

CHEST[®]

Official publication of the American College of Chest Physicians



Children With Asthma Miss More School : Fact or Fiction?

Mark W. Millard, Pauline T. Johnson, Anna Hilton and Mary Hart

Chest 2009;135;303-306; Prepublished online October 10, 2008;
DOI 10.1378/chest.08-1642

The online version of this article, along with updated information
and services can be found online on the World Wide Web at:
<http://chestjournal.chestpubs.org/content/135/2/303.full.html>

CHEST is the official journal of the American College of Chest Physicians. It has been published monthly since 1935. Copyright 2009 by the American College of Chest Physicians, 3300 Dundee Road, Northbrook, IL 60062. All rights reserved. No part of this article or PDF may be reproduced or distributed without the prior written permission of the copyright holder.
(<http://chestjournal.chestpubs.org/site/misc/reprints.xhtml>)
ISSN:0012-3692



Children With Asthma Miss More School*

Fact or Fiction?

Mark W. Millard, MD, FCCP; Pauline T. Johnson, PhD, RN;
Anna Hilton, MSN, RN; and Mary Hart, RRT, RCP

Background: It is widely believed that children with asthma miss considerably more school than children without asthma. Previous surveys have indicated that 49% of children with asthma miss school (Asthma in America, 1998), but only a few studies have attempted to quantify the amount of school missed. Understanding the role of asthma in school attendance will help direct limited health-care resources to the children who need them most.

Methods: We investigated school absence rates in fourth- through sixth-grade students in 19 inner-city schools in the Dallas Independent School District (DISD). The sample consisted of 353 students who were identified as possibly having asthma based on responses to a modified Brief Pediatric Screen instrument and who underwent spirometry and/or exercise challenge (EC) testing to confirm the diagnosis of asthma: 25 students were excluded for $FEV_1 < 70\%$ and without bronchodilator response, while 157 students had EC-positive test results, and 171 students had EC-negative test results. We compared yearly absences for these students with each other, with all fourth- through sixth-grade students in the 19 study schools, and with all fourth-through sixth-grade students in the district. We also tabulated data from a separate database that included asthma patients identified by the school registered nurse (RN). Absence data by school and by grade level were provided by the school district for the 2002–2003 school year.

Results: Absence rates were as follows: 2.54% (EC positive), 2.12% (EC negative), 2.59% (abnormal FEV_1), 2.86% (RN identified), 2.85% (all fourth- through sixth-grade students in study schools), and 2.95% (all fourth- through sixth-grade students in the DISD).

Conclusion: Students with asthma in the DISD miss no more school their classmates without asthma. (CHEST 2009; 135:303–306)

Key words: asthma; pediatric; school absenteeism

Abbreviations: DISD = Dallas Independent School District; EC = exercise challenge; NAEPP = National Asthma Education and Prevention Program; RN = registered nurse

It is widely believed that children with asthma miss considerably more school than children without asthma. In the 1998 Asthma in America survey,¹ school absences related to asthma symptoms were

reported by almost half of families with children with asthma. Data collected by the Dallas Independent School District (DISD) for the 1998–1999 school year noted that asthma was the leading cause of chronic school absenteeism for health-related reasons.² Even so, no literature has appeared that has examined the quantitative effect of asthma on school absenteeism in a sample that included all children

*From the Baylor University Medical Center–Baylor Martha Foster Lung Center (Dr. Millard and Ms. Hart), Dallas, TX; Baylor University Louise Herrington School of Nursing (Dr. Johnson), Dallas, TX; and Veterans Administration (Ms. Hilton), Memphis, TN.

The study was supported by funds from the Dallas Asthma Consortium and the Summerfield Roberts Foundation. The authors have no conflicts of interest regarding the subject matter of this article.

Manuscript received August 7, 2008; revision accepted September 5, 2008.

Reproduction of this article is prohibited without written permission from the American College of Chest Physicians (www.chestjournal.org/misc/reprints.shtml).

Correspondence to: Mark W. Millard, MD, FCCP, Baylor University Medical Center, 3500 Gaston Ave, Dallas, TX 75246

DOI: 10.1378/chest.08-1642

with asthma, regardless of severity. Therefore, no studies have challenged the assumption that children with asthma miss more school than those without asthma. In this study, a cooperative venture of the Baylor Martha Foster Lung Center, the Baylor University Graduate Program in Nursing, and the DISD, we sought to quantitate the effect of asthma on school absenteeism during the 2002–2003 school year among children with varying degrees of asthma severity.

