

ORIGINAL ARTICLE

Effects of the pulmonary rehabilitation program on the quality of life of asthmatic children and their parents

Efeitos da reabilitação pulmonar sobre a qualidade de vida: uma visão das crianças asmáticas e de seus pais

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ABSTRACT

Introduction: The assessment of quality of life in asthmatic children and adolescents is important, as severe asthma, or its uncontrolled symptoms, prevents the participation of these individuals in sports activities, disturbs sleep and, consequently, the regular school performance. However, the disease does not have an impact only on the patients, but it also affects the quality of life of their parents. **Objective:** To evaluate the quality of life of asthmatic children and the perception of their parents/tutors regarding their children's quality of life before and after a Pulmonary Rehabilitation Program (PRP). **Patients and Methods:** 5 male children, with a mean age of 8.16 ± 1.83 years, were studied and 6 parents/tutors, before and after a 24-session PRP. All the children had a clinical diagnosis of mild and moderate asthma. The Pediatric Asthma Quality of Life Questionnaire (PAQLQ) was applied to the children, whereas a second and specific questionnaire was applied to the parents. The absolute scores of the questionnaires before and after the PRP were compared by Wilcoxon's test with $p < 0.05$. **Results:** There was no significant difference in the comparison of the results of the children's questionnaire, before and after PRP. However, absolute improvement was verified in the majority of the questions in both questionnaires. **Conclusion:** The quality of life questionnaires applied to the asthmatic children and their parents did not detect any significant variation regarding the analyzed questions. However, the absolute variations in several items, involving the two instruments, suggest a clinical improvement in the quality of life shown by both questionnaires.

KEYWORDS

asthma/rehabilitation, quality of life, child

RESUMO

Introdução: A determinação da qualidade de vida de crianças e adolescentes asmáticos é importante, pois a asma grave ou com sintomas mal controlados, impede a participação desses indivíduos em esportes, prejudica o sono e, conseqüentemente, o rendimento escolar. Entretanto a doença não tem somente um impacto sobre os pacientes, mas também afeta a qualidade de vida de indivíduos ligados a eles. **Objetivo:** Avaliar a qualidade de vida das crianças asmáticas e a percepção dos pais/responsáveis quanto à qualidade de vida de seus filhos antes e após um programa de reabilitação pulmonar (RP). **Materiais e Métodos:** Foram estudadas 5 crianças, sexo masculino, com idade média de $8,16 \pm 1,83$ anos e 6 pais/responsáveis, antes e após um programa de reabilitação de 24 sessões. Todas as crianças tinham diagnóstico clínico de asma leve e moderada. Foi aplicado o questionário Pediatric Asthma Quality of Life Questionnaire (PAQLQ) para as crianças e um segundo questionário específico para os pais. As pontuações numéricas dos questionários pré e pós RP, foram comparadas pelo teste de Wilcoxon, sendo considerado um $p < 0,05$. **Resultado:** Não houve diferença significativa, na comparação dos resultados pré e pós RP. Entretanto, verificou-se melhora absoluta na maioria das questões em ambos os questionários. **Conclusão:** Os questionários de qualidade de vida aplicados às crianças asmáticas e aos seus pais/responsáveis, não detectaram variação significativa. Contudo, as variações absolutas em vários itens envolvendo os dois instrumentos sugerem uma melhora clínica na qualidade de vida em ambos os questionários.

PALAVRAS-CHAVE

asma/reabilitação, qualidade de vida, criança

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INTRODUCTION

Asthma is one of the most incident chronic diseases in childhood, being the most important cause of limitations for sports and other activities. From the clinical point of view, asthma represents a diffuse obstruction of the airways that is spontaneously reversible, or with treatment, which can course with hyperinsufflation and hyperactivity of the airways to specific and unspecific stimuli.^{1,2}

Asthma has a multifactorial etiology, characterized by the diversity of symptoms and the most common manifestation are the recurrent respiratory problems. The functional alterations that are characteristic of asthma are, in general, caused by the spasm of the smooth bronchial musculature, mucosal edema and bronchial hypersecretion, causing an increase in the airway resistance, irregular distribution of the inspired air, ventilation/perfusion ratio disorders and higher energy consumption during the respiratory work.³

Childhood asthma is responsible for important sleep alterations, which significantly impairs the global performance of these children during the day, mainly the school performance⁴. In a study of prevalence carried out in Recife, between the years 1994-95 and 2000, it was observed that, on average, the annual prevalence of asthma crises that impaired the sleep of the studied children was 13 and 10.3%, respectively. The study evaluated more than 3,000 schoolchildren and it was verified that the asthmatic children presented a higher number of school absences and a higher rate of school dropout when compared to normal controls.⁵

It is believed that the improvement in the physical condition of asthmatic children makes them more capable of coping with health problems, as it improves the cardiorespiratory fitness, supplying reserves to face the obstructive crises.⁶

According to Teixeira et al,³ the regular participation in physical activities resulted in an increase in exercise tolerance and work capacity, with less discomfort and a decrease in bronchospasm.

