

EMERGENCY DEPARTMENT

Beliefs about Medications in Asthmatic Children Presenting to Emergency Department and Their Parents

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Objective. The aim of our study was to assess the relationship of beliefs about medications questionnaire (BMQ) scores of asthmatic children presenting to the emergency department and their parents with asthma severity parameters. **Methods.** Eighty children with asthma presenting to the emergency department with acute asthma findings and their mothers were enrolled in the study. BMQ was applied to all parents and children older than 7 years of age. Asthma severity clinical score was recorded. **Results.** The mean age of children (39 males, 41 females) was 49.1 ± 42.8 months. Parent necessity and concerns scores were significantly correlated with their counterparts in children ($r = 0.74$ and $r = 0.60$, respectively). Difference between necessity and concerns scores was correlated between parents and children ($r = 0.60$, $p = .002$). Child's necessity score was significantly correlated with respiratory severity score ($r = -0.43$, $p = .036$). **Conclusion.** BMQ necessity and concerns scores of asthmatic children in the emergency department and their parents are correlated with asthma severity. Although not assessed in this study, this result may be attributed to the relationship of necessity and concerns with drug adherence. Therefore, increasing the knowledge about asthma medications in asthmatic children and their parents may contribute to asthma control and decrease their emergency visits with acute asthma findings.

Keywords asthma, beliefs about medications, concerns, necessity, emergency

INTRODUCTION

Despite the fact that current pediatric asthma guidelines emphasize the importance of planned and long-term inhaled treatment for asthma control in children, adherence to therapeutic regimens varies widely (1). Nonadherence to inhaled treatment in children with asthma is associated with increased rate of exacerbations and emergency department visits (2, 3). Patient's beliefs about treatment are a strong determinant of adherence, in particular how they judge the necessity of treatment for maintaining future health (necessity beliefs) relative to concerns about potential adverse effects (1, 4–10).

The Beliefs about Medications Questionnaire© (BMQ)¹ (11) can be used to quantify necessity beliefs and concerns, with proven validity across a range of illnesses, including asthma (8), and in different cultures and languages (11–14). The BMQ has also been used in studies of children and parents' beliefs about medicines in relation to adherence and general health outcome (15–17). Conn et al. (17) showed that parents' rating of their beliefs about necessity relative to their concerns about their child's treatment (necessity concerns differential scores) was related to adherence to asthma medication. Moreover, it has been demonstrated that parents' beliefs that can be modified are associated with asthma control and therapy adherence (18). However, the BMQ has not been assessed in asthmatic children presenting to emergency department with acute asthma findings and their parents.

The aim of our study was to assess the relationship of BMQ scores of asthmatic children presenting to the emergency department and their parents with asthma severity parameters and to examine the validity and reliability of the Turkish adaptation of the BMQ for asthmatic children and their parents.

METHODS

Study Design

This is a cross-sectional study.

Study Subjects

All children presenting to the emergency department with acute asthma findings and their mothers were enrolled in the study consecutively. Diagnosis of asthma was based on history of recurrent cough and wheezing with prolonged expiration time that demonstrated clinical reversibility with short-acting bronchodilator therapy (19). Acute asthma exacerbation findings included wheezing and prolonged expiration on physical examination.

Study Measurements

Sociodemographic characteristics and disease characteristics of children such as duration of asthma, asthma symptom score, and duration of follow up were recorded in the Pediatric Allergy Department. Requirement of inhaled bronchodilator and systemic steroid use, number of acute asthma exacerbations, and number of routine control and other visits to the outpatient department and hospitalizations during the previous 3 months were asked. Severity of

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exacerbation was evaluated with respiratory clinical severity score. BMQ was applied to all parents and to children aged above 7 years. Parents filled in the BMQ-asthma themselves while child questionnaires were filled in by one of the researchers during emergency department stay of the child. Parents were not present when the questionnaires were applied to the children.

The study was approved by Celal Bayar University Institutional Review Board and signed informed consents were obtained from the subjects or their parents.