MATERIALS AND METHODS

As part of an inner-city school asthma screening and identification project funded by the Dallas Asthma Consortium and the Summerfield Roberts Foundation, 3,100 students in 19 elementary schools received asthma symptom screening questionnaires (adapted from the Brief Pediatric Screen³). Of the 1,555 students who returned questionnaires, 477 (31% of returned sample) had symptoms of possible asthma. These students were offered free, school-based asthma testing that involved initial spirometry and a 10-min free-run exercise challenge (EC), followed by serial spirometry. In order to participate in the study, parents/caregivers were required to give consent for their children to receive a nebulized bronchodilator treatment following the EC, as indicated by the study protocol, which was based on guidelines from the National Heart, Lung, and Blood Institute National Asthma Education and Prevention Program (NAEPP). Consistent with NAEPP guidelines students were diagnosed with asthma when they exhibited either a 12% postbronchodilator improvement (≥ 200 mL) or a 10% decline in FEV₁ following exercise cessation. All aspects of the school-based asthma testing were administered by an asthma team consisting of registered nurses (RNs) and respiratory therapists specifically trained in the study protocol. This protocol was approved by the Institutional Review Board of Baylor University Medical Center.

Of the 477 students offered free, school-based asthma testing, 382 (80%) accepted; of these 382 students, 379 (99%) were actually tested. Of the 379 students tested, 157 (41%) received confirmed diagnoses of asthma based on the NAEPP guidelines. By April 2003, all asthma testing had concluded; and, for the last 6 weeks of school, extensive measures were undertaken to ensure that students who had positive test results for asthma had every opportunity to receive appropriate and affordable asthma treatment. Parental consent for treatment was received for 83 of the entire group of asthmatic students. This group of 83 students consisted of 65 students who had tested positive for asthma and 18 additional students who arrived at the study schools after the

asthma screening and identification program, but were identified by the school RN and parents/caregivers as having either confirmed diagnoses or severe symptoms of asthma. The asthma team made every attempt to provide free treatment and follow-up care in a manner acceptable to the individual families. They also maintained a presence in the study schools through the end of May 2003 to provide weekly asthma education and treatment resources to school staff and all students and their parents/caregivers. Additionally, the asthma team evaluated weekly peak flows, FEV₁, and student reports of asthma symptoms in those students enrolled in the treatment phase of the study.

At the end of the school year, school attendance data were requested from the school district. The school district provided group attendance information, based on each student's attendance data but reported to us as a group composite, out of privacy considerations. Composite absence rates were requested for students who were identified as having positive results for symptoms associated with asthma on the asthma questionnaires. Additionally, absence rates were requested for a group of students that were previously identified by RNs as having asthma. If these students participated in the screening process, they were also included within other group data reported. Absence rates were calculated by dividing the days of absence by the days of school enrollment during the 2002–2003 year. These absence rates were compared with overall absence rates at the 19 schools participating in this project as well as overall absence rates within the fourth through sixth grades of the overall DISD. Statistical analysis was performed using χ^2 tests to compare absence rates among the overall district, the 19 schools, and the various groups of students with asthma or asthma-like symptoms identified on the questionnaire.

RESULTS

Table 1 presents the yearly absence rates of a 477-student sample of fourth- through sixth-grade students from the 19 study schools who had positive results for symptoms associated with asthma on the asthma screening questionnaires. This sample is compared with (Table 2) overall attendance rates of all fourth- through sixth-grade students within the 19 study schools, and all fourth- through sixth-grade students within the DISD. The questionnaire-positive sample of students was divided into three groups: those with positive EC results; those with negative EC results; and those who did not participate in the EC test because of abnormal or low spirometry

Table 1—Absence Rates of Sample of Fourth- to Sixth-Grade Students From the 19 Study Schools Who Yielded Positive Results for Symptoms Associated With Asthma on the Asthma Screening Questionnaires and All Fourth- to Sixth-Grade Students in the 19 Study Schools and in the DISD

Variables	Positive EC Results	Negative EC Results	Abnormal or Low Spirometry Results	School Nurse Identified	All Fourth to Sixth Graders in 19 Study Schools	All Fourth to Sixth Graders in the District
Days of absence, No.	688	629	102	535	26,505	195,050
Days of membership, No.	27,112	29,309	3,933	18,700	931,535	6,618,383
Annual absence rate, %	2.54	2.12	2.59	2.86	2.85	2.95

