Asthma Control Test and Asthma Quality of Life Questionnaire Association in Adults

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ABSTRACT

Asthma control and quality of life are expected to be correlated. We aimed to evaluate the association of asthma control test (ACT) with asthma quality of life questionnaire (AQLQ) and guideline based control assessment. We also aimed to investigate the impact of therapy adjustment according to ACT score on AQLQ

A total of 101 asthmatic patients were included. ACT, AQLQ and Global Initiative for Asthma (GINA) based control assessments were performed. Based on ACT, treatment was adjusted by stepping down in controlled and stepping up in uncontrolled/partly controlled patients. In some controlled/partly controlled patients, no therapy adjustment was done. After 3-months the same parameters were reevaluated.

We found a statistically significant association between ACT and AQLQ, a one point increase in ACT was associated with a 0.129 point increase in AQLQ. ACT scores increased significantly in the step-up group; however AQLQ total scores were not affected after therapy adjustment. We found that ACT was concordant with GINA recommended control classification in the first (kappa=0.511, 7.718) and third months (kappa=0.599, 7.912) (*P*<0.001 for both).

We determined an association between ACT and AQLQ. ACT was also found fairly concordant with GINA. However, treatment adjustment according to ACT was not found satisfactory in terms of quality of life.

Keywords: Asthma; Quality of life; Questionnaires

INTRODUCTION

Asthma is a chronic inflammatory airway disease which affects 300 million individuals throughout the world. Guidelines for the management of asthma issued by the Global Initiative for Asthma (GINA) have focused primarily on optimum disease control. The absence or minimization of chronic symptoms and exacerbations; minimal or no requirement for relievers; no limitation of daily activities; near-normal lung functions are the control assessment parameters of asthma defined by GINA guidelines.[1] However, it is recommended to evaluate all aspects of asthma control

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using multidimensional indexes such as quality of life and inflammatory biomarkers beyond symptoms and functional parameters in order to cover total disease control.[2]

It is difficult, expensive and time consuming to investigate all parameters of asthma control in clinical practice. A feasible and simple method is needed. Asthma Control Test (ACT) has been developed to assess asthma control levels and may serve this aim. ACT (a trademark of QualityMetric (Lincoln, RI)) is a questionnaire with 5 items that represent the multidimensional perspective of asthma control in terms of activity limitation, shortness of breath, night symptoms, and use of rescue medication and self-perception of asthma control.[3]

Health-related quality of life (HRQL) can determine patients' perceptions of physical limitation and mental impairment related with their disease.[4] The Asthma Quality of Life Questionnaire (AQLQ) is a disease-specific, self-administered quality-of-life tool. It has been developed by Juniper and designed to be used in clinical trials.[5] A few studies report weak associations between conventional clinical indices and the outcomes of the AQLQ[6,7] while others have found that achieving asthma control is associated with significant improvements in AQLQ score.[8-10]

In our study, we aimed to evaluate the association of ACT with AQLQ as well as guideline based control assessment. We also evaluated the impact of providing asthma therapy based on ACT score on AQLQ levels.

MATERIALS AND METHODS

Between 2008 and 2009 a total of 101 (consecutive) stable asthmatic patients with ages between 18 and 55 years admitted to our respiratory outpatient department were included in the study. They had clinically documented asthma and reversible airflow limitation was demonstrated with an improvement equal to or greater than 15% and 200 ml of forced expiratory volume in 1 second (FEV1) after inhalation of 200 µg of salbutamol or with a positive methacholine test. Patients with a stable disease on medication and aged 18 to 55 years were included. Patients with other forms of airway obstruction or known acute or chronic comorbidities interfering with physical and psychological performance were excluded.