BMQ and Translation to Turkish

The BMQ applied to the children was composed of 18 items including 11 statements about the beliefs about necessity of their inhaler medications and 7 statements about the concerns regarding them (Table 1).

The BMQ applied to the parents included statements such as "My child's health, at present, depends on this inhaler," "The fact that my child has to take this inhaler worries me," "My child's life would be impossible without this inhaler," "Without this inhaler my child would be very ill," "I sometimes worry about long-term effects of this inhaler," "This inhaler is a mystery to me," "My child's health in the future will depend on this inhaler," "This inhaler disrupts my child's life," "I sometimes worry about my child becoming too dependent on this inhaler," "This inhaler protects my child from becoming worse," "This inhaler does more harm than good," "Children who are receiving this inhaler should stop their treatment every now and again," "This inhaler is the most important part of my child's asthma treatment," "I have been given enough information about this inhaler," "I am concerned that this inhaler might become less effective if my child uses it regularly," "This inhaler is harmless to my child," "I can give my child as much of this inhaler as needed, without having to worry about my child becoming

too dependent on it," and "This inhaler gives my child unpleasant side effects."

Answers to both child and parent questionnaires were indicated as the degree of agreement with each statement on a 5-point Likert-type scale, ranging from strongly disagree to strongly agree. Responses were scored from 1 to 5 where 1 = strongly disagree and 5 = strongly agree, with some items being scored in the reverse order. The items in both child and parent versions were grouped into two domains as "concerns" and "necessity." Mean of the scores obtained for the individual items within each domain was calculated to give a scale score (range 1–5). Scores were interpreted as a continuous scale where higher scores indicated stronger beliefs in the concepts represented by the scale. To assess the balance between perceived benefit and costs associated with the prescribed medication, difference between necessity and concerns scores was calculated. Positive value for the difference indicated that the patients' beliefs about necessity outweighed their concerns (1).

Both parent and child BMQ-asthma questionnaires were translated to Turkish in a systematic way. First, the original questionnaires were translated to Turkish by two independent native Turkish speakers. Then a consensus translation was formed from these two independent translations. Following this step Turkish translation was back-translated into English and compared with the original questionnaires.

Patient-Reported Asthma Symptom Score

Asthma symptom score included five items reflecting chronic asthma symptoms such as dyspnea, tightness in chest, daytime wheeze, nocturnal wheeze, and daily performance. Scoring of the items increased from 0 to 3 as the severity increased. Total score was calculated by adding up the scores of all items (20).

Respiratory Clinical Severity Score

Clinical severity score included respiratory rate, retractions, dyspnea, and auscultation findings as parameters. The total score ranged between 1 and 12 and higher scores indicated more severe findings. Respiratory rate and dyspnea classifications were different between different age groups (21).

Statistical Analysis

Statistical analyses were performed using SPSS 13.0 (SPSS, Chicago, IL, USA) computer program. Correlations between asthma severity parameters and BMQ scores were performed using Pearson's correlation analysis. Student's *t*-test was used to compare BMQ scores between girls and boys and between children younger and older than 7 years of age. Internal consistency and item-total score correlations were used for reliability analysis. Internal consistency was tested using Cronbach's alpha for every subscale of the instrument. The item score and total score relationships were explored by Pearson's correlation analysis for parental BMQ-asthma and by Spearman's analysis for child BMQ-asthma.

TABLE 1.—List of items of the BMQ questionnaire applied to the children.

Items about necessity	
My health, at present, depends on this inhaler	
My life would be impossible without this inhaler	
Without this inhaler I would be very ill	
My future health depends on this inhaler	
This inhaler protects me from becoming worse	
This inhaler is the most important part of my asthma treatment	
I have been given enough information about my preventer treatment	
Items about concerns	
Having to use this inhaler worries me	
Sometimes I worry about the long-term effects of this inhaler	
This inhaler is a mystery to me	
This inhaler disrupts my life	
I sometimes worry about becoming too dependent on this inhaler	
This inhaler does more harm than good	
People who are on preventer treatments should stop their treatment every now and again	
I am concerned that this inhaler might become less effective if I use it regularly	
This inhaler is harmless	
I can use as much of this inhaler as I need, without having to worry about becoming too dependent on it	
This inhaler gives me unpleasant side effects	

RESULTS

Sociodemographic Characteristics of the Study Population

Eighty children with asthma (39 male, 41 female) and their mothers were enrolled in the study. Of these children, 24 were aged above 7 years and answered the BMQ for children. The mean age of all the children enrolled was 49.1 ± 42.8 months. Mothers and fathers of most children enrolled in the study had graduated from primary school or less (83.8% and 73.8%, respectively) (Table 2).