The physical activity that is part of pulmonary rehabilitation programs (PRP) must be carried out together with the medical treatment, environmental and educational control and family support. However, the onset of asthma symptoms makes the asthmatic child avoid the practice of physical exercises, in fear that new asthma crises might occur. These situations end up creating a vicious circle of physical hypoactivity and deterioration of the general physical fitness.

Until recently, the main concern related to asthma was the treatment of the crises and their intensity variations, as well as the prevention of recidivism through environmental and medication measures. With the advent of new long-term inhaled medications, the prognosis improved quite a lot. Therefore, the main concern is to allow the patients to lead a better life with asthma and improved their quality of life.⁴

Quality of life (QoL) is a parameter that has been very often considered in the study of several nosological entities, mainly in the adult population.^{5,6} The measurement of health-related QoL became an important indicator in clinical tests, strategies of improvement in clinical practice, research and health care assessment, being

important for the identification of children and adolescents with special needs.⁷

Additionally, the discussion of the model of the global approach of the individual within a biopsychosocial context makes the assessment of the quality of life an essential parameter in rehabilitation programs.⁸

QoL is determined by individual perceptions of life position, within the context of culture, in a system of value where one lives and in the association of ideals, expectations, standards and concerns and it undergoes transformation in response to disease.^{4,9}

The measurement of QoL of asthmatic children and adolescents is important, as the severe asthma or its uncontrolled symptoms, as previously reported, prevents the participation of these individuals in sports practice, disturbs sleep and the school performance,⁴ so that these children and adolescents present a bad QoL.

However, the disease does not affect the patients only, but also affects the QoL of the individuals related to the patient.⁴ To the best of our knowledge, there have been no studies that evaluated the QoL in asthmatic children before and after a supervised PRP, involving stretching, resistance exercises and practice of physical exercises.

OBJECTIVE

The objective of the present study was to evaluate the QoL of asthmatic children and the perception of their parents/tutors regarding the QoL of their children before and after a PRP involving physical exercises.

METHODS

Study design

This was a quasi-experimental study.

Study subjects

Children with a clinical diagnosis of mild to moderate asthma, registered at the Centro de Referencia Campos Sales do Sistema Unico de Saude (Brazilian Public Health System - SUS), in the city of Belo Horizonte, state of Minas Gerais, Brazil, whose files were part of the Pediatric Pneumology Department Record, from January to June, 2006, were recruited for the study. Male children aged 6 to 14 years, who lived in the city of Belo Horizonte and were treated at the Centro de Referencia Campos Sales were enrolled. The exclusion criteria included children with ambulation or active mobility difficulties; those with orthopedic, neurological or muscular affections; children whose parents disagreed with the proposed method and refused to sign the informed consent form and children who did not commit to follow 24-session PRP. The children's parents received transportation vouchers for the children and accompanying parent, to guarantee attendance to the PRP.

Procedures

All recruited children were referred to the school-clinic of Centro

Universitário de Belo Horizonte - UNI-BH, to start the rehabilitation program. The PRP was carried out in 24 50-minute sessions, three times a week. The pulmonary rehabilitation program consisted of stretching exercises, upper limb (UULL) strengthening, abdominal muscle strengthening and aerobic exercises.

