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The factors of family management affecting asthma control status in school-age children with asthma in China

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Abstract

Objective: To identify the factors of family management affecting asthma control status in school-age children with asthma in China.

Method: The cross-sectional descriptive study was conducted among 139 children with asthma and their parents. The age range of the children was 7 to 14 years of age ($M_{age}=9.85$; 76.26% boys). Eight dimensions (Children Identity, View of Condition, Management Mindset, Parental Mutuality, Parenting Philosophy, Management Approach, Family Focus, Future Expectation) of the Family Management Scale for Children with Asthma (FMSCA) were used as factors of family management. The Asthma Control Test (ACT) and the Children Asthma Control Test (C-ACT) were used to measure the asthma control status of children. A parental questionnaire was used to collect information regarding demographic data of familial socioeconomic status, general data about the child, and medical services status (Follow-Up Plan, received manual of asthma education, attended a lecture on asthma) received from medical institutions. A

multivariate ordinal logistic regression model was performed.

Results: Factors significantly associated with asthma control were 'Follow-Up Plan' (OR, 2.004; 95% CI, 1.009-3.981), 'Attended a Lecture on asthma' (OR, 2.586; 95% CI, 1.103-6.066) and two dimensions of the FMSCA, 'Children Identity' (OR=1.133; 95% CI, 1.024-1.254) and 'Family Focus' (OR=1.114; 95% CI, 1.007-1.232).

Conclusion: This study shows that asthma control status of school-age children in China is related to the parents' views of their child as having a "normal condition" and the parents' satisfaction with the balance between asthma related management and other aspects of family life.

Keywords Asthma Control, Children, Family management, Ordinal logistic regression

Introduction

The most prevalent chronic inflammatory disorder of airways that may cause wheezing, coughing, and shortness of breath in childhood is asthma ^[1]. Roughly 14% of children experience asthma symptoms worldwide ^[2]. In 2010, a study found that 3.02% of children suffered from asthma in mainland China, and it had been increasing quickly since 1998 ^[3]. The Global Initiative for Asthma (GINA) demonstrates that asthma can be controlled greatly by effective management, although it cannot be cured ^[4]. According to the criteria of 'well-controlled' asthma defined by GINA, 53.5% of patients' asthma control status did not achieve the goal of 'well-controlled' in Europe in 2010 ^[5]. Moreover, 85.8% of patients' asthma was not well controlled in major cities of China in 2015 ^[6]. More attention should be paid to asthma control in children in China since the proportion of uncontrolled asthma in children in mainland China ranks first in the Asia-Pacific region ^[7]. Poorly controlled asthma may have numerous negative impacts on asthmatic children, such as, activity impairment, poor quality of life, missed school days, and even irreversible lung function impairment. Considering that, the control of childhood asthma is an important public health issue in China.

As of yet, asthma is incurable, and therefore asthma management focuses on asthma

control. Specifically, asthma management entails trigger identification and avoidance, symptom monitoring and response, and timely and appropriate use of medication ^[8]. Given that asthma management takes place within the family unit, the proper and active management of asthma in families is critical to asthma control. In recent years, researchers have documented many associations between family factors and the control of asthma in children ^[9,10]. For instance, a family atmosphere marked by conflict, lack of parental support, and a chaotic environment have been linked with worse physical health-related outcomes (such as heightened inflammation) among youth ^[11,12]. Researchers have long shown that socioeconomic conditions, parental perception of asthma management, family communication, cohesion, parental relationship, and problem-solving ability are associated with better childhood asthma outcomes (such as fewer asthma attacks and better quality of life, QOL) ^[13,14]. In addition, there is evidence which reports that children from families with more positive communication patterns during mealtimes have better asthma-related QOL compared with those from more conflicted families ^[15]. It has been demonstrated that there is an important contribution to asthma control in children who have high quality family atmosphere or harmonious family relationship. Conversely, long-term domestic violence increases the risk of asthma attacks in children, and it is tripled when compared to families where there is no violence ^[16].

