

## Impact of Asthma on the Quality of Life of Adolescent Patients from Saudi Arabia

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### Abstract

**Background:** Bronchial asthma is a chronic inflammatory disease afflicting people worldwide without distinction of age, gender or ethnicity. The health-related quality of life (HRQL) of adolescents with asthma can be disrupted considerably and may reflect the effectiveness of symptoms management, therapy and health services provided.

**Objective:** To evaluate the health-related quality of life (HRQL) of Saudi Arab adolescents with documented clinical history of asthma, classified by severity.

**Methods:** In this cross-sectional survey, the Pediatric Asthma Quality of Life (PAQLQ) and the Mini Asthma Quality of life (Mini-AQLQ) questionnaires were applied to 135 randomly recruited asthma patients (11-to-19 years old) in the period between January and June 2012, grouped as intermittent, mild, moderate, or severe.

**Results:** In 9 of 27 questions, significantly impaired HRQL was perceived by severe asthmatics, relative to intermittent patients; in particular, almost all aspects of the symptoms category significantly bothered the severe asthmatics. In emotional aspects, mild and moderates feel frustrated because couldn't keep up with others, whereas in social activities, moderate and severe groups indicated worse scores in school attendance, relative to intermittent asthmatics. In physical activities, severe and moderate groups reported lowest scores. A consistent finding was related to the influence of environmental triggers: Dust, cigarette smoke and air pollution impaired HRQL of all four asthma groups, relative to intermittent asthmatics.

**Conclusion:** Asthma lowers the health-related quality of life of Saudi adolescent patients, in terms of physical, emotional, symptoms, and environmental triggers, impairing mainly the severe asthmatics.

**Keywords:** Pediatric asthma; Teenagers; Asthma severity; Questionnaire; Quality of life score; Mini-AQLQ; PAQLQ

### Introduction

Since the early 1960s, extensive epidemiological studies have confirmed the rise in asthma prevalence, morbidity and mortality rates in many countries and ethnic populations, thus becoming one of the most common chronic pulmonary diseases in the world [1,2]. Asthma affects not only the breathing capacity of patients, but also impacts their health-related quality of life (HRQL), as defined by the general well-being and happiness of the individual, in relation to physical, emotional and social aspects [3-5].

Quality of life questionnaires aim to collect data as accurate as possible, about a patient's symptoms and functioning on daily life. Such information could in turn be used by physicians and caregivers to evaluate the management of asthma and therapy efficacy [6-8]. In that view, many studies around the world have investigated how asthma affects HRQL of asthmatic patients. For instance, several studies have found that asthmatic teenager girls have lower HRQL perception than asthmatic boys; also, education about asthma disease and the proper use of medication play an important role [9-11]. In general, asthmatics have their daily life activities disrupted, such as attendance to

workplace and school, as well as limiting their basic physical and social activities [10,12-14]. Furthermore, HRQL is more compromised in patients with refractory asthma or requiring oral steroids [15]. Reportedly, steroid-resistant asthmatics are significantly more predisposed to anxiety and depression than patients with well controlled symptoms, and experience fatigue, sleep disturbances and have a general feeling of frustration [16]. Therefore, higher rates of hospitalization, more frequent visits to the emergency department (ER), and poor HRQL self-assessment (e.g., reporting some restrictions in daily activities), are characteristic of this subgroup [17].

In Saudi Arabia, approximately 11% of the population (of which many are children and adolescents) suffers from this disease [18]. So far, no studies in Saudi Arabia have been done to investigate the impact of asthma on the HRQL of adolescents. Although similar surveys have been done in many countries, divergence in responses to medical treatment suggest important cultural, gender and socio-economic differences; therefore, extrapolation of foreign results into another society is discouraged [19]. Indeed, the Saudi society has unique peculiarities, including linguistic, religious, cultural and health care setting different in relation to Western societies, which justify this work. In this cross-sectional survey, we interviewed adolescents with asthma from Saudi Arabia, by using the highly reliable and fully

validated Pediatric Asthma Quality of Life questionnaire (PAQLQ) and the Mini Asthma Quality of life Questionnaire (MiniAQLQ) [6,13]. The goal was to evaluate the impact of asthma severity symptoms and environmental factors on the emotional, physical and social aspects of life of Saudi adolescent patients.