Asthma Characteristics of the Study Population

Asthma findings had started at 17.4 ± 23.1 months of age. Mean duration of follow up was 15.4 ± 16.7 months. Mean asthma symptom score and number of asthma exacerbations during the previous 3 months were 5.5 ± 3.0 and 1.9 ± 1.4 , respectively. Mean requirements of bronchodilator and systemic steroid were 14.3 ± 15.0 and 2.6 ± 3.9 days during the previous 3 months. Mean days of hospitalization were 2.8 ± 5.8 . Numbers of presentations to the outpatient department were 2.4 ± 1.6 and 0.9 ± 1.3 for routine follow up and for acute symptoms, respectively. Moreover, number of presentations to the emergency department for acute asthma symptoms was 0.8 ± 1.1 (Table 3).

TABLE 2.—Sociodemographic characteristics of the children and parents enrolled in the study.

Characteristic	n (%)
Gender of the child	
Male	39 (48.8)
Female	41 (51.3)
Education of mother	
≤Primary school	67 (83.8)
High school	11 (13.8)
University	2 (2.4)
Education of father	
≤Primary school	59 (73.8)
High school	18 (22.5)
University	3 (3.7)

TABLE 3.—Disease characteristics of the children enrolled in the study.

Characteristics	Mean ± SD
Age at first asthma symptoms (months)	17.4 ± 23.1
Duration of follow up (months)	15.4 ± 16.7
Asthma symptom score ^a	5.5 ± 3.0
Number of asthma exacerbations ^b	1.9 ± 1.4
Use of bronchodilator ^c	14.3 ± 15.0
Use of systemic steroid ^c	2.6 ± 3.9
Hospitalization (days)	2.8 ± 5.8
Presentations to the outpatient clinic for routine follow up ^b	2.4 ± 1.6
Presentations to the outpatient clinic for acute asthma ^b	0.9 ± 1.3
Presentations to the emergency department for acute asthma symptoms ^b	0.8 ± 1.1

Notes: ^aAsthma symptom score ranges between 0 (good) and 15 (bad).

^bNumber during the previous 3 months.

^cDays of use during the previous 3 months.

TABLE 4.—Mean child and parent BMQ necessity and concerns scores.

BMQ score	Mean ± SD
Parental BMQ	
Necessity	2.2 ± 0.5
Concerns	3.3 ± 0.4
Child BMQ	
Necessity	2.2 ± 0.5
Concerns	3.6 ± 0.6

Note: Necessity and concerns scores range between 1 and 5, higher score meaning a stronger belief.

Beliefs about Medications Scores of Parents and Children

Parent necessity and concern scores were 2.2 ± 0.5 and 3.3 ± 0.4 , respectively. Means of the child's necessity and concern scores were 2.2 ± 0.5 and 3.6 ± 0.6 , respectively. Mean differences between necessity and concerns scores for parents and children were -1.14 ± 0.71 and -1.39 ± 0.86 , respectively (Table 4).

Child's gender did not significantly influence parental BMQ scores. Necessity scores were 2.2 ± 0.5 and 2.2 ± 0.5 for parents of boys and girls, respectively ($p = .935$). Concerns scores were 3.3 ± 0.4 and 3.4 ± 0.4 for parents of boys and girls, respectively ($p = .243$). Children's necessity and concerns scores did not change significantly with the gender of the child either ($p = 1.00$ and $p = .735$, respectively). Parent necessity and concerns scores did not differ significantly between children younger and older than 7 years of age ($p = .395$ and $p = .224$, respectively).

