Validity and reliability of the Turkish version of the clinical COPD questionnaire

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Abstract

This study was conducted to determine the validity and reliability of the Turkish version of the Clinical COPD Questionnaire developed to evaluate respiratory symptoms, restrictions in physical activity, and emotional problems experienced by the patients with chronic obstructive pulmonary disease (COPD) within the past one week. The study was conducted on 100 patients with COPD who were admitted to the pulmonary diseases outpatient clinic at a training and research hospital in Ankara between January 2 and February 10, 2017. In studies in methodological kind, patient information form and the Clinical COPD Questionnaire it was used. In this study, the Cronbach's alpha coefficient of total scores of the questionnaire was 0.903 and Intraclass Correlation Coefficient (ICC) was found to be 0.80. The Cronbach's alpha values and ICCs of the subscale of the questionnaire were 0.878 and 0.734 for the functional state, 0.867 and 0.846 for mental state, and 0.827 and 0.828 for the symptoms. The questionnaire was re-administered one week after. The study concludes that the Turkish version of Clinical COPD Questionnaire is a valid and reliable tool to be used in the Turkish population.

Keywords: COPD; nursing; Clinical COPD questionnaire; validity; reliability.

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1. Introduction

Chronic obstructive pulmonary disease (COPD) is an obstructive disease of the airway affecting the quality of life of patients (Sundh, Janson, Lisspers, Montgomery & Stallberg, 2012). It is guessed that approximately 3 million deaths were caused by the disease in 2015. It is known that the third leading cause of death according to the data of the World Health Organization (WHO, 2015). Patients experience dyspnea, cough, sputum production, fatigue, anxiety, and sleeplessness associated with airway obstruction (Lohne et al., 2010). The severity of symptoms affects the quality of life of patients with COPD and causes physiological, psychological and emotional changes in the patients (Iguchi et al., 2013; Scano, Gigliotti, Stendardi & Gagliardi, 2013). The studies on the quality of life of patients with COPD show that the disease has a significant impact on psychological and emotional status of the patients, and causes a decrease in the quality of life of patients (Partridge, Karlsson & Small, 2009; Hu & Meek, 2005; Joshi, Joshi & Bartter, 2012).

It is of great importance to evaluate symptom severity and quality of life in patients with a chronic disease (Sundh et al., 2012). Saint George Respiratory Questionnaire (SGRQ) and Clinical COPD Questionnaire (CCQ) are often used in the literature to evaluate quality of life of patients with COPD (Jones et al., 2009; van der Molen et al., 2003). In our country, only SGRQ is used (Polat et al., 2013; Yorgancioglu et al., 2012). The symptom severity of the patients is assessed using the COPD assessment test and modified British Medical Research Council (mMRC) dyspnea scale (van der Molen et al., 2003; Tsiligianni et al., 2016). Evaluation of health-related quality of life of patients with COPD in a short period of time provides convenience in clinical practice (Ringbaek, Martinez & Lange, 2012).

Clinical COPD questionnaire has been developed to evaluate airway symptoms, restriction in physical activities, emotional problems, and measure clinical health status of the patients. CCQ is composed of 10 items and divided into three subscales: symptoms (4 items), functional state (4 items) and mental state (2 items). The questions are rated from 0 to 6 on a 7-point scale, and lower scores indicate higher quality of life (van der Molen et al, 2003). CCQ is used to reflect last one week (7 days) or last 24 hours. The questionnaire examines the experiences of patients in the last 24 hours or 7 days (Kocks et al., 2006).

The CCQ requires a shorter administration time, which is an advantage over SGRQ. CCQ is a practical and simple. Therefore, it is used as a descriptive survey during clinical control visits in order help prevent COPD exacerbation (van der Molen et al., 2003; Kocks et al., 2010). According to the study of Ringbaek, Martinez and Lang (2012), only 34.5% of the COPD patients self-administering the questionnaire received support from the healthcare personnel (Ringbaek et al., 2012).