The school-age years (approximately ages 7 through 14 years), represent a critical time period for children with asthma. School-age children spend an increasing amount of time away from their parents at school and in extracurricular activities, and naturally they are exposed to more triggers and stresses. In addition, school-age asthmatic children have strong behavioral plasticity, and the family atmosphere plays an important role in the occurrence and development of behavioral problems ^[17]. Typically, increased self-management ability in children are associated with the parental perception of childhood asthma management, family communication, family cohesion, parental relationship, and a parent's problem-solving ability, which then indirectly affects the asthma control status. Unfortunately, the asthma control status in school-age children is not ideal in China ^[18]. The reason is likely that there is a

problem in the family management of the disease. Therefore, exploring the factors of family management in school-age asthmatic children in China is vital to improving the asthma control status. Given that there were no tools to measure specific family management or the family influencing factors on asthma control before 2014, many studies used the Family Assessment Device or Family Management Measure to reflect the factors of family management^[19,20]. These, however, were not very accurate due to it being a nonspecific assessment tool for asthmatic children. To remedy this lack of tools, Xing Yana et al developed and validated a questionnaire based on the Family Management Style Framework (FMSF) in 2012^[21] -- namely the Family Management Scale for Children with Asthma (FMSCA) -- which provides an instrument which can be used in the Chinese context^[22]. FMSF specified three major components: definition of the situation, management behaviors, and perceived consequences, with a total of 8 dimensions (Children Identity, View of Condition, Management Mindset, Parental Mutuality, Parenting Philosophy, Management Approach, Family Focus, Future Expectation). The FMSCA also has 8 such dimensions derived from 57 specific items which can be used to measure the family management status of children with asthma. A higher the score for each dimension indicates better family management status. However, it was unclear which specific dimensions have more significant effects on asthma control status. In a sense, these 8 dimensions can be used as 8 factors of family management for asthmatic children. Therefore, it is feasible to use FMSCA to explore the factors of family management affecting asthma control status in school-age children, and to our knowledge, there is no research using FMSCA to explore such factors.

The asthma control status in school-age asthmatic children in China is lower than the criteria of well-controlled asthma defined by GINA. This implies that asthma prevention and control could be planned through effective family management^[23]. However, the factors of family management affecting asthma control status remain to be explored, and the FMSCA has not been previously applied to school-age children with asthma in China. This study aimed to use FMSCA to determine which of the

factors of family management effect the asthma control status in school-age children with asthma in China.

Methods

Date Sources, Date Collection, and Study Samples

The subjects in the research were 139 children with asthma, ages 7 to 14 years, and his/her caregiver who had volunteered to participate in this cross-sectional descriptive study. They were recruited as they were waiting to see a doctor in the outpatient department of four hospitals in northern China (Beijing Children's Hospital; Capital Institute of Pediatrics; Qilu Children's Hospital of Shandong University; and Gansu Provincial Maternity and Child-Care Hospital). Data was collected between December 2015 and September 2016. The inclusion criteria for a child participant included: being age 7 to 14 years at the time of enrollment, and having a parent-reported current diagnosis of asthma. Parent inclusion criteria included the ability to read and speak Chinese and being a co-residence with the child at least 50% of the time. Children were excluded if they were suffering from pneumonia, traumatic brain injury, obstructive sleep apnea, or an asthma exacerbation requiring oral corticosteroids within the prior 30 days. These exclusion criteria were selected as each could negatively affect performance on the executive function measures. Eligible participants were taken to a meeting room where a trained nurse guided the participants to sign an informed consent form and to complete two questionnaires regarding asthma control and family management. This study was approved by the Medical Ethics Committee of Beijing University of Chinese Medicine, China.

Measurements in the Survey

A survey questionnaire was administered separately to the children and their parents. Specifically, children answered the items measuring asthma control status, and parents answered items measuring the status of family management for childhood asthma.

Demographic Information of Survey Participants

The demographic questionnaire consisted of general information about the child and their family, including the child's age and gender, disease course, family income,

parental education, whether the child was the sole offspring (yes or no), whether there was a family history of asthma, whether there was a follow-up plan, whether they had received a manual of asthma education (yes or no), and whether they had attended a lecture on asthma (yes or no). There are also questions about annual family income and home environment (communication, conflict).