Stretching

The stretching of the respiratory accessory muscles was performed before the start of each PRP session. The child remained sitting with the back supported, with the upper limbs comfortably positioned. Series of 10 repetitions of anterior cervical flexion and right and left lateral flexion movements were performed.¹⁰

Upper limb strengthening

The UULL exercises were also performed before the start of the cardiorespiratory training. The children remained sitting, well positioned with the back supported and performed 3 series of 15 repetitions of UULL abduction at 180° above the head and other 3 series of 15 repetitions of a movement consisting of abduction at 90° followed by horizontal adduction.¹¹

Abdominal muscle strengthening

The abdominal muscles are considered synergistic inspiration muscles and before the PRP itself, the children were advised to perform trunk flexion exercises from a dorsal decubitus position, on an appropriate floor mat placed on the floor of the therapeutic gym. Each child performed 3 series of 10 repetitions of the respective movement.¹⁰

Aerobic Exercises

After the previously described initial exercises, the children were submitted to aerobic training, with a calculated overload of 75 - 85 % of the maximum HR predicted for the age.^{12,13} To ensure the children's interest and commitment, varied training activities were proposed, and among them, electromagnetic treadmill, cycloergometer, trampoline and walking. During the aerobic training, the children were monitored regarding HR, RR, SpO₂ and dyspnea scale.¹⁴ At the end of the session, all vital signs were measured once more.

Before and after this rehabilitation program, the children and their parents were submitted to the Quality of Life (QoL) assessment using specific tools.

The questionnaire used for QoL assessment of asthmatic children, the Asthma Quality of Life Questionnaire (PAQLQ-A)⁶ and the questionnaire for the assessment of the parents' perception¹⁵ were applied separately so that there would be no response induction, and always by the same examiner; the questionnaires could not be self-applied. The children and their parents/tutors received transportation vouchers as an attempt to guarantee the attendance to the rehabilitation sessions.

Tool

The QoL questionnaire used to evaluate the children, the Pediatric Asthma Quality of Life Questionnaire (PAQLQ),⁶ was validated for the Brazilian population and consists of 23 questions,

divided in three domains: physical activity limitations (PAL) (5 questions), symptoms (10 questions) and emotions (8 questions). In the PAL domain, three questions were selected individually by each child, from an activity sheet presented to them and the patients could then choose the activities that had bothered them the most when performing them in the previous week.

The first three questions of the questionnaire concerned the three chosen activities and the other 20 questions referred to daily living questions involving symptoms, limitations and the influence of emotions on asthma. The answers were evaluated through a 7-point response-card, in which 1 indicated the maximum impairment and 7, no impairment.

A QoL questionnaire was also applied to the person in charge of the asthmatic child. This tool was based on the questionnaire proposed by Juniper et al,¹⁵ and consisted of 13 questions with two domains: physical activity limitation (PAL) (four questions) and emotional function (nine questions). The questionnaire was applied as an interview and the answers to every item were graded using a similar scale to the one used with the children. The questionnaire evaluated the impairments experienced by the adults in charge of the children regarding the previous week.

Ethical Concerns

The study was approved by the Ethical Committee of our Institution under #026 / 2005. The parents/tutors signed the Free and Informed Consent Form.

Statistical Analysis

A descriptive analysis of the data was carried out, and these were expressed as means± standard deviations. The SPSS statistical package version 13.0 was used for the analysis. The Shapiro-Wilk's normality test was used for the statistical analysis. For the comparison between the numerical values graded in the QoL scales, the Wilcoxon's non-parametric test was used. Statistical significance was set at $p < 0.05$.

RESULTS

Children's questionnaire

A total of 29 male children, with a mean age of 8.16 ± 1.83 years, were selected at the Centro de Referência Campos Sales, with a clinical diagnosis of asthma, in the period between January and May, 2006. Of these, 14 children met the inclusion criteria, but only 10 started the rehabilitation program after the initial assessment. During the program, four children were excluded due to constant absenteeism and one had difficulty to understand the questions related to the PAQLQ-A questionnaire. For the final analysis, the questionnaire was applied to 5 children and 6 parents/tutors.

The activities chosen at the PAQLQ-A questionnaire by the children were play ball, run, skip rope, go up steep streets, do homework, study, swim, roller skate and play tag. These were classified as activities 1, 2 and 3, following the order at which they

were more often performed in their daily lives.

There was no statistically significant difference when comparing the questions on QoL in the children before and after the PRP. However, the absolute values demonstrated that there was an improvement in the QoL perception in 12 evaluated questions (questions 1, 2, 3, 5, 6, 7, 11, 15, 16, 17, 18, 19). The description of each question and the pre and post-PRP comparison are shown in Table 1.

