Journal of Experimental Research

June 2017, Vol 5 No 1
www.er-journal.com
Email: editor-in-chief@er-journal.com

Received: February 19, 2017
Accepted for Publication: May 2, 2017

ACADEMIC PERFORMANCE OF PRIMARY SCHOOL CHILDREN WITH ASTHMA

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Abstract

The academic performance of children with asthma may differ from that of their non-asthmatic colleagues. Reports on the academic performance of children with asthma are limited and the findings are inconsistent. The academic performance of children with asthma in Enugu, Nigeria is determined in this study. Children with asthma aged 5–11 years were recruited consecutively at the weekly asthma clinic of the University of Nigeria Teaching Hospital (UNTH) Enugu, Nigeria. Their age-, sex- and socio-economic- matched non- asthmatic classmates were recruited as controls. Academic performance was assessed overall using the average of the overall scores in the three term examinations of same session as well as specifically using the performance in four key subjects (English, mathematics, Social Studies and Sciences). Socio-economic status was determined using the occupational status and educational attainment of each parent. The median (range) overall academic scores for the children with asthma 79.04% (36.08% - 99.57%) was not significantly different from those of controls 80.01% (50.65% - 97.47%) ($U = 6804$, $p = 0.461$). We concluded that the academic performance of children with asthma compares favorably with that of children without asthma.

Keywords: Asthma, School, Academic performance, Children

INTRODUCTION

Asthma is one of the most common chronic illnesses among children, affecting over six million children globally (Masoli et al. 2004). Children with asthma, similar to children with other chronic illnesses, are at the intersect of the health and education systems and are expected to compete with non-asthmatic counterparts in the same classroom under the same learning conditions (Bateman et al. 2008). Asthmatic attacks may significantly affect their academic performance. While academics are crucial in the development of every child, children with asthma may not perform as well as their non-asthmatic colleagues.

The impact of asthma on academic performance is relatively unexplored. Available results from studies conducted vary significantly even within the same country (Taras and Potts-Datena, 2005; Moonie et al. 2008; krenitsky-Korn, 2011; Gutstadt et al. 1989).Thus while some studies (Moonie et al. 2008; Gutstadt et al. 1989; Lindgren et al.1992) concluded that the disease process has no negative effect on academic performance, others (krenitsky-Korn, 2011; Fowler et al.1992) reported significant negative effect of asthma on academic performance. Associations have also been suggested between asthma and learning disabilities (Fowler et al. 1992), reading problems (Tonnessen et al. 1994), grade repetition (Freudenberg et al. 1980), and behavioral problems (Bussing et al.1995; Creer et al. 1992; Mcquaid et al. 2001).

Most of the studies (Lindgren et al.1992; Moonie et al. 2008; krenitsky-Korn, 2011) on asthma and academic performance in children with asthma have been in developed countries and despite the high prevalence of asthma among Nigerian school children (Falade et al. 1998; Okoromah, 1995), there has been no study to my knowledge to determine the impact of asthma on academic performance in our environment. However, considering the socioeconomic and educational situation in Nigeria, the academic performance of children with asthma could be different from that of those in developed countries as academic performance of children with other chronic disease conditions such as epilepsy (Ibekwe et al. 2008, sickle cell disease (Ogunfowora et al. 2005; Ezenwosu et al. 2013) and behavioral disorders

(Akpan et al. 2010) in Nigeria have shown.

This study was therefore done to determine the influence asthma has, if any, on the academic performance of school children. The results are expected to contribute to the development of school health programs for children with asthma in Nigeria.

MATERIALS AND METHODS

Primary school-aged children with asthma attending the weekly asthma clinic of the University of Nigeria Teaching Hospital (UNTH), Enugu were the study population. Consecutive children with asthma aged 5–11 years who had been in the same primary school for over one academic session during the study period (September 2012 – August 2013) were recruited. Before enrollment, in order to ascertain eligibility, necessary data (including age, sex, school, class, medical history, occupation and education of both parents) were obtained from the accompanying parent/caregiver of the asthmatic child and the child subsequently assessed clinically for chronic and debilitating medical conditions such as heart disease, seizure disorders and cerebral palsy that are known to affect academic performance independently (Perrin, 1996). The control group consisted of normal classmates of the children with asthma as proposed by Richard and Burlew (1997). The minimum sample size was estimated at 117, based on the estimated prevalence of 50% when prevalence is not known. One hundred and twenty children with asthma who satisfied the inclusion criteria were recruited after informed consent were obtained from their parents/caregivers.