## Methods

### Patients

A total of 135 adolescents, aged 11-19 years old and clinically diagnosed with asthma and classified according to Guidelines by the Global Initiative for Asthma in adolescents (GINA) [20], were recruited at the Pediatric Asthma Clinic of the King Khalid University Hospital in Riyadh, Saudi Arabia in the period between January and June, 2012. Patients were randomly recruited at the time of their visit to the clinic, during a period spanning 10 months. All patients were evaluated by pulmonologists, who confirmed a documented clinical history of asthma and follow-up visits, and were classified into 4 asthma severity groups according to GINA guidelines: Intermittent, mild, moderate and severe [20]; because of the random recruitment, no effort was done to equalize the size's groups. Criteria of eligibility were: a) Be a Saudi citizen; b) Clinical history of at least one year of asthma; c) Aged from 11 to 19 years old. Patients were excluded if they presented other disorders or diseases, such as acute respiratory tract infections in the past two weeks, or if they were tobacco smokers. The study protocol was approved by the Institutional Review Board (IRB) of the college of Medicine, King Saud University. All patients and control subjects in this study signed an informed consent approved by the IRB.

### Study design and assessment of quality of life

Patients were invited to participate in this survey and an informed written consent was signed from the parent/guardian before administering the questionnaire. The study protocol was approved by the Institutional Review Board (IRB) of the college of Medicine, King Saud University. Patients were interviewed individually, face to face, in a dedicated room whenever possible, to ensure confidentiality and privacy. The interviewer read the questions keeping in mind the comprehensive capability of the patient/subject; a pilot reliability test was also performed, using the entire questionnaire with a random sample of asthmatics (n=12) to verify that they provided reliable answers. Both the PAQLQ and the Mini-AQLQ overlap in many questions; thus, the applied questionnaire contained all the questions of the Pediatric Asthma Quality of Life Questionnaire (PAQLQ) and complemented with the Mini-AQLQ, for questions pertaining to environmental triggers, which are absent in the PAQLQ [4,6,21]. Both

questionnaires are highly reliable and well validated tools translated into many languages including Arabic, and cover the most important and bothersome aspects affecting the daily lives of asthmatics [3,6,22]. Taking into consideration that Saudi Muslims have distinct cultural, social activities and religious habits compared to Western nations, authors decided to include three exploratory, non-validated questions, to evaluate the potential negative impact of asthma on: a) The performance of their religious customs; b) Whether asthma would affect the choice of a career; and c) Whether asthma would affect their work efficiency.

### Statistical analysis

HRQL score values for each question (variable) ranged from 1 (indicating maximum impairment) to 7 (no impairment at all) [4,6]. Both the mean scores and the total sums of scores for each question were calculated. The overall score, which is the mean of all responses per asthma severity group was also calculated. For each question item, to determine possible significant differences in HRQL mean scores among the four asthma severity groups, one-way ANOVA was performed; when significant differences were detected (two-tailed  $P < 0.05$ ), Dunnett's multiple comparison tests were performed by comparing the HRQL mean scores of the intermittent group versus those of the mild, moderate and severe groups. Equality of population variances was confirmed through Bartlett's tests in all cases. Further, a score analysis by categories (physical, emotional, social, symptoms, environmental) was performed: For each category, the HRQL scores of corresponding questions were summed up and the means calculated; to determine significant differences among the 4 asthma severity groups, one-way ANOVA tests were done; Dunnett's multiple comparison tests were performed by comparing the intermittent group's score versus those of the mild, moderate and severe asthma groups. Significant differences were considered at two-tailed  $P$  values  $< 0.05$  in all cases. Data were analyzed using SPSS and/or GraphPad Prism software packages.

## Results

A total of 135 adolescents were recruited, which were asthma patients classified into intermittent, mild, moderate or severe groups. Principal demographic and clinical data of the recruited asthmatics are presented in Table 1. There were fewer severe asthmatics recruited, whereas the largest group corresponded to the intermittent asthmatics; because of the random recruitment procedure, no effort was made to equalize the sample size of each group. The age of all asthmatic patients averaged 14.6 years old (standard deviation of  $\pm 2.3$ ); the majority were male students (58.5%), attending secondary school (60.7%).

Patients	Age <sup>*</sup>	Gender ratios	Total subjects (%)	Scholar Education		
		M/F		Primary	Secondary	High-School
Intermittent	14.5 $\pm$ 2.2	29/19	48 (35.5)	13	31	4
Mild-persistent	14.7 $\pm$ 2.2	27/15	42 (31.1)	9	30	3
Moderate-persistent	14.0 $\pm$ 2.4	17-Aug	25 (18.5)	9	13	3
Severe-persistent	15.3 $\pm$ 2.3	Jun-14	20 (14.8)	5	8	7

<sup>\*</sup> Mean age (years)  $\pm$  S. Dev.

