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Original article

Health-related quality of life in childhood bronchial asthma

Background: *Asthma is a public health problem that adversely affects different aspects of quality of life (QoL). Childhood asthma is common in Egypt and associated with repeated school absenteeism and hospital admission.* ***Objective:*** *To evaluate health-related quality of life (QoL) in children with bronchial asthma in an attempt to identify the most important determinants adversely affecting the QoL.* ***Methods:*** *In this cross-sectional study, 140 children with physician- diagnosed bronchial asthma were clinically evaluated to determine level of asthma control and were administered pediatric asthma quality of life questionnaire (PAQLQ), and questionnaire for the main determinants affecting QoL including socio-demographic, disease-related and patient-related factors.* ***Results:*** *They were 77 males and 63 females whose ages ranged between 7 and 17 years with a mean of 10.2 years. The overall PAQLQ score ranged between 2.22 and 6.61 with a mean ± SD of 4.08 ± 1. Uncontrolled asthma was associated with the lowest QoL scores ($p \leq 0.01$). Users of systemic steroids had significantly lower overall PAQLQ score, score of symptoms, score of emotional function than non-users ($p < 0.05$). Difficulty in obtaining the drugs significantly adversely affects the patient QoL scores apart from that of activity limitation ($p<0.05$). Parental smoking, use of systemic steroids, difficulties in obtaining drugs, asthma related hospital admission and level of asthma control were the determinants of overall PAQLQ score for children with bronchial asthma.* ***Conclusion:*** *Childhood asthma significantly adversely affects the QoL of the affected children. Control of the main determinants of QoL scores might improve the QoL of these patients.*

Keywords: Childhood asthma, Quality of Life, Asthma control, Parental smoking.

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INTRODUCTION

Asthma is a highly prevalent chronic respiratory disease affecting 300 million people world-wide. The burden of this disease to governments, health care systems, families, and patients is increasing worldwide.[1]

In Egypt, the prevalence of asthma among school children in the Nile Delta region is about 7.7%.[2] Asthma is relatively common in Egypt, and probably under diagnosed and under treated, particularly among children from less wealthy families.[3]

The WHO has estimated that 16 million disability-adjusted life-years are lost annually due to asthma, representing 1% of the total global disease burden. It is a public health problem not just for high-income countries; it occurs in all countries regardless of the level of development.[4] Pediatric asthma accounts for a large proportion of childhood hospitalizations, healthcare visits, absenteeism from day care/school and missed work days by parents.[5] For example, in Egypt up to one in four children with asthma is unable to attend school regularly because of poor asthma control.[6]

Health related quality of life (HRQoL) is the component of overall quality of life that is determined primarily by the person's health, and which can be influenced by clinical interventions. It is defined as the functional effects of an illness and its consequent therapy upon a patient, as perceived by the patient.[7] Previous research supports the recommendation that health-related quality of life should be measured in addition to conventional clinical parameters in patients with asthma.[8]

Poorly controlled asthma in the growing child may impact emotional, intellectual and physical development.[9] Asthma-specific QoL questionnaires have been developed to quantify, in a formal and standardized way, the effects of asthma on the patient's daily life and well-being, and the extent to which a given treatment reduces these effects.[10, 11]

Probably the greatest challenge in measuring child and adolescent HRQoL is not only to capture the individual perspective, but also to accommodate the physical, emotional and social changes that occur as the child develops and understands the concepts that are being addressed.[10]

With this as a background, we aimed to evaluate HRQoL in children with bronchial asthma in an attempt to identify the most important determinants adversely affecting the HRQoL in these patients. This could eventually improve the plan of management in children with bronchial asthma through conclusive recommendations.

METHODS

Study design and population:

This was a cross-sectional study which comprised 140 children with physician-diagnosed bronchial asthma. They were recruited during the period from March, 2010 to December, 2010 from the Pediatric Allergy and Immunology Unit, Ain Shams University (50 patients) and the Outpatient Clinic at Abbassia Chest Hospital (90 patients). They were 77 (55%) males and 63 (45%) females, their ages ranged between 7 and 17 years with a mean of 10.2 years.

The study protocol was approved by the Local Ethics Committee of Scientific Research, Faculty of Medicine, Ain Shams University. Verbal consent was taken from the caregivers of the participants and verbal assent was taken from the children older than 7 years. The study objectives and tools were explained to the children and their caregivers, and they were reassured about the confidentiality of the study data.