The CCQ has been translated into more than 60 languages and most have been validated. The questionnaire was adapted for use in populations in Italy, India and Greece (Damato et al., 2005; Papadopoulos et al., 2011; Herbert, Nambiar, Rao & Ravindra, 2013). Although the questionnaire was translated into Turkish by van der Molen and his colleagues, Turkish version has not yet been evaluated for its validity and reliability.

The this study was conducted to determine the validity and reliability of the Turkish version of Clinical COPD Questionnaire which was developed by van der Molen et al. (2003) to evaluate respiratory symptoms, restrictions in physical activity and emotional problems experienced by the patients with COPD within the past one week.

2. Method

2.1. Study universe and study sample

This study was conducted, using a face-to-face interview technique, on 100 patients who were admitted to the Department of Pulmonary Diseases at Ministry of Health of Turkey, Yıldırım Beyazıt University Ankara Atatürk Education and Research Hospital between January 1 and February 10, 2017.

The study included patients with FEV1/FVC <0.70 in respiratory function test, aged 40 years and over, patients who are able to establish healthy communication and who do not have hearing and/or speech disorder, and patients who are literate and who provided consent to participate in the study.

2.2. Data collection method

The questionnaire developed by the researchers and clinical COPD questionnaire were used in collecting study data.

2.2.1. Questionnaire form

This form contains questions investigating descriptive features of the patients such as gender, age, and results of respiratory function tests.

2.2.2. Clinical COPD questionnaire

This questionnaire was developed to evaluate airway symptoms, restrictions in physical activity and emotional status and quality of life of patients. The questionnaire contains 10 items and it is easy to administer. The lowest score is 0 points and the highest score is 6 points. Higher scores in this questionnaire indicate decrease in the quality of life. Calculation of scores in the Turkish version of the Clinical COPD questionnaire is as follows: total score = (item 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10) / 10; Symptoms = (item 5 + 6) / 2; Functional state = (item 2 + 7 + 8 + 9) / 4; Mental state = (item 1 + 3 + 4 + 10) / 4.

2.2.3. Language equivalence study

The questionnaire was previously translated into Turkish by van der Molen and his colleagues; for evaluation of the conformity to the Turkish language, the questionnaire was backtranslated into English from Turkish by three linguists who speak and understand Turkish and English and who have good command of medical terminology. The original questionnaire form was compared with backtranslated version, and original questionnaire was found to be applicable.

2.2.4. Content validity study

After assessing language equivalency of the questionnaire, content validity was evaluated by pulmonary diseases specialists who studied patients with COPD.

2.2.5. Reliability study

The reliability and internal consistency of the questionnaire were evaluated to determine whether reliability shows temporal changes (test-re-test).

2.2.6. Construct validity study

Construct validity was evaluated by examining the factors assessed by the questionnaire or by investigating the relationship of the questionnaire with different questionnaires and other scales. Construct validity was evaluated using exploratory factor analysis (EFA) and/or confirmatory factor analysis (CFA). In exploratory factor analysis, principle component analysis was performed with varimax rotation. Goodness of fit indices $\chi2$, RMSEA, GFI, AGFI, CFI, SRMR, RMR and IFI) were used in confirmatory factor analysis.

2.3. Statistical analysis

Statistical analysis was performed using SPSS version 18 (SPSS Inc., Chicago, IL, USA) and LISREL version 9.2 (SSI, Inc., Skokie, IL, USA) software packages. Descriptive statistics were expressed in number, percentage and mean. Validity and reliability of the data were evaluated using AF and DFA. Exploratory factor analysis Cronbach's alpha coefficient, test-retest correlation for timeliness invariance, item-total score correlation and correlations between the items were evaluated. Goodness of fit indices were calculated in confirmatory factor analysis.