**Table 1:** Characteristics and frequencies of the recruited adolescent asthmatic patients.

Category	Variables§	‡ HRQL scores by groups				*P values
		Intermittent	Mild	Moderate	Severe	
			Persistent	persistent	persistent	
Physical activities	Q1. Strenuous activities	3.5	3.3	3	3.1	0.529
	Q2. Moderate activities	2.6	2.9	2.4	3	0.475
	Q3. Couldn't keep up with others	4.4	5	4.3	3.9	0.15
	Q4. School-related activities	2.9	3.4	2.8	3.7 <sup>(1)</sup>	0.004*
Emotional aspects	Q5. Feel frustrated	6.1	5.8	5.4	5.2	0.519
	Q6. Feel afraid of not having asthma medication available	5.6	6	4.8 <sup>(1)</sup>	5.0 <sup>(1)</sup>	0.04*
	Q7. Feel worried, concerned or troubled	5.5	5.2	5.2	5.1	0.364
	Q8. Feel angry	5.6	4.9	5.4	4.4	0.119
	Q9. Feel different or left out	6.6	5.8 <sup>(1)</sup>	6.6	6.2	0.05
	Q10. Feel frustrated because couldn't keep up with others	6.5	5.2 <sup>(1)</sup>	5.3 <sup>(1)</sup>	5.6	0.031*
	Q11. Feel frightened by an asthma attack	5.1	4.5	4.5	4	0.423
Asthma Symptoms	Q12. How much did coughing bothered you	5	3	3.7	2.4 <sup>(1)</sup>	0.021*
	Q13. How much did shortness of breath bothered you	3.4	2.4 <sup>(1)</sup>	2.9	2.1 <sup>(1)</sup>	0.015*
	Q14. How much did chest tightness or chest heaviness bothered you	4.4	3.4	3.7	3.0 <sup>(1)</sup>	0.050*
	Q15. How often did you have trouble getting a good night's sleep	4.6	4.4	4.7	3.9	0.403
	Q16. How much did wheezing bother you	4	4.3	3	2.8 <sup>(1)</sup>	0.014*
	Q17. How often did your asthma wake up at night	5	4.0 <sup>(1)</sup>	4.4	2.9 <sup>(1)</sup>	0.031*
	Q18. How often did you feel out of breath	5.4	4.9	4.6	3.3 <sup>(1)</sup>	0.004*
	Q19. How often did you have difficulty taking a deep breath	4.5	3.7	4.3	3.3	0.094
Environmental factors	Q20. Feel bothered by or have to avoid dust	3	2.4	2.1	2	0.059
	Q21. Feel bothered by or have to avoid cigarette smoke	2.7	2.6	2.6	2.7	0.995

	Q22. Feel bothered by or have to avoid going outside because of weather or air pollution	3.7	4.2	3	3.1	0.145
Social activities	Q23. How limited have you been doing social activities	2.5	2.9	3	4.1	0.069
	Q24. How often did asthma prevent you from going to school	5	4.4	3.8 <sup>(1)</sup>	3.5 <sup>(1)</sup>	0.012*
	Q25. How often did asthma prevent you from performing your religious duties	6.3	5.7	6.2	6.1	0.386
	Q26. Feel that asthma will affect your choice of a career	6.1	5.6	6	6.2	0.483
	Q27. Feel that asthma will affect your working efficiency	6.3	5.3 <sup>(1)</sup>	6	6.2	0.024*
Overall scores		4.7	4.3	4.2	3.9	0.211

§The questions are listed in short form for the sake of space, keeping the essential keywords. ¶Overall scores: the mean of all responses per asthma severity groups. \*One-way ANOVA P values. Significance was considered at two-tailed P<0.05. ‡Dunnett's post-hoc tests, where scores from mild, moderate and severe groups marked with <sup>(1)</sup> and highlighted with bold font were significantly different than those of intermittent group.