Study measurements

1. Clinical evaluation

Detailed history was taken with special emphasis on the duration and severity of asthma, treatment given and the level of control. Levels of asthma control were classified into controlled, partly controlled and uncontrolled according to GINA guidelines 2010.[11] Socio-demographic characteristics of each patient were fully addressed.

Each patient was subjected to general examination as well as chest, ENT and skin examination to verify diagnosis. Patients with associated allergic rhinoconjunctivitis and/or atopic skin diseases were excluded from the study. Weight and height of the patients were taken to calculate body mass index (BMI). Classification of patient's BMI into underweight, normal, overweight and obese was done according to the Egyptian Growth Charts for boys and girls.[12]

2. ***Interviewer administered questionnaires***

Pediatric asthma quality of life questionnaire (PAQLQ)

It measures the functional (physical, emotional, occupational and social) problems that are most troublesome to children (7-17 years) with asthma [13]. PAQLQ has 23 questions in three domains (symptoms, activity limitation and emotional function). The PAQLQ has a time specification of one week so children were asked to recall their experiences during the previous week, there is evidence that this is the maximum length of time over which younger children can recall their experiences with any degree of accuracy [14, 15] and to respond to each question on a 7-point scale (7 = no impairment, 1 = severe impairment). Three of the activity questions were "patient-specific" which means that each child identified and scored three activities which were limited by his asthma. The number of questions in each domain is as follow:

- Activity limitation: 5 (2 generic, 3 patient-specific)
- Symptoms: 10
- Emotional function: 8

Scoring the PAQLQ:

The 23 questions in the PAQLQ are divided into 3 domains:

Domains	**Questions**
Activity limitation:	1, 2, 3, 19, 22
Symptoms:	4, 6, 8, 10, 12, 14, 16, 18, 20, 23
Emotional function:	5, 7, 9, 11, 13, 15, 17, 21

Individual questions were equally weighted. The overall PAQLQ score was the mean of the responses to each of the 23 questions. The resultant overall score would be between 1 and 7. The domains were analyzed in exactly the same way (the domain scores were also the mean values for the items in each domain). So that the score of each domain would be also between 1 and 7.

PAQLQ used in the study was obtained from the QOL TECHNOLOGIES Ltd after written approval from Jilly Styles (Personal Assistant to Professor Elizabeth Juniper, McMaster University Canada). The approval was sent through email.

Questionnaire for the main determinants that may affect QoL of asthmatic children:

It includes data concerning *socio-demographic factors* such as sex, age, educational level, residence, father's and mother's education, father's and mother's occupation, parental smoking, presence of pets at home and family income. *Disease related factors* such as its duration, level of control, type of drug used and its side effects,

presence of difficulties in consultation or in obtaining the drugs and rate of consultation and *patient related factors* such as school absenteeism due to asthma, hospital admission and its number and presence of other chronic diseases.

Statistical Methods

Data were analysed using SPSS (Statistical Package for Social Sciences) version 18. Quantitative data e.g. age were presented as mean ± standard deviation. Qualitative data e.g. sex, were presented as count and percentage. Independent t test was used to compare data between two groups and one-way ANOVA was used when more than two groups were to be compared then Post Hoc test was used (using the LSD) to detect the difference between individual groups. Correlations among QoL score and different study parameters were determined by using Pearson's test. Multivariate analysis was done by multiple linear regression to find out the significant determinants of QoL of asthmatic children. For all tests, $p < 0.05$ is considered significant.

RESULTS

Socio-demographic characteristics

The studied patients were 77 (55%) males and 63 (45%) females, their ages ranged between 7 and 17 years with a mean of 10.2 years. Hundred-ten (78.6%) of patients were in primary school, 23 (16.4%) in preparatory school and 7 (5%) in secondary school. Hundred-twenty two (87.1%) patients were living in an urban area, while only 18 (12.9%) patients were living in a rural area. The father and mother educational level varied between illiterate to highly-educated with illiteracy accounting for 11 % in fathers and 30 % in mothers of the studied patients. Skilled work was the main paternal occupation (44.3%) in the studied sample while 121 (86.4%) mothers were housewives. Fifty-seven (40.7%) patients were exposed to parental smoking, and 15 (10.7%) had pets at home. Sixty-six (47.1%) patients had their family income ranging between (500-<1000 LE) per month, while 27 (19.3%) patients had their family income less than 500 LE per month.