At the schools, the non-asthmatic children who were of the same age sex and socio-economic class as the children with asthma were selected as controls from the school register. A total of one hundred and twenty pupils were also selected as control group. The home of each of the selected controls was visited for informed consent and for the completion of necessary data. They were also assessed clinically for chronic and debilitating medical conditions such as heart disease, seizure disorders and cerebral palsy that are known to affect academic performance independently before enrollment (Perrin, 1996).

Socio-economic status of both subjects and controls were determined using the occupation and educational attainment of both parents and their substitutes as proposed by Oyedeji (1985). Class 1 represented the highest social class and class V the lowest. Each parent was scored separately by finding the average score of the two factors (occupation and educational level). The mean of the scores for the father and mother approximated to the nearest whole number was chosen as the social class of the child. There was no validated academic achievement measure in Nigeria; hence this study, similar to earlier related studies (Ezenwosu et al. 2013; Ibekwe et al. 2008), employed the use of school examination report. The average overall score in percentage for each child in each of the three term examinations for 2012/2013 academic session was calculated as a measure of the overall score academic performance of the child. Also the average of the scores for the academic session for each of the children in each key subject (English, Mathematics, Social Studies and Sciences), expressed in percentage was used as a measure of their specific academic performance in each of the four key subjects. These represented the academic performances (Overall and specific) and were further graded as high ($\geq$ 75%), average (50 – 74%) and low (< 50%). Those with low scores were considered as having poor academic performance. This measure has been used previously for the assessment of academic performance of school children (Ibekwe et al. 2008; Ezenwosu et al. 2013). However, varying standards between individual teachers may affect this measurement approach.

Health Research Ethics Committee of UNTH, Enugu approved the study and the Enugu State Ministry of Education gave clearance before the study was commenced.

Means of IQ that was normally distributed was compared using Student's t test and ANOVA while other variables that were not normally distributed (academic performance, socio-economic class) were compared using the Mann-Whitney U test. The significance of association between categorical variables was determined using chi-square. Test of relationships were also done using the Pearson's and Spearman's rho Correlation where appropriate and multiple linear regression analysis. The level of significance was taken as $p < 0.05$.

RESULTS

One hundred and twenty children with asthma and one hundred and twenty non-asthmatic controls were drawn from 105 primary schools in Enugu. Table 1 show the age and sex distribution of the subjects and controls. There were 81 (67.5%) males and 39 (32.5%) females (male: female ratio 2.1:1) in each group. The age range was 5 to 11 years while the mean age ± standard deviation (SD) was 8.20 ± 1.92years. Fifty percent (50%) of the children (subjects and controls) in this study were from socioeconomic class II.

Table 1: Age and sex distribution of the subjects and controls.

Age (years)	Subjects		Controls	
	Male (%)	Female (%)	Male (%)	Female (%)
5 – 8	45 (55.6)	24 (61.5)	45 (55.6)	24 (61.5)
9 – 11	36 (44.4)	15 (38.5)	36 (44.4)	15 (38.5)
Total	81 (100.0)	39 (100.0)	81 (100.0)	39 (100.0)

$\chi^2 = 0.39$, d.f = 1, p < 0.535

The median (range) overall academic scores for the subjects and controls as shown in Table 2 were 79.04% (36.08% - 99.57%) and 80.01% (50.65% - 97.47%), respectively. The difference in the median overall academic scores for the subjects and controls was not statistically significant (U = 6804, p = 0.461). There was also no statistically significant difference between subjects and controls in selected key subjects.

Table 2: Comparison of median overall and specific subjects scores of study subjects and controls

Subjects	Subjects (n = 120) Median (Mean rank)	Controls (n = 120 Median (Mean rank)	Mann-Whitney U	*P* – value
Overall score	79.04 (123.80)	80.01 (117.20)	6804.00	0.461
Mathematics	78.67 (125.23)	71.00 (115.78)	6633.00	0.292
English	78.67 (113.90)	83.17 (127.10)	6408.00	0.141
Social studies	83.00 (129.24)	82.17 (111.76)	6151.50	0.051
Science	79.34 (121.55)	81.33 (119.45)	7074.00	0.815

The median overall scores for male subjects and controls are shown in Table 3 and that for female subjects and controls in Table 4. There was a statistically significant difference in median overall academic scores between male subjects and controls (p = 0.017) (Table 3) but not between female subjects and controls (p = 0.137) (Table 4). There was also a statistically significance difference in median scores for mathematics (p = 0.008) and social studies (p = 0.005) between male subjects and controls (Table 3) and for English between female subjects and controls (p = 0.001) (Table 4). The difference between male subjects and controls in median scores for English (p = 0.625) (Table 3) and between female subjects and controls in median scores for mathematics (p = 0.137), social studies (p = 0.892) and sciences (p = 0.857) (Table 4) were not significant.

