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A study on the validity and reliability of the turkish version of clinical chronic obstructive pulmonary disease questionnaire

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Abstract.
BACKGROUND: Chronic obstructive pulmonary disease (COPD) is a progressive disease negatively affecting health-related quality of life. The related scales in Turkish are limited in number and generalizability.
OBJECTIVE: To perform validity and reliability studies of the Turkish version of the Clinical Chronic Obstructive Pulmonary Disease Questionnaire (CCQ).
METHODS: This study was conducted at the Department of Chest Diseases, with 100 volunteer COPD patients with a mean age of 67.72 $\pm$ 9.78 years. After obtaining the necessary permission, translation procedures were applied for Turkish cultural adaptation. Finally, a single Turkish translation was created, and this questionnaire was evaluated by linguists. Incomprehensible items were corrected in a pilot study. Baseline and test-retest measurements after 2 weeks were performed. Internal consistency analysis was made for validity, and correlations were calculated with the 36-Item Short Form Health Survey (SF-36), the modified Medical Research Council (mMRC) and Respiratory Function Tests (RFTs).
RESULTS: Cronbach's alpha value was found to be 0.90 for the first obtained data and 0.91 for the second obtained data. There was similarity at the rate of 0.97 between the first and second measurements in terms of total scores of the CCQ. The questionnaire significantly correlated with the SF-36, mMRC and RFTs ($-0.85 \leqslant r \leqslant 0.69$, $p < 0.05$).
CONCLUSIONS: As a result of this study, the Turkish version of CCQ was determined to be reliable and valid. The CCQ is an easy-to-use questionnaire in terms of application-calculation and can be safely used for the clinical assessment and monitoring of patients.

Keywords: Chronic obstructive pulmonary disease, quality of life, reproducibility of results, dyspnea, respiratory function test, cross-cultural adaptation

1. Introduction

Chronic obstructive pulmonary disease (COPD) is a disease characterized by irreversible airway obstruction, in which chronic bronchitis and emphysema are often both present. Many factors, such as airway obstruction, cause a decrease in respiratory muscle strength, changes in the respiration pattern, air trapping, and hypoxemia, all of which play a significant role in progression of the disease [1–3]. These factors lead to dyspnea, which is the most important symptom of the disease, varying in parallel with the severity of the disease, and has a significant effect on quality of

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life [4].

In the guide published by the Global Initiative for Chronic Obstructive Lung Disease (GOLD), it is stated that the valid and reliable methods to be used in assessing COPD symptoms are the COPD Assessment Test (CAT), the Modified British Medical Research Council (mMRC) breathlessness scale, and the Clinical COPD Questionnaire (CCQ) [5].

CCQ is a questionnaire that is frequently used for COPD patients [6]. Validity and reliability studies of this questionnaire have been conducted in different languages, such as Italian, Taiwanese, and Greek [7,9]. The questionnaire consists of a total of 10 questions, and patients can complete it in a short time [10,11]. It has 3 main domains, namely symptoms, mental status, and functional status [6]. The questionnaire is a very efficient tool in the determination of the short- and long-term severity of COPD and complies with other questionnaires. It is easier to use than other similar questionnaires [6,10–13]. From a literature review, it was seen that there has been no validity and reliability study of the Turkish version of CCQ, which is a fast and easy-to-understand assessment scale specified in the GOLD 2013 guide. Therefore, the present study was conducted to determine the validity and reliability of the Turkish version of CCQ. The validity and reliability of this questionnaire, which evaluates individuals with COPD, is of great importance for the Turkish literature.

2. Materials and methods

2.1. Materials

The study included 112 patients diagnosed with COPD at the Kütahya Health Sciences University Evliya Çelebi Training and Research Hospital. We have chosen this amount of subjects as it has been stated that the sample size should be at least ten times the number of questions in the survey [14]. After informing the subjects about the study, written consent was obtained. Approval for the study was granted by the Clinical Research Ethics Committee of Eskisehir Osmangazi University Medical Faculty (No. 80558721/93). Illiterate, unstable patients under 40 years or those in an exacerbation period with an active lesion were excluded from the study. The patients included in the study had no limitations in daily-life activities and no orthopedic, neurological or psychiatric problems, no COPD exacerbation history in the previous 4 weeks and had been diagnosed with COPD in accordance with GOLD 2013 criteria.

