Worse Quality of Life for Children With Newly Diagnosed Attention-Deficit/Hyperactivity Disorder, Compared With Asthmatic and Healthy Children

Rodrigo Escobar, MD*; Cesar A. Soutullo, MD, PhD‡; Amaia Hervas, MD§; Xavier Gastaminza, MD||; Pepa Polavieja, BSc*; and Inmaculada Gilaberte, MD*

ABSTRACT. Objective. To evaluate the quality of life (QOL) of untreated children with newly diagnosed attention-deficit/hyperactivity disorder (ADHD), compared with asthmatic and healthy children.

Methods. This prospective, case-control study included a group of 120 children, 6 to 12 years of age, with newly diagnosed ADHD according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Subjects were matched according to age, gender, and health care area with 2 control groups, ie, 93 asthmatic children and 120 healthy children. Sociodemographic characteristics and Child Health Questionnaire scores were collected.

Results. The QOL of children with ADHD was rated worse than that of asthmatic or healthy children for most Child Health Questionnaire domains. The greatest differences were found in behavior, social limitations attributable to physical problems, emotional impact on parents, and family activities. Almost every psychosocial domain was more affected in comparison with asthmatic children and both psychosocial and physical domains in comparison with healthy children.

Conclusions. ADHD interferes with the daily lives of children, parents, and families even more than asthma, primarily in areas related to psychosocial functioning, although evidence of impaired physical functioning also emerged. Delays in recognition, assessment, and management of ADHD may affect negatively the QOL of those children. Pediatrics 2005;116:e364–e369. URL: www.pediatrics.org/cgi/doi/10.1542/peds.2005-0386; quality of life, attention-deficit/hyperactivity disorder, asthma.

ABBREVIATIONS. ADHD, attention-deficit/hyperactivity disorder; CHQ, Child Health Questionnaire; CI, confidence interval; HRQOL, health-related quality of life; QOL, quality of life.

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Conflict of interest: Dr Escobar, Ms Polavieja, and Dr Gilaberte are full-time employees of Eli Lilly and Company; Drs Soutullo and Hervas have served on the advisory boards and speaker bureaus of and have had research funded by Eli Lilly and Company. Address correspondence to Rodrigo Escobar, MD, Avenida de la Industria, 30, 28108 Alcobendas (Madrid), Spain. E-mail: escobar.rodrigo@lilly.com PEDIATRICS (ISSN 0031 4005). Copyright © 2005 by the American Academy of Pediatrics.
healthy children. This article reports the results obtained in this study of quality of life (QOL), as measured with the Child Health Questionnaire (CHQ).

METHODS

Participants

Participants were included in the study from March 2003 to April 2004. The study population consisted of 3 groups, ie, 1 case group and 2 control groups. Subjects in the case group were children and adolescents 6 to 12 years of age with newly diagnosed ADHD according to Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition diagnostic criteria, confirmed with the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present and Lifetime Version. A minimal severity score of 1.5 SD above the normative value for age and diagnostic subtype on the ADHD Rating Scale, Parent Version/Investigator Administered, was required. Children were enrolled in 13 child psychiatry or child neurology units in Spain. Subjects were matched according to age, gender, and health care area with the 2 control groups. The asthmatic control group included children with newly diagnosed asthma, who were recruited in pediatric outpatient clinics on the basis of clinical criteria. The healthy control group included children with no known underlying medical or psychiatric illness, who were recruited during pediatric consultations at well-child visits or during pediatric visits for acute and minor illnesses (such as acute pharyngitis, acute otitis, or other acute viral upper respiratory tract diseases). Children with a history of bipolar disorder I or II, psychosis, mental retardation, current or recent serious medical conditions, or having received pharmacologic treatment for ADHD or asthma for ≥2 weeks before evaluation were excluded from the study. Children with ADHD and comorbid asthma were excluded from the study.

This study was approved by the ethics committee of each participating site and was conducted in accordance with the ethical principles of the Declaration of Helsinki and Good Clinical Practice standards. After a full explanation of the study was given to each child and their parents or guardians, written informed consent was obtained from the parents or guardians and assent was obtained from the child before enrollment in the study. A sample size of 111 evaluable subjects per group was required to detect a minimal difference of 0.4 in the CHQ scores between 2 groups, with 80% power and a 1-sided significance level of α = .05; assuming 3 groups and a common SD of 1.