Table 3: Comparison of median overall and specific subjects scores of male subjects and controls

Subjects	Subjects (n = 81) Median (Mean rank)	Controls (n = 81) Median (Mean rank)	Mann-Whitney U	p-value
Overall score	78.11 (90.33)	70.35 (72.67)	2565.00	0.017
Mathematics	74.33 (91.33)	64.74 (71.67)	2484.00	0.008
English	79.00 (84.78)	70.00 (78.22)	3015.00	0.374
Social studies	83.00 (91.94)	68.50 (71.06)	2434.50	0.005
Science	79.00 (83.28)	73.33 (79.72)	3136.50	0.629

Table 4: Comparison of median overall and specific subjects scores of female subjects and controls

Subjects	Subjects (n = 39) Median (Mean rank)	Controls (n = 39) Median (Mean rank)	Mann-Whitney U	*P* –value
Overall score	84.00 (35.69)	90.33 (43.31)	612.00	0.137
Mathematics	84.81 (35.69)	89.33 (43.31)	612.00	0.137
English	76.67 (30.27)	94.00 (47.73)	400.50	< 0.001
Social studies	91.67 (39.15)	85.00 (39.85)	747.00	0.892
Science	90.00 (39.04)	90.00 (39.96)	742.50	0.857

Tables 5a and 5b show the comparison of overall academic performance and performance in specific subjects between male and female Subjects while table 6a and 6b show the same for controls. There was no statistically significant difference in the overall academic performance between male and female subjects (

Table 5a: Comparison of academic performance of male and female subjects

	Academic Performance			
	Poor	**Average**	**Good**	**Total**
Groups	n (%)	n (%)	n (%)	
Male	3 (3.7)	33 (40.7)	45 (55.6)	81 (100.0)
Female	3 (7.7)	15 (38.5)	21 (53.8)	39 (100.0)
Total	6 (5.0)	48 (40.0)	66 (55.0)	120 (100.0)

$\chi^2 = 0.89$; d.f = 2; p = 0.642

Table 5b: Comparison of median overall and specific subject scores of male and female subjects.

Subjects	**Male (n = 81) Median (Mean rank)**	**Female (n = 39) Median (Mean rank)**	**Mann-Whitney U**	**p-value**
Overall score	78.11 (90.33)	84.00 (35.69)	1474.50	0.556
Mathematics	74.33 (91.33)	84.81 (35.69)	1341.00	0.181
English	79.00 (84.78)	76.67 (30.27)	1485.00	0.596
Social studies	83.00 (91.94)	91.67 (39.15)	1372.50	0.245
Science	79.00 (83.28)	90.00 (39.04)	1264.50	0.077

Table 6a: Comparison of academic performance of male and female controls

	Academic Performance			
	Poor	Average	Good	Total
Groups	n (%)	n (%)	n (%)	n (%)
Male	0 (0.0)	45 (55.6)	36 (44.4)	81 (100.0)
Female	0 (0.0)	6 (15.4)	33 (84.6)	39 (100.0)
Total	0 (0.0)	51 (42.5)	69 (57.5)	120 (100.0)

$\chi^2 = 17.38$; d.f = 1; $p < 0.001$

Table 6b: Comparison of median overall and specific subject scores of male and female Controls

Subjects	Male (n = 81) Median (Mean rank)	Female (n = 39) Median (Mean rank)	Mann Whitney U	p value
Overall score	70.35 (72.67)	90.33 (43.31)	772.00	< 0.001
Mathematics	64.74 (71.67)	89.33 (43.31)	931.50	< 0.001
English	70.00 (78.22)	94.00 (47.73)	859.50	< 0.001
Social studies	68.50 (71.06)	85.00 (39.85)	936.00	< 0.001
Science	73.33 (79.72)	90.00 (39.96)	1039.50	0.002

The age-specific comparison of median overall academic scores between the subjects and controls is shown in Table 7. There were statistically significant differences in the median overall academic scores at ages 7 (p = 0.045), 9 (p = 0.015) and 11 (p = 0.009) years. The differences at 6 and 10 years approached statistical significance. The median score of subjects was higher than that of controls at 6, 7 and 9 years and lower at 10 and 11 years. There was a statistically significant weak negative correlation (Pearson's) between age and median overall scores in the subjects (r = - 0.467, p < 0.001)). The correlation among the controls was not statistically significant (r = - 0.146, p = 0.112).

