

Chronic Asthmatic Chest Troubles and Their Effects on Cognitive Functions, Psychosocial Behaviour and Academic Achievement among Children in Egypt

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Abstract: Chronic illness is clearly an important factor affecting psychosocial state of children and adolescents. This case-control study is an effort to clarify the effect of chronic asthmatic chest troubles as a chronic illness on the cognition and psychological aspects of such chronically ill children. This was a case control study conducted at the Chest Clinic of the Abou El-Reesh Children's Hospital, Cairo University. It included 23 children suffering from chronic asthmatic chest troubles (13 boys and 10 girls) with an age range of 6-15 years and a mean age of $9.6 \pm 2.67 (\pm SD)$. Twenty three age and sex matched healthy children and living under the same socioeconomic conditions were taken as controls. The Arabic Version of the Revised Wechsler Intelligence Scale for Children (WISC-R) and Pediatric Symptom Checklist (PSCL) were used to assess the cognitive and psychosocial adjustment among children while the mid-year scores for Mathematics and Arabic language were used to evaluate the academic performance. Our results indicated that chronic asthmatic disease has a negative effect on cognitive abilities, psychosocial behavior and academic achievement of such children.

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1. Introduction:

Health, happiness, independence, and productivity are basic human desires. For children, this means achieving normal growth and development, acquiring a sense of accomplishment, developing an identity, and initiating independence. Although, over time, all children face the same developmental tasks, achieving these developmental milestones depends on many conditioning factors⁽¹⁾. One conditioning factor that greatly influences developmental outcomes and quality of life is chronic illness⁽²⁾.

Chronic diseases affect an estimated 10-20% of all children during childhood and adolescence⁽³⁾. Chronic chest troubles are the most common cause of chronic illness in children and can affect cognition, psychosocial behavior, and school performance of children. Children with chronic illness are at higher than average risk for behavioral disorders⁽⁴⁾. The general consensus of the literature is that chronically ill children are at risk for psychological problems. In chronic childhood conditions, as a whole, the risk of psychopathology is about 2.5 times higher than in the general population⁽⁵⁾. One epidemiological study showed that among 4-16 years old child, those with chronic health problems were 2-4 times more likely to have a diagnosable behavioral disorder than their healthy peers⁽⁶⁾.

In pediatric population psychosocial factors in chronic illness may impede optimal outcome. Overt and covert adjustment problems and psychiatric illness may present as unexplained medical symptoms, non-compliance with medical treatment, school refusal and high-risk behaviors. These signs may alert the physician to the presence of underlying issues in the child and/or the family. Before referral to a mental health professional, the doctor should try to identify the presence of underlying issues, focus on family-centered care and schedule visits to monitor compliance and other issues⁽⁷⁾.

Early detection and treatment of psychosocial problems may lead to considerable health benefits. Psychosocial problems have a high prevalence rate and lead to high costs of disease. They also cause substantial restrictions in daily functioning in later life and are the major cause of long-term work disability in young adults⁽⁸⁾. Only a minority of children with psychological or psychosocial problems are under treatment⁽⁹⁾. Research has shown that early detection and treatment improves these children's prognosis substantially, but a complete analysis of its cost effectiveness has yet to be carried out⁽¹⁰⁾.

Epidemiological studies showed that roughly one in ten children under the age of 15 suffers from a chronic disease. Other epidemiologic

studies estimated that one third of children less than 18 years of age are suffering from one or more chronic disorders or diseases⁽¹¹⁾. In addition, there is an increased prevalence of learning and speech difficulties, sensory dysfunctions, mental handicaps and behavioral problems⁽¹²⁾.

The aim of this study was to assess the cognitive functions, psychosocial behavior, and school achievement in chronic asthmatic children and compare them with healthy children of the same age.

2. Subjects & Methods:

This case-control study had been carried out on 46 Egyptian children (23 patients and 23 controls). The two groups were examined and evaluated medically and psychologically, to find whether ill children have more psychological problems than healthy controls. Their age ranged from 6-15 with mean age of 9.6±2.67 years.