The necessary permission for the Turkish reliability and validity study was obtained in 2012 from van der Molen, who developed the questionnaire. For cultural adaptation to the Turkish society, the questionnaire was translated from English to Turkish by two different persons. A single Turkish translation was created from those translations. This Turkish questionnaire was then back-translated into English by two native English speakers with a good knowledge of Turkish, and that translation was then compared with the original questionnaire. By correcting the observed differences, a Turkish questionnaire was obtained, which was assessed and modified by two linguists in terms of the Turkish language grammatical structure. Prior to the assessment of the reliability and validity of the adapted and modified questionnaire, it was applied to a test group of 20 subjects. Any changes required in the questionnaire were made and the questionnaire was finalized.

All the participants were informed about the process prior the study. Prior the assessment, a record was made of the history, complaints, age, body weight, height, body mass index (BMI), gender, smoking habits, COPD type, and CAT score of each participant. In order to determine the test-retest reliability, the questionnaire was applied initially and then again two weeks later. For the validity, the correlation with the 36-Item Short Form Health Survey (SF-36), Respiratory Function Tests (RFTs), and mMRC was examined. The assessments used are specified in the next section.

2.2. Methods

2.2.1. Assessments

Clinical COPD Questionnaire (CCQ)

The Clinical COPD Questionnaire, developed by Mollen et al. in 2003, assesses symptoms with 4 items, functional status with 4 items, and mental status with 2 items. The questionnaire is based on a 7-point Likert scale, with a low score indicating an increase in COPD severity. In order to calculate a score for the questionnaire, the participant must answer at least 90% of the items [11,15].

2.2.2. Respiratory function tests (RFTs)

RFT is the main test method used in assessing lung functions. It is routinely utilized in the diagnosis of obstructive and restrictive lung diseases, the deter-

mination of the severity of the disease and the response to the treatment, the decision whether or not surgical intervention is appropriate, and for diagnosis, examination and disablement assessments of occupational diseases. Since the duration of the implementation depends on the cooperation of the patient, it varies among patients. In this study, the Forced Vital Capacity (FVC), Forced Expiratory Volume in 1 second (FEV1) and FEV1/FVC values of the patients were recorded [12]. All RFTs were applied using a Koko Legend 314000 Model RFT device (serial number: 2006LB0634).

2.2.3. Short form health survey (SF-36)

SF-36 is a widely used general health scale, which assesses many aspects of health. It consists of 36 items under 8 subheadings. The physical health score is obtained by calculating the total of the physical function, physical role limitation, pain, and general health scores, and the global mental health score is the total of the vigor (vitality, energy), social function, emotional role limitation and mental health scores. High scores indicate good health [16,17]. The validity and reliability study of the SF-36 questionnaire was carried out by Koçyiğit et al. in 1999 and the Turkish version of the SF-36 was used in this study [18].

2.2.4. Modified british medical research council (mMRC) dyspnea scale

Dyspnea is one of the major symptoms of COPD. The level of dyspnea provides information about the progression of the disease and is also measurable. The patient declares his/her level of difficulty of breathing with a score between 0 and 4. A high score indicates more severe dyspnea. The mMRC Dyspnea Scale is compatible with the health status score and other dyspnea questionnaires, and is easy to apply [5,19,20]. The reliability and validity study was carried out by Milacic et al. [21].

2.3. Statistical analysis

Data obtained in the study were statistically analyzed using SPSS-20 software. Demographic data were presented as mean ± standard deviation (SD) values. Conformity of the data to normal distribution was assessed with the Kolmogorov-Smirnov test and the data were found to have normal distribution. For the reliability of the CCQ, test-retest was applied. The results were interpreted through Cronbach's alpha coefficient in terms of correlation and internal consistency. The results were analyzed using intraclass correlation coefficient (2,1) and factor analysis [22,23]. To evaluate the validity of the questionnaire, correlation values were examined of the comparison with the clinical tests and questionnaires. The Pearson correlation coefficient was utilized in the correlation analysis. A value of $p < 0.05$ was accepted as statistically significant.

Table 1
Demographic characteristics of the subjects

Variables	Mean ± SD
Age (year)	67.72 ± 9.78
Height (cm)	166.97 ± 6.53
Weight (kg)	68.94 ± 16.77
Body Mass Index (kg/m^2)	24.74 ± 6.03
Pack-year	52.54 ± 30.42
CAT score	22.24 ± 10.16

cm: Centimeter, kg: Kilogram, CAT: COPD Assessment Test, SD: Standard deviation.

Table 2
Descriptive values of the subjects

Variables	n	%
Gender		
Male	96	96
Female	4	4
Diagnosis		
Chronic Bronchitis	20	20
Emphysema	80	80
mMRC		
None	3	3
1	31	31
2	16	16
3	28	28
4	22	22
GOLD Level		
A	8	8
B	19	19
C	5	5
D	68	68

mMRC: Modified Medical Research Council. GOLD: Global Initiative for Chronic Obstructive Lung Disease.