Table 7: Age specific comparison of median overall scores between subjects and controls

Age (years)	Subjects Median (Mean rank)	Controls Median (Mean rank)	Mann-Whitney U	*p* –value
5	80.63 (18.50)	82.34 (18.50)	162.00	1.000
6	99.10 (5.00)	91.49 (2.00)	0.00	0.050
7	87.68 (22.00)	82.38 (15.00)	99.00	0.045
8	84.35 (31.70)	86.39 (29.30)	414.00	0.594
9	72.54 (29.38)	59.88 (19.63)	171.00	0.015
10	91.47 (2.00)	97.47 (5.00)	0.00	0.050
11	65.00 (19.25)	71.83 (29.75)	162.00	0.009

DISCUSSION

In this study of aspects of academic performance and its determinants among primary school children with asthma, the overall academic performance of the subjects as well as in selected school subjects of children was comparable with that of age-, sex- and socio-economic class- matched controls.

The finding of a male preponderance among the subjects is consistent with the reports from previous studies (Falade et al. 1998; Fajt and Wenzel, 2009; Detjen, 1991) which noted that males are more affected by asthma before puberty. The reason suggested was the smaller lung size in males in childhood which however becomes larger in adulthood (Falade et al. 1998). The male preponderance may also reflect preferential treatment, even in health matters, given to male children in our environment (Ezenwosu et al. 2013). The subjects in this study were recruited from the hospital.

Majority of the subjects belonged to socio-economic classes I and II and none of the subjects were in socio-economic class V. This is in keeping

with earlier reports (Liu et al. 2007; Littlejohns and Macdonald, 1993) that noted asthma to be one of the few diseases that are more common in the higher socio-economic classes. The reason could be due to life style encounters like early use of formula feeds, canned foods with additives and other social factors that are more common among people of higher socio-economic class compared to those in the lower socio-economic classes and can predispose to airway hypersensitivity. It could also indicate that more parents in the higher socio-economic classes (I and II), compared to those in the socio-economic classes III and IV, avail themselves of the specialized services offered by the teaching hospital (Ezenwosu et al. 2013).

The overall academic performance of subjects did not differ from those of controls. This corroborates the findings of earlier studies (Silverstein et al. 2001; Gutstadt et al. 1989; Le louam and Schweitzer, 2004) and could be because majority of the subjects in this study had good asthma control which may have masked the effect of asthma on academic performance. However Fowler and colleagues (1992) working in the USA reported a greater likelihood of poor academic performance among children with asthma compared with healthy children. This was an epidemiological survey on children using the grade system of education which did not exclude other chronic conditions known to affect academic performance. In contrast to the study by Fowler and colleagues (1992) this study excluded children with chronic diseases such as SCA, Epilepsy and cerebral palsy that are known to affect academic performance of children. Other confounding variables like socio-economic class were also accounted for.

Studies on academic performance of children with other chronic diseases such as Sickle Cell Anaemia (Ezenwosu et al. 2013) and epilepsy (Ibekwe et al. 2008) done in the same study environment using similar study design as used in this study, found that overall academic performance of these children were not significantly different from their age-, sex- and socio-economic class-matched classmates. The reason for this finding could be the similarity between these studies since they were all hospital- based using children who are accessing specialized care in the hospital which could have masked the effect of the disease on their academic performance when compared to their healthy controls.

There was also no difference in academic performance between subjects and controls with regards to selected specific subjects. This finding is in agreement with the work by Gutstadt and colleagues (1989) and is also similar to the findings from studies on other chronic diseases like SCA and epilepsy (Ogunfowora et al. 2005; Ibekwe et al. 2008; Alikor, 2007). However; this finding is at variance with that of Krenitsky-Korn (2011) who reported that children with asthma scored significantly lower in mathematics when compared with children without asthma. While Krenitsky-Korn's work was based on interviewer reported responses on performance in mathematics only, this study more objectively obtained and used the scores of the children in mathematics as well as in three additional key subjects (English, Sciences, Social studies) over an academic year

Differences were noted between subjects and controls of the same gender in overall academic performance and performance in selected key subjects. Male subjects had better academic performance overall as well as in mathematics and social studies compared to male controls. This differs from the report by Krenitsky-Korn (2011) and Gutstadt and colleagues (1989). Also female subjects performed poorer than their female Controls in English. The reason for these differences is unclear. However, the better academic performance noticed among male asthmatics compared to male controls could be because these male asthmatics reduce activities that may result in asthma attacks and channel their time and energy to reading and other academic activities. The significantly higher proportion of males compared to females in the study population may also have influenced these findings.