QoL scores for the studied children

The overall PAQLQ score ranged between 2.2 and 6.6 with a mean ± SD of 4.1 ± 1, the score of activity limitation ranged between 1.6 and 6 with a mean ± SD of 3.9 ± 0.8, score of emotional function ranged between 2 and 7 with a mean ± SD of 4.8 ± 1.2 and the least score was that of symptoms ranged between 1.6 and 7 with a mean ± SD of 3.6 ± 1.3.

Effect of socio-demographic factors on QoL for the studied children

Male sex adversely affected the score of activity limitation being worse in males than females (t= -3.9, p=<0.01). The other QoL scores showed no significant difference between males and females. There was a significant negative correlation between the age of the patients and QoL scores ($p<0.05$) except for the score of symptoms ($p>0.05$).

Among different domains of QoL scores, only the patient emotional function score was significantly affected by patient educational level, being worse among patients in preparatory level ($p<0.05$).

The residence of the patients did not significantly affect QoL scores ($p>0.05$). The same finding was observed for the effect of father's education and occupation on different domains of QoL scores ($p>0.05$). On the other hand, mother's education affected the score of symptoms with borderline significance ($p=0.05$) being found between the group of highly qualified mothers on one hand and the groups of (illiterate, read and write and average qualified) on the other hand. Also, mother's occupation significantly affected the patient overall PAQLQ score, scores of symptoms and emotional function with higher scores for those of working mothers (table 1). Both parental smoking and presence of pets at home did not significantly affect the patient QoL scores ($p>0.05$). Similarly, the family income did not affect the patient QoL scores ($p>0.05$).

Effect of different disease-related factors on QoL scores for the studied children

The descriptive data for different asthma-related factors is displayed in table 2.

A significant negative correlation was found between asthma duration and overall PAQLQ score and patient activity limitation score ($p<0.05$).

The level of asthma control significantly affected overall and domains of QoL scores ($p\leq0.01$) where uncontrolled asthma was associated with the lowest QoL scores (table 3). Applying post hoc test revealed that patients with controlled asthma had significantly higher overall PAQLQ score, scores of activity limitation and symptoms when compared to those with partly controlled and uncontrolled asthma ($p<0.01$), while score of emotional function was significantly higher among patients with controlled asthma ($p<0.01$) and those partly controlled asthma ($p=0.04$) when compared to patients with uncontrolled asthma.

Drug therapy of asthma namely inhaled steroids, long acting β2 agonists and oral

theophylline did not affect significantly overall and domains of QoL scores (p>0.05). On the other hand, users of systemic steroids had significantly lower overall PAQLQ score, score of symptoms, score of emotional function as compared to non-users (p<0.05) with no significant effect on score of activity limitation (p>0.05).

Although, the presence of drug adverse effects was associated with lower overall and domains of QoL scores except for that of symptoms, it was statistically not significant (p>0.05). On the other hand, difficulties in obtaining the drugs significantly adversely affect overall and domains of QoL scores apart from that of activity limitation (p<0.05).

Difficulty in medical consultation was associated with lower albeit not significant overall and domains of QoL scores (p>0.05). On the other hand, increased rate of medical consultation was associated with significantly higher overall and domains of QoL scores (p<0.05).

Effect of different patient characteristics on QoL scores for the studied children

Hundred- twelve (80%) patients showed school absenteeism because of their asthma. Eighty- four (60%) patients were admitted to hospital because of asthma exacerbation, where 14% of these patients were admitted once while 11% of them were admitted five or more times. Fourteen (10%) patients had another chronic disease (4 had nocturnal enuresis, 2 had chronic liver diseases, 2 had iron deficiency anemia, one had epilepsy, one had immune thrombocytopenic purpura and another had juvenile rheumatoid arthritis). Hundred-twenty two patients (87.1%) had normal BMI while 8 (5.8%) patients were obese and 10 (7%) were underweight.

The most common restricted activity during the week preceding the study among patients was playing with friends (19.05%), followed by walking (13.57%) and playing football (13.33%) (figure 1).