3. Results

A total of 112 patients diagnosed with COPD were initially examined. Due to the lack of data and incompatibility, 12 patients were excluded and the study was therefore completed with 100 patients (96 males, 4 females). The mean age of the patients included in the study was 67.72 ± 9.78 years. The descriptive data, mean and standard deviation values of the cases are presented in Table 1, and the numbers and percentages are presented in Table 2.

To determine the reliability of the questionnaire, the test-retest results were examined and the test-retest re-

Table 3
Reliability of CCQ

CCQ	Intraclass correlation coefficient (ICC)	95% CI*
Symptoms	0.96	0.94–0.97
Mental state	0.96	0.95–0.97
Functional state	0.94	0.89–0.96
Total	0.97	0.95–0.98

CCQ: Clinic COPD Questionnaire, * 95% Confidence interval for ICC in this study.

liability and internal consistency of CCQ were found to be at a good level (Table 3). The subgroups of test-retest reliability correlations and the total scores ranged from 0.95 to 0.97. The Cronbach's alpha coefficient value was calculated to be 0.90 for the first test of CCQ internal consistency and 0.91 for the retest.

The correlation between SF-36 and mMRC was examined to evaluate the validity. While significant negative relationships were observed between the subgroups of SF-36 and RFT data, a significant positive relationship was observed with mMRC. The values of those data are presented in Table 4.

4. Discussion

From the results of this study, it was concluded that the Turkish version of CCQ is a reliable and valid questionnaire that can be used in clinical follow-up examinations. To determine the validity of the CCQ, the correlation of SF-36 with RFTs and mMRC was examined, and to determine the reliability, the same questionnaire was conducted on the same patients twice at a 2-week interval.

COPD is a significant health problem throughout the world [6,12,13,22–24]. According to the 2007 data of the World Health Organization, it is estimated that by 2030, COPD will have moved up four places to be ranked seventh among the diseases leading to morbidity and mortality. It has been projected that even if all the causes of COPD were eliminated today, the disease would still be evident for 20 years because of the slow progression of the disease. COPD incidence has been reported in the >40 years age group at rates varying from 4% to 20% because of different definitions used [6,9,10,19]. As COPD has been seen to lead to higher rates of mortality and morbidity in older patients, rehabilitation and treatment of symptoms that restrict daily activities of COPD patients are of global importance. Therefore, it is vital that not only the patient status is accurately and reliably determined, but also the efficiency of the treatments, in a very short time under intense conditions of the hospital environment [4].

CCQ was developed for the follow-up of COPD patients in clinics. It is a widely used questionnaire that can be easily understood and completed by the patients themselves. It provides information about the clinical status of airways, emotional dysfunctions, and activity limitations of the patient in the last week [13]. It has been reported that the questionnaire, which was developed by Molen et al. in 2003 and for which the reliability and validity have been studied, can be used not only for COPD patients but also for those considered to be at high-risk of COPD [15].

The validity and reliability study of the Italian version of this questionnaire was carried out by Damato et al. [27]. Furthermore, the study of validity at different disease phases was applied by Kocks et al. [28]. The reliability and validity of the assessment of the health status of COPD patients in a clinic environment was evaluated by Antoniu et al. [29]. It has been reported that this questionnaire, for which validity studies were made on both COPD and coronary failure patients, can be used to determine the health status of those patients [6]. In another study, it was reported that the CCQ is of reliable and valid use in institutions offering first-line health services [30]. In addition, van Dam, van Isselt et al. reported that the questionnaire is also valid in determining the changes in patients [31]. However, there are few studies in the literature which have examined the relationship of this questionnaire with different quality of life scales and parameters and where it has been used to determine the actual status of COPD patients [11,12,32–35]. Therefore, the selection of CCQ for a validity and reliability study of the Turkish version was made with the consideration of the advantages such as ease-of-use and usability in assessing the treatment process. In the current study, the same questionnaire was implemented to the same patients at different times, a high correlation was found between the assessments made, and thus the questionnaire was determined to be reliable.