Male subjects compared favorably well with female subjects in overall performance and in the four specific subjects but male controls performed significantly poorly compared to female controls The reason for these gender differences in academic performance between male and female subjects and controls is also unclear. Earlier works had suggested that males perform better than females especially in mathematics and science and this was linked to differential development in the cerebral hemispheres of males and females during intra-uterine life caused by circulating peri-natal hormones (Berenbaum et al. 1995), social factors (Andre et al. 1999) and genetics (Martin et al. 1997; Plomin et al. 2008; Rijsdijk and Sham, 2002). However, more recently the reverse is believed to be the case as female children are reported to perform better than their male colleagues in virtually all subjects including Mathematics and Sciences that were previously thought to be within the male domain (Halpem, 2007). It was suggested that social and cultural factors could be among several possible explanations for this new trend and that parents may assume boys are better at mathematics and science so they might encourage girls to put more effort into their studies, which could lead to the slight

advantage girls have in all courses (Halpem, 2007). Gender differences in learning style were also suggested as another possibility as girls tend to study in order to understand the materials, whereas boys emphasize performance (Halpem, 2007).

CONCLUSIONS

The overall academic performance of primary school children with asthma is similar to that of non-asthmatic children in the same setting.

Competing interests

The authors declare that they have no competing interests.

Acknowledgements

We thank the Health Research Ethics Committee of UNTH for giving the approval to carry out this study. We thank also the Enugu State Ministry of Education for giving the clearance for the study. We appreciate Mr Ikenna Uche for assisting in data collating and analysis. Our gratitude also goes to the head teachers and teachers of various schools visited for their co-operation. We cannot fail to acknowledge the parents/caregivers for their willingness to participate in the study.

REFERENCES

Akpan MU, Ojinnaka NC, Ekanem EE. (2010).Academic performance of school children with behavioural disorders in Uyo, Nigeria. Afr Health Sci. 10: 154–158.

Alikor EAD. (2007). Common growth and development problems. In: Azubike JC, Nkanginieme KEO (editors). Paeditrics and Child Health in a Tropical Region 2nd ed. Owerri: African Educational Series. 70-82.

Andre T., Whigham M, Hendrickson A, Chambers S. (1999). Competency beliefs, positive affect and gender stereotypes of elementary students and their parents about science versus other school subjects. Journal of Research in Science Teaching. 36:719-747.

Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, FitzGerald M, Gibson P, Ohta K, O'bryne P, Pederson SE and Pizzichini E.(2008). Global strategy for asthma management and prevention: GINA executive summary. Eur Respir J. 31:143-178.

Berenbaum S.A, Korman K, Leveroni C. (1995). Early hormones and sex differences in cognitive abilities. Learning and Individual Differences.7:303-321.

Bussing R, Halfon N, Benjamin B, Wells KB. (1995). Prevalence of behavior problems in US children with asthma. Arch *Pediatr Adolesc Med.*149: 565-572.

Creer TL, Stein RE, Rappaport L, Lewis C. (1992).Behavioral consequences of illness: Childhood asthma as a model. *Pediatrics.*90: 808-815.

Detjen P. (1991).Allergic bronchopulmonary aspergillosis. In: Lynch JP, editor. Immunologically Mediated Pulmonary Disease. USA: Lippincott Co. 399-412.

Ezenwosu O.U, Emodi I.J, Ikefuna A.N, Chukwu B.F, Osuorah C.O. (2013).Determinants of academic performance in children with sickle cell anemia. BMC Paediatr.13:189-197.

Falade AG, Olawuyi F, Osinusi K, Onadeko BO. (1998). Prevalence and severity of symptoms of asthma, allergic rhino-conjunctivitis and atopic eczema in secondary school children in Ibadan, Nigeria. East Afr Med J.75:695-698.