Both asthma related school absenteeism and hospital admission were associated with lower overall and domains of QoL scores (table 4). The number of asthma related hospital admission had no significant effect on QoL scores for asthmatic patients (p>0.05), however, using post hoc test showed that the overall PAQLQ score was higher among patients with no history of admission when compared to those with single up to three-times hospital admission (p<0.05). Associated chronic illnesses or obesity did not significantly affect overall and domains of QoL scores (p>0.05).

Linear regression for determinants of QoL for children with bronchial asthma

Parental smoking, use of systemic steroids, difficulties in obtaining drugs, asthma related hospital admission and level of asthma control were the determinants of overall PAQLQ score for children with bronchial asthma which was used as the dependent variable in this model.

Patient sex, level of asthma control and underweight were the determinants of score of activity limitation for children with bronchial asthma which was used as the dependent variable in this model. Parental smoking, difficulties in obtaining drugs, asthma related hospital admission and level of asthma control were the determinants of score of symptoms for children with bronchial asthma which was used as the dependent variable in this model. Patient age, parental smoking, use of systemic steroids, difficulties in obtaining drugs, asthma related hospital admission and level of asthma control were the determinants of score of emotional function for children with bronchial asthma which was used as the dependent variable in this model (table 5).

Table 1. Effect of mother occupation on QoL scores

	Mother occupation	Mean	SD	t-test	P
Overall PAQLQ score	Working	4.65	1.11	2.73	0.01
	Housewife	3.99	0.96		
Score of activity limitation	Working	4.18	1.00	1.43	0.16
	Housewife	3.89	0.80		
Score of symptoms	Working	4.38	1.35	2.89	<0.01
	Housewife	3.50	1.23		
Score of emotional function	Working	5.28	1.29	2.01	0.05
	Housewife	4.68	1.21		

PAQLQ: Pediatric asthma quality of life questionnaire, P< 0.05: Significant, P<0.01: Highly significant.

Table 2. Descriptive statistics for different factors related to asthma

Variable		Minimum	Maximum	Mean	SD
Duration of asthma (by years)		1.00	15.50	8.62	3.13
Rate of consultation (by weeks)		1	12	3.6	2.4
Variable		Frequency			Percent
Levels of asthma control					
Controlled		32			22.9%
Partly controlled		85			60.7%
Uncontrolled		23			16.4%
Drug					
Inhaled steroids	No	52			37.1%
	Yes	88			62.9%
B-2 agonists	No	15			10.7%
	Yes	125			89.3%
Theophylline	No	131			93.6%
	Yes	9			6.4%
Systemic steroids	No	117			83.6%
	Yes	23			16.4%
Antihistaminics	No	134			95.7%
	Yes	6			4.3%
Presence of drug side effects					
No		129			92.1%
Yes		11			7.9%
Drug side effects					
Visual disturbances		1			0.7%
Body edema		6			4.3%
Skin allergy		2			1.4%
Muscle weakness		1			0.7%
Chronic constipation		1			0.7%
Bone aches		1			0.7%
Difficulty in obtaining drug					
No		54			38.6%
Yes	Cost of drug	82			58.6%
	Unavailable	4			2.9%
Difficulty in consultation					
No		128			91.4%
Yes	Cost of consultation	1			0.7%
	Distance	11			7.9%

Table 3. Effect of asthma control on QOL scores

	level of asthma control							
	Controlled		Partly controlled		Uncontrolled			
	Mean	SD	Mean	SD	Mean	SD	F-test	P
Overall PAQLQ score	4.70	0.88	3.96	0.91	3.67	1.13	9.72	<0.01
Score of activity limitation	4.39	0.54	3.82	0.83	3.68	0.94	7.42	<0.01
Score of symptoms	4.44	1.15	3.41	1.15	3.26	1.45	9.85	<0.01
Score of emotional function	5.21	1.21	4.75	1.20	4.17	1.16	5.09	0.01

PAQLQ: Pediatric asthma quality of life questionnaire, P< 0.05: Significant, P<0.01: Highly significant.