The 23 children were previously diagnosed to have chronic asthmatic chest disease and randomly selected. They regularly attended the chest clinic at Abu El- Reesh Children's Hospital, Cairo University. Inclusion criteria included children previously diagnosed to have bronchial asthma, age range between 6-15 years and of both sexes. Exclusion Criteria included children less than 6 years old and those older than 15 years, neurological diseases e.g. cerebral, mentally retarded children and asthmatic chest diseases less than 6 months duration. The control group included 23 healthy children matched for age, sex, educational level and socio-economic state as the patients group. They were selected from the brothers and sisters of the patients group. The controls were free from any chronic illness especially chronic asthmatic chest diseases.

All studied cases were subjected to the following:

History taking: including personal history (age, sex), past history (onset and duration of the disease).

Clinical examination: full clinical examination was done including general examination and local chest examination in order to diagnose chronic chest disease and exclude any other diseases. Diagnosis of chronic chest disease was confirmed by reviewing the laboratory and radiological findings of the patients.

Anthropometric measurements include body weight and height.

Assessment of cognitive abilities: They were assessed by a battery of psychological tests that covered verbal and non-verbal intelligence, memory, learning, problem solving, and attention. The children were individually assessed. All psychological evaluations were administered in one session. The tests used were:

A-The Arabic Version of the Revised Wechsler Intelligence Scale for Children (WISC-R)^(13, 14). This is the most widely used test for intellectual assessment and covers an age range of 6-16years. The test is scored according to a manual from which verbal and performance scores and intelligent quotient are obtained.

B-The Auditory Vigilance Test: It measures the attention ability of the child. It is a measure of the efficiency of identifying signal stimuli in the context from the non-signal ones⁽¹⁵⁾.

C-The Figural Memory Test: This is a measure of the free recall of visual objects⁽¹⁵⁾. The free recall score is the number of items recalled correctly. The classification score is obtained by counting the number of the shifts from one category to the other, which is made by the subject during his recall. This was considered as an indicator of how he can organize aspects in his memory.

Assessment of psychosocial behaviour: Children's behaviour was evaluated by a brief version of parent-completed Pediatric Symptom Checklist (PSCL-17). Although certain responses may suggest a diagnosis, the PSCL is a screening tool and not a diagnostic one. If positive, the clinician should pursue a brief interview, reviewing the child's major areas of functioning (school, family, activities, friends and mood). If this brief interview supports the PSC findings, the clinician then decides whether a follow-up appointment, further evaluation or referral is indicated⁽¹⁶⁾.

Assessment of Academic Achievement: Was assessed using the mid-year test scores of Arabic language and mathematics subjects for each child. It is considered as a good indicator of academic and learning performance⁽¹⁷⁾. Each group is classified according to the mid-year scores into good achiever (the mid-year score is ≥ 70%) and poor achiever (the mid-year score is < 70%).

Statistical Methods:

Data were statistically described in terms of range, mean ± standard deviation (± SD), frequencies (number of cases) and percentages when appropriate. Comparison of quantitative variables between the study groups was done using Student *t* test for independent samples. For comparing categorical data, Chi square (χ^2) test was performed. Exact test was used instead when the expected frequency is less than 5. A probability value (*p* value) less than 0.05 was considered statistically significant. All statistical calculations were done using the computer programs Microsoft Excel 2003 (Microsoft Corporation, NY, USA) and SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

3. Results

The study included 23 chronic asthmatic patients with an age range of 6-15 years, 10 females (43.5%) and 13 males (56.5%) and 23 age and sex matched healthy controls, Table (1). There was no

significant statistical difference between cases and controls as regards age and sex ($P > 0.05$), on the other hand weight and height were significantly higher in controls compared to asthmatics ($P < 0.05$).

Table (1) Demographic and anthropometric characteristics of the studied groups

| Variable | Asthmatics | Controls | P Value |
|------------------|--------------|-------------|---------|
| Age (mean±SD) | 9.6±2.67 | 10.5±2.75 | > 0.05 |
| Sex (no, %) | | | |
| Female | 10 (43.5%) | 10 (43.5%) | > 0.05 |
| Male | 13 (56.5%) | 13 (56.5%) | |
| Weight (mean±SD) | 25.57±10.65 | 35.26±7.98 | 0.008* |
| Height (mean±SD) | 125.32±13.38 | 135.44±9.03 | 0.010* |

A comparison between cases and controls regarding the cognitive abilities is shown in Table (2). It includes full scale IQ, figural memory test and auditory vigilance test.

(A) Full scale IQ:

The mean full scale IQ for asthmatics was significantly lower than controls ($P < 0.05$).