Table 2— χ^2 Test of Homogeneity for Comparison of Proportions of Absences Between Selected Groups of Fourth- to Sixth-Grade Asthma Questionnaire-Positive Students and Fourth- to Sixth-Grade General Population Students in the DISD*

Variables	Positive EC Results	Negative EC Results	Abnormal or Low Spirometry Results	School Nurse Identified
All fourth to sixth graders in 19 study schools				
χ^2	9.05	50.622	8,991	0.0110
df	1	1	1	1
p Value	0.0026†	0.000†	0.343	0.916
All fourth to sixth graders district wide				
χ^2	15.84	65.531	1,719	0.5156
df	1	1	1	1
p Value	0.000069†	0.000†	0.1898	0.473

*df = degrees of freedom.

†Significance level at $p = 0.05$.

results and did not respond to inhaled bronchodilator. A fourth group consisted of students who were identified by the school RN prior to screening as having asthma. Some of these students were also included in the EC groups. The entire population of students from the 19 study schools and from the district represent the control groups.

School absence rates in each group were within 1% of each other, although a χ^2 test of homogeneity found the absence rates in both EC-positive and EC-negative groups to be statistically lower than in all the students in the 19 study schools and all the students in the district. There were no significant differences in the absence rates of the students who had abnormal spirometry and the absence rates of the study schools ($p = 0.343$) or the district ($p = 0.1898$). Likewise, there were no significant differences in the absence rates of the group identified by the school RN and the absence rates in the study schools ($p = 0.916$) and the district ($p = 0.473$). Additionally, the analysis of attendance rates of the cohort of students who enrolled in the 6-week comprehensive management program was not substantially different from the larger group of students with asthma.

DISCUSSION

Asthma ranks first (48%) among medical disorders that prohibit or significantly limit children from attending school, compared with neurodevelopment disorders (24%) and learning behavior disorders (12%).⁴ In 1990, pediatric asthma in the United States was estimated to account for 10 million lost school days (mean of 8.7 days missed per year per child), 200,000 hospitalizations, and an estimated \$6.2 billion in asthma-related costs.⁵ In 1995, we reported significant differences in the school absence rate of controls vs students with asthma receiv-

ing home-based treatment vs students with asthma receiving school-based treatment; the children who participated in that study were involved in a project targeted at students with previously diagnosed asthma.⁶ The current data suggest, however, that asthma does not appear to have such a profound impact on school attendance rates in Dallas. Several factors may help explain this novel observation. It is important to note that slightly $> 90\%$ of school campuses in the DISD have their own full-time school RN, who by district policy completes, asthma management plans on every child identified, and provides urgent care with bronchodilators during school hours for children with symptomatic asthma. These nurses receive yearly continuing education on a number of topics, including asthma and appropriate asthma therapies based on the NAEPP guidelines, and are empowered to refer students to local community clinics as appropriate. The observation in the current study that absence rates among RN-identified students and screening-identified students were no different suggests that overall asthma control in children may have improved between 1995 and 2003. This improvement may be related to the penetration of the NAEPP guidelines into the medical community caring for children with asthma. In our earlier project (1995), the children in this three-arm study were identified by school RNs as having symptomatic asthma, and two groups received active treatment for 16 weeks; none of the students with asthma in the control group were receiving antiinflammatory therapy at that time. In comparison, the participants of the current study came from a general sample of all fourth, fifth, and sixth graders in 19 study schools regardless of previous history or suspicion of asthma. This group represented a larger pool than that identified by RNs on the basis of symptoms or self-reported diagnosis at the time of enrollment in the fall. We did not have

access to individual medical plans for each student, although anecdotal reports from the school RNs suggested that many of identified children were receiving controller medications for asthma.

Among the observations of school absence rates related to asthma is that of Clark et al,⁷ who also reported that school absences among children with asthma were no different from students without asthma in Detroit schools. However, these authors felt that actual, undetected differences may have been obscured by the overall large number of absences within that urban school district. Clark et al⁷ also noted parent-reported improvements in asthma-related absence following asthma intervention. Interestingly, while Dallas represents an urban school district, overall school attendance is excellent, perhaps related to implementation of state-mandated competency testing required for promotion to the next grade level. Our asthma intervention, occurring the last 6 weeks of school impacted about half of the students identified as having asthma, and as such did not significantly affect absence rates.

