Chronic Asthmatic Chest Troubles And Their Effects On Cognitive Functions, Psychosocial Behaviour And Academic Achievment 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 chronic illnesses, on the cognition and psychological aspects of such chronically ill children. This study was executed in the Chest Clinic of the Abou El-Reesh Children's Hospital, Cairo University. The Study was carried out on 23 children suffering from chronic asthmatic chest troubles (13 boys and 10 girls) with an age range of 6-15 years (mean age ± SD = 9.6±2.67). Twenty three age and sex matched children not suffering from any disease and living under the same socioeconomic conditions were taken as controls. WISC-R and 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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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 ***(*Charron-Prochownik, 2002*)***. One conditioning factor that greatly influences developmental outcomes and quality of life is chronic illness ***(*Jackson and Vessey, 2000*)***.

Chronic diseases affect an estimated 10-20% of all children during childhood and adolescence ***(*Geist et al, 2003*)***. 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 **(Tavormina et al, 1996).** 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 **(Noeker et al, 2005)**. One epidemiological study showed that among 4-16 years old, those with chronic health problems were 2-4 times more likely to have a diagnosable behavioral disorder than their healthy peers. **(Goldberg et al, 1997)**

Psychosocial factors in chronic illness in the pediatric population 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 well visits to monitor compliance and other issues.

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 **(Murthy et al, 2001)** Only a minority of children with psychological or psychosocial problems are under treatment **(Reijneveld et al, 2004).** If untreated, problems are likely to persist in later life and can lead to serious limitations in daily functioning **(Verhulst and vander Ende, 1996).** 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 (**Nelson, Westhues and MacLeod, 2003)**.

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

PATIENTS & METHODS

This case-control study had been carried out on 46 Egyptian children (23 patients and 23 controls). The two groups were examined for medical and psychological evaluation, to find whether ill children have psychological problems than healthy controls. Their age ranged from 6-15 years.

The study included 23 children 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 both sexes. Exclusion Criteria included children less than 6 years old and those more than 15 years old, neurological diseases e.g. cerebral, mentally retarded children and asthmatic chest diseases less than 6 months duration. A control group of 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:

1) History taking: including: age, sex, onset of disease and its duration.

2) 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.

3) Assessment of anthropometric measures (weight and height).

4) 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) (Wechsler, 1977, Kamel and Ismail, 1993). 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 score and intelligent quotient are obtained from.

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. **(Pollite, 1984).**

C-The Figural Memory Test: This is a measure of the free recall of visual objects. **(Pollite, 1984).** 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.

5) Assessment of psychosocial behavior: Children's behavior was evaluated by a brief version of parent-completed Pediatric Symptom Checklist (PSC-17). Although certain responses may suggest a diagnosis, the PSC 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 **(Jellinek et al, 1995).**

6) Assessment of academic Achievement: Was assessed using the mid-year test scores of Arabic language and arithmetic subjects for each child. It is considered as a good indicator of academic and learning performance **(Silver, 1989).** Each group is classified according to the mid-year scores into good achiever (the mid-year score is $\geq$ 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.

RESULTS

The study was conducted on 23 patients and 23 age and sex matched controls (table 1, 2).

Table (1) Age of children in the study sample

	Asthmatics	Controls
Range	6-15 y	6-15y
Mean	9.6	10.5
±SD	2.67	2.75

P value > 0.05(non significant)

Table (2) Sex distribution of children.

		Asthmatic group	Control group
F	Count	10	10
	%	43.5%	43.5%
M	Count	13	13
	%	56.5%	56.5%

P value > 0.05 (non-significant)

Anthropometric measures between the two groups were highly significant as shown in table 3.

Table (3) Results of anthropometric measures in asthmatics and controls

	Asthmatics		Controls		P value
	Mean	±SD	Mean	±SD	
Weight	25.57	10.65	35.26	7.98	.008*
Height	125.32	13.38	135.44	9.03	.010*

*P value < 0.05 (significant)

Cognitive abilities:

A- Full Scale IQ: Table (4) shows analysis of the full scale IQ for the two groups. The mean full scale IQ for asthmatics was 73.61% compared to 93.54% for the control group. It shows significant diminution in asthmatics. (P value < 0.05)

Table (4) Full scale IQ and results of Figural Memory test

	Asthmatics		Controls		P value
	Mean	±SD	Mean	±SD	
Full scale IQ	73.61%	12.79	93.54%	12.72	.000*
Free recall	8.13	3.49	11.22	2.67	.001*
Classification	2.83	2.19	4.54	1.59	.034*

B-Figural Memory test:

- **Free recall:**

The mean free recall scores for asthmatics was 8.13±3.49, while the mean free recall scores for the controls was 11.22± 2.67 which is highly significant in asthmatics (P= .001) (Fig. 1).

