence Questionnaire, and a study of its validity and reliability, was obtained from the authors, Ebadi et al. (2017), together with information on the original form of the questionnaire

and how it should be evaluated. The language and content validity analyses were performed in the first stage, and the reliability analyses were performed in the second stage.

Language validity

Translations of the questionnaire into Turkish were performed by a total of four people, including three faculty members from the Department of internal medicine nursing, and a specialist in the field of English language and literature. The four translations were then evaluated by the investigators, and a single combined translation was created (Alpar, 2016). The clarity of expression and the form of the text were reviewed by a professor of Turkish language and literature, and a teacher of the Turkish language. The questionnaire was then backtranslated from Turkish to English by two experts fluent in both languages. This translation was compared with the original questionnaire.

Content validity

Experts from five fields were consulted to evaluate the content validity of the Turkish version of the questionnaire. The Davis technique was used to evaluate the expert opinions (Davis, 1992). The expert opinions were graded as “very appropriate” (4 points); “appropriate but minor changes are required” (3 points); “somewhat appropriate but the item and the way it is expressed should be revised” (2 points); and “not appropriate” (1 point). The “content validity index” related to an item is obtained by dividing the number of experts who grade the options as “very appropriate” or as “appropriate but minor changes are required” by the total number of experts. Instead of comparing the value with a statistical criterion, a value of 0.80 is accepted (Davis, 1992).

Reliability analyses

Following the language and content validity study of the questionnaire, written permission was obtained from the hospitals in which the study was to be conducted. The 175 nurses who had been working in intensive care for at least one year and had volunteered to participate were then interviewed face-to-face. Two weeks later, the questionnaire was administered a second time in the same manner to 75 nurses to perform a time-stability study (test-retest). Confirmatory factor analysis was conducted to evaluate the construct validity of the questionnaire (Alpar, 2016).

Data analysis

Microsoft Excel and IBM SPSS (Statistical Package for Social Sciences) Release 22.0 were used to

evaluate the data. The descriptive findings were presented as mean, standard deviation, and the lowest and highest scores. Before analyzing the data, the data set was checked for incorrect data entries and lost data, and prepared for the analysis. Since the knowledge sub-dimension of the questionnaire consisted of 18 items, with a score of one for correct answers and zero for incorrect answers, exploratory factor analysis based on the tetrachoric correlation matrix was performed to investigate validity, and the KR-20 reliability index value was calculated to determine score reliability. Factor analysis based on the tetrachoric correlation matrix was performed with the “psych” package developed by Revelle (2019) in the R-Project programming language. Since the attitude and practice sub-dimensions of the questionnaire used a five-point Likert scale, confirmatory factor analysis was performed to determine the construct validity, and the Cronbach alpha value was calculated to identify score reliability. Confirmatory factor analysis was performed in the LISREL 8.80 program. The questionnaire was also administered for a second time to 75 nurses in the study group two weeks after the first application, and the test-retest reliability was investigated by calculating the correlation between the results of the two applications.

Results

Findings related to the descriptive characteristics of the patients

The study was conducted with a total of 175 intensive care nurses. The age range was 24–48 years, and the mean age was 31.4 (\pm 6.18 years) (Table 1).

Content validity of the Eye Care Clinical Competence Questionnaire

Questionnaire items were evaluated by five experts according to the Davis Technique. The content validity ratio of the questionnaire items, and the questionnaire content validity index were calculated as 1.0.

Construct validity and reliability analyses of the Eye Care Clinical Competence Questionnaire

The first part of the Eye Care Clinical Competence Questionnaire contains questions about knowledge on the subject. The first 18 questions that constitute the knowledge sub-dimension consist of multiple choice items, and since items were scored as one for correct answers and zero for incorrect answers, we used factor analysis based on the tetrachoric correlation matrix to examine the construct validity. When factor analysis was performed, the factor load values of eight of the items were found to be lower than

0.30; item 2 (0.19); item 3 (0.07); item 6 (0.15); item 8 (0.23); item 9 (0.17); item 10 (0.02); item 13 (0.08); and item 18 (0.01). These items were gradually excluded from the analysis, starting from the item with the lowest factor load value and then repeating the factor analysis. Factor load values are presented in Table 2. The factor load values of the ten items in the knowledge sub-dimension of the questionnaire adapted to the Turkish cultural context varied between 0.31 and 0.71 (Table 2). The items

were also found to be collected under a single factor. The eigenvalue for the single factor was 2.55, and the variance for the single factor was 0.25 (Table 2).