An issue complicating the comparison and interpretation of data on asthma in school-aged children is the lack of consistency with which potential participants are identified for studies. Inclusion criteria vary widely. Studies in the past have looked at students who were unable to attend school because of medical impairments and then attempted to determine the responsible disease processes. One such study was from the 1992–1994 National Health Interview Survey⁸ in which asthma was determined to be responsible for absence in 17.5% of the children who were unable to attend school due to a medical reason. Other studies, such as ours in 1995, identified participants based solely on referrals from school RNs. A recent report by Moonie et al⁹ that likewise used RN identification of students with asthma found that the absence rate was higher among students with asthma than those without by 1.5 days per student. Our most recent study compares asthma morbidity among students identified by a respiratory screening questionnaire followed by school-based asthma testing, a methodology that identified more students with asthma than RN identification alone. Obviously, students who are identified according to hospitalization, emergency department visits, or inability to attend school have much higher morbidity than children with asthma who are able to attend school. These fundamental differences in methodology may partially account for the differences seen in outcome measurements such as school absences. Future studies should meticulously define inclusion criteria. There is no controversy that individuals with severe asthma suffer significant morbidity from uncontrolled symptoms. For school-aged

children, untreated asthma can lead to excessive school absences and an inability to maximize their learning experiences when they are at school. Indeed, the data from Moonie et al⁹ show a clear relationship between school absences and academic achievement. We were unable to obtain group academic achievement scores on standardized district-wide tests in our study, which was not the primary focus of our investigation. However, our data suggest that, for whatever reason, the overall impact of asthma on school attendance appears to have lessened when compared to historical figures, and that any differences in attendance rates are, for all intents and purposes, academically insignificant.

CONCLUSIONS

From this study, we reached four conclusions: (1) in the DISD, children with asthma do not miss more school days than their peers without asthma; (2) group school-absence rates may not accurately reflect student-specific asthma morbidity in school-aged children; (3) other measures of the impact of uncontrolled asthma on academic achievement should be studied, taking care to ensure that the measures are carefully defined and consistently used across research settings to promote the comparison of findings; and (4) allocation of limited school resources to school nurse salaries may be more cost-effective and produce better asthma control outcomes than district-wide efforts at testing for asthma.

REFERENCES

- 1 Asthma In America™ A landmark survey. Available at: <http://www.asthmainamerica.com/cities/national.html>. Accessed December 5, 2008
- 2 Annual report 1998–1999. Dallas, TX: Dallas Independent School District, 1999
- 3 Wolf RL, Berry CA, Quinn K. Development and validation of a brief pediatric screen for asthma and allergies among children. *Ann Allergy Asthma Immunol* 2003; 90:500–507
- 4 Msall ME, Avery RC, Tremont MR, et al. 1994 National health interview survey. *Pediatrics* 2003; 111:548–554
- 5 Newacheck PW, Taylor WR. Childhood chronic illness: prevalence, severity, and impact. *Am J Public Health* 1992; 82:364–371
- 6 Millard MW, Johnson PT, McEwen M, et al. A randomized controlled trial using the school for anti-inflammatory therapy in asthma. *J Asthma* 2003; 40:769–776
- 7 Clark B, Brown R, Joseph CL, et al. Effects of a comprehensive school-based asthma program on symptoms, parent management, grades and absenteeism. *Chest* 2004; 125: 1674–1679
- 8 Msall ME, Avery RC, Tremont MR, et al. 1994 National health interview survey. *Pediatrics* 2003; 111:548–554
- 9 Moonie S, Sterling DA, Figgs LW, et al. The relationship between school absence, academic performance, and asthma status. *J Sch Health* 2008; 78:140–148

Children With Asthma Miss More School : Fact or Fiction?
Mark W. Millard, Pauline T. Johnson, Anna Hilton and Mary Hart
Chest 2009;135; 303-306; Prepublished online October 10, 2008;
DOI 10.1378/chest.08-1642

This information is current as of February 24, 2010

Updated Information & Services	Updated Information and services, including high-resolution figures, can be found at: http://chestjournal.chestpubs.org/content/135/2/303.full.html
References	This article cites 7 articles, 4 of which can be accessed free at: http://chestjournal.chestpubs.org/content/135/2/303.full.html#ref-list-1
Open Access	Freely available online through CHEST open access option
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://www.chestjournal.org/site/misc/reprints.xhtml
Reprints	Information about ordering reprints can be found online: http://www.chestjournal.org/site/misc/reprints.xhtml
Email alerting service	Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.
Images in PowerPoint format	Figures that appear in CHEST articles can be downloaded for teaching purposes in PowerPoint slide format. See any online article figure for directions