- **Classification :**

The mean of classification scores for asthmatics was 3.83±2.19 while the mean of classification scores for controls was 4.54±1.59. It shows significant diminution in asthmatics (P value =.034) (Fig. 1).

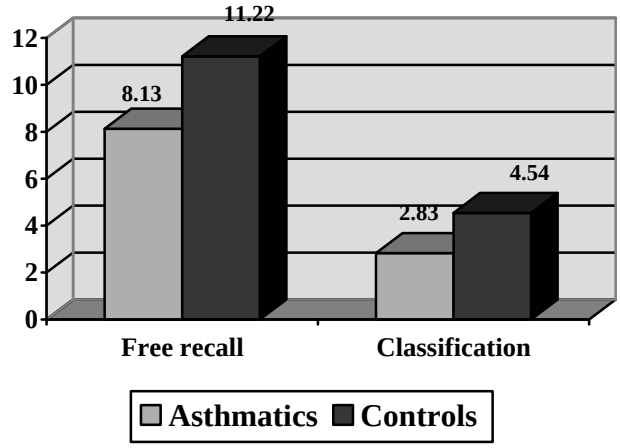

Figure (1) results of Figural Memory test in asthmatics and controls.

C-Auditory Vigilance test: Table (5) shows the results of auditory vigilance among study groups.

Table (5) Results of Auditory Vigilance test in asthmatics and controls.

		Asthmatics		Controls		P value
		Mean	±SD	Mean	±SD	
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 value < 0.05 (significant)

- **Test A**

The mean for right answers in asthmatics was 9.83±2.25 while the mean for right answers in controls was 14.00± 1.28 with highly significant diminution in asthmatics (P= .000) (Fig. 2). The mean for wrong answers in asthmatics was 3.17± 2.25 while the mean for wrong answers in controls was 1.02 ±.1.27 with highly significant diminution in asthmatics (P= .000) (Fig. 2).

- **Test B**

The mean for right answers in asthmatics was 10.65 ±2.12 while the mean for right answers in controls was 12.16 ±1.24 with highly significant diminution in asthmatics (P= .001) (Fig. 2). The mean for wrong answers in asthmatics was 4.52 ±2.37 while the mean for wrong answers in controls was 0.88 ±1.26 with highly significant diminution in asthmatics (P= .000) (Fig. 2).

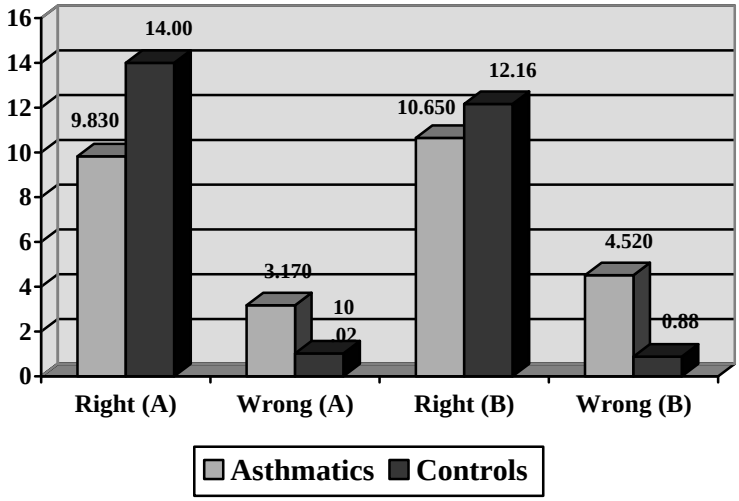

Figure (2) Results of Auditory Vigilance test in asthmatics and controls

iii.Psychosocial behavior for asthmatics and controls is shown in Table 6.
iv.