Asthma Control Status

The Asthma Control Test (ACT) ^[24] and the Children-Asthma Control Test (C-ACT) ^[25] taken in this study are designed for adults and adolescents 12 years or older and for children 4 to 11 years old respectively, to measure their asthma control status by asking the respondent to consider five items, namely, limitation of activity, shortness of breath, nocturnal symptoms, use of emergency drugs, and a self-evaluation of asthma control for the last four weeks. The ACT rates asthma control status by summing the answers to all 5 items (each on a 5-point scale). The C-ACT consists of two parts with a total of 7 items (each on a 5-point scale) to describe the asthma control status. For items 1 to 4, a researcher asks the child to answer, and items 5 to 7 are answered by their parent. For the C-ACT, a score of ≤ 19 points (for ACT, a score of < 20 points) indicates that the asthma status is uncontrolled, 20-22 points (for ACT, 20-24 points) indicates partially controlled, and a score of ≥ 23 points (for ACT, ≥ 25 points) indicates that the asthma is completely controlled. As a definition, we considered the asthma to be controlled if in the prior a month, the child did not have difficulty breathing, did not use emergency medicine, and they engaged in daily activities as normal children. In this study, 89 children with asthma took the C-ACT; 50 children with asthma took the ACT.

Family Management Factors

The Family Management Scale for Children with Asthma (FMSCA) is a 57-item questionnaire for parents, which was developed based on the Family Management Style Framework by the research team of Xing Yana ^[21,22]. The scale consists of 8 dimensions, namely, Children Identity, View of Condition, Management Mindset, Parental Mutuality, Parenting Philosophy, Management Approach, Family Focus, and Future Expectation. The FMSCA has excellent internal consistency (Cronbach's

$\alpha=0.918$), a very good split-half reliability ($r=0.802$, $p < 0.01$) and test-retest reliability ($r=0.857$, $p < 0.01$), indicating a satisfactory test reliability^[22]. The FMSCA can serve as a valid and reliable measure of family management level for Chinese children with asthma^[22]. The development, dimensions and items of the scale are shown at the website:

<https://www.tandfonline.com/doi/suppl/10.1080/02770903.2019.1571085?scroll=top>.

According to the definition provided by Knafl and Xing Yana^[21,22], Children Identity is 'Parental view of the child and the extent to which those views focus on the condition or normalcy and capabilities or vulnerabilities'. Generally speaking, Children Identity refers to how closely the parents think the life of their child compares to an imagined normal life without the illness. For example, "I think my child looks the same as other healthy children of the same age", and "Despite asthma, our child gets along well with their classmates". Parents who view their asthmatic child to be normal get a higher score on this dimension. The dimension, View of Condition, is defined as 'Parental beliefs about the cause, seriousness, predictability and course of the condition'. For example, "I know that asthma is a chronic inflammatory disease of the airway". Management Mindset is 'Parental views of the ease or difficulty of carrying out the treatment regimen and their ability to manage effectively'. For example, "I often feel exhausted taking care of my child's asthma". Parental Mutuality is 'Parental beliefs about the extent to which they have shared or discrepant views of the child, the illness, parenting philosophy, and their approach to condition management'. For example, "My partner and I share similar views on the severity of asthma in our children". Parenting Philosophy is 'Parent's goals, priorities, values, and beliefs that guide the overall approach and specific strategies for condition management'. For example, "Asthma management can help my child learn, work and live the same as normal people in future". Management Approach is 'Parent's assessment of the extent to which they and their child have developed a routine and related strategies for management of the condition and incorporated it into their everyday life'. For example, "I can identify the triggers for asthma attacks in my child". Family Focus is 'Parent's assessment of, and satisfaction with, how condition

management has been incorporated into family life'. For example, "My child's illness hinders our family relationship". Future Expectation is 'Parent's assessment of the implications of the condition for their child's and their family's future'. For example, "I have confidence in my child's asthma control and recovery". Each item in the questionnaire asked for a five-point response rating (from 'completely disagree' to 'completely agree'). A higher item score and a higher scale score indicate better family management ability to treat asthma. The present study used 8 dimensions from the FMSCA to explore the factors of family management affecting asthma control status in school-age children with asthma in China.