Measurements

Asthma Control Test

Asthma control test is a self administered 5 item questionnaire developed for assessing asthma control level. It evaluates the most recent 4 week time period; each item is scored between 1 and 5, with the total score ranging from 5 to 25. An ACT score of 25 indicates that asthma is "controlled," whereas a score between 20 and 24 shows partially controlled asthma and a score of <20 indicates "uncontrolled" asthma.[3] Thus, asthmatic patients were classified as follows: patients with a score of 25 as totally controlled; those with a score between 20-24 as partially controlled and those with a score of ≤19 as uncontrolled asthmatics. Then, the totally controlled and partially controlled patients were re-grouped as controlled patients (ACT>19) and others were included in the uncontrolled group. The Turkish version of ACT was used in this study.[11,12]

Asthma Quality of Life Questionnaire (AQLQ)

The Juniper AQLQ is a disease specific quality of life questionnaire comprising 32 items in four health domains: *activity limitation* (11 items), *symptoms* (12 items), *emotional function* (5 items) and *environmental stimuli* (4 items). This instrument measures quality of life over the two weeks prior to the interview. Each item within the AQLQ is equally weighted. The patients select from an ordinal scale of 7 point,-Likert type answer for every item. The domain scores are computed as the means of domain-specific items and global AQLQ score is computed as the mean of the domain scores. The score of each domain and the global score range from 1 to 7, corresponding to no impairment and maximum impairment, respectively, in quality of life. The minimum clinically important difference for AQLQ has been reported as 0.52.[13] The original English version of the AQLQ has already been adapted to Turkish by four independent Turkish bilingual senior translators (CS, SE, EE, HF). Translation has been made in collaboration with MAPI Research Institute. In this study, this Turkish version of AQLQ has been used.

GINA Classification of Asthma Ccontrol

Asthma control has been defined as; no or ≤2 daytime symptoms/week, no activity limitations, no nocturnal symptoms, no or ≤2 reliever need/week, normal lung functions and no exacerbations. Partly

control has been defined when any of the following was present in any week; >2 daytime symptoms/week, activity limitations, nocturnal symptoms, >2 reliever need/week, PEF or FEV1<80% predicted and one or more exacerbations/year. Uncontrolled has been defined as; presence of 3 or more features of partly controlled asthma in any week.[1]

Pulmonary Function Tests (PFTs)

PFTs were performed using Jaeger Master Screen Pneumo V452İ device by a single technician. The best test among three consecutive tests was accepted. FEV_1, FVC, FEV_1/FVC were measured according to ATS criteria.[14]

All questionnaire data were collected by authors during face-to-face interviews. The method of filling out the questionnaire was explained and patients provided written informed consent. The study was approved by the institutional human-research review board.

Study Design

Measures were collected in this cohort at a baseline and 3-month follow-up visit. Based on ACT control status, treatment was adjusted where necessary at baseline by stepping down (reducing the number or dose of medication they use) therapy in controlled patients (ACT=25), stepping up (increasing the number or dose of medication they use) therapy for uncontrolled (ACT<20) and partly controlled (ACT between 20-24) patients. In some controlled (ACT=25) and partly controlled patients (ACT between 20-24), no therapy adjustment was done.

Statistical Methods

Statistical analyses were performed with SPSS 15.0 (SPSS, Inc., Chicago, USA). Data were expressed as median with range, or mean with standard deviation according to the distribution of the parameters. We constructed a linear regression model to evaluate the association between ACT score and AQLQ domain and total scores, adjusting for age and sex. Mean AQLQ total scores of the study population in different ACT categories were compared with t test. Wilcoxon signed ranks test was used for evaluating ACT and AQLQ change according to treatment adjustment. Kappa measure of agreement was used to analyze the concordance of ACT and GINA control level (p>0.8 are considered almost perfect agreement).[15]

RESULTS

Demographic, clinical data and pulmonary functions of the patients at the baseline visit are shown in Table 1. Three patients had asthma attack, 2 of them were pregnant and 13 were lost in the follow-up. Therefore, there were only 83 patients in the control visit.

Mean AQLQ total scores were 5.31±1.05 for controlled patients, 5.01±0.68 for partially controlled and 4.03±0.35 for uncontrolled patients according to ACT (p<0.001). We found a statistically significant association between ACT and AQLQ (p<0.001). A one point increase in ACT was associated with a 0.129 point increase in AQLQ which represented minimum clinically important difference of 0.25 (Figure 1). We also determined a significant association between ACT and all AQLQ domain scores among which activity limitation had the highest score (p<0.001), at the baseline visit (Table 2).