Parents' questionnaire

Regarding the parents' questionnaire, it was applied to 4 mothers, 1 father and 1 first-degree aunt; the choice of these individuals was made considering the person who first took the child for clinical assessment. Comparing the values scored by the parents at the start and the end of the program, we verified a significant improvement in the perception of QoL by the parents/tutors regarding question 6 only, which asks "How many sleepless nights did the parents endure due to the child's asthma". All the other questions in the parents' questionnaire presented a variation in absolute values when comparing the pre- and post-PRP assessment, although without statistical significance, demonstrating a tendency toward the QoL improvement in the view of the parents/tutors regarding the child's asthma (Table 2).

DISCUSSION

The attempt to avoid the asthma crisis triggering factors makes the asthma an important stress source, leading many patients to great restrictions regarding the physical, social and emotional aspects of their daily living and thus, to the impairment of their QoL.⁷

In the present study, we did not observe a significant QoL improvement in the children's perception after the PRP. However, throughout 12 questions, we observed an improvement in these children's QoL perception, which probably did not present statistical significance due to small sample size that was assessed, even after financial support was offered for the transportation of these children to ensure attendance to the program.

Other studies have evaluated the QoL of asthmatic children;^{6,16} however, none of them is related to a specific and supervised pulmonary rehabilitation program.

In one of these studies,¹⁷ the authors verified the efficacy of an unsupervised home PRP, where the exercises were administered by the parents for 30 days. A significant improvement in QoL was observed in the studied children. It is worth mentioning that the exercise program was carried out with 16 children.

In another study in 2006, by Basaran et al,¹⁸ the QoL was assessed in 62 children with moderate asthma and these were randomly divided in two groups: one group carried out a basketball training program for 8 weeks and another group performed a home program to control the asthma crises. Significantly beneficial effects were observed in the group that carried out the basketball training program, when compared to the control group.

Fanelli et al,¹⁹ in a recent study carried out in 2007, carried out the aerobic training of 21 children with moderate-severe persistent

TABLE 1
Comparison of the quality of life before and after the pulmonary rehabilitation program (children).

Questions		Initial mean	Final mean	P
1	Activity 1 - How much did the asthma bother you? PAL	3.80 (2.04)	4.20 (1.48)	0.65
2	Activity 2 - How much did the asthma bother you? PAL	3.40 (2.30)	5.00 (1.87)	0.41
3	Activity 3 - How much did the asthma bother you? PAL	4.80 (1.09)	5.00 (1.58)	0.78
4	How much did the coughing bother you? S	3.20 (2.38)	2.80 (2.48)	0.85
5	Frequency at which you became upset? EF	4.00 (1.87)	5.60 (2.19)	0.19
6	Frequency at which you became tired? S	4.00 (1.73)	5.00 (0.70)	0.10
7	Frequency at which you became bothered? EF	4.60 (1.81)	4.80 (1.78)	0.70
8	How much did the crises bother you? S	4.20 (2.77)	4.20 (1.92)	1.00
9	Frequency at which you became angry? EF	5.00 (2.44)	4.80 (2.68)	0.36
10	How much did the wheezing bother you? S	3.80 (1.92)	3.20 (1.30)	0.55
11	Frequency at which you became irritable? EF	4.60 (2.07)	4.80 (1.48)	1.00
12	How much did the chest constriction bother you? S	5.60 (2.60)	4.40 (2.07)	1.65
13	Frequency at which you felt different from others? EF	4.40 (2.07)	4.40 (2.30)	1.00
14	How much did the shortness of breath bother you? S	4.80 (2.38)	3.40 (0.89)	0.26
15	Frequency at which you were upset for not following others' rhythm? EF	4.40 (1.14)	5.40 (2.60)	0.35
16	Frequency at which you woke up at night? S	4.60 (2.30)	5.00 (2.12)	0.59
17	Frequency at which you did not feel comfortable? EF	4.60 (1.51)	4.80 (1.30)	0.70
18	Frequency at which you felt shortness of breath? S	3.20 (2.38)	5.40 (1.81)	0.17
19	Frequency at which you thought you could not follow others' rhythm? PAL	4.20 (2.38)	4.40 (2.07)	0.70
20	Frequency at which you slept badly at night? S	4.80 (1.48)	4.00 (1.41)	0.41
21	Frequency at which an asthma crisis made you afraid? EF	5.40 (2.30)	5.40 (2.30)	1.00
22	How much did the asthma bother you? PAL	5.20 (1.78)	4.80 (1.30)	0.65
23	Frequency at which you had difficulty to take a deep breath? S	4.80 (1.30)	4.80 (0.44)	1.00

* Values are expressed in means and the numbers in parentheses represent the SD.