Statistical Analysis

Statistical analysis was performed using SAS software (version 9.3). 139 children with asthma were divided into three groups by the cutting their scores for the ACT or C-ACT, creating a group with uncontrolled asthma, a group with partially controlled asthma, and a group where the asthma was completely controlled. Preliminary analysis was conducted to determine whether there were any group differences on demographic variables (i.e., gender, sole offspring, disease course), and whether there were any differences on the 8 subscales of the FMSCA. First, a normality test was performed on the initial measurement data, then we conducted comparisons between groups. For data that passed these tests, we performed a Student's t-test or analysis of variance, and for data that didn't pass the normality test, we performed a Kruskal-Wallis H test. For enumeration data, a Cochran-Mantel-Haenszel X^2 test was performed. Finally, since the response variable 'asthma control status' is ordinal in nature (based on the score of the ACT and C-ACT), we constructed a multivariate ordinal logistic regression model to estimate the odds ratio (OR) to determine which factors were associated with the outcome. We introduced variables that caused differences between groups into a multivariate ordinal logistic regression model, and used a stepwise regression method to determine how much influence each of the factors of family management had on the status of asthma control. A statistical significance of 5% was used for all of the analyses.

Model Fitting

Since the response variable ‘asthma control status’ is ordinal in nature (based on the score of ACT and C-ACT), a proportional odds model (POM) was formed first, without a careful assessment of the model adequacy. A chi-squared test for the proportional odds assumption ^[26] was employed to see whether the main model assumption was violated or not. The response variable is trichotomized with three categories: ‘1’= uncontrolled asthma, ‘2’= partially controlled asthma, and ‘3’= completely controlled asthma. A goodness of fit of the model was determined using a likelihood ratio test, along with previous parallel lines testing.

Results

Asthma Control Status in Patients of Different Demographics

139 children ages 7-14 years (mean [M] = 9.85, standard deviation [SD] = 0.71) enrolled in this cross-sectional study, 89 of which took the C-ACT, and 50 who took the ACT. Participants (n = 139) were divided into 3 groups: uncontrolled (27; 19.42%), partially controlled (42; 30.22%) and completely controlled (70; 50.36%). The Cochran-Mantel-Haenszel test showed the variability according to group, with significant differences for the following variables: Follow-Up Plan (P=0.011), home environment (P=0.027) and Attended a Lecture on asthma (P=0.039). These results are shown in Table 1.

The score on certain dimension of the FMSCA affects the asthma control status

The analysis of variance or Kruskal-Wallis *H* test showed that there were significant group differences between the asthma ‘uncontrolled group’, ‘partially controlled group’ and ‘completely controlled group’ on 6 subscales of FMSCA (Table 2), specifically Children Identity, View of Condition, Management Mindset, Management Approach, Family Focus, and Future Expectation. Furthermore, the mean scores of the 6 subscales in the completely controlled group were significantly higher than those of the uncontrolled group and the partially controlled group, which indicates that higher scores on these 6 subscales were associated with better asthma control status.

The factors of family management affected the status of asthma control

A multivariate ordinal logistic regression model was used to predict how much influence each of the factors of family management had on the status of asthma control. We introduced those variables which showed differences between groups into a multivariate ordinal logistic regression model; the variables were Follow-up Plan, Home Environment, Attended a Lecture on asthma, Children Identity, View of Condition, Management Mindset, Management Approach, Family Focus, and Future Expectation. The statistical result of the model was significant ($X^2=23.78$, $P<0.0001$) and with a P value for the parallel lines assumption of 0.248. Those variables significantly associated with asthma control status (Table 3) were Follow-up Plan (OR=2.004; 95% CI, 1.009-3.981), Attended a Lecture on asthma (OR=2.586; 95% CI, 1.103-6.066), Children Identity (OR=1.133; 95% CI, 1.024-1.254), and Family Focus (OR=1.114; 95% CI, 1.007-1.232). The order of the impact of the four variables on asthma control from high to low were: 1) Children Identity, 2) Attended a Lecture on asthma, 3) Family Focus, and 4) Follow-up Plan. So, we see that the factors of family management which affected the status of asthma control were Children Identity and Family Focus.