2.4. Ethical aspects of the study

Permission was obtained from van der Motel over e-mail communication to perform validity and reliability study of the Clinical COPD Questionnaire. Gazi University Ethics Committee (30/12/2016-Resolution No. 77082166-604.01.02) and Department of Pulmonary Diseases at Ministry of Health of Turkey, Yildirim Beyazit University, Ankara Ataturk Education and Research Hospital provided permission for the conduction of the study. Individuals providing consent to participate in the study were informed and all signed an informed consent form.

3. Results

3.1. Descriptive characteristics

Demographic characteristics of the participating patients are shown in Table 1.

Table 1. Findings of demographic characteristics of patients

Characteristics	x+sd (min-max)
Age	63.15+8.72 (40-79)
Gender	
Male	%90
Female	%10
Spirometric Values	
FEV1	1.63+0.56 (0.59-3.42)
FVC	2.63+0.80 (1.06-5.11)
FEV1/FVC	61.54+7.97 (37-69)
Predicted FEV1	55.73+14.49 (21-95)
Predicted FEV1>80	%2
80> Predicted FEV1>50	%65
50> Predicted FEV1>30	%28
Predicted FEV1<30	%5

3.2. Findings related to the validity and reliability of the scale

3.2.1. Validity analysis

3.2.1.1. Construct validity (factor analysis)

Clinical COPD Questionnaire was administered to 100 patients. According to the results of the survey, quality of life was evaluated with three dimensions (functional state, mental state and symptoms). The construct validity of the questionnaire adapted to Turkish language was evaluated using AF and DF (Table 2, Table 3). The validity in exploratory factor analysis was examined by the correlation between all items.

The sampling adequacy and Bartlett tests were performed in the study. The Kaiser-Meyer-Olkin study (KMO) sampling adequacy coefficient was found to be 0.815, and X2 value in Bartlett sphericity test was found to be 711.442 (p <0.001). The original questionnaire tested for its validity and reliability has three domains. Therefore, results of rotation factor analysis using the principle component analysis in AFA was limited to three factors. This has yielded a questionnaire with 10 items and three domains. The analysis revealed that factor item content was different than factor item content in the original questionnaire. Total variance of the questionnaire in exploratory factor analysis was 65.94%, where variances of the subscales were 55.93% for mental state, 12.75% for functional state, and 9.13% for symptoms. According to the analysis results, the factor loading was 0.623-0.903 (item 2,

item 7-9) for functional state dimension, 0.638-0.962 (item 1, item 3, item 4, item 10) for mental state dimension, and 0.594-0.848 (item 5-6) for symptom dimension (Table 2).

Table 2. Factor analysis of Clinical COPD Questionnaire

	Functional state	Factors Mental State	Semptoms
On average, during the past week, how often did you feel:			
1. Short of breath at rest?		.735	
2. Short of breath doing physical activities?	.903		
3. Concerned and about getting a cold or your breathing getting worse?		.804	
4. Depressed (Down) because of your breathing problem?		.962	
In general, during the past week, how much of the time:			
5. Did you cough?			.594
6. Did you produce phlegm?			.848
On average, during the past, how limited were you in these activities because of your breathing problem:			
7. Strenuous physical activities (such as climbing stairs, hurrying, doing sports)?	.761		
8. Moderate physical activities (such as walking, housework, carrying things)?	.926		
9. Daily activites at home (such as dressing, washing yourself)?	.623		
10. Social activities (such as talking, being with children, visiting friends/relatives)?		.638	

3.2.1.2. Confirmatory factor analysis

Confirmatory factor analysis was performed for Clinical COPD questionnaire. Goodness of fit indices relevant to the confirmatory factor analysis were as follows: $\chi^2=132.29$, sd=32, RMSEA=0.177, RMR=0.80, GFI=0.80, AGFI=0.65, CFI=0.85 and IFI=0.86.