Item analysis was performed for the ten-item knowledge sub-dimension of the questionnaire adapted for the Turkish cultural context. The knowledge section questionnaire scores were listed from the highest to the lowest, with the top 27 classified as the higher group, and the bottom 27% as

Table 1 Characteristics of the ICU nurses (n = 175)

Items		n	%
Gender	female	114	65.14
	male	61	34.86
Education	high school	27	15.43
	university	143	81.71
Workplace	master degree	5	2.86
	general ICU	17	9.71
	coronary ICU	26	14.86
	cardiovascular ICU	12	6.86
	pediatrics ICU	12	6.86
	anesthesia ICU	31	17.71
	internal medicine ICU	34	19.43
	surgical ICU	14	8.00
	neonatal ICU	3	1.71
	neurology ICU	26	14.86
Working shift	only daytime	30	17.14
	16 hours shift	42	24.00
	24 hours shift	53	30.29
	mixed shift	50	28.57
Had intensive care nursing certificate	yes	41	23.43
	no	134	76.57
Domain-specific publication tracking	yes	119	68.00
	no	56	32.00
Years of experience in nursing	1–3 years	43	24.57
	4–6 years	52	29.71
	7 years and above	80	45.71
Years of experience in intensive care	1–3 years	84	48.00
	4–6 years	54	30.86
	7 years and above	37	21.14

ICU – intensive care unit

Table 2 Factor load values for the knowledge sub-dimension of the questionnaire

Item number	Factor 1
1	0.31
4	0.71
5	0.40
7	0.41
11	0.47
12	0.60
14	0.42
15	0.68
16	0.43
17	0.48
Eigenvalues	2.55
The explained variance	0.25
Total variance explained	0.25

the lower group. The difference between the higher group and the lower group was investigated with the t-test, and the results are presented in Table 3.

As regards the internal consistency coefficients, the KR-20 value was calculated in order to identify the reliability of the knowledge sub-dimension test scores of the questionnaire. The KR-20 value of the internal consistency coefficients was calculated to determine the reliability of the scores, and was found to be 0.57 for the knowledge sub-dimension, while the test-retest reliability index was 0.69. In addition, the test-retest reliability index was calculated by administering the test again to 75 subjects from the study group after a certain period of time.

The attitude sub-dimension of the questionnaire consists of eight items, while the practice sub-dimension consists of ten items, rated according to a five-point Likert scale. Confirmatory factor analysis was conducted to evaluate the structure of the attitude- and practice-related items of the inventory adapted to the Turkish cultural context.

When confirmatory factor analysis was performed, the fit index values, factor load values, and error variances were investigated, and the model data fit was evaluated. Since the error variance value of a particular item of the practice dimension was 0.91 (Item 26) during the analysis, this item was excluded, and the analysis repeated. Fit index values, factor load values (max-min) and error variance (max-min) values are presented in Table 4. In addition, the measurement model obtained as a result of the analysis is presented in Figure 1.

Since the attitude and practice dimension of the questionnaire were rated using a five-point Likert scale, the Cronbach alpha coefficient was calculated to determine the reliability of the questionnaire scores. In addition, after a certain period of time, the test was administered again to 75 subjects from the study group, and the test-retest reliability index was calculated. The test-retest reliability was 0.81 for the attitude subquestionnaire, and 0.78 for the practice subquestionnaire.