Table 4. Effect of school absenteeism and hospital admission on patients' QoL scores

	School absenteeism	Mean ± SD	t-test	P	Hospital admission	Mean ± SD	t-test	P
Overall PAQLQ score	No	4.56 ± 1.13	2.87	0.01	No	4.42 ± 1.09	3.36	< 0.01
	Yes	3.97± 0.94			Yes	3.86 ± 0.87		
Score of activity limitation	No	4.31± 0.9	2.77	0.01	No	4.17 ± 0.92	2.87	0.01
	Yes	3.83± 0.79			Yes	3.77± 0.73		
Score of symptoms	No	4.15±1.43	2.53	0.01	No	3.99 ±1.39	2.87	0.01
	Yes	3.49 ± 1.2			Yes	3.37 ± 1.13		
Score of emotional function	No	5.21±1.28	2.21	0.03	No	5.12 ±1.22	2.85	0.01
	Yes	4.65±1.2			Yes	4.53 ±1.19		

PAQLQ: Pediatric asthma quality of life questionnaire, P < 0.05: Significant, P <0.01: Highly significant.

Table 5. Linear regression analysis for determinants of patients' QoL scores

	Overall PAQLQ score	Score of activity limitation	Score of symptoms	Score of emotional function
Age	NS	NS	NS	S
Sex	NS	HS	NS	NS
Parental smoking	HS	NS	S	HS
Use of systemic steroids	S	NS	NS	S
Difficulties in obtaining drugs	HS	NS	HS	HS
School absenteeism	NS	NS	NS	NS
Hospital admission	HS	NS	HS	HS
Rate of consultation	NS	NS	NS	NS
Controlled asthma	HS	HS	HS	NS
Partly controlled asthma	NS	NS	NS	S
Obesity	NS	NS	NS	NS
Underweight	NS	S	NS	NS

PAQLQ: Pediatric asthma quality of life questionnaire, S: Significant, NS: Non-significant.

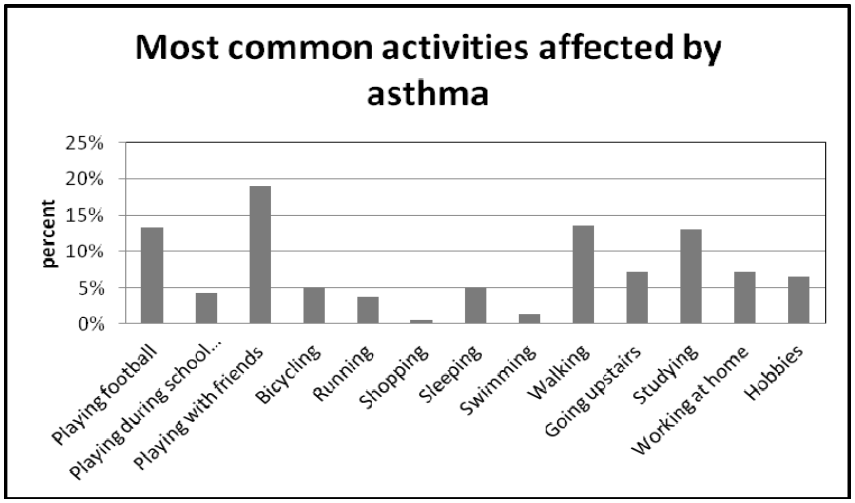

Figure 1. Effect of asthma on patients' activities

DISCUSSION

The PAQLQ has been fully validated for use in both clinical practice and clinical trials. It contains the day-to-day problems and limitations that the majority of children aged between 7 and 17 years with asthma find most troublesome. It has got both discriminative properties (reliability and cross-sectional validity) and strong evaluative properties (responsiveness and longitudinal validity).[16, 17] This study demonstrated that the score of symptoms was the most affected domain, suggesting limitations in the medical service or non-compliance of the patients which is reflected on the level of control of their asthma and hence their symptoms. Similarly, a previous study conducted to validate the Arabic version of PAQLQ among asthmatic Egyptian children reported that score of symptoms was the most affected.[18] On the other hand, activity limitation domain was the most affected domain in previous studies measuring QoL among asthmatic children in Sweden[19], Jordan[20], Poland[21] and Brazil.[22] This might be related to the discrepancy in the level of medical service and life style between Egypt and the aforementioned countries.