Discussion

The asthma control level in children was associated with ‘Follow-Up Plan’ and ‘Attended a Lecture on asthma’

The primary goals of asthma treatment emphasized in Chinese and international asthma guidelines are to control asthma symptoms and prevent asthma flare-ups, which makes it imperative to evaluate the asthma control status for every patient^[8,27]. Our results reflect that only 70 children (139 children, approximately 50%) met the criteria of having their asthma completely controlled. Stated another way, the asthma control status according to GINA criteria was sub-optimal among school-age children with asthma in China. In the demographic information, there are three variables affecting the status of asthma control, namely, Follow-Up Plan, Home environment, and Attended a Lecture on asthma. However, when the above variables are introduced

into a regression model, only Follow-Up Plan and Attended a Lecture on asthma enter the regression model. This finding is in agreement with asthma management strategies proposed by the CINA guideline ^[29]. ‘Follow-Up Plan’ means that the doctor should contact his/her patient regularly to determine the progress of the patients’ illness, and thus adjust the medication dosage according to the results of the follow-up, rather than the standard prescription estimates. Furthermore, the CINA guideline proposes that a follow-up appointment with the patient’s usual primary care professional or asthma specialist should be made within a few days of discharge to assure that treatment is continued until baseline control parameters, including personal best lung function, are reached ^[28]. For the factor of ‘Attended a Lecture on asthma’, parents will have a better understanding of the daily management of asthma, while those who did not attend a lecture on asthma may generally understand asthma but may not know how to effectively manage childhood asthma in a family context. A study has shown that even after 6 months following an educational session, researchers found that parents still showed improvement in the ability to make decisions and to provide care for their asthmatic child ^[29]. Moreover, Janson et al ^[30] reported individualized asthma self-management education attenuates the usual decrease in medication adherence and improves clinical markers of asthma control. Therefore, having parents attend lectures on asthma is helpful to improve the asthma control level. In addition, we found there was no significant relation between medication compliance and asthma control ($p=0.149$), which is different from the results observed by previous studies ^[31-33]. This difference is likely due to the specificity of the question we asked (Has your child forgotten to take their medicine since your child was diagnosed? Yes/No) to determine the medication compliance of the children. Parents' answers may not fully represent the whole situation, making this question prone to false negative results. In future studies, we suggest that researchers should use a professional medicine compliance scale to more accurately determine the medication compliance.

The factors of family management affecting asthma control status in school-age children with asthma in China are ‘Children Identity’ and ‘Family Focus’

The FMSCA is a specific family management status assessment scale for asthmatic

children. It consists of eight dimensions which reflect the family management status, with a higher score indicating a better family management status^[22]. The scale can be helpful for nurses and other health care providers to improve asthma management in daily clinical practice, as well as providing a basis for family centered care to promote family disease management in children with asthma^[22]. In this study, 8 dimensions of the FMSCA were used to represent 8 factors of family management, and we explored which of those factors influenced the asthma control status in school-age children in China. According to our analysis of data from the FMSCA, we found that there were significant differences in the scores of 6 of the dimensions, namely, Children Identity, View of Condition, Management Mindset, Management Approach, Family Focus, and Future Expectation between asthmatic patients who were classified in 3 groups: completely controlled group, partially controlled group, uncontrolled group. Higher scores of these 6 dimensions were associated with better asthma control status. However, after controlling for demographic differences among the three groups, only Children Identity and Family Focus entered into the regression model. Moreover, Children Identity was the top ranked contributing factor for childhood asthma control, which implies that Children Identity plays a very important role in asthma control in school-age children. Children Identity is defined as a parents' view of the child and the extent to which those views focus on 'the condition or normalcy and capabilities or vulnerabilities. Knafl and his team^[21] stated that parents' beliefs about the child's capabilities are tied closely to their understanding of the condition and its associated demands and limitations. For example, parents may focus on the likely impact of the condition with regard to the normalcy of the child's development, and view the asthmatic child as ill child instead of normal child. This study shows that there is a positive correlation between the Children Identity and asthma control scores, indicating that when the parents' view of their child is closer to normal children, the better is the overall level of asthma control. Knafl et al^[34] proposed that parents' views of their child as normal are reflected in an accommodative parenting philosophy which has its goal of assuring a normal life for the child with chronic illness and is evident in parenting behaviors such as encouraging the ill child to take