Table 3 Item analysis of the knowledge sub-dimension of the questionnaire

Item number	Item difficulty	Point double series correlation coefficient	Upper group mean	SD	Lower group mean	SD	t
1	0.70	0.40	0.89	0.31	0.47	0.50	4.920
4	0.06	0.40	0.17	0.38	0.00	0.00	3.072
5	0.07	0.28	0.17	0.38	0.02	0.15	2.509
7	0.39	0.45	0.68	0.47	0.09	0.28	7.437
11	0.60	0.49	0.94	0.25	0.28	0.45	8.776
12	0.63	0.58	0.96	0.20	0.19	0.40	11.747
14	0.29	0.48	0.55	0.50	0.06	0.25	5.991
15	0.29	0.58	0.72	0.45	0.04	0.20	9.410
16	0.09	0.34	0.21	0.41	0.02	0.15	2.993
17	0.48	0.49	0.68	0.47	0.13	0.34	6.545

SD – standard deviation; t – t-test value

Table 4 Confirmatory factor analysis results of attitude and practice sub-dimension of the questionnaire

	χ^2	χ^2/df	p	CFI	GFI	NFI	RMSEA	Factor load values		Error variances	
								max.	min.	max.	min.
Questionnaire	309.42	3.06	0.000	0.93	0.78	0.91	0.109	0.84	0.52	0.73	0.30
Suggested value		≤ 3		≥ 0.90	≥ 0.90	≥ 0.90	≤ 0.080	≥ 0.30		≤ 0.90	

χ^2 – chi-square; χ^2/df – a ratio of chi-square divided by the degrees of freedom; CFI – comparative fit index; GFI – Goodness of Fit Index; NFI – Normed Fit Index; RMSEA – root-mean-square error of approximation; min. – minimum; max. – maximum