3.3. Reliability analysis

3.3.1. Timeliness invariance and internal consistency

The Cronbach's alpha coefficient for internal consistency of the questionnaire and test-retest reliability were assessed using Pearson's correlation coefficients (Table 4). The Cronbach's alpha coefficient of total scores of the questionnaire was 0.903 and Intraclass Correlation Coefficient (ICC) was found to be 0.80. This value indicates that the survey is reliable. The Cronbach's alpha values and ICCs of the subdimensions of the questionnaire were 0.878 and 0.734 for functional state, 0.867 and 0.846 for mental state, and 0.827 and 0.828 for the symptoms. These values indicate that Turkish version of the questionnaire is a highly valid tool.

The test-retest reliability of the questionnaire was evaluated one week after the first administration of the questionnaire. The mean test-retest total scores of the questionnaire were 1.83±0.81 and 1.82±0.72, and correlation coefficient was 0.935 (p<0.01). There was a significant correlation between overall mean score and mean scores in the subdimensions.

Table 3. Test-retest reliability and clinical correlation efficacy of the Clinical COPD Questionnaire

	Test* Mean+SD	Retest** Mean+SD	Chronbach's alpha coefficient (Test; Retest)	ICC	Chronbach's alpha in the original version
Functional state	2.44+0.92	2.39+0.87	0.878;0.872	0.734	0.89
Mental state	0.93+0.77	0.94+0.68	0.867;0.828	0.846	0.80
Semptoms	2.41+1.34	2.43+1.17	0.827;0.825	0.828	0.78
Total	1.83+0.81	1.82+0.72	0.903;0.894	0.800	0.91

*Test, First questionnaire completion attempt **Second questionnaire completion after 1 week

3.3.2. Inter-item analysis and item total score correlation coefficient

Inter-item analysis and item-total score correlation coefficient ranged between 0.612 and 0.752 (Table 4). Inter-item correlation coefficients of the questionnaire were calculated ($p < 0.05$) (Table 5).

Table 4. Item analysis / item-total score correlation coefficient

Questions	item-total score correlation	Cronbach alpha value when item is deleted
On average, during the past week, how often did you feel:		
1. Short of breath at rest?	.612	.897
2. Short of breath doing physical activities?	.650	.894
3. Concerned and about getting a cold or your breathing getting worse?	.712	.892
4. Depressed (Down) because of your breathing problem?	.663	.893
In general, during the past week, how much of the time:		
5. Did you cough?	.700	.892
6. Did you produce phlegm?	.621	.898
On average, during the past, how limited were you in these activities because of your breathing problem:		
7. Strenuous physical activities (such as climbing stairs, hurrying, doing sports)?	.752	.887
8. Moderate physical activities (such as walking, housework, carrying things)?	.614	.896
9. Daily activites at home (such as dressing, washing yourself)?	.717	.891
10. Social activities (such as talking, being with children, visiting friends/relatives)?	.712	.890

Table 5. Inter-item analysis correlation coefficient

Questions	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q10
Q 1	1	.542	.481	.596	.448	.273	.430	.423	.432	.600
Q 2		1	.422	.409	.405	.292	.813	.667	.580	.387
Q 3			1	.799	.565	.508	.525	.288	.559	.652
Q 4				1	.628	.404	.463	.231	.421	.625
Q 5					1	.705	.561	.382	.437	.501
Q 6						1	.470	.471	.499	.525
Q 7							1	.602	.617	.483
Q 8								1	.626	.449
Q 9									1	.684
Q 10										1

4. Discussion

The aim of this study was to evaluate validity and reliability of the Turkish version of Clinical COPD Questionnaire developed by van der Molen et al. (2003) to evaluate respiratory symptoms, restrictions in physical activity and emotional problems experienced by the patients with COPD in the last one week, and introduce this questionnaire into the practice. AFA and DFA were performed while adapting the questionnaire to the Turkish language.