Measures

Data collected included sociodemographic characteristics of children and their families and QOL, as measured with the CHQ. The ADHD Rating Scale was evaluated by the investigator, and the Clinical Global Impression-Severity and the Conners’ Parent Rating Scale-Revised, Short Form, were also used to determine the disorder severity among children with ADHD. The 50-item version of the CHQ was used to measure QOL. This instrument is a generic health status measure designed to record the physical and psychosocial well-being of children ≥5 years of age; it assesses children’s physical and mental health and parents’ perceptions of the extent to which problems in these areas interfere with peer and school activities, family activities, and the child’s ability to perform general activities. It has been applied in studies of chronically ill children in several countries. CHQ includes a broad spectrum of child- and family-focused health areas divided into the following sections (concepts): physical functioning, role/social limitations-emotional/behavioral, role/social limitations-physical, bodily pain/discomfort, behavior, mental health, self-esteem, general health perceptions, parent impact-emotional, parent impact-time, family activities, and family cohesion. Parents were instructed to consider the 4-week period preceding the completion of the questionnaire. As recommended in the CHQ manual, before analysis of results, the raw score of each scale was transformed to a scale of 0 to 100, with higher scores indicating a better QOL. Two summary scores (physical and psychosocial) were calculated. A physical or psychosocial summary score of 50 represents the mean in the general US population. Ten points above or below reflects 1-SD difference in either direction. The CHQ has been tested and validated, with normative values developed for asthma, ADHD, cystic fibrosis, epilepsy, and juvenile rheumatoid arthritis for the US population.

Design and Procedures

Subjects with ADHD were recruited by a child psychiatrist or neuropsychiatrist, and asthmatic and healthy control subjects were recruited by a pediatrician in a screening visit, where sociodemographic characteristics were collected and inclusion and exclusion criteria were checked. Subjects with ADHD were primarily enrolled consecutively and matched subsequently by age (6–9 or 10–12 years) and gender (male or female), at each study site, with the 2 control groups of asthma and healthy children. Thirty-six ADHD patients were referred for an evaluation visit with a child psychiatrist or neuropsychiatrist, where QOL and clinical parameters were measured (no more than a 2-week interval was allowed between selection and evaluation visits for subjects with ADHD or asthma).

Data Analyses

Summary statistics using number of observations, mean, and SD were reported for quantitative variables, with absolute and relative frequencies for categorical variables. Sociodemographic characteristics were compared between the 3 groups with McNemar tests. For CHQ scores, paired between-group comparisons were analyzed with paired t tests. Two-point differences in CHQ scores were considered very small differences, 5-point differences were considered clinically and socially relevant differences, 10-point differences were considered moderate differences, and 20-point differences were considered great differences. To avoid chance significance when the different paired t tests were performed, a Bonferroni adjustment was applied; each variable was tested at a significance level of .0018, to maintain an overall significance level of .05.

Ordinal logistic regression models were applied to the data with the intention of exploring the impact on QOL that other clinically relevant variables not used for matching could have. The scores for the 2 summary measures of CHQ were dichotomized into good QOL (scores of ≥40) or poor QOL (scores of <40) according to the normative values for the US population. These new variables were used as dependent variables in the models. The independent variables included in the model together with group (asthma, healthy, or ADHD) were educational attainment of parents and family structure.

RESULTS

A total of 237 participants were enrolled, ie, 124 subjects with ADHD, 93 asthmatic control subjects, and 120 healthy control subjects. Four of the 124 subjects with ADHD could not be matched with a control subject and therefore were excluded from the analyses. Sociodemographic characteristics of subjects are summarized in Table 1. More healthy children (95%) than asthmatic children (86%) or children with ADHD (81.7%) were living with both parents.

Parent-reported scores on the CHQ are summarized in Table 2. Figures 1 and 2 show the mean differences for each subscale and the respective 95% confidence intervals (CIs) between children with ADHD and asthmatic children and between children with ADHD and healthy children, respectively.

The QOL of children with ADHD was rated worse than that of asthmatic children for most domains. The greatest differences were found for behavior (mean difference: –22.44; 95% CI: –27.18 to –17.71; P < .0001), role/social limitations-physical (mean difference: –22.40; 95% CI: –28.91 to –15.89; P < .0001), parent impact-emotional (mean difference: –21.33; 95% CI: –28.71 to –13.95; P < .0001), and family activities (mean difference: –20.68; 95% CI: –26.86 to –14.50; P < .0001). These differences were considered to be clinically and socially relevant because they were outside the range of –5 to 5 points. Statistically significant differences were also seen for self-esteem (mean difference: –8.15; 95% CI: –12.82
**TABLE 1.** Sociodemographic Characteristics of Participants