part in usual school and extracurricular activities and making whatever arrangements might be needed to facilitate such participation. In daily life, asthmatic children often have limited activities due to asthma attacks, and sometimes feel inferiority and other negative emotions due to the use of asthma drugs outside the home environment. In severe cases, children may leave the group and even form a psychology of isolation. There is a study which has shown that many children with asthma resist playing with their peers because they are worried about being asked about their disease ^[35]. Therefore, parents should actively encourage their child to participate in group activities to minimize the difference between their child and other healthy children, so that the child can face the disease with a positive attitude. This is especially important for keeping the child's adherence to their therapeutic schedule. In addition, school-age children have some self-management ability. Studies indicate that school-age children can share in some of their healthcare decisions and even self-manage their asthma medications ^[36,37]. There was a study based on grounded theory methods which revealed that school-age children are at the most suitable age to develop their self-care abilities ^[38]. Therefore, if a parent views their ill child as normal, that may stimulate the child's potential and encourage children to learn asthma self-management. Furthermore, evidence supports the notion that asthma self-management in school-age children can lead to improved quality of life, decreased exacerbations, fewer hospital admissions, and improved asthma control status ^[39,40].

Another factor that entered into the regression model is Family Focus, which is defined as 'Parent's assessment of and satisfaction with how condition management has been incorporated into family life'. Knafl et al ^[21] in 2012 further expanded the Family Focus dimension to include parents' satisfaction with the balance between condition management and other aspects of family life as well as their assessment of the extent to which there is an appropriate balance. This study shows that a higher score on the dimension 'Family Focus' indicates a greater level of asthma control status in children, which means that the ability of parents to balance daily life and asthma management plays an important role in asthma control in children. The integration of daily family life and disease management needs cooperation and

cohesion among family members. Daphne Koinis-Mitchell et al ^[41] believe that improving cohesion among the family members of children with asthma, and improving their ability to cooperate in daily life and asthma management, can reduce the incidence of asthma in children. Moreover, if family members integrate disease management tasks into their daily family life, it means that chaos and violence may decrease, in other words, family relationships and family atmosphere will be more harmonious. Previous study has demonstrated that a good family atmosphere and harmonious family relationships play an important role in improving asthma control in children ^[16]. In addition, we believe a family with school-age children faces many challenges, including the raising the children, managing the disease of asthma, and the economic burden of a long-term disease. Thus, improving the ability of family members to both coordinate daily family life and to manage asthma has become more and more important for asthma control in school-age children. Furthermore, there is a study which has shown that parents of children with illnesses can quickly strike a balance between daily life and managing the illness by mastering the conventional methods of disease treatment and care ^[42]. Therefore, medical staff may effectively improve the level of asthma control in children by emphasizing health education for the child's caregivers and ensuring that they master the skills of asthma family management.

Strengths and Limitations

The main strength in this study is that for the first time the professional Family Management Scale for Children with Asthma (FMSCA) was used to explore the factors of family management affecting asthma control status in school-age children in China. As for limitations, the relatively small sample size and the method of recruiting participants may have led to a less representative sample. Moreover, most of the samples in this study are from Beijing and surrounding cities, and this study may not reflect the conditions seen in southern China and rural areas. In future studies, researchers need to expand the sample size and investigate the family management status of children with asthma in southern China and rural areas. Another obvious limitation of this study is its acquisition of medication compliance by only one

question, ‘Has your child forgotten to take their medicine? Yes/No’, which likely does not reflect the entire state of affairs of medication compliance by the children.

Conclusion

In summation, the parents' views of their child as normal and striking a balance between daily life and managing asthma appear to play a key role in successful family management of childhood asthma in school-age children. Understanding the mechanisms by which the factors of family management is associated with asthma control provides insight into possible avenues of prevention/intervention for better childhood asthma management. Furthermore, parents who report that they have scheduled follow up visits and have attended an asthma lecture exhibit a better asthma control status. We feel that these dimensions are probably associated with better understanding of the daily management of asthma. The study was done in a large urban setting, and further study is needed to clarify the factors of family management affecting asthma control status for children with asthma in southern China and rural areas.

Disclosure statement

The authors declare no conflicts of interests. The authors alone are responsible for the content and writing of the paper.