In our study, the patients' overall and different domains of QoL scores were significantly lower in males than females. According to the 2006 CDC's nationwide asthma report, males experience a higher asthma prevalence rate and death rate throughout most of childhood compared with females.[23] Also, smaller airways and higher airway resistance and more field of activity in males than females could lead to greater disease burden in asthmatic males than females and hence lower QoL.[24] This was in conform with the results of previous studies measuring QoL in asthmatic adolescents using PAQLQ in Iran[24] and Brazil.[25] On the other hand, lower QoL in asthmatic women in Canada was reported in a previous study.[26] Similarly, asthmatic girls were found to have lower QoL scores than asthmatic boys in different studies from Sweden[19], Jordan[20], United States[27] and Germany[28]. It has been reported that girls are more anxious about their health and therefore are more likely to over-report their symptoms and to show their deficiencies than boys.[19]

In this series, older patients had lower QoL scores. Similarly, a previous study in Serbia reported that older asthmatic children had lower QoL scores than younger ones.[29] Greater limitations in performing activities that older children found in their everyday lives, and their exposure to various stimuli such as cigarette smoke, dust, strong smells, perfumes, or weather changes more than young ones may be the cause of decreased QoL scores among older children. Also younger children adapt more easily to the disease by choosing less limiting everyday activities.[29]

On the other hand, younger asthmatic children were found to have lower QoL scores than older ones in previous studies from Jordan[20, 30], United States[27], Germany[28] and Sweden.[31] Adolescents are able to handle the burden of the disease than younger children owing to cognitive and emotional developmental variations in grasping the content measured.[32]

The level of patient education in our study affected QoL scores where score of emotional function was significantly lower among patients in the preparatory level than those in the primary level. School duties and activities are increased with higher school grades which could then be adversely affected by the burden of asthma.

Patients with highly educated mothers in our study had higher score of symptoms than other levels of mother's education. A higher caregiver educational level may play a role in raising the awareness about chronic diseases with a better coping ability which leads to improvement of QoL scores among their children. Also, higher education level can contribute to employment opportunities and higher family income. Similarly, a previous study reported that the caregiver educational level was the most important factor affecting the quality of life of asthmatic preschool children where higher caregiver educational level was associated with higher QoL scores.[33] Also, higher overall QoL score, score of symptoms and score of emotional function were observed in patients with working mothers reflecting possible better level of asthma control while mothers of children with less controlled asthma usually found a conflict between work and care for their children preferring to stay home.

Higher family income was associated with higher patient QoL scores albeit not significant. Higher family income improves the affordability of the required treatment, health care services and hence a better QoL. Moreover, a secure income is a reassurance to the family members and contributes to their psychological wellbeing. Positive effect of high family income on QoL scores was previously reported.[33, 34]

In this study, the lack of significant effect of parental smoking and presence of pets on QoL scores may be attributed to the lack of follow up of these patients which may uncover the actual effect of environmental factors on QoL scores. However, previous studies did not find a direct relationship between parental smoking and QoL of asthmatic children in United States.[35, 36]

An indirect association between parental smoking and pets exposure and QoL of asthmatic children was suggested by their contribution to asthma exacerbations thus decreased QoL scores for these children.[37] However, a previous study showed that parental smoking was directly associated with lowers patient QoL scores among preschool asthmatic children in Taiwan.[33]

Although our study couldn't demonstrate a significant difference in the QoL scores between rural and urban residence, there was a common suggestion that QoL in asthmatic patients would be lower in rural inhabitants than urban ones because of the difficulties to reach medical health care services, while urban children can probably attend medical facilities more easily and thus receive better care of their asthma.[38] This was demonstrated in previous studies in Jordan[20], Serbia[29] and Spain.[39]

In this study, the duration of asthma adversely affected overall PAQAQ score and score of activity limitation. This could reflect older age together with the persistent asthmatic patients' concern about their future and allowed activities in the face of their chronic illness. This was in conform with a previous study in Israel.[40] However, other studies demonstrated that longer asthma duration in adults was associated with higher QoL scores.[25, 29, 41-43] In 2006, the Global Strategy for Asthma Management and Prevention was revised to emphasize asthma management based on clinical control, rather than asthma severity, for better management and outcome. In this study, patients' QoL scores were worse in those with lower level of asthma control ($p<0.05$). Uncontrolled asthma is associated with more frequent symptoms, more limitations in activities that might exacerbate asthma attacks. Moreover, children with uncontrolled asthma are often worried about asthma attacks. Similar results were reported in previous studies on asthmatic children in Italy[44] and in United States.[45] However, in adults, a good QoL score was not correlated to asthma control.[43]