Table 1. Demographic and functional parameters of the study population

Topics	Baseline visit (n=101)
Mean age±SD (year)	41.9 ± 11.4
Male, %	18
Median Disease duration (IQR) (year)	2 (1-4)
Smoking status, No(%)	
Current smoker	21 (21%)
Ex-smoker	9 (9%)
Nonsmoker	71 (70%)
Mean FEV1 (% predicted) ±SD	93.36 ± 13.88
Mean FEV1 (lt) ±SD	2.65 ± 0.63
Mean FEV1/FVC (%)±SD	78.09 ± 6.87
Comorbid diseases (present), No(%)	33 (33%)
Control level (GINA guidelines), No(%)	
Controlled	22 (22%)
Partly controlled	20 (20%)
Uncontrolled	59 (58%)
Median ACT score (IQR)	20 (16-23)
Mean AQLQ total score±SD	4.59 ± 0.94
Therapy Change, No(%)	
Step up	47 (47%)
Step down	4 (3%)
No change	50 (50%)

(IQR: Interquartile range, FEV1: Forced expiratory volume in 1 second, FVC: Forced vital capacity, GINA: Global Initiative for Asthma, ACT: Asthma Control test, AQLQ: Asthma Quality of Life Questionnaire)

Table 2. Linear regression models of ACT and AQLQ domains and total score at first month baseline visit.

Topics	Beta1	Standard Error	t	P value
AQLQ total score	0.129	0.016	7.860	<0.001
Activity limitation	0.179	0.020	8.824	<0.001
Symptoms	0.167	0.016	10.465	<0.001
Emotional function	0.076	0.029	2.650	0.009
Environmental stimuli	0.095	0.026	3.692	<0.001

Table 3. ACT and AQLQ values of the study population according to treatment adjustment at baseline and 3-month follow-up

Groups and Topics	Baseline visit (n=101)	3-month follow-up visit (n=83)	P value
Step up group	(n=40)	(n=40)	
ACT median, IQR	16 (14-17)	18 (15-21)	0.001
AQLQ mean ± SD	4.21 ± 0.92	4.18 ± 1.03	0.776
Step down group	(n=4)	(n=4)	
ACT median, IQR	25 (25-25)	22 (20.5-23.5)	0.066
AQLQ mean ± SD	4.92 ± 1.15	4.87 ± 0.67	0.902
No change group	(n=39)	(n=39)	
ACT median, IQR	22 (21-24)	22 (18-24)	0.158
AQLQ mean ± SD	4.96 ± 0.73	5.09 ± 0.71	0.221

(ACT: Asthma Control Test, AQLQ: Asthma Quality of Life Questionnaire, IQR: Interquartile range, SD: Standard deviation)
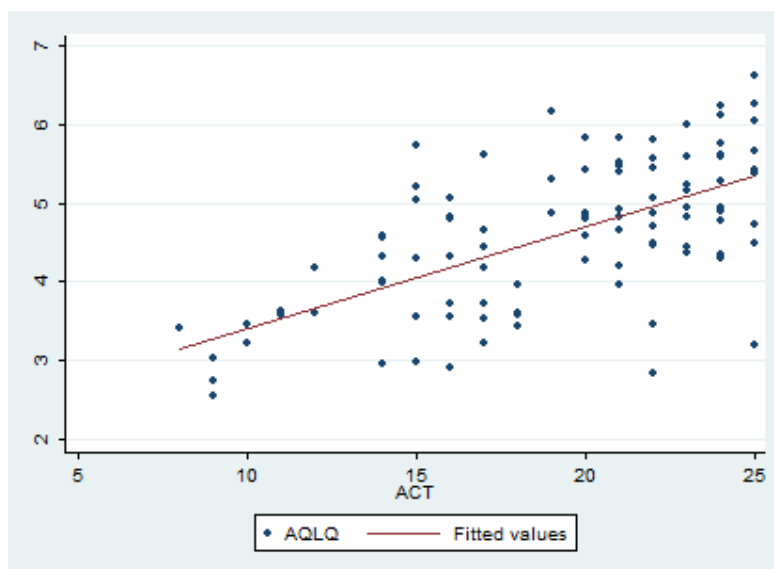
Figure 1. The linear regression graph of baseline ACT and AQLQ association. ACT: Asthma Control Test, AQLQ: Asthma Quality of Life Questionnaire.