(B) Figural Memory test:

(C) Auditory vigilance test:

Test A & B in asthmatics showed significant diminution as regards right answers compared to

controls ($P=0.000$) and wrong answers were significantly higher in asthmatics as compared to controls ($P=0.000$) as shown in Table (2).

A statistically significant difference was found between cases and controls as regards the free recall and the classification (Fig 1). The mean free recall score for asthmatics was 8.13 ± 3.49 compared to 11.22 ± 2.67 for controls ($P < 0.05$). For the classification, the mean scores for asthmatics was 2.83 ± 2.19 compared to 4.54 ± 1.59 for controls ($P < 0.05$).

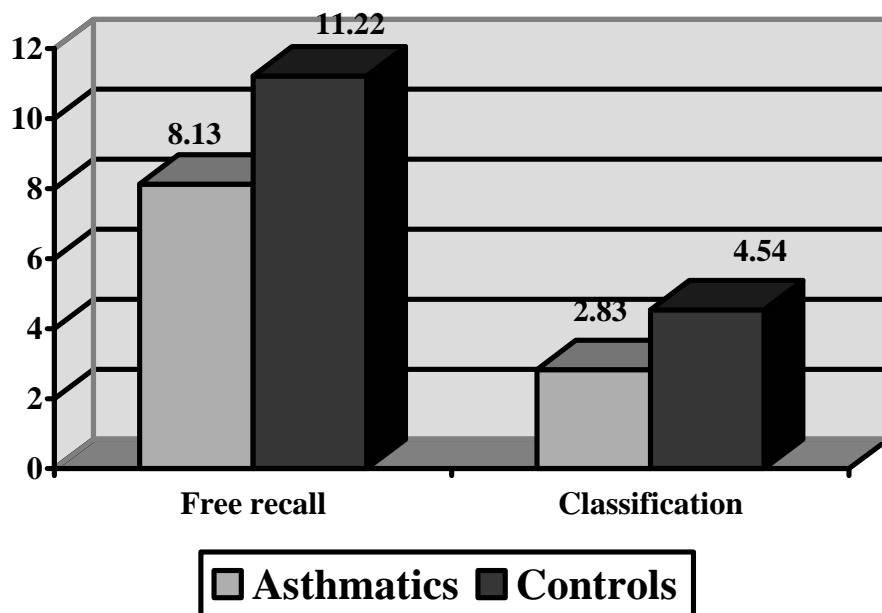


Figure (1) Results of Figural Memory test in asthmatics and controls.

Table (2) Cognitive abilities of the studied groups

| | Asthmatics Mean ± SD | Controls Mean ± SD | P Value |
|-----------------------------|-------------------------|-----------------------|---------|
| (A) Full Scale IQ | 73.61±12.79 | 93.54±12.72 | .000* |
| (B) Figural Memory test | | | |
| • Free Recall | 8.13±3.49 | 11.22±2.67 | .001* |
| • Classification | 2.83±2.19 | 4.54±1.59 | .034* |
| (C) Auditory Vigilance test | | | |
| Test A | | | |
| • Right answers | 9.83±2.25 | 14.00±1.28 | .000* |
| • Wrong answers | 3.17±2.25 | 1.02±1.27 | .000* |
| Test B | | | |
| • Right answers | 10.65±2.12 | 12.16±1.24 | .001* |
| • Wrong answers | 4.52±2.37 | 0.88±1.26 | .000* |

*P < 0.05

A statistical difference was seen between asthmatic and control in all domains of psychological behavior while 13% of asthmatic patients show externalizing behavior as well as attention problems, none of the controls

(0%) show such behavior (P<0.05). On the other hand 39.1% of the asthmatics show internalizing behavior compared to 6% of controls with a significant statistical difference between them (P<0.05) (Table 3)

Table (3) Results of Psychosocial behavior in asthmatics and controls

| | Asthmatics | | Controls | | Pvalue |
|------------------------|------------|------|----------|------|--------|
| | N | % | N | % | |
| Externalizing behavior | | | | | |
| Positive | 3 | 13 | 0 | 0 | 0.007 |
| Negative | 20 | 87 | 23 | 100 | |
| Internalizing behavior | | | | | |
| Positive | 9 | 39.1 | 1 | 4.3 | 0.001 |
| Negative | 14 | 60.9 | 22 | 95.7 | |
| Attention problems | | | | | |
| Positive | 3 | 13 | 1 | 0 | 0.007 |
| Negative | 20 | 87 | 23 | 100 | |

Fig 2 showed a comparison between asthmatics and controls concerning academic achievement. It was found that 43.5% of asthmatics show poor

mathematics as well as arabic scores significantly different from control as none of them showed poor scores (0%), (P<0.05).