Use of systemic steroids adversely affected the overall PAQLQ score, score of symptoms, score of emotional function ($p<0.05$). The side effects of systemic steroids mainly acne, increased weight and altered mood could impair the patient's QoL and his/her peer group interactions, moreover, systemic steroids implied uncontrolled asthma. Similarly, lower overall PAQLQ and score of emotional function was associated with the use of systemic steroids in Turkish asthmatic children.[46]

On the other hand, inhaled steroids reduce airway inflammation, bronchial responsiveness, exercise induced asthma, improve lung function and hence reduce symptoms in children with asthma and improve quality of life in asthmatic children and their families.[47-49]

The negative effect, albeit not significant, of inhaled steroids on QoL scores in our study could be explained as parents whose children have been prescribed preventive medication as inhaled steroids may take this to mean that their children have very significant asthma, and these parents may subsequently develop heightened perceptions about their children's medical vulnerability. Parents who perceived that their children were more vulnerable were significantly more likely to keep their children home from school, sporting activities and from playing with friends. Excessive parental concerns of vulnerability can disrupt the child parent relationship, leading to behavioural and emotional problems in the child.[50, 51]

Patients who had difficulty in obtaining their drug had lower overall PAQLQ score, score of symptoms and score of emotional function ($p<0.05$). This difficulty was mainly due to cost of the drugs (95.4% of difficulties) reflecting the inability to follow the drug regimen regularly with eventual inadequate asthma control and decreased QoL scores.

The significant positive correlation between the rate of consultation and different domains of QoL scores ($p<0.05$) was an expected finding where increased rate of consultation and follow up is associated with more adherence to treatment, better asthma control and therefore higher QoL scores.

The significantly decreased overall and domains of QoL scores among the studied patients with asthma related school absenteeism implied less controlled asthma symptoms which in turn associated with poor QoL scores. Similarly, school absenteeism was associated with poor QoL scores among asthmatic adolescents in United States.[2] Also, the overall and domains of QoL scores were significantly decreased among patients with asthma related hospital admission ($p<0.05$), hospital admission for asthmatic patients is mainly indicated for poorly controlled cases with more frequent symptoms and hence lower QoL scores. The same results were found in a study done in Australia and found a negative association between QoL in adults with asthma and the number of hospital admission.[53] We could not find a significant effect of increased BMI on QoL scores. However, previous studies demonstrated lower QoL scores among asthmatic adolescents[54] and adults[55, 56] with increased BMI. In our study, use of systemic steroids, asthma related hospital admission, level of

asthma control, parental smoking and difficulties in obtaining the drugs were the determinants of overall PAQLQ score for children with bronchial asthma. However, the determinants of the score of activity limitation were patient sex, underweight as well as level of asthma control. Parental smoking, difficulties in obtaining the drugs, asthma related hospital admission and level of asthma control were the determinants of the score of symptoms. While patient's age, parental smoking, difficulties in obtaining the drugs, use of systemic steroids, asthma related hospital admission and level of asthma control were the determinants of score of emotional function.

A previous study on asthmatic children found that among the strongest independent determinants of QoL of asthmatic children were the child's age and sex.[57] While the significant determinants of asthmatic adolescents quality of life included gender (higher scores for boys) and exposure to passive smoking in the home (higher scores for those not exposed).[58]

In conclusion, this study showed that the most affected QoL domain for asthmatic children was the symptoms domain. Asthma duration, level of asthma control, systemic steroids use, presence of difficulty in obtaining drugs and rate of consultation were the disease related factors that significantly affected different QoL scores for asthmatic children. History of asthma related school absenteeism and hospital admission had a significant effect on different QoL scores. The final model determine QoL for asthmatic children included level of asthma control, asthma related hospital admission, patient's age and sex, rate of consultation, use of systemic steroids and parental smoking.

A study limitation is related to its conduction among a sample of asthmatic children who had particular characteristics excluding those with mild intermittent asthma. All of our patients were outpatients undergoing regular check-ups in specialized tertiary hospitals and were well informed concerning treatment regimens. Therefore, our patients were not representative of all asthmatics, which restrict the possibility of extrapolating our findings to the asthmatic population in general. Another limitation of our study is related to its cross-sectional design, and hence the long term effects of asthma on QoL of asthmatic children could not be evaluated.

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