**Table 2:** Comparative analysis of HRQL mean scores by questions among asthma severity groups.

Table 2 shows a comparative analysis of the impact of asthma on HRQL scores from patients classified in four different severity groups. Multiple pairwise comparisons between the intermittent group versus mild, moderate and severe asthma revealed significant differences in 13 out of 27 questions; most of them (9 questions) confirmed that severe asthmatics (and sporadically moderate and mild asthmatics) perceived their HRQL as more adversely affected in relation to intermittent patients. This was particularly consistent in questions of the asthma symptoms category: The aspects that bothered significantly the severe asthmatics more than intermittent asthmatics were coughing (Q12), shortness of breath (Q13), chest tightness (Q14), wheezing (Q16), night wakeups (Q17) and feel out of breath (Q18). In contrast, in two particular questions, Q4 (school-related activities) and Q23 (social activities), the results were the opposite, in the sense that the severe group reported significantly better scores than the other groups with milder symptoms. Regarding the overall scores, quantitative differences greater than 0.5 in the 7-points scale, between intermittent (4.7) and moderate (4.2) and severe (3.9) groups were observed; although they were not statistically significant (ANOVA, P value=0.211), differences of such magnitude are considered clinically important [23].

The questions are listed in short form for the sake of space, keeping the essential keywords. Overall scores: The mean of all responses per asthma severity groups. \*One-way ANOVA P values. Significance was considered at two-tailed P<0.05. ‡Dunnett's post-hoc tests, where scores from mild, moderate and severe groups marked with <sup>(1)</sup> and highlighted with bold font were significantly different than those of intermittent group.

The data were also analyzed by categories, in which the HRQL mean sum of scores of the mild, moderate and severe groups were compared to those of the intermittent group (Table 3). This test found significant differences only within the symptoms category, indicating that the

mild, moderate and severe groups of patients had a worse perception of their HRQL than that of the intermittent patients.

Categories	‡ HRQL Mean Sum scores ± SDev				*P-values
	Intermittent	Mild	Moderate	Severe	-1
Physical activities	8.95 ± 3.36	9.66 ± 3.94	8.28 ± 3.53	9.9 ± 5.27	0.424
Emotional aspects	41.02 ± 8.03	37.42 ± 8.24	37.2 ± 10.55	35.4 ± 10.77	0.071
Asthma Symptoms	34.93 ± 8.8	29.83 ± 10.15 <sup>(1)</sup>	30.72 ± 9.14	23.35 ± 9.46 <sup>(1)</sup>	0.0001*
Environmental factors	9.41 ± 5.24	9.16 ± 4.81	7.72 ± 3.98	7.7 ± 5.24	0.34
Social activities	26.25 ± 4.36	23.81 ± 5.06	25.0 ± 5.5	26.05 ± 6.6	0.139

\*One-way ANOVA P values; ‡Dunnett's post-hoc tests; scores from mild, moderate and severe groups marked with <sup>(1)</sup> and highlighted with bold font were significantly different than those of intermittent group. Significance was considered at two-tailed P<0.05

**Table 3:** Comparative analysis of HRQL sums of scores by categories.

## Discussion

Asthma disease can result in varying degrees of restrictions in a patient's life, perceived in general as a lower quality of life which includes physical, emotional and social aspects [6,8,9,13,15]. Although many studies around the world have been conducted in order to evaluate the impact of asthma on HRQL aspects of life [15,17,24,25], in Saudi Arabia, analyses on the quality of life of adolescents with different asthma severity symptoms are lacking.

This study identified a number of questions from different categories with better sensitivity at detecting HRQL score differences among the asthma groups. In general, (with two exceptions mentioned) the detrimental effect of asthma on HRQL appeared to be a function of its severity: Severe persistent asthmatics tended to be more sensitive to environmental triggers, prone to disrupting schooling activities, limiting strenuous physical activities (e.g., sports) and complaining of many symptoms causing discomfort, in relation to other asthma groups.

Specifically, regarding physical aspects, scores for strenuous activities (Q1) but not moderate activities (Q2) were diminished by asthma in severe and moderate asthmatics, whereas mild and intermediate asthmatics reported equivalent scores. Possibly, severe and moderate asthmatics avoid strenuous exercise for fear of triggering an exacerbation [26]. In contrast, the intermittent and mild asthmatics do practice strenuous physical activities more frequently, suggesting that their milder symptoms may not bother them enough. This is supported by the lack of significant differences in Q2 (moderate activities) and Q3 (couldn't keep up with others). In this respect, a Portuguese team reported similarities in sedentary lifestyles between adult asthmatics and healthy subjects: Depending on whether adult male and female asthmatics achieved control of symptoms, these patients did as much moderate and vigorous physical activities as healthy subjects [27]. As an alternative explanation, some reports have indicated that asthmatic children often express denial at their inability to have a normal life; for instance, some adolescents may have a 'risky' behaviour, by forcing themselves to act 'normally', trying to fit with their peers in order to avoid exclusion or ostracism [28].