Table (6) Results of psychosocial behavior in asthmatics and controls

		Asthmatics		Controls		P value
		N	%	N	%	
Externalizing behavior	**Positive**	3	13%	0	0%	0.007*
	Negative	20	87.0%	50	100%	
Internalizing behavior	**Positive**	9	39.1%	3	6.0%	0.001*
	Negative	12	60.9%	47	94.0%	
Attention problems	**Positive**	3	13.0%	0	0%	.007*
	Negative	20	87.0%	50	100%	
Normal children		9	39.1%	47	94.0%	.000*

*P value < 0.05 (significant)

1- Externalizing abnormalities:

The behavioral questionnaire (PSCL) showed that: 3 asthmatics (13.0%) had externalizing behavior and no one had the same behavior in controls. 20 asthmatics (87.0 %) were normal compared to 50 controls (100%) with highly significant diminution in asthmatics (P= .007) (Fig. 3,4).

2- Internalizing disorders:

The internalizing behavior was found in 9 asthmatics (39.1%) as compared to 3 controls (6.0%). 12 asthmatics (60.9 %) had no internalizing behavior compared to 47 (94.0%) in controls with highly significant diminution in asthmatics (P=.001) (Fig. 3,4).

3-attention disorders:

As regard to the attention problems, there were 3 asthmatics (13.0%) compared to 0 controls (0%) had attention problems with highly significant diminution in asthmatics (P= .007) (Fig. 3,4).

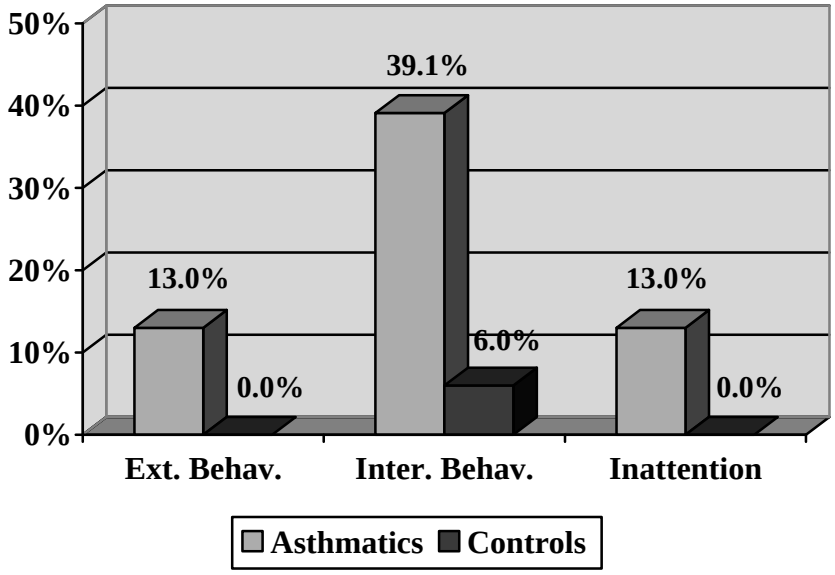

Figure (3) positive behavioral problems in asthmatics and controls.

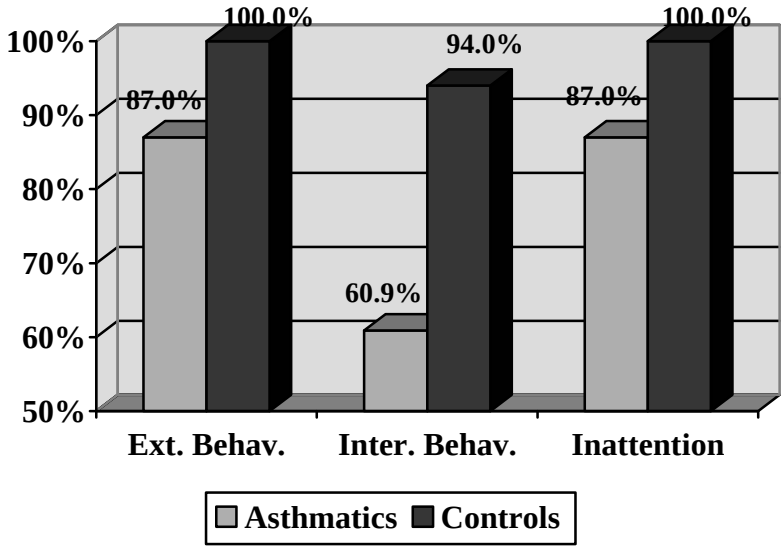

Figure (4) negative behavioral problems in asthmatics and controls.

v. **Academic Achievement:** Table (7) shows results of academic achievement among study groups.