Fajt ML, Wenzel SE. (2009). Asthma phenotypes in adults and clinical implications. Expert Rev Respir Med. 3:607-625.

Freudenberg N, Clark N, Feldman C, Clark NM, Millman EJ, Valle I, Wasilewski Y. (1980).The impact of bronchial asthma on school attendance and performance. *J Sch Health.*35: 522-526.

Fowler MG, Davenport MG, Garg R. (1992). School functioning of US children with asthma. *Pediatrics.* 90:939-944.

Gutstadt LB, Gillette JW, Mrazek DA, Fukuhara JT, La Brecque JF, Strunk RC. (1989). Determinants of school performance in children with chronic asthma. Am. J. Dis Child.143:47– 475.

Halpern D, Aronson J, Reimer N, Simpkins S, Star J, Wentzel K. (2007). Encouraging girls in mathematics and science. National Centre for Education Research.

Ibekwe RC, Ojinnaka NC, Iloeje SO. (2008).Academic performance of school children with epilepsy. J Coll. Med..13:18-22.

Krenitsky- Korn S. (2011). High school students with asthma: attitudes about school health, absenteeism, and its impact on academic achievement. Paediatr. Nurs. 37: 61-68.

Le Louarn A, Schweitzer B. (2004). Relationship between asthma or asthma-related symptoms and school problems among French children attending kindergarten. Epidemiol Sante Publique.52:29-38.

Lindgren S, Lokshin B, Stromouist A, Weinberger M, Nassif E, McCubbin M, Frasher R.(1992). Does Asthma or treatment with theophylline limit children's academic performance? N Engl J Med. 327:926-930.

Littlejohns P, Macdonald LD. (1993).The relationship between severe asthma and social class. Respir. Med. 87:139-143.

Liu AH, Covar RA, Spahn JD, Leung DYM. (2007). Childhood Asthma In: Kliegman RM, Berhman RE, Jenson HB, Stanton BF. Nelson Textbook of pediatrics, 18th edition. Saunders Elsevier. 143.

Martin N, Boomsma D, Machin G. (1997). A twin-pronged attack on complex traits. *Nat Genet.17:387-392*.

Masoli M, Fabian D, Holt S, Beasly R. (2004). The global burden of asthma: Executive summary of the GINA Dissemination Committee report.Allergy.59:469-478.

Mcquaid LE, Kopel SJ, Nassau JH. (2001). Behavioral adjustment in children with asthma: A meta-analysis. *Devel. Behav. Pediatr.* 22: 430-439.

Moonie S, Sterling DA, Figgs LW, Castro M. (2008).The relationship between school absence, academic performance, and asthma status. J. Sch. Health.78: 140-148.

Nettles AL. (1994). Scholastic performance of children with sickle cell disease. J. Health. Soc. Policy. 5: 123-40.

Ogunfowora OB, Olanrewaju DM, Akenzua GI. (2005). A comparative study of academic achievement of children with sickle cell anemia. J. Natl. Med. Assoc. 97: 405-408.

Okoromah NC. (1995). A study of bronchial asthma among primary school children in Enugu urban area. Part 2 Fellowship Dissertation, National Postgraduate Medical College of Nigeria.

Oyedeji GA. (1985). Socio-economic and cultural background of hospitalized children in Ilesha. Nig J Paediatr.12:111-117.

Perrin JM. (1996).Chronic illness in Children In: Kliegman RM, Arvin AM (Eds), Nelson's textbook of Paediatrics, 15th Ed. W.B Saunders Co.124-127.

Plomin R, DeFries JC, McClearn GE, McGuffin P. (2008). Behavioral genetics. 5th ED. New York: Worth Publishers.

Richard HIN, Burlew KA. (1997). Academic performance among children with sickle cell disease: setting minimum standards for comparism groups. Psychol Rep.81: 27–34.

*Rijsdijk FV, Sham PC. (2002).*Analytic approaches to twin data using structural equation models. *Brief Bioinform. 3:119-133.*

Silverstein MD, Mair JE, Katusic SK, Wollan PC, O'connell EJ, Yunginger JW.(2001). School attendance and school performance: a population-based study of children with asthma. J *Pediatr.*139:278-283.

Taras H, Potts–Datena W. (2005).Chronic health conditions and students performance at school. J Sch Health.75: 255 – 266.

Tonnessen FE, Holen T, Lundberg I, Larsen JP. (1994). Immune disorders and dyslexia. *Reading and Writing: An Interdisciplinary Journal.*6:151-160.