



Predictive Value of the TRACK Questionnaire as a Measure of Asthma Control in Preschool Aged Children

Ozge Yilmaz,^{1*} Ahmet Turkeli,¹ Sebnem Sahin,² Hasan Yuksel¹

¹Celal Bayar Univ Medical Faculty, Department of Pediatric Allergy and Pulmonology, Manisa, Turkey

²Celal Bayar Univ Medical Faculty, Department of Pediatrics, Manisa, Turkey

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Assessment of asthma control in preschool children is important for therapeutic decisions. Aim of this study was to evaluate the predictive value of TRACK questionnaire scores for subsequent clinical parameters and to investigate the validity and reliability of the Turkish version of the TRACK questionnaire. We enrolled 100 children with asthma aged 4 years or younger in this cohort study. We recorded sociodemographic characteristics and clinical severity parameters. A pediatric allergist filled in the asthma severity scale and the caregiver of the child filled in the TRACK questionnaire. We called in the children again at the end of one month and recorded the same parameters and administered TRACK again. Uncontrolled asthma was defined as a TRACK score below 80. According to the TRACK score, 65% of the children had controlled asthma initially while at the end of the study 64.1% had controlled asthma. At the beginning of the study, all clinical parameters were worse in children with uncontrolled asthma according to TRACK score. Similarly, other objective clinical parameters during the following one month period were worse in children with initial uncontrolled asthma. Cronbach's alpha score for the TRACK questionnaire was 0.84. Turkish TRACK questionnaire is a valid and reliable tool that is predictive of short term asthma prognosis.

Key Words: Asthma; preschool; questionnaire

INTRODUCTION

Main goal of asthma treatment in children is to achieve and maintain disease control in all aspects of the clinical spectrum including symptoms, activity limitations, use of rescue bronchodilators and lung function.¹ Adequate therapeutic plan which depends on correct assessment of control in children is vital to decrease morbidity and to inhibit remodeling at this period of life.²

The only asthma control measure validated into Turkish was the Asthma Control Test for children (C-ACT) which is suitable for use in children aged 4 years and above.^{3,4} However, there was no questionnaire for evaluation of asthma control in Turkish children younger than 4 years. Test for Respiratory and Asthma Control in Kids (TRACK) has been developed to evaluate asthma control specifically in preschool children.⁵ It has been shown to carry the characteristics of an ideal outcome measure and it is reliable.⁶

We therefore translated the TRACK questionnaire into Turkish and set out to conduct a study to evaluate the short term predictive value of TRACK questionnaire scores for objective clinical

parameters such as exacerbations, symptom severity and bronchodilator requirement and to investigate the validity and reliability of the Turkish version of the TRACK questionnaire

MATERIALS AND METHODS

Study population

We enrolled all children with asthma aged 4 years or younger who presented to the Department of Pediatric Allergy and Pulmonology clinic between September and December 2010 for routine care or for exacerbation of asthma. Diagnosis of asthma was based on clinical characteristics of cough and wheezing that varies over time and that is reversible with bronchodilator administration, at least 3 documented episodes of wheezing as suggested by GINA guidelines.¹

Correspondence to: Ozge Yilmaz, MD, Celal Bayar University, Medical Faculty Department of Pediatric Allergy and Pulmonology, Manisa, Turkey. Tel: +90-5333690131; Fax: +90-2324899623; E-mail: oyilmaz_76@hotmail.com
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• There are no financial or other issues that might lead to conflict of interest.

Study design

This was a cohort study and it was approved by the Ethical Board of Celal Bayar University. Written informed consent was obtained from parents of all study subjects.

Data collection

Data collection for each subject started with their first presentation to the department during the study period. We recorded sociodemographic characteristics of the children including age, gender, education and sociodemographic characteristics of the mother and father such as education and occupation. In an attempt to evaluate the clinical severity of wheezing and asthma during the previous one month period, we questioned and recorded total number of days of bronchodilator requirement, days of emergency visits, days of acute symptoms (exacerbations) and days of hospitalization from the caregiver. Moreover, a pediatric allergist filled in the asthma severity scale.⁷ Lastly, caregiver of the child filled in the TRACK questionnaire. We called in the children again at the end of one month and recorded the same parameters again and administered TRACK to the caregiver again.

Test For Respiratory and Asthma Control In Kids

Test for Respiratory and Asthma Control in Kids is a 5 item questionnaire that assesses asthma control during the previous 4 week period.⁵ The parents are asked to answer each question by marking one of the 5 choices. Choices are scored from 0 to 20 in increments of 5. Sum of the scores of all items make up the total TRACK score which ranges from 0 to 100 and scores below 80 are considered as poor asthma control.

Turkish translation of TRACK questionnaire

Initially two translators who are native Turkish speakers and fluent in English translated the TRACK questionnaire into Turkish. Then, they formed one consensus Turkish translation. Another translator back-translated this consensus Turkish questionnaire into English. A pediatric allergist compared the back translation with the original TRACK questionnaire. Finally, we conducted cognitive debriefing with ten parents and discussed if the questions and choices were comprehensible.