Regarding the impact of asthma on emotional aspects, our study found that severe, moderate and mild groups were significantly affected in relation to intermittent asthmatics. In particular, severe and moderate groups were worried about not having their medication (Q6), whereas mild and moderate patients reported to feel frustrated because couldn't keep up with others (Q10). These finding contrasts with other reports that found no correlation of HRQL scores with emotional factors and that anxiety or depression do not always associate with asthma [10,29]. Nevertheless, other investigators have confirmed that exacerbations are truly detrimental to HRQL [3,9,15].

Furthermore, this study found that environmental factors such as dust, smoke and air pollution exert an important effect, by consistently lowering HRQL scores of all asthmatics; even though no significant differences among the asthma groups were found, the observed trend is to lower the scores, suggesting that these environmental triggers could be bothersome for asthmatics. In fact, dust allergens are considered a major environmental issue in Saudi Arabia [30].

Regarding social activities that were restricted by asthma, school attendance (Q24) scores were significantly worse in moderate and severe patients, comparatively to intermittent asthmatics. However, the severe asthma group not always reported the worse scores; in one particular variable, limitation in performing social activities as a result of asthma (Q23), this group of patients reported significantly better scores than the intermittent. Such unrestricted contrasts with observations in childhood asthma; for instance in children from the Netherlands, several social aspects were negatively influenced by asthma, and bullying by their peers was also reported [31]. It has been argued that some asthma patients see themselves as leading normal lives, but this could be a biased perception influenced by adjustments in their lifestyles imposed by disease [32]. In addition, by including three exploratory non-validated questions, this study revealed that

asthma does not affect significantly the performance of their religious duties, nor induce concerns about their future job or career. Congruent with these observations, a study from the Netherlands reported similar HRQL scores between asthma adolescents and a reference control group, in relation to self-reported psychosocial problems [33]. Another study from the United States also failed to find significant differences on all psychosocial aspects between young asthma adult patients and those with no chronic condition [34]. Evidently, asthma as a disease may not be a major factor limiting the social life of Saudi adolescents; this is congruent with reported changes in behaviour of adolescent patients, who deny the seriousness of their disease, perhaps because they fear to be perceived differently from others [35]. In turn, such 'abnormal' behaviour could represent an obstacle in the diagnosis and management of the disease [36].

## Limitations and Future Research

Although valuable information was obtained directly from the patients, and our main objective was achieved, potential shortcomings in this study need to be addressed in the future. A characteristic of the Saudi society is the practice of gender segregation, with women facing restricted rights and inequalities in comparison to other countries of the Middle East [37]; in contrast to men, for which there are no restrictions in physical exercise or social activities, women have mobility restrictions and limited or nil access to sport facilities. Therefore, since a predominance of female teenagers over males were recruited in the severe groups, relative to the intermittent, mild and moderate groups, we cannot exclude the possibility that this difference could have influenced HRQL scores. Another limitation of this survey is that it was not possible to collect information about their asthma control status. Further research should focus on gender differences, by comparing HRQL of women and men in relation to asthma, and to identify and characterize risk factors with greatest impact on HRQL and how such factors could be prevented and managed. These findings could help suggesting improvements on the Saudi medical system and to direct health practitioners on ways to manage symptoms, so as to improve the quality of life of patients.

## Conclusion

This study showed that asthma lowers significantly the quality of life of Saudi asthmatic adolescents in several aspects, with environmental, emotional and physical activities as being particularly influenced. We postulate that lack of symptoms control in intermittent and mild asthmatics, contributes to lower HRQL perception; this hypothesis deserves further analysis in the future.

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## Disclosure

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## Author Contribution

RK, BAM, FM, SIH, RSA were responsible for the execution of the study, interviewing patients and subjects, collection of data, and performed a preliminary analysis and report. AVT performed the

compilation of data, statistical analyses, and wrote the manuscript. AF, MMS, SMI, SM, participated in the initial phase of planning and design of the study, and analyzed the clinical history of the recruited patients. RH was the main coordinator responsible in the design, planning and reviewing of the preliminary report and final manuscript. All authors read and approved the final manuscript.

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