<table>
<thead>
<tr>
<th></th>
<th>ADHD (n = 120)</th>
<th>Asthmatic (n = 93)</th>
<th>Healthy (n = 120)</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y, mean (SD)</td>
<td>9.0 (1.9)</td>
<td>9.3 (2.0)</td>
<td>9.3 (1.8)</td>
<td></td>
</tr>
<tr>
<td>Male gender, n (%)</td>
<td>94 (78.3)</td>
<td>71 (76.3)</td>
<td>94 (78.3)</td>
<td></td>
</tr>
<tr>
<td>Place of residence, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10 000 inhabitants</td>
<td>22 (18.3)</td>
<td>11 (11.8)</td>
<td>14 (11.7)</td>
<td></td>
</tr>
<tr>
<td>10 000–100 000 inhabitans</td>
<td>64 (53.3)</td>
<td>51 (54.8)</td>
<td>70 (58.3)</td>
<td></td>
</tr>
<tr>
<td>&gt;500 000 inhabitants</td>
<td>34 (28.3)</td>
<td>31 (33.3)</td>
<td>36 (30.0)</td>
<td></td>
</tr>
<tr>
<td>Educational level, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kindergarten</td>
<td>3 (2.5)</td>
<td>3 (3.2)</td>
<td>2 (1.7)</td>
<td>.7508</td>
</tr>
<tr>
<td>Elementary school</td>
<td>109 (90.9)</td>
<td>79 (85.9)</td>
<td>108 (90.0)</td>
<td></td>
</tr>
<tr>
<td>Secondary school</td>
<td>8 (6.6)</td>
<td>10 (10.8)</td>
<td>10 (8.3)</td>
<td></td>
</tr>
<tr>
<td>Family structure, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>.0025</td>
</tr>
<tr>
<td>Both parents</td>
<td>98 (81.7)</td>
<td>80 (86.0)</td>
<td>114 (95.0)</td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>1 (0.8)</td>
<td>2 (2.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>20 (16.7)</td>
<td>11 (11.8)</td>
<td>6 (5.0)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 (0.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupational status of parents, n (%)†</td>
<td>1 (0.8)</td>
<td>1 (1.1)</td>
<td></td>
<td>.4866</td>
</tr>
<tr>
<td>Both parents unemployed</td>
<td>4 (3.3)</td>
<td>5 (4.4)</td>
<td>4 (3.3)</td>
<td></td>
</tr>
</tbody>
</table>

* Frequencies were analyzed with a McNemar test.
† Homemakers are considered as employed.

**TABLE 2.** Parent-Reported CHQ Scores

<table>
<thead>
<tr>
<th>Score, Mean (SD)</th>
<th>ADHD (n = 120)</th>
<th>Asthmatic (n = 93)</th>
<th>Healthy (n = 120)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical functioning</td>
<td>98.3 (4.3)</td>
<td>93.5 (13.3)*</td>
<td>99.4 (2.8)</td>
</tr>
<tr>
<td>Role/social limitations-emotional/behavioral</td>
<td>85.5 (14.7)</td>
<td>90.7 (16.6)</td>
<td>98.8 (4.3)*</td>
</tr>
<tr>
<td>Role/social limitations-physical</td>
<td>72.1 (26.6)</td>
<td>94.8 (12.5)*</td>
<td>98.6 (5.9)*</td>
</tr>
<tr>
<td>Bodily pain/discomfort</td>
<td>79.7 (21.9)</td>
<td>75.3 (21.8)</td>
<td>83.7 (16.5)</td>
</tr>
<tr>
<td>Behavior</td>
<td>49.2 (16.9)</td>
<td>72.0 (15.0)*</td>
<td>77.3 (11.0)*</td>
</tr>
<tr>
<td>Mental health</td>
<td>60.6 (13.3)</td>
<td>66.1 (15.9)*</td>
<td>76.1 (12.0)*</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>71.9 (18.3)</td>
<td>79.9 (16.0)*</td>
<td>89.2 (13.1)*</td>
</tr>
<tr>
<td>General health perceptions</td>
<td>73.5 (16.6)</td>
<td>66.1 (17.4)</td>
<td>76.6 (18.9)</td>
</tr>
<tr>
<td>Parent impact-emotional</td>
<td>39.5 (19.0)</td>
<td>61.3 (27.5)*</td>
<td>76.5 (24.6)*</td>
</tr>
<tr>
<td>Parent impact-time</td>
<td>80.6 (21.2)</td>
<td>88.1 (16.3)</td>
<td>94.7 (14.6)*</td>
</tr>
<tr>
<td>Family activities</td>
<td>64.9 (23.0)</td>
<td>84.5 (17.7)*</td>
<td>92.1 (14.5)*</td>
</tr>
<tr>
<td>Family cohesion</td>
<td>60.8 (26.0)</td>
<td>72.2 (22.7)</td>
<td>72.9 (19.2)*</td>
</tr>
<tr>
<td>Physical summary score</td>
<td>51.6 (6.2)</td>
<td>50.5 (7.2)</td>
<td>55.1 (4.0)*</td>
</tr>
<tr>
<td>Psychosocial summary score</td>
<td>38.3 (7.5)</td>
<td>47.6 (8.6)*</td>
<td>53.2 (5.7)*</td>
</tr>
</tbody>
</table>

Lower scores indicate worse QOL.