In this study, the SF-36 was selected to determine the validity of the questionnaire being examined [18, 36]. The SF-36 can be completed in as short a time as 10 minutes by the patient him/herself, and it has subsections related to physical functions, emotional role limitations, social functions, mental health, physical role limitations, energy, pain, and general health [37–40]. The questionnaire is widely used as a general health questionnaire in pulmonary diseases such as COPD. It is gradually becoming more important to

Table 4
Relation between CCQ and other parameters

Variables	CCQ			
	Symptoms	Functional state	Mental state	Total
	r (p)	r (p)	r (p)	r (p)
SF-36				
Physical health				
Physical functioning	−0.68 (< 0.01)	−0.89 (< 0.01)	−0.57 (< 0.01)	−0.85 (< 0.01)
Role-physical	−0.39 (< 0.01)	−0.49 (< 0.01)	−0.42 (< 0.01)	−0.51 (< 0.01)
Bodily pain	−0.37 (< 0.01)	−0.37 (< 0.01)	−0.27 (< 0.01)	−0.35 (< 0.01)
General health	−0.47 (< 0.01)	−0.47 (< 0.01)	−0.42 (< 0.01)	−0.48 (< 0.01)
Mental health				
Vitality	−0.38 (< 0.01)	−0.55 (< 0.01)	−0.57 (< 0.01)	−0.57 (< 0.01)
Social functioning	−0.40 (< 0.01)	−0.61 (< 0.01)	−0.44 (< 0.01)	−0.57 (< 0.01)
Role-emotional	−0.31 (0.02)	−0.49 (< 0.01)	−0.43 (< 0.01)	−0.48 (< 0.01)
Mental health	−0.44 (< 0.01)	−0.54 (< 0.01)	−0.60 (< 0.01)	−0.60 (< 0.01)
RFT				
FVC	−0.36 (< 0.01)	−0.48 (< 0.01)	−0.26 (< 0.01)	−0.44 (< 0.01)
FEV1	−0.41 (< 0.01)	−0.56 (< 0.01)	−0.24 (0.01)	−0.49 (< 0.01)
FEV1/FVC	−0.16 (0.1)	−0.21 (0.03)	−0.04 (0.64)	−0.15 (0.13)
mMRC	0.61 (< 0.01)	0.67 (< 0.01)	0.41(< 0.01)	0.69 (< 0.01)

CCQ: Clinic COPD Questionnaire, SF-36: Short Form 36, RFT: Respiratory Function Test, FVC: Forced Vital Capacity, FEV1: Forced Expiratory Volume in 1 second, FEV1/FVC: Forced Expiratory Volume in 1 second/ Forced Vital Capacity, mMRC: Modified Medical Research Council.

determine symptom-related loss of quality of life of COPD patients, and many studies have used the SF-36 in comparison with other scales [6,17,39,41–45]. According to the results of previous studies in the literature, SF-36 is a highly-sensitive and useful scale in determining the quality of life of COPD patients [17,46]. The results of the current study demonstrated a significant relationship between SF-36 and CCQ, and it was thus concluded that CCQ can be used to determine the symptoms of patients.

RFTs and mMRC were also used in the current study to determine validity. mMRC and FEV1 values play a critical role in determining the symptoms of patients, and they are preferred in routine follow-up examinations because of the ease of implementation. It has been reported that mMRC and CCQ values in particular are very useful in revealing the differences related to airway obstruction in healthy individuals and COPD patients [47]. Dyspnea during gentle exercise has been reported to generally develop when the FEV1 values of the patient decrease to 50% [48]. The use of mMRC in the evaluation of dyspnea was first described by Fletcher in 1952, and it provides information about the level of dyspnea of the patient when undertaking various activities from gentle to strenuous exercise [4,5,48]. The respiration load of COPD patients increases as a result of chronic infection and inflammation in energy-requiring activities, and the patient feels more obstruction while breathing as the disease progresses, which limits the exercise performance [38,49]. CCQ questions the severity of dyspnea, symptoms and activity limitations. Therefore, the relationship of CCQ with RFTs and mMRC was discussed in this study, and it was determined that the questionnaire is a valid measure.

One of the strengths of this study was the application of the Turkish version of validity and reliability study. By choosing a widely used questionnaire that is quick and simple to apply, we enlarged its area of use. Furthermore, the CCQ is a questionnaire that is recommended within the diagnosis criteria of GOLD 2013. Another strength of this study was the selection of widely used assessment methods to determine the symptoms and severity of the disease. The study initially included 112 cases, which was considered to be a sufficient number, as it has been previously stated in literature that sample size should be at least ten times the number of questions in the survey [14], and the study was completed with 100 subjects. However, to be able to achieve such a high number of subjects, it was not possible to have homogenous distribution of the patients according to COPD stage. This heterogeneity could be considered a limitation of the study.

5. Conclusions

In conclusion, the Turkish version of CCQ is a valid and reliable method for assessing COPD patients. The implementation is easier than other COPD questionnaires as it is shorter, more easy to comprehend, and

the scores can be calculated quickly. Therefore, the CCQ is a valid and reliable questionnaire that can be used in clinics, especially in those with high patient traffic.

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Conflict of interest

The authors have no conflict of interest to declare.

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