Exploratory factor analysis reveals the concordance between the variables (Uyumaz, Mor-Dirlik & Cokluk, 2016). The KMO and Bartlett sphericity tests were used to evaluate the fitness of study sample. KMO must be higher than 0.60 and p must be less than 0.05 in the Bartlett test to analyze the data to be adequate in the factor analysis (Sipahi, Yurtkoru & Cinko, 2006). KMO sampling adequacy coefficient was found to be 0.815, and X2 value in the Bartlett sphericity test was found to be 711.442 (p <0.001). According to these results, evaluated data were found to be adequate for factor analysis. As original questionnaire developed by van der Molen et al. comprised of three subdimensions, number of subdimensions in the present study was limited to three. The questionnaire was composed of 10 items and three subdimensions. The analysis revealed that the number of items in the subdimenisons was different from the number of items in the subdimensions of the original form. Total variance of the questionnaire in exploratory factor analysis was 65.94%, where variances of the subscales were 55.93% for mental state, 12.75% for functional state, and 9.13% for symptoms.

Confirmatory factor analysis (DFA) evaluates the questionnaire or scale being tested considering previously established theories and hypotheses developed based on the studies (Uyumaz et al., 2016). It is commonly used in quantitative and experimental studies to evaluate the adequacy of multi-item scales comprised of multiple subdimensions (Levine, 2016). Chi-square, RMSEA, SMRS, GFI, AGFI, and CFI are commonly used DFA methods. The values in RMSEA, SMRS, GFI, AGFI and CFI range from 0 to 1. $\chi 2/sd$ ratio being less than 5 in confirmatory factor analysis, GFI, AGFI and CFI values being higher than 0.90, and RMSEA and SMRS values being less than 0.08 are lower limits for the acceptance of model data fit (Capik, 2014). Considering the results of this study, data from this questionnaire must be used with cautious based on the mentioned assessment criteria. However, factor loading of all items in the questionnaire being above 0.04 suggests that the Turkish version of the questionnaire is applicable.

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In this study, the Cronbach's alpha coefficient of overall score in this questionnaire was found to be 0.903 and ICC was 0.80. The Cronbach's alpha values of the subscale of the questionnaire were 0.878 for functional state, 0.867 for mental state, and 0.827 for the symptoms. The Cronbach's alpha coefficient for the total score in the original version of the questionnaire was 0.91. These values in the subdimensions of functional state, mental state, and symptoms were 0.89, 0.80 and 0.78, respectively (van der Molen et al., 2003). The Cronbach's alpha coefficient is frequently used in reliability studies and ranges from 0 and 1 points. A negative result indicates that the scale does not measure similar characteristics. Low Cronbach's alpha coefficient shows that the test is not homogeneous and measures combined effect of several parameters at the same time. The Cronbach's alpha coefficient is evaluated as follows; $0.00 \leq \alpha < 0.40$ unreliable, $0.40 \leq \alpha < 0.60$ low reliability $0.60 \leq \alpha < 0.80$ fairly reliable, $0.80 \leq \alpha < 1.00$ highly reliable (Kılıç, 2016). According to this coefficient, it can be suggested that Turkish version of the Clinical COPD questionnaire is reliable.

Test-retest reliability coefficient and item-total correlation values are also used to evaluate the reliability of the questionnaires. Test-retest shows variability between the first test and the last test (Hayran & Hayran, 2011). In this study, re-test was performed in errors one week after the first test and the results of test-pretest assessment showed that the test was highly reliable. This result indicates that the Turkish version of the questionnaire is valid and reliable.

5. Conclusion

In conclusion, the Turkish version of the Clinical COPD Questionnaire developed to assess functional state, symptoms, and emotional state of individuals with COPD and adapted to many languages is composed of three subdimensions. Analysis of the results shows that the Turkish version of the Clinical COPD questionnaire is an applicable tool. The present study recommends practical use of questionnaire that is easy to administer with short and clear expressions.

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