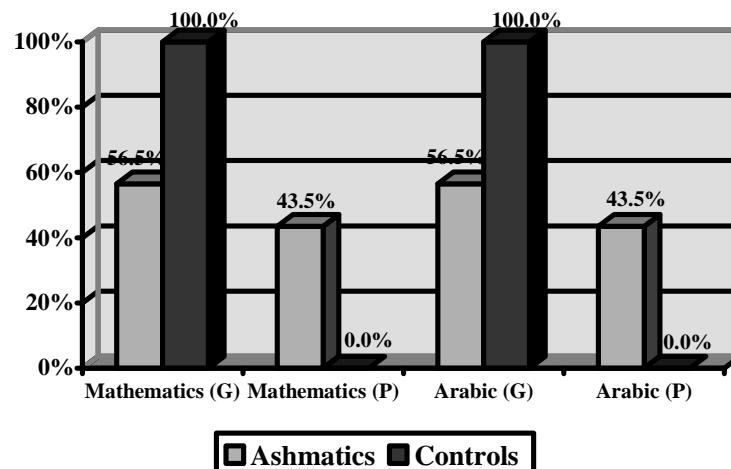


Figure (2) Academic achievement in asthmatics and controls. G: good achievers P: poor achievers

4. Discussion:

Epidemiologic studies indicate that up to half of pediatric visits reflect behavioral, psychosocial, and educational concerns⁽¹⁸⁾. Most of the pediatrics problems are psychosocial problems that are not severe enough to be classified as psychiatric disorders but interfere with children's social and academic development⁽¹⁹⁾.

Children who have symptoms of illness for more than 3 months, or who require hospitalization or extensive home based services for more than one month in 12 months period are said to have chronic disease⁽²⁰⁾. Contrary to El-Baz definition, Leblan et al (2003)⁽²¹⁾ suggested that the term chronic illness refers to illnesses that require at least 6 months of continuous medical care, permanent life style changes and continuous behavioral adaptation to the unpredictable course of the illness.

Blckman & Gurka (2007)⁽²²⁾ showed that on top of physical symptoms like coughing, wheezing, and difficulty of breathing, children with asthma are also at increased risk of behavioral, emotional, and developmental problems.

In this study, PSCL was used as a screening test that provided a quick, valid, and reliable method for detection of psychosocial problems. It reflects parent's impressions of their child's psychosocial functioning with acceptable sensitivity and specificity⁽²³⁾. Using PSCL for behavioral assessment showed that asthmatics had significantly more behavior problems across several domains compared with normal controls.

This study showed significant effect of bronchial asthma on cognitive and behavioral functioning of asthmatic children. These findings are consistent with Naude and Pratorius (2003)⁽²⁴⁾.

McQuaid et al. (2001)⁽²⁵⁾, found evidence of behavioral problems in both externalizing and internalizing domains (mainly anxiety and depression). The findings in this study agreed with other studies, which showed a relationship between asthma and internalizing behaviors generally⁽²⁶⁾.

It was found that in child/adolescent populations with asthma, up to one third met criteria for co-morbid anxiety disorders⁽²⁷⁾ particularly children with severe asthma⁽²⁸⁾. Additionally, a link between higher levels of global internalizing symptoms and childhood asthma has been shown⁽²⁹⁾. The present study showed significant differences between asthmatics and controls as regard to attention problems. However, Feldman et al. (2006)⁽³⁰⁾ didn't find such affection.

Calam et al (2005)⁽³¹⁾ documented lower scores on a measure of attention and concentration for children with asthma which is consistent with results of this study. Because behavioral problems are

associated with poorer school adjustment and academic achievement, the identification and treatment of problems at this young age potentially could prevent subsequent disruptive behaviors and school difficulties⁽³²⁾. Agreeing with the results of this study, a research suggested that children with asthma experience more internalizing and total behavior problems than healthy children⁽³³⁾.