* Numbers in bold represent the final absolute mean that is higher than the initial absolute mean.

* PAL=physical activity limitation; S= Symptoms; EF= Emotional Function

TABLE 2
Comparison of quality of life before and after the pulmonary rehabilitation program (parents).

Questions		Initial mean	Final mean	P
1	How frightened were you when your child presented symptoms? FE	3.80 (2.56)	4.10 (2.22)	0.78
2	How much did you family have to change plans due to asthma? LA	2.80 (2.13)	3.80 (2.56)	0.41
3	How upset were you due to the child's bad mood? FE	4.30 (2.06)	5.80 (1.83)	0.06
4	What was the impact of asthma on your job? LA	2.10 (1.94)	3.50 (2.58)	0.19
5	How much did you worry about the symptoms? FE	2.00 (1.26)	3.50 (2.50)	0.10
6	How many nights of sleep did you lose because of asthma? LA	3.30 (1.75)	5.60 (1.96)	0.04
7	How upset were you at the impact of asthma on your family? FE	4.80 (2.99)	5.10 (2.31)	0.65
8	How many times were you awoken at night because of asthma? LA	4.40 (1.67)	4.50 (2.73)	0.78
9	How sad were you because your child had asthma? FE	3.80 (3.12)	5.00 (3.09)	0.18
10	How concerned were you with your child's performance? FE	2.50 (1.64)	4.60 (1.86)	0.06
11	How worried were you about the effects of medication? FE	2.60 (2.65)	4.60 (1.86)	0.14
12	How worried were you about overprotecting your child? FE	3.50 (1.87)	4.80 (2.63)	0.25
13	How concerned were you about your child having a normal life? FE	2.80 (2.13)	5.00 (2.00)	0.07

* Values are expressed in means and the numbers in parentheses represent the SD.

* p < 0.05

* The bold number in question 6 demonstrates statistical significance and in the others, significant trends.

* PAL=physical activity limitation; EF= Emotional Function*

asthma and observed a significant improvement in the physiological variables associated to submaximal exercise and a significant improvement in the QoL of the studied children.

Thus, all the data related to childhood asthma, physical exercises and QoL demonstrate that the cardiorespiratory training has a main role in the clinical management of asthma and its control and in the quality of life of the affected children and their parents/tutors.

A factor that might have influenced the non-observance of QoL improvement in the children of the present study was the weather conditions at the time of the reassessment of these children. Although the assessments occurred in the month of October (springtime), exceptionally in the city of Belo Horizonte, at this time of the year, there was a sudden decrease in the temperature, with temperatures close to 17°C, according to the National Meteorology Service.²⁰

According to Saldanha et al,²¹ the influence of weather changes, particularly sudden decreases in temperature, are associated with a higher dispersion of aeroallergens. In this situation, asthma crises are more frequently observed. Other studies have demonstrated that low temperatures are related with a higher frequency of asthma crises.²²

Of the 5 reassessed children, 3 had presented an asthma crisis one week before the QoL questionnaires were reapplied and this fact can be attributed to the weather changes that occurred during this period. The questionnaire applied to the children (PAQLQ-A) stipulates that the adequate age range for its use is 7 to 17 years. However, the study was carried out in children aged 6 or older, as it was difficult to recruit individuals for the study. The factor of the age younger than the one proposed by the questionnaire might have interfered with the understanding of the questions, impairing the perception of the QoL.

It is important to consider that the children included in this study did not present any significant alteration in pulmonary function and were clinically classified as having mild or moderate asthma, so that the disease did not represent a considerable disability to them, justifying the small variations in the perception of QoL. The questionnaire applied to the parents identified a significant improvement in only one of the questions, possibly due to the same clarified reasons for the children, with a direct effect on the parents' perception. It is also important to consider that the small sample size and the lack of a control group prevent any generalization of the results and might have been the reason for the lack of observation of statistically significant results in our study.

CONCLUSION

The QOL questionnaires applied to asthmatic children and their parents/tutors did not detect a significant variation in this parameter before and after the proposed rehabilitation program. However, absolute variations in several items involving the 2 questionnaires suggest an improvement in the QOL related to the rehabilitation program. Thus, it can be inferred that the children presented a better performance in their activities of daily living and that the parents/tutors perceived this change. We suggest that further studies be carried out with larger sample sizes, with the inclusion of children, separated by groups, with different degrees of airway flow obstruction, including more severe ones, as well as the addition of a control group.

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