* P < .001 versus ADHD (means analyzed with paired t tests).

QOL of children with ADHD was also rated worse than that of healthy children for most of the domains. Again, domain subscales with the greatest differences were parent impact-emotional (mean difference: −37.01; 95% CI: −42.62 to −31.41; P < .0001), behavior (mean difference: −28.09; 95% CI: −31.85 to −24.32; P < .0001), family activities (mean difference: −27.28; 95% CI: −31.85 to −22.71; P < .0001), and role/social limitations-physical (mean difference: −26.53; 95% CI: −31.54 to −21.52; P < .0001). Significant differences were also seen for self-esteem (mean difference: −17.33; 95% CI: −21.47 to −13.18; P < .0001), mental health (mean difference: −15.46; 95% CI: −18.90 to −12.02; P < .0001), parent impact-time (mean difference: −13.99; 95% CI: −18.63 to −9.34; P < .0001), role/social limitations-emotional/behavioral (mean difference: −13.33; 95% CI: −16.01 to −10.66; P < .0001), and family cohesion (mean difference: −10.71; 95% CI: −16.49 to −4.93; P = .0004). Both psychosocial and physical functioning subscales showed lower scores for children with ADHD. Consequently, both the psychosocial summary score (mean difference: −15.07; 95% CI: −16.94 to −13.20; P < .0001) and the physical summary score (mean difference: −3.42; 95% CI: −4.71 to −2.13; P < .0001) were statistically significantly lower for children with ADHD, compared with healthy children, although only the difference in the psychosocial summary scores was clinically and socially relevant. The results suggest that, in a broad

...
range of areas related to both psychosocial and physical functioning, parents of children with ADHD perceived that their children’s health problems interfered significantly more with the lives of children, parents, and families than did the parents of healthy children. Results of the multivariate analyses indicated that family structure in the different models did not modify significantly the effect of illness on QOL in either the physical or the psychosocial parameters.

**DISCUSSION**

To our knowledge, this is the first report that compares directly a group of untreated children with newly diagnosed ADHD with 2 matched control groups, one of children with a new diagnosis of asthma and the other of “healthy” children. We included these populations to evaluate the burden of illness itself, thereby avoiding a confounding treatment effect.

Parents of children with ADHD perceived that their children’s health problems interfered with the daily lives of children, parents, and families. The level of interference was perceived as being greater than that reported by parents of children with asthma or healthy children, predominantly in areas related to psychosocial functioning but also in some areas related to physical functioning. Parents of children with ADHD reported behavioral problems, limitations in schoolwork or activities with friends as a result of physical problems, emotional impact and worry as a result of the child’s health, and limitations in family activities to a greater extent than did parents of asthmatic or healthy children. To a lesser extent, children with ADHD had worse family relationships, lower self-esteem, and more feelings of anxiety or depression than did asthmatic or healthy children. Parents of children with ADHD had more limitations on their personal time than did parents of the 2 control groups. Children with ADHD were also more limited in schoolwork or other daily activities as a result of emotional or behavioral problems and in everyday physical activities than were healthy children. As a result, children with ADHD showed impaired psychosocial functioning, compared with asthmatic children, and impaired psychosocial and physical functioning, compared with healthy children. Differences between the ratings for children with ADHD and asthmatic children were smaller than those between the ratings for children with ADHD and healthy children. Before the study start, parents and children were informed that there would not be any change in their treatment or any reward for their participation in this study. This eliminated the possibility of the introduction of bias whereby
parents of children with ADHD might have benefited by rating their children’s HRQOL lower.

The results of this study are comparable to results obtained for the normative samples of asthmatic children and the general population in the United States. However, the 95% CIs for the mean scores for children with ADHD in the current study were below the 25th percentile of the normative values for physical functioning, role/social limitations-physical, and physical summary score. In addition, regarding the differences between children with ADHD and healthy children, data for the normative samples did not show the significant differences noted in the current study for role/social limitations-physical. This impaired physical functioning had not been reported previously for children with ADHD. Although it is possible that this might be only a casual finding for this study population, it is worthy of additional research.