Statistical analysis

The reliability of the TRACK questionnaire was analyzed by calculating the Cronbach alpha coefficient. We analyzed construct validity by comparing asthma severity score and bronchodilator requirement in the previous month among children with controlled and uncontrolled asthma according to initial TRACK score, and by comparing the frequency of: any emergency department visit because of respiratory problems, any hospitalization for asthma, and 2 or more asthma exacerbation during the previous month among children with controlled and uncontrolled asthma. We used Mann Whitney U test for

the former comparisons and Pearson chi-square tests for the latter.

Similarly we assessed the predictive value of the TRACK questionnaire by comparing the same outcomes as measured during follow-up against baseline level of asthma control (controlled vs. uncontrolled).

Finally, we assessed responsiveness of the instrument by comparing the change in TRACK score in children with stable or improved clinical status and in children with worsening clinical status using Mann Whitney U test. Worsening clinical status was defined as a need for hospitalization, emergency department visit or more than one exacerbation.

We performed statistical analysis of the study data by SPSS 15.0 statistical package. Statistical significance was defined as $P < 0.05$ and all p-values were 2-tailed.

RESULTS

Sociodemographic characteristics

Total of 100 children (64 male, 36 female) were enrolled in the study and 92 also completed the one-month follow-up visit. Median (SE) age at asthma onset was 6.0 (0.7) months. Among the mothers of the children enrolled in the study, 66% had primary school education or below, while 24% were high school graduate and 10% were university graduate. Additionally, 86% of the mothers were not working, mostly housewives. Among the fathers, 66% had primary school education or below, 27% were high school graduates and 7% were university graduate. Most of the fathers (65%) were blue collar workers while 27% had their own business or were white collar worker.

Asthma characteristics

Median (SE) asthma scores at the beginning and end of the study were both 1.0 (0.1). Median (SE) days of bronchodilator requirement during the previous month at the beginning and end of the study was 0.0 (0.2) and 0.0 (0.4) days respectively. At the beginning of the study 23% of all the study population had presented to the emergency department because of respiratory problems and 8% had been hospitalized while at the end of the study 28.3% had presented to the emergency and 12% had been hospitalized. At the beginning of the study 18% of the parents while at the end of the study 28% of the parents reported that their child had more than one asthma exacerbation. According to the TRACK score, 65% of the children had controlled asthma initially while at the end of the study 64.1% of children had controlled asthma (Table 1).

Validity and reliability of the TRACK questionnaire and relation with objective asthma control parameters

At the beginning of the study, asthma symptom score and days of bronchodilator requirement during the previous one month period was significantly higher in children with uncon-

Table 1. Clinical parameters during the previous one month period among children with controlled and uncontrolled asthma at the beginning of study*

	Controlled asthma (n=65)	Uncontrolled asthma (n=35)	<i>P</i> [§]
Previous one month period			
Asthma severity score ^{†,‡}	1.0 (1.0-1.0)	2.0 (1.0-3.0)	0.002
Days of bronchodilator use [†]	0.0 (0.0-0.0)	3.0 (0.0-5.0)	<0.001
Emergency visit (%)	1.5	62.9	<0.001
Hospitalization (%)	0	22.9	<0.001
>1 Exacerbation (%)	0	51.4	<0.001
Follow up one month period			
Asthma severity score ^{†,‡}	1.0 (1.0-1.0)	1.0 (1.0-1.0)	0.39
Days of bronchodilator use [†]	0.0 (0.0-0.0)	5.0 (0.0-7.5)	<0.001
Emergency visit (%)	16.7	50	<0.001
Hospitalization (%)	1.7	31.3	<0.001
>1 Exacerbation (%)	11.7	43.8	<0.001

*Asthma control is defined as a TRACK score of 80 and above.

[†]Expressed as Median(Interquartile range).

[‡]Asthma severity score ranges from 1(good) to 12 (bad).

[§]We used Mann Whitney test for continuous variables and Pearson's chi square test for categorical variables.

trolled asthma according to TRACK score ($P=0.02$ and $P<0.001$ respectively). Similarly, emergency department visit frequency, having more than one exacerbation and frequency of hospitalization during the previous one month period were significantly higher in children with uncontrolled asthma ($P<0.001$ for all) (Table 1).

We found that the change in TRACK score was sensitive to clinical change during follow up ($P<0.001$) (Figure). Cronbach's alpha score for the TRACK questionnaire was successful with a value of 0.84.

Predictive value of TRACK score for asthma severity

Asthma severity score during the follow up one month period was higher in children with uncontrolled asthma compared to the ones with controlled asthma initially ($P<0.001$). Similarly, days of bronchodilator use during the follow up one month period was significantly higher in children with uncontrolled asthma at the beginning of the study ($P=0.001$). We also found that frequency of emergency department visit, hospitalization and having an asthma exacerbation during the follow up one month was significantly more common in children with uncontrolled asthma at the beginning of the study with a relative risk of 5.9, 16, and 5.9 respectively (Table 1).