Treatment adjustment resulted in an increase in ACT levels in the step up group ($p<0.001$); however, there was an insignificant slight decrease in ACT for the step down group. The AQLQ total scores were found not to be affected by therapy adjustment (Table 3).

ACT was shown to be concordant with GINA recommended asthma control classification in the first (kappa=0.511) and third months (7.912) ($p<0.001$ for both).

DISCUSSION

The main finding of this study is the association of asthma control assessed by ACT and AQLQ. Asthma control has been defined as the removal or reduction of the asthma manifestations by treatment. Both, current clinical state and future risk of loss of asthma control are involved in asthma control concept and achieving an optimum quality of life is the target.[16] The four major characteristics of asthma (symptoms, airway obstruction, airway hyper responsiveness and airway inflammation) have been reported to be weekly correlated with each other.[17-19] Therefore, none of these parameters are completely convenient for asthma control assessment and in the management of asthma they should be evaluated together.

The ACT is a relatively simple and easy to administer composite score. It has been validated against spirometry,[20] and quality of life.[21] Kwon showed that the ACT correlated significantly with the AQLQ and with each of the four specific domains (activity, emotions, symptoms, and environment) in Korean population.[22] They reported lower ACT scores in patients with lower AQLQ scores as well as the correlation of ACT and AQLQ changes in different visits. In our study, we also determined an association between the ACT and all domains and total score of AQLQ in Turkish population. This was also supported by the finding that the AQLQ total scores were different among different levels of asthma categories assessed by ACT.

Asthma-related quality of life is a measure of the patient's own assessment of their level of asthma. The AQLQ scores between total control and well-controlled patients classified by GINA were found different even in high levels of control.[10] Treatment adjustment for controlling asthma has been shown to improve the health-related quality of life. However, treatment response depends on the baseline status of the individuals mainly the phenotype, dose and duration of the applied treatment as well as the features of outcome measures.[16] In our study, we adjusted the treatment of the study population according to ACT control levels. In the step up subgroup, the treatment change resulted in significant increase in ACT (clinically significant) but not in AQLQ total scores. In step down group ACT and AQLQ total scores, were found to have a tendency to decreasealthough it is difficult to comment on this subgroup because there were only 4 patients. Since the minimum clinically important difference for AQLQ has been defined as 0.52, the observed changes in AQLQ total scores in all the subgroups were clinically insignificant. Therefore, our treatment adjustment according to asthma control levels did not affect the quality of life, although ACT increased slightly. This is a challenging result consistent with the current guidelines that recommend evaluating the asthma control by multiple outcomes, particularly according to phenotypes and tailoring the therapy for individual's state.

GINA guideline based control definition is determined by the patient's recent clinical status (symptoms, night waking, reliever use, exacerbations). Thomas M has compared asthma control measured by the ACT and the GINA criteria in a multicentric cross-sectional study among 2949 asthmatic patients attending primary care.[23] They have shown that an ACT score ≥ 20 predicted GINA-defined controlled asthma 51% of the time, while a score of <19 predicted partly controlled or uncontrolled asthma 94% of the time, with a kappa statistic of 0.42, representing a moderate agreement. They concluded that an ACT score <19 was useful for identifying patients with poorly controlled asthma as defined by GINA. In our study, we did not determine a cut off point, however we looked for the concordance of ACT and GINA classifications of asthma control and we found a relatively high agreement between them both in the first and third months (kappa=0.599 and 0.511, respectively) which also might represent the reproducibility of these two measures.

There were some limitations in our study. Since, "gold standard" for asthma control has not been defined comparisons of composite scores are somewhat difficult. Another limitation of this study is the small

number of the participants which may have an influence on the relation of ACT and AQLQ.

We determined an association between ACT and AQLQ in our study. Furthermore, ACT was found fairly concordant with GINA guidelines. However, treatment adjustment according to ACT was not satisfactory in terms of quality of life. Therefore, we suggest that although ACT is a feasible tool for control assessment in asthma, it is not completely adequate for management of asthma.

ACKNOWLEDGEMENT

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