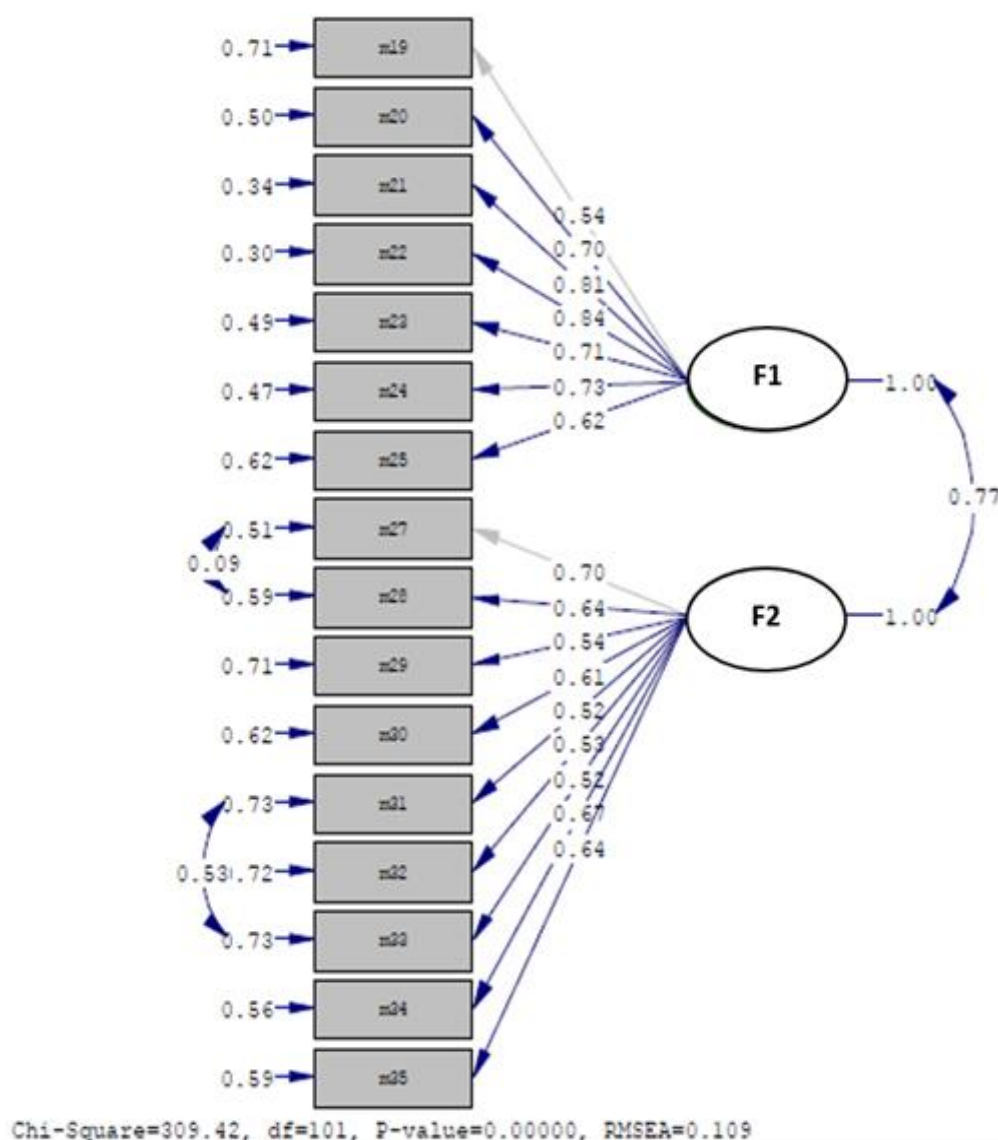


Figure 1 Measurement model of attitude and practice sub-dimension of the questionnaire

Discussion

The validity and reliability study of the Turkish adaptation of the “Eye Care Clinical Competence Questionnaire” (consisting of three sub-dimensions and 35 items), in conjunction with the evaluation of the clinical competence of nurses regarding eye care in intensive care patients, indicates that the questionnaire is appropriate for a Turkish context in terms of its language, content, construct validity, and reliability, and that it can be used to evaluate the clinical competencies related to eye care of nurses who provide care to intensive care patients. While the original questionnaire consists of a total of 35 items, the Turkish version consisted of 26 items, as analyses indicated that the factor load values of eight items (items 2, 3, 6, 8, 9, 10, 13 and 18) from the

knowledge sub-dimension were less than 0.30, and that the error variance value of item 26 was 0.91.

The content validity index of questionnaire adaptation studies should be ≥ 0.80 (Alpar, 2016). The content validity index calculated as a result of evaluating the opinions received from the five field experts related to form items was determined to be 1.0, and the form was deemed to meet the necessary criterion in terms of content validity in our study.

The first section of the “Eye Care Clinical Competence Questionnaire”, developed by Ebadi et al. (2017), consists of three sub-dimensions: knowledge, attitude, and practice. There are 18 multiple-choice questions that measure level of knowledge (Ebadi et al., 2017). In order to investigate the construct validity of this section,

factor analysis based on the tetrachoric correlation matrix was performed. The factor load values of eight items were found to be lower than 0.30 as a result of factor analysis: item 2 (0.19); item 3 (0.07); item 6 (0.15); item 8 (0.23); item 9 (0.17); item 10 (0.02); item 13 (0.08); and item 18 (0.01); and these items were gradually excluded from the analysis by starting with the item with the lowest factor load value and repeating the factor analysis.

The factor load values of the ten items in the knowledge sub-dimension of the questionnaire adapted to the Turkish cultural context were found to vary between 0.31 and 0.71 (Table 2). Accordingly, it can be said that the items included in the knowledge sub-dimension of the questionnaire serve their purpose. The items were also found to be collected under a single factor. The eigenvalue for the single factor was 2.55, and the variance for the single factor was 0.25 (Table 2).

The difference between the lower group and the higher group of the ten items in the knowledge sub-dimension of the questionnaire adapted to the Turkish cultural context was investigated with a t-test. The analysis revealed that the item difficulty index varied between 0.09 and 0.70. Accordingly, it can be said that the prepared test is difficult. The item discrimination indices (point double series correlation) varied between 0.28 and 0.58 (Table 3), indicating that the prepared items serve their purpose. The t-test between the higher group and the lower group showed a significant difference for all items ($p < 0.05$) (Table 3). The items in the knowledge sub-dimension of the questionnaire are, therefore, expected to be successful in differentiating between individuals in the higher group and the lower group.

The KR-20 value of the internal consistency coefficients was calculated to determine the reliability of the scores, and was found to be 0.57 for the knowledge sub-dimension, while the test-retest reliability index was 0.69. Cronbach alpha values are calculated as reliability measurements, with a value below 0.50 considered as indicating low reliability, 0.50 to 0.80 moderate reliability, and values above 0.80 high reliability (Salvucci et al., 1997). The test scores can, therefore, be said to be moderately reliable.