DISCUSSION

The results of this study have demonstrated that TRACK score can predict asthma outcome in the following month and is sensitive to change in objective clinical asthma parameters. We have shown that Turkish TRACK questionnaire is a valid and reliable

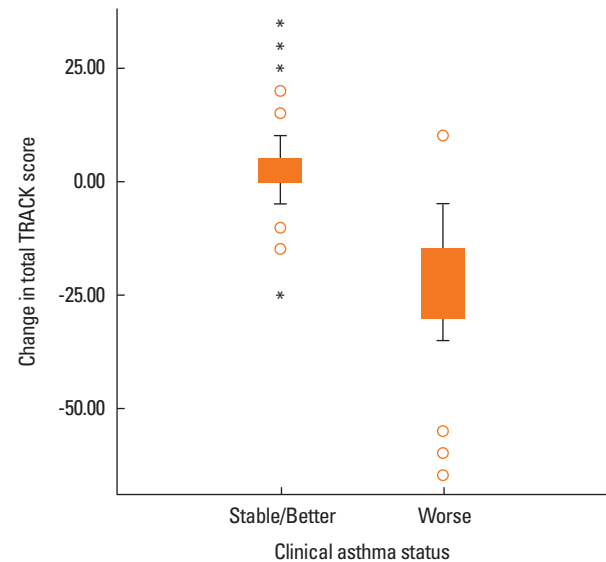


Figure. Sensitivity of the TRACK scores to change in clinical asthma status. *Mann Whitney U test.

tool that is associated with objective clinical parameters such as number of acute asthma exacerbations and need for emergency department visits.

New guidelines for asthma emphasize asthma control as the mainstay of treatment plan and patient follow up.^{1,8} Control may be defined as the degree of decrease in symptoms and functional impairment due to asthma and it includes another component described as the risk for future unwanted events such as exacerbations.⁹ Asthma control assessed by Asthma Control Questionnaire in adults is predictor of future exacerbations.¹⁰ Therefore, assessment of asthma control with valid and reliable tools may guide treatment as well as future predictions for clinical manifestations of asthma. However, this aspect is a cumbersome task for preschool children with asthma for whom parental report is required and lung function tests can not be performed on a regular basis. On the other hand, treatment of asthma in this age group is important because remodeling seems to initiate during this period. Therefore this period may be a vulnerable one to prevent development of chronic airway changes.^{11,12}

One of the most significant results of our study is the value of TRACK score in predicting objective clinical asthma features during the following 4 weeks. This finding may indicate that TRACK questionnaire, which is a short and easy to use scale, may be incorporated in clinical practice of pediatric asthma and guide in treatment plans. It had been demonstrated in adults with asthma that symptom scores evaluating previous 2 weeks period were predictive of future asthma exacerbations.¹³ Moreover, it was reported that asthma control assessment could predict asthma outcome in the following 3 month period and that evaluation of symptoms were as sensitive in prediction of future asthma events as lung function test evaluations.^{14,15}

However, none of the previous research had enrolled preschool children with asthma. Therefore, the results of our study are unique in demonstrating that TRACK questionnaire which is a parent reported control measure for asthma in preschool children, can predict asthma outcome and exacerbations in the following 4 week period.

The TRACK questionnaire developed in English by Murphy *et al.* had been shown to be a valid and reliable tool that reflects the changes in asthma control over a short follow up period in children younger 4 years old.^{6,16,17} One of the aims of our study was to evaluate the validity of the Turkish translation of this questionnaire. We demonstrated that asthma severity score, days of bronchodilator requirement were higher and having an emergency department visit, more than one asthma exacerbation and hospitalization was more common in children with uncontrolled asthma according to the TRACK score. Moreover, we have shown that TRACK score is sensitive to the changes in clinical status of asthma. These results demonstrate that Turkish TRACK questionnaire is a valid tool that measures asthma control in terms of objective clinical characteristics. Evaluation of validity by analyzing the association of TRACK scores with objective parameters is thought to be the appropriate method since the presence of correlation between many control questionnaire scores and objective clinical severity parameters have been demonstrated in different age groups.^{17,18} Moreover, in concordance with our results, previous studies had also shown that English version of TRACK was able to discriminate between children in different groups of respiratory status.¹⁷

Cronbach alpha analysis for the Turkish TRACK questionnaire revealed a value of 0.84 and demonstrated that it is a reliable measure. Internal consistency reliability analysis using Cronbach alpha was reported to be 0.75 and 0.71 for the original English TRACK questionnaire, therefore suggesting a successful internal consistency.¹⁷

The major limitation of our study was the lack of a longer duration of follow up. This would have provided information regarding the period of time TRACK questionnaire can predict asthma outcomes and would have allowed us to make suggestions about the ideal intervals to perform TRACK in preschool children with asthma.

In conclusion, TRACK is a questionnaire that may be used to predict short term future asthma outcomes in preschool children and may aid in planning asthma treatment. Moreover, Turkish translation of TRACK is a valid and reliable tool that can be used in clinical evaluation of this group of children.

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