Rosa Alati et al (2005)⁽³⁴⁾ provided information on the association between both asthma prevalence and internalizing symptoms but didn't report any association between externalizing symptoms and prevalence of asthma. Their number of asthmatics was 5153 and they used different methods of assessment. This study showed a greater prevalence of internalizing behavior problems among children and adolescents who had asthma compared with non asthmatics. These results are consistent with the results of Craske et al, (2001)⁽³⁵⁾. Consistent with the findings of Gutstadt et al (1989)⁽³⁶⁾, in this study, academic performance and intelligence test scores indicated that, overall, the academic capabilities of children with asthma were less, compared with healthy children of the same socioeconomic status.

Children with asthma may be at risk for decreased school functioning due to acute exacerbations, increased absenteeism, iatrogenic effects of their asthma medication, and the stress associated with a chronic illness. Factors that may contribute to poor school performance among children with asthma include iatrogenic effects of oral steroids, poor medical management of the disease, and psychological problems⁽³⁷⁾.

Bender and Bruce (1995)⁽³⁸⁾ discussed the impact of asthma on children's school achievement. They found negative effect on the educational process, consistent with results of this study. They suggested that the cause may be due to medications that produce mild, temporary changes, affecting learning and classroom performance. For most asthmatic children, their illness does not result in permanent brain function changes that compromise their educational adaptation and performance. Increased school absence, stress of chronic illness, isolation from peers, diminished physical activities, reduced adult expectations and self esteem, and depression can compromise children's academic adaptation and progress.

5. Conclusion and Recomendation

- The present study confirms the effect of chronic asthma on school age children. It was found that chronic asthmatic children were developmentally retarded, have more psychological problems, lower cognitive ability, and academic performance compared to healthy controls.

- Medical school training needs to be more focused on the psychosocial issues and psychiatric disorders that affect adolescents with chronic illness rather than on the specific biological issues associated with the medical illness itself.

References

- Charron-Prochownik D. Special needs of the chronically ill child during middle childhood: Application of a stress-coping paradigm. *Journal of Pediatric Nursing* 2002; 17 (6): 407-413.
- Jackson P, Vessey J. Primary care of the child with a chronic condition. 3rd ed. St. Louis: Mosby; 2000.
- Geist R, Grdisa V, Otley A. Psychosocial issues in the child with chronic condition. *Best Practice & Research Clinical Gastroenterology* 2003; 17 (2): 141-152.
- Tavormina JB, Kasthner LE, Slater PM. Chronically ill children: A psychological and emotionally deviant population. *J Abn Child Psychol* 1996; 4: 99-110.
- Noeker M, Haverkamp-Krois A, Haverkamp F. Development of mental health dysfunction in childhood epilepsy. *Brain & Development* 2005; 25:5-16.
- Goldberg S, Janus M, Washington J, et al. Prediction of behavioral problems in healthy and pediatric samples. *Dev Behav Pediatrics* 1997; 18: 304-313.
- Verhulst FC, van der Ende J, Koot HM. Handleiding voor de CBCL/4-18 [Manual for the CBCL/4-18]. Rotterdam, the Netherlands, Erasmus University, Department of Child and Adolescent Psychiatry, Sophia Children's Hospital, 1996.
- Murthy RS, Bertolote JM, Epping-Jordan J, et al. The World health report 2001 Mental health: new understanding, new hope. Geneva, World Health Organization 2001.
- Reijneveld SA, Brugman E, Verhulst FC, et al. Identification and management of psychosocial problems among toddlers in Dutch preventive child health care. *Arch Pediatr Adolesc Med*. 2004;158:811-817.
- Nelson G, Westhues A, MacLeod J. A meta-analysis of longitudinal research on preschool prevention programs for children. *Prevention & Treatment* 2003; 6:1-32.
- Costello EJ, Foley DL, Angold A. Ten year research update review: the epidemiology of child and adolescent psychiatric disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, 45(1):8-25.
- Williams JG, Higgins JP, Brayne CE. Systematic review of prevalence studies of autism spectrum disorders. *Archives of Disease in Childhood* 2006; 91(1):2-5.
- Wechsler D. Manual for the Wechsler Intelligence Scale for Children- Revised (WISC-R). New York: The Psychological Corporation, 1977.
- Kamel M, Ismail E. Wechsler Intelligence Scale for Children, Arabic Version. Cairo: EL- Nahda El- Massryia, 1993.
- Pollite E. Methods for the behavioral assessment of the consequences of malnutrition. In: Lockwood ER, Scrimshaw NS, editors. *Methods for the evaluation of the impact of food and nutrition programs*. Tokyo: UNU, 1984.
- Jellinek MS, Little M, Murphy JM, et al. The pediatric symptom checklist: Support for a role in a managed care environment. *Arch Pediatr Adolesc Med*. 1995; 149: 740-746.
- Silver LB. Learning disabilities in children; J. Amer Acad Child Adolesc Psychiatr 1989; 28: 309- 313.
- Starfield B, Gross E, Wood M, et al. Psychosocial and psychosomatic diagnoses in primary care of children. *Pediatrics* 1980; 66:159-167.
- Sharp L, Pantell RH, Murphy LO, et al. Psychosocial problems during child health supervision visits: eliciting, then what? *Pediatrics* 1992;89:619-623.
- Perrin EC, Stancin TA. Continuing Dilemma: Whether and how to screen for concerns about children's behavior. *Pediatr Rev*. 2002; 23 (8): 264-275.
- Leblanc T, Goldsmith T, Patel DR. Behavioral aspects of chronic illness in children and adolescents. *Pediatr Clin N Am* 2003; 50:859-878.
- Blackman JA, Gurka MJ. Developmental and behavioral comorbidities of asthma in children. *Journal of Developmental and Behavioral Pediatrics* 2007; 28(2):92-99.
- Fielding JE. Psychosocial screening Questionnaires. In: Green M, Haggerty RS, editors. *Ambulatory Pediatrics* 1st ed. Saunders W.B.A. Co.; 1990. p. 139.
- Naude H, Pratorius E. Early Child Development and Care, v173 n6 p699-709 Dec 2003.
- McQuaid EL, Kopel SJ, Nassau JH. Behavioral adjustment in children with asthma: a meta-analysis. *J Dev Behav Pediatr* 2001; 22:430-439.
- Mrazek DA, Schuman WB, Klinnert M. Early asthma onset: risk of emotional and behavioral