Table (7) Results of academic achievement in asthmatics and controls

		Asthmatics		Controls		P value
		N	%	N	%	
Midyear Mathematics scores	**Good achiever**	13	56.5%	50	100%	.000*
	Poor achiever	10	43.5%	0	0%	.000*
Midyear Arabic scores	**Good achiever**	13	56.5%	50	100%	.000*
	Poor achiever	10	43.5%	0	0%	.000*

*P value < 0.05 (significant)

A- Midyear Mathematics scores:

10 (43.5 %) asthmatics compared to 0 (0%) controls were poor achievers with a highly statistically significant difference between the two groups (P= .000) (Fig. 5).

B- Midyear Arabic scores:

10 (43.5 %) asthmatics compared to 0 (0%) controls were poor achievers with highly statistically significant difference between the two groups (P= .000) (Fig. 5).

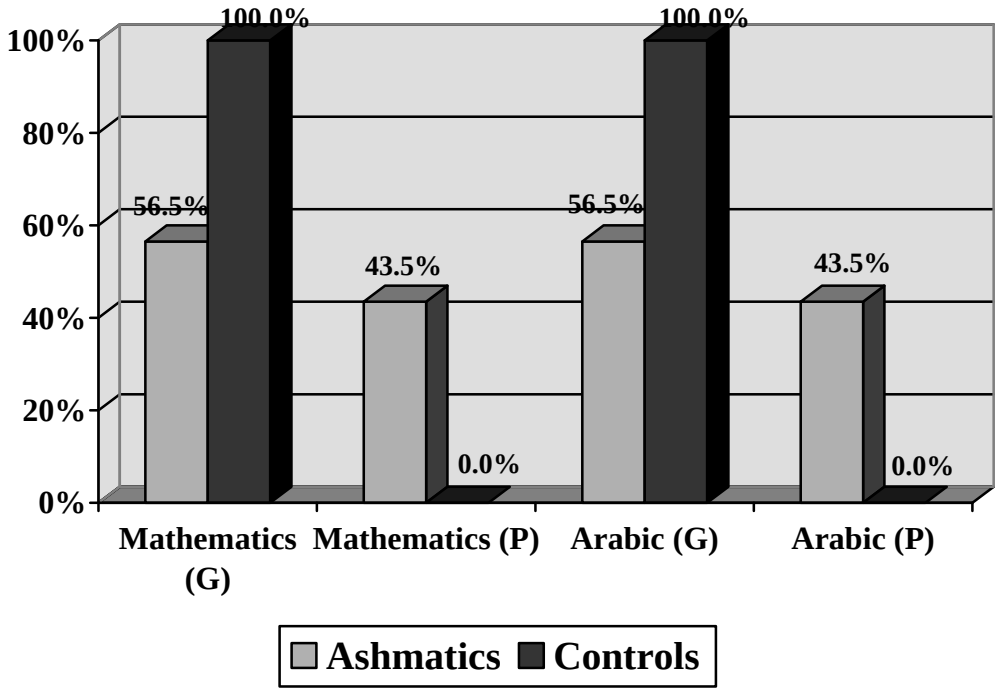

Figure (5) Results of academic achievement in asthmatics and controls.
G: good achievers P: poor achievers

iv. Nocturnal Enuresis (NE): Table 8 shows that nocturnal enuresis was found in 6 asthmatics (26.1%) compared to 0 (0%) controls with highly statistically significant difference between the two groups (P= .000).

Table (8) Results of nocturnal enuresis in asthmatics and controls

	Asthmatics		Controls	
	N	%	N	%
Positive cases	6	26.1%	0	0%
Negative cases	17	73.9%	50	100%

P= 0.000 (highly significant**)**

DISCUSSION

Epidemiologic studies indicate that up to half of pediatric visits reflect behavioral, psychosocial, and educational concerns **(Starfield et al, 1980).** Most of these problems are psychosocial problems that are not severe enough to be classified as psychiatric disorders but interfere with children's social and academic development **(Sharp et al., 1992).** Identification of parental concerns about children's behavior and evidence of problematic behavior are increasingly accepted as part of the basic responsibilities of primary care providers **(Perrin and Stancin, 2002).**

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. **(El-Baz et al, 1995)** Contrary to El-Baz definition, **Leblan et al (2003)** 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