Correlation of Beliefs about Medications Scores and Asthma Severity Parameters

Parent necessity score was weakly correlated with the age of the child at which asthma findings had started ($r = 0.23$, $p = .042$). Similarly there was a weak but significant correlation between parent necessity score and asthma symptom score ($r = -0.22$, $p = .049$) (Figure 1). On the other hand, parent concerns or differential score was not significantly correlated with any of the asthma characteristics or severity parameters.

Child's necessity score was correlated with respiratory clinical severity and concerns score was significantly correlated with the number of bronchodilator requirement days ($r = -0.43$, $p = .036$ and $r = -0.53$, $p = .009$, respectively). Child's differential score between necessity and concerns was significantly correlated with the number of days of bronchodilator requirement ($r = 0.45$, $p = .028$).

Correlation of Beliefs about Medications Scores of Parents and Children

Parent necessity score was significantly correlated with the child's necessity score ($r = 0.74$, $p < 0.001$). Similarly parent concerns score was significantly correlated with the child's concerns score ($r = 0.53$, $p = .009$). The difference between necessity and concerns scores was significantly correlated between parents and children ($r = 0.60$, $p = .002$).

Reliability of the BMQ

Cronbach's alpha scores of parental necessity and concerns scores were 0.69 and 0.64, respectively. Similarly,

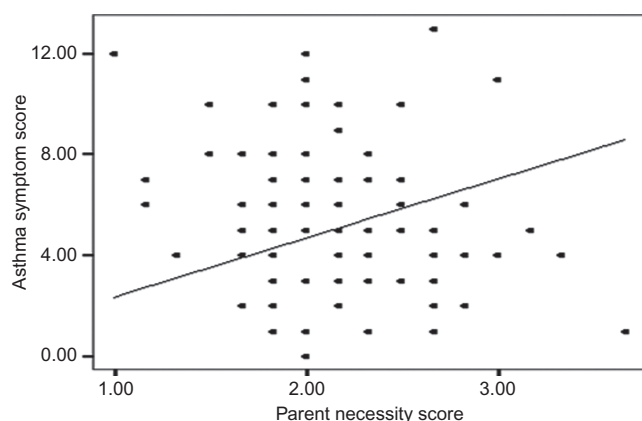


FIGURE 1.—Correlation of parent necessity score and asthma symptom score.

those of the child's necessity and concerns scores were 0.74 and 0.79, respectively.

Item-scale correlations for parent BMQ-asthma revealed that all items in necessity and concerns scales were significantly correlated with their corresponding scale. For parental necessity score, all items were correlated with the total score with a Pearson's coefficient of above 0.50 except for question "n5," which had a coefficient of 0.48. For the parental concerns score all items were correlated with the total score with a Pearson's coefficient of above 0.35 except for question "c11r," which had a coefficient of 0.26.

Similarly item-scale correlations for child BMQ-asthma revealed that all items in the necessity scale were significantly correlated with the total score with a Spearman's rho of above 0.44 for all. Similarly, all items of concerns scale were significantly correlated with the total score with Spearman's rho of above 0.55 except for "c2," "c3," and "c8r" items, which were not significantly correlated with Spearman's rho of 0.27, -0.18 , and 0.20, respectively.

DISCUSSION

The results of this study demonstrate that both parent and child BMQ necessity and concerns scores are correlated with some clinical characteristics in asthmatic children presenting to the emergency department with acute asthma findings. Parent necessity score was correlated with asthma symptom score reflecting the status of asthma control during the previous 3 months. Child's necessity score was significantly correlated with respiratory clinical severity score reflecting the severity of acute findings leading to the emergency department visit while concerns score was correlated with the number of bronchodilator requirement days during the previous 3 months. Child's differential score was correlated with the number of days of bronchodilator requirement. Moreover, parent and child BMQ scores were correlated with each other. Turkish versions of parent and child BMQ-asthma were found to be reliable.