The attitude sub-dimension of the questionnaire consists of seven items, while the practice sub-dimension consists of ten items, both evaluated using a five-point Likert scale. Confirmatory factor analysis (CFA) was performed to investigate the compliance of the five-factor structure with Turkish culture. After drawing a PATH diagram, the t values of the items were checked. The table is significant at the 0.05

level if the t value exceeds 1.96, and at the 0.001 level if the t value exceeds 2.56. Items that are insignificant should be excluded from the questionnaire (Salvucci et al., 1997). Item 26 was excluded from the analysis in our study as its error variance value was found to be 0.91.

Confirmatory factor analysis for the attitude and practice section of the questionnaire revealed that the χ^2/sd value was between 3 and 5, indicating that the model had a moderately good fit (Alpar, 2016; Çapık, 2014). CFI is a model that predicts the lack of a relationship between the variables. A CFI value > 0.90 is acceptable. GFI is one of the fit-related indexes developed later, and varies between 0.64 and 0.93. The normal value for GFI is > 0.95 and an acceptable value is > 0.90 . The RMSEA value should be < 0.08 to be acceptable (Çapık, 2014). We found a CFI value of 0.93, and an NFI value of 0.91 in this study (Table 4). Values over 0.90 indicate a model that fits very well with the data (Çapık, 2014; Salvucci et al., 1997). The RMSEA index was found to be 0.109 for the model, indicating that the model does not fit the data. Evaluating the fit indices in general revealed that the two-dimensional model showed the best fit. The factor load values of all the items in the questionnaire were above 0.30 (Table 4). Accordingly, all the items were found to serve their purpose (Çapık, 2014; Salvucci et al., 1997).

When we determined the Cronbach alpha values for the attitude and practice sub-dimensions of the questionnaire using a five-point Likert scale, the value was 0.87 for the attitude sub-dimension, 0.85 for the practice sub-dimension, and 0.84 for the whole questionnaire. Accordingly, the attitude and practice sub-dimensions and the entire questionnaire are highly reliable. Ebadi et al. calculated the Cronbach alpha value to be 0.68 for the knowledge sub-dimension, 0.76 for the attitude sub-dimension, 0.90 for the practice sub-dimension, and 0.83 for the total questionnaire in their 2015 study in which they reported the development of the “Eye Care Clinical Competence Questionnaire” (Ebadi et al., 2017).

In addition, we calculated the test-retest reliability index by administering the test again, after two weeks, to 75 subjects. The correlation between the two results from the same group after this interval was close to one, indicating the stability of the test scores and their stability over time (Salvucci et al., 1997). The test-retest reliability was 0.81 for the attitude subquestionnaire, and 0.78 for the practice subquestionnaire in this study. The measurements obtained from the Turkish adaptation of the “Eye Care Clinical Competence Questionnaire” are, therefore, reliable.

Implication for clinical practice

- Eye complications are a serious problem in intensive care unit patients.
- The most effective method for preventing eye complications is the use of eye care procedures by intensive care nurses.
- The “Eye Care Clinical Competence Questionnaire” helps in the evaluation of the clinical competence of intensive care nurses regarding eye care.

Limitation of study

The results of the study were limited to intensive care nurses of the three hospitals where the study was conducted.

Conclusion

This study confirms that the Turkish version of the “Eye Care Clinical Competence Questionnaire” is a valid and reliable measurement tool that will provide an objective evaluation of the clinical competencies of intensive care nurses, who play an important and effective role in preventing eye complications in ICU patients. This measurement tool can be used in studies to evaluate the knowledge, attitude, and practices of intensive care nurses regarding eye care. Improving the clinical competencies of nurses related to the eye care of intensive care patients will contribute to the prevention, early diagnosis, and treatment of ocular complications.

Ethical aspects and conflict of interest

Written permission for the Turkish adaptation of the Eye Care Clinical Competence Questionnaire and its validity and reliability study was obtained from Ebadi et al. via e-mail. Written permission from the Human Research Ethics Committee (issue no. E11048) and verbal and written permission from the study participants were also obtained.

All authors have contributed significantly, and that all authors are in agreement with the content of the manuscript. The authors have no conflict of interest.

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Author contributions

Conception and design (BBÖ, NÖ), data acquisition (BBÖ, BT, ED), data analysis and interpretation (BBÖ, NÖ), drafting manuscript (BBÖ, BT, ED, NÖ), critical revision of manuscript (BBÖ, NÖ), final approval and accountability (BBÖ), supervision (NÖ).

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