The finding in the present study indicate that there are obvious differences between children with chronic asthmatic chest troubles and healthy children as regard to cognitive abilities, behavior and school performance. Nevertheless, pediatricians are not adequately trained and/or do not have the time to evaluate every child's psychosocial status **(Costello and Janiszewski, 1990, Jellinek et al, 1995).** One method of focusing on the limited time available to those children likely to have psychosocial problems is to use a screening procedure **(Jellinek, 1982).** As with any screening test, a psychosocial screening procedure must be economical, brief, and accurate, and easy to understand, administer and interpret **(Jellinek, 1995).**

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 (**Fielding, 1990).** Using PSCL for behavioral assessment showed that asthmatics had significantly more behavior problems across several domains compared with normal controls. **McQuaid et al. 2001**, found evidence of behavioral problems in both externalizing and internalizing domains (mainly anxiety and depression). Our findings agreed with other studies, which showed a relationship between asthma and internalizing behaviors generally **(Mrazek et al 1998).**

In a more recent review, the authors showed that in child/adolescent populations with asthma, up to one third met criteria for co-morbid anxiety disorders **(Katon et al., 2004)** particularly children with severe asthma **(Ortega et al, 2004**). Additionally, a link between higher levels of global internalizing symptoms and childhood asthma has been shown **(Gillaspy et al., 2002).** We found significant differences between asthmatics and controls as regard to attention problems. However, **Jonathan et al. (2006)** didn't find such affection.

Robert Finn (2003) studied the effect of asthma on sleep and attention of children by Questionnaires administered to the children's parents. The study revealed a significant difference between asthmatics and controls.

James et al (2007) 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. According to this study, parents of children with asthma were twice as likely to report that their child has severe problems with behavior, emotions, concentration, or getting along with others. The study also found that children with asthma are at increased risk for: attention deficit hyperactivity disorder (ADHD), depression behavioral and conduct problems and learning disabilities. ADHD was twice as common among children with asthma and three times more common among those with severe asthma. These results are consistent with our results in which we found significant diminution in asthmatics compared to controls as regard to psychosocial problems.

Asthma has medical, psychological and physical effects on school age children. The flare-up of asthma may lead to impaired daily function and absence from school. A study from California showed that on average, 7 children with active asthma missed 2.6% of school days per year. Sixty six percent of the studied cases mentioned that bronchial asthma affected their school attendance and they missed several school days. We have to consider this finding as a warning signal to give more attention to the role

of health education as an important preventive tool for many health problems, which in turn affect the school attendance and the scholastic achievement of the students.

Calam et al 2005 documented lower scores on a measure of attention and concentration for children with asthma which is consistent with our findings. 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 (**Raver 2002**). Agreeing with our findings, a research suggested that children with asthma experience more internalizing and total behavior problems than healthy children **(Klinnert et al, 2000).**

Rosa Alati et al (2005) 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**.** We found 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.** Consistent with the findings of **Linda et al(1989)**, 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.

We noticed significant effect of bronchial asthma on cognitive and behavioral functioning of asthmatic children. These findings are consistent with **Naude and Pratorius (2003).** 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 **(Marianne et al, 1993).**

Bender and Bruce (1995) discussed the impact of asthma on children's school achievement. They found negative effect on the educational process, consistent with our results. 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. Co-occurrence of factors like severe illness, poverty, and family dysfunction may increase the risk for educational and psychosocial impairment. In our study, there is no opportunity to discuss the effects of such factors in the asthmatics.

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 under 18 years of age are suffering from one or more chronic disorders or diseases**. (Costello et al 2006, Shah et al 2006 and Gallasi et al 2006)** In addition, there is an increased prevalence of learning and speech difficulties, sensory dysfunctions, mental handicaps and behavioral problems. **(Smith, 2003 and Williams et al, 2006)**. In our study chronic asthmatics and non asthmatic chest troubles (chronic diseases) were at increased risk of behavioral problems than healthy children.

CONCLUSION

1-Children with chronic asthmatic chest troubles represent a population at possible high risk for mental and psychosocial maladjustment.

2-Asthmatic children have more psychosocial problems than healthy children.

3-Asthmatic children have lower cognitive abilities and academic performance than healthy children.

4-Chronic asthmatic chest troubles have retarded weight and height compared to healthy children.

5-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 factor issues associated with the medical illness itself. Psychosocial issues and psychiatric disorders are clearly important factors affecting adolescents with chronic illness.

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