Child and parent beliefs about necessity and concerns about the medication used is one of the strongest determinants of adherence to treatment and it influences general outcome (1, 15–17). Moreover, parental beliefs about disease itself influence clinical follow up (22). Necessity and concerns scores of BMQ have been shown to be correlated with medication adherence in a variety of chronic diseases (8, 11, 23, 24). Asthma-specific BMQ for children and for parents was used in this study to evaluate the beliefs about necessity and concerns about asthma medications in asthmatic children who presented to the emergency department with acute asthma findings and their parents.

Patients' beliefs about the medications prescribed for them can be classified into two main aspects including the necessity of the medication for maintaining their health and the concerns about potential side effects of the medication (1). Adherence to a specific medication is influenced by the balance between patients' beliefs about necessity and concerns (1, 16). Beliefs about the necessity of a prescribed medication and adherence to it were shown to be correlated in many different chronic diseases, and it is known that nonadherence to treatment in diseases like asthma leads to poor asthma control and frequent exacerbations (1, 10, 25, 26). Therefore, in this study asthmatic children presenting to the emergency department with acute asthma findings suggesting poor asthma control were enrolled.

Many sociodemographic and psychological characteristics of both parents and children influence the necessity and concern scores for asthma treatment (17, 27–29). It has been demonstrated that concerns score outweighed the necessity score in a higher percentage of the parents of children less than 7 years of age (17). However, in our study, neither parental nor child's BMQ scores were found to be correlated with the child's age. Moreover, comparison of parental necessity and concerns scores between parents of children aged below and above 7 years failed to reveal a significant difference. The difference between our and previous study results might be attributed to the relatively low number of children aged 7 years or above in our study. This limitation might have led us to underestimate the difference. However, surprisingly, parental education did not seem to have a significant influence on BMQ scores in a previous study (17). Similar to a previous study demonstrating the absence of influence of parental education on BMQ scores, neither maternal nor paternal education influenced BMQ scores in our study. However, it needs to be considered that the majority of parents enrolled in our study had graduated from primary school.

Additionally, in a previous study, concerns score outweighed the necessity score in a higher percentage of mothers who rated their child's last asthma exacerbation as severe demonstrating that parents who experience severe exacerbations according to their own opinion tend to lose their belief in treatment (17). Understanding perception of the disease and treatment by the patient may help the physician improve asthma control. The results of our study indicated that parent necessity score was significantly correlated with asthma symptoms score of the child.

This might be interpreted in both causal ways: either the maternal loss in beliefs about the necessity of medications leads to an increase in asthma symptoms or the increase in asthma symptom score leads to a decrease in maternal beliefs about the necessity of medications.

Lower necessity score was observed in asthmatic children with higher respiratory severity score. Children who have severe asthma exacerbation as indicated by a high respiratory severity score seem to have lower beliefs in necessity of their asthma medications. Similar to the above explanation for mothers, this result might be attributed to the more severe exacerbation leading to a loss in beliefs about necessity or the lower beliefs in necessity leading to a more severe exacerbation potentially due to nonadherence to therapy.

One surprising result of our study was the reverse correlation between the number of bronchodilator requirement and child's concerns score because a higher number of bronchodilator requirement indicates a worse asthma control with more frequent symptoms. We had expected more severe findings to lead to higher concerns score regarding chronic inhaled steroid treatments. However, our results demonstrated that as the number of days of bronchodilator requirement increased, concerns score of the child decreased.

A major limitation of the study was the lack of an objective tool to measure adherence to treatment. Another limitation is the cross-sectional design, which precluded us from detecting causal relationships.

CONCLUSIONS

The BMQ necessity and concerns scores of asthmatic children presenting to the emergency department and their parents are correlated with asthma severity. Although not assessed in this study, this result may be attributed to the relationship of necessity and concerns with drug adherence. Therefore, increasing the knowledge about indications and necessity of asthma medications in asthmatic children and their parents may contribute to asthma control and decrease emergency visits with acute asthma findings.

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DECLARATION OF INTEREST

The authors declare no conflict of interest relevant to the topics in this article.

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