- difficulties. *J Child Psychiatry* 1998; 39:247-254.
- 27. Katon WJ, Richardson L, Lozano P, et al., The relationship of asthma and anxiety disorders. *Psychosom Med*. 2004; 66:349-355.
 - 28. Ortega AN, McQuaid EL, Canino G, et al. et al. Comorbidity of asthma and anxiety and depression in Puerto Rican children. *Psychosomatics* 2004; 45:93-99.
 - 29. Gillaspy SR, Hoff AL, Mullins LL, et al. Psychological distress in high-risk youth with asthma. *Journal of Pediatric Psychology*. 2002; 27:363-371.
 - 30. Feldman JM, Ortega AN, McQuaid EL, et al. Comorbidity between asthma and internalizing disorders among Puerto Rican children at one-year follow-up. *Psychosomatics* 2006; 47(4): 333-339.
 - 31. Calam R, Gregg L, Simpson A, et al. Behavior problems at study. *Am J Respir Crit Care Med*. 2005; 171:323 -327.
 - 32. Raver C. Emotions matter: making the case for the role of young children's emotional development for early school readiness. *Soc Policy Rep*. 2002; 16:3-18.
 - 33. Klinnert MD, McQuaid EL, McCormick D, et al. A multimethod assessment of behavioral and emotional adjustment in children with asthma. *Journal of Pediatric Psychology* 2000, 25 (1), 35-46.
 - 34. Rosa Alati, PhD, O'Callaghan M, Najman JM, et al. Asthma and Internalizing Behavior Problems in Adolescence: A Longitudinal Study *Psychosomatic Medicine* 2005;67:462-470.
 - 35. Craske MG, Poulton R, Tsao JC, et al. Paths to panic disorder/agoraphobia: an exploratory analysis from age 3 to 21 in an unselected birth cohort. *J Am Acad Child Adolesc Psychiatry*. 2001; 40(5):556-563.
 - 36. Gutstadt LB, MEd; Gillette JW, Mrazek DA, et al. Determinants of school performance in children with chronic asthma. *Am J Dis Child*. 1989; 143(4):471-475.
 - 37. Celano MP, Geller RG. Learning school performance and children at asthma: how much at risk? *Journal of Learning Disabilities* 1993; 26(1):23-32.
 - 38. Bender, and Bruce G. *School Psychology Quarterly*. Vol 10(4), Win 1995, p 274.

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