The differences between groups regarding family structure were of concern because of the potential influence on psychosocial functioning. Family structure was explored as a possible confounding factor, but a significant modification of QOL was not seen. This finding supports the validity of these results.

The differences between groups regarding family structure were of concern because of the potential influence on psychosocial functioning. Family structure was explored as a possible confounding factor, but a significant modification of QOL was not seen. This finding supports the validity of these results. Despite the fact that some differences in behavior and mental health domains might be expected between the groups, an impact on HRQOL was evident. As noted above, parents of children with ADHD perceived that the health problems of their children interfered with the daily lives of children, parents, and families, even more than parents of children with asthma, a common chronic condition with a significant burden for affected children. This is a significant finding, considering that one of the goals of health care is to improve patients’ perceptions of their health, given the extent to which their health problems interfere with their QOL. This impaired QOL observed for children with ADHD could have been influenced by the presence of other comorbid psychiatric conditions. In fact, according to the diagnostic interview with the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present and Lifetime Version, children with ADHD in the current study showed significantly more comorbid disorders (mainly oppositional defiant disorder) and anxiety disorders than did asthmatic or healthy children (data not shown). Finally, the time to diagnosis of ADHD, once the onset of symptoms occurred, was long (mean: $5.8 \pm 2.3$ years), with a median age at symptom onset of 3 years. The time when child behavior began to interfere with school, family, and social functioning used to be several years after the onset of

![Mean differences (with 95% CIs) in CHQ scores between children with ADHD and healthy children. A negative difference indicates worse QOL for children with ADHD than healthy children. Differences lower than −5 or higher than +5 are considered clinically relevant (as indicated with dotted lines). ‡P < .001 (means analyzed with paired t tests). Lim. indicates limitations.](image-url)
symptoms\textsuperscript{20} and, by the time diagnosis was made, impaired functioning was already apparent. This long interval from the onset of symptoms to diagnosis highlights the difficulties of parents, teachers, and clinicians in ADHD recognition. Increases in ADHD awareness may shorten time to diagnosis. Early recognition, assessment, and management of this condition can redirect the educational and psychosocial development of most children with ADHD.

The main limitation of the study is that it relied on information obtained from parents, rather than from the patients themselves. It is possible that the health perceptions of the children might have differed from those of their parents. There is evidence suggesting a difference in parents’ and children’s perceptions of child QOL.\textsuperscript{21,22} However, for the pediatric population, parent proxy tools are accepted generally as being reliable measures of child health status. It is also possible that parents might have attributed incorrectly children’s impaired QOL to a particular disease when actually the impairment was caused by other factors. In this way, certain sociodemographic characteristics or comorbid conditions might be associated with impaired functioning. However, the results presented here describe parents’ perceptions of the impact of ADHD, which is arguably key to the physical, psychological, and social functioning of children with ADHD and their families. Finally, the time from the onset of symptoms to diagnosis was not controlled for children with asthma as for children with ADHD, and information regarding the type and severity of asthma experienced by children in the control group was not collected.

CONCLUSIONS

These results suggest that children with ADHD and their families have problems in their everyday lives that go beyond the symptoms of the disorder. Furthermore, this interference with the daily lives of children, parents, and families is reported by parents as being even greater than that of children with asthma (a common chronic condition with a significant burden for affected children), mainly in areas related to psychosocial functioning. Impaired physical functioning is also apparent in comparison with healthy children. There was a 2- to 12-year diagnostic delay for children with ADHD (mean: 5.8 \pm 2.3 years), which probably had an effect on the impact of illness on QOL. Early recognition, assessment, and management of this condition can redirect the educational and psychosocial development of most children with ADHD.

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e369

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An error appeared in the article by Escobar et al, titled “Worse Quality of Life for Children With Newly Diagnosed Attention Deficit/Hyperactivity Disorder, Compared With Asthmatic and Healthy Children” that was published in the September 2005 issue of Pediatrics Electronic Edition (2005;116:e364–e369). In the Results section on page e365, the first line reads: “A total of 237 participants were enrolled, ie, 124 subjects with ADHD, 93 asthmatic control subjects, and 120 healthy control subjects.” The sentence should read as follows: “A total of 337 participants were enrolled, ie, 124 subjects with ADHD, 93 asthmatic control subjects, and 120 healthy control subjects.”

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A statement should appear in the article by Stettler et al, titled “High Prevalence of Overweight Among Pediatric Users of Community Health Centers” published in the September 2005 issue of Pediatrics Electronic Edition (2005;116:e381–e388). The statement should read: “The views and opinions expressed in this manuscript are those of the authors and do not reflect the official policy or position of the Health Resources and Services Administration, the US Department of Health and Human Services, or the US Government.”

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