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Table 1. The asthma control status in patients of different demographics (N = 139)

Demographic Variables (n, %)	Uncontrolled group (n=27)	Partially controlled group (n=42)	Completely controlled group (n=70)	X^2_{cmh}
Gender				0.041
Male (106, 76.3%)	20	34	52	
Female (33, 23.7%)	7	8	18	
The sole offspring				1.988
Yes (93, 66.9%)	19	25	38	
No (46, 33.1%)	8	17	32	
Disease course (years)				0.691
<1 (19, 13.7%)	6	5	8	
$1 \leq x < 3$ (38, 27.3%)	7	10	21	
≥ 3 (82, 59.0%)	14	27	41	
Family history of asthma				2.144
Yes (20, 14.4%)	3	4	13	
No (119, 85.6%)	24	39	57	
Follow-Up Plan				6.471*
Yes (89, 64.0%)	13	25	52	
No (50, 36.0%)	14	17	18	
Home environment ^a				4.904*
Close (118, 84.9%)	20	35	63	
Not Close (21, 15.1%)	7	7	43	
Family income (per year/thousands) ^b				0.531
0<100 (88, 63.3%)	16	32	40	
>100 (51, 36.7%)	11	10	30	
Parental education ^c				0.903
12+ (97, 69.8%)	23	25	49	

<12 (42, 30.2%)	4	17	21	
Received manual of asthma education ^d				0.0002
Yes (82, 59.0%)	16	24	41	
No (57, 41.0%)	11	18	29	
Attended a Lecture on asthma ^e				4.243*
Yes (33, 23.7%)	5	5	23	
No (106, 76.3%)	22	38	46	
Have forgotten to take the medicine ^f				2.079
Yes (45, 32.4%)	11	16	19	
No (94, 67.6%)	16	26	51	

*p<0.05

^a Home environment refers to whether the relationship between family members is harmonious: close means harmony, not close means disharmony.

^b Follow-Up Plan refers to whether the child was seen for follow-up visits once every three months.

^c Attended a Lecture on asthma refers to whether the family had attended at least one asthma lecture in the hospital before the survey.

^d Family income refers to the income of a child's family (in Chinese Yuan) for one year, which indicates the family economic status.

^e Parental education refers to the educational level of the parents of the child. High: 13 years of education and more, Low: 12 years of education or less.

^f Have forgotten to take the medicine refers to whether, before this survey, the parent of the children orally answered whether the children had missed taking drugs at least once.

Table 2. Group difference on scores of the FMSCA

Subscale	Uncontrolled group ($\bar{x} \pm s^{\#}$)	Partially controlled group ($\bar{x} \pm s^{\#}$)	Completely controlled group ($\bar{x} \pm s^{\#}$)	H
Children Identity	24.70 $\pm$ 5.50	26.98 $\pm$ 3.42	27.91 $\pm$ 2.41	8.29 [*]
View of Condition	22.59 $\pm$ 5.60	24.50 $\pm$ 3.66	25.60 $\pm$ 3.19	7.53 [*]
Management Mindset	11.11 $\pm$ 4.69	10.88 $\pm$ 4.05	12.97 $\pm$ 4.66	6.18 [*]
Parental Mutuality	33.93 $\pm$ 5.20	32.98 $\pm$ 6.97	35.23 $\pm$ 6.23	5.03
Parenting Philosophy	18.59 $\pm$ 1.50	17.67 $\pm$ 2.09	18.34 $\pm$ 1.88	3.52
Management Approach	82.59 $\pm$ 7.73	80.71 $\pm$ 8.93	85.17 $\pm$ 7.54	7.56 [*]
Family Focus	14.59 $\pm$ 3.35	14.71 $\pm$ 3.59	16.84 $\pm$ 3.52	13.83 ^{**}
Future Expectation	22.04 $\pm$ 2.56	21.17 $\pm$ 3.68	23.24 $\pm$ 3.52	11.30 ^{**}

mean $\pm$ standard deviation

*p<0.05

**p<0.01

Table 3. Results of the multiple POM showing how the variables influence asthma control status

Variables	Regression coefficient	Wald χ^2	P	OR	95% CI*		Standardized regression coefficient
Intercept 1	-5.7157	17.319	<0.0001				
Intercept 2	-4.0565	9.395	0.002				
Follow-Up Plan	0.695	3.947	0.047	2.004	1.009	3.981	0.185
Attended a Lecture on asthma	0.950	4.774	0.029	2.586	1.103	6.066	0.224
Children Identity	0.125	5.822	0.016	1.133	1.024	1.254	0.253
Family Focus	0.108	4.380	0.036	1.114	1.007	1.232	0.217

*Confidence Interval