

SCHOOL BOYS WITH BRONCHIAL ASTHMA IN AL-KHOBAR CITY, SAUDI ARABIA: ARE THEY AT INCREASED RISK OF SCHOOL ABSENTEEISM?

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هدف الدراسة : كان الهدف من إجراء هذه الدراسة المقطعية هو تحديد معدل فترة الغياب عن المدرسة بين التلاميذ السعوديين الذين يعانون من الربو القصبي بمدينة الخبر والعوامل المرتبطة معه **طريقة الدراسة :** هذه دراسة مقطعية . تضمن منهج الدراسة توزيع إستبانة خاصة وقد أكملت من قبل الوالدين لما مجموعه 1482 تلميذاً من الذين وافقوا المعايير الخاصة للدراسة. **نتائج الدراسة:** معدل حالات الربو المشخصة بواسطة الإستبانة كان 9.5% (141 / 1482) . كان معدل الفترة الغيابية عن المدرسة بين الأولاد المصابين بالربو هو 13.6 ± 3.4 يوماً مقارنة ب 3.7 ± 2.2 يوماً بين الأولاد الأصحاء. كان هذا المعدل بين الأولاد المصابين بالربو ذا ارتباط إيجابي مهم بأولئك الذين كانوا أصغر ، مع تناقص المستوى الاجتماعي الإقتصادي، وجود حيوانات أليفة في المنزل ، مع شخص مدخن في العائلة في الوقت الحالي (أب أو كلا الوالدين)، مع التاريخ المرضي لزيارة غرفة الطوارئ بالمستشفى أو الدخول إلى المستشفى. بينما كان هذا المعدل ذا ارتباط سلبي ومهم بالإستعمال المصاحب للأدوية الوقائية ضد مرض الربو متضمنة تلك المستعملة بشكل ملائم . تعاطى الأولاد المصابون بالربو من الطبقات الاجتماعية الإقتصادية المتوسطة والأوطأ الأدوية الوقائية بشكل أقل ولكن كان لديهم تواريخ أكثر لزيارة غرفة الطوارئ والدخول إلى المستشفى . تم رصد معادلة الإنحدار الخطية المتعددة للفترة الكلية للغياب عن المدرسة خلال السنة الأكاديمية الحالية تم رصدھا .

الخاتمة : عانى أطفال المدارس المصابون بالربو من معدل فترة غيائية عن المدرسة أعلى من زملائهم الأصحاء . عائلات أطفال المدارس المصابين بالربو من الطبقات الاجتماعية الإقتصادية الأوطأ كانوا أكثر عرضة لآثار هذا المرض.

الكلمات المرجعية: الربو القصبي الطفولي ، الغياب عن المدرسة، المملكة العربية السعودية

Objective: The objective of this cross-sectional study was to determine the mean period of school absenteeism (MPSA) among Questionnaire Diagnosed Asthmatic (QDA) Saudi schoolboys of Al-Khobar city and the factors associated with it.

Methods: The methodology of this cross-sectional study included the distribution of a self-administered questionnaire, which was completed by the parents of 1482 schoolboys who satisfied the selection criteria of the study.

Results: The prevalence rate of QDA was 9.5% (141/1482). MPSA among Questionnaire Diagnosed Asthmatic Boys (QDAs) was 13.6 ± 3.4 days compared to

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3.7 ± 2.2 days among non-QDA boys (non-QDAs). Among QDAs, it was associated significantly and positively with those who were younger, with a decreasing level of socioeconomic class, history of pets at home, presence of a current smoker in the family (father or both parents), visit to a hospital emergency room, and admission to hospital. It was significantly and negatively associated with concomitant use of prophylactic medication(s), including those used appropriately. QDAs from middle and lower socioeconomic classes used less prophylactic medication(s) but had had more visits to an emergency room and had admissions to hospital. The multiple linear regression equation for the total period of school absenteeism (TPSA) during the current academic year was generated.

Conclusions: QDAs have higher MPSA compared to their non-asthmatic classmates. The impact of this disease increases particularly among QDAs belonging to lower socioeconomic families.

Key Words: Childhood asthma, School absence, Saudi Arabia

INTRODUCTION

Bronchial asthma during childhood has been considered the single most prevalent cause of childhood disability in the past 25 years.¹ Children who are frequently absent from school tend to perform poorly and are more likely to drop out before graduation from high school.² Increased school absenteeism among children was shown to be related to low assessment made by teachers of their social, psychological and educational adjustment.³ Excessive school absenteeism was also found to be associated with future unemployment, maladjusted behavior, wasted opportunity and increased welfare costs.² Persistent school absenteeism may signal such health problems as inability to cope with, or manage chronic illnesses such as bronchial asthma. In addition to emergency room visits and hospitalization, school absenteeism was considered a valid morbidity marker for asthma.³ As a tool, school absenteeism patterns can be made readily available for use as indicators of childhood or/and family dysfunction that may really be the result of unmet health needs.⁴

Reports from Eastern Saudi Arabia estimated the prevalence of bronchial

asthma among school children as approximately 10%.^{5,6} and there is enough evidence to suggest that the prevalence of this disease is on the increase.⁷ Consequently, morbidity and mortality of bronchial asthma continues to rise.^{8,9} In Eastern Saudi Arabia, environmental factors were found to be associated with the etiology of bronchial asthma among school children.^{5,6,10} The prevalence of bronchial asthma among Saudi school children was found to be higher in industrial, agricultural and urban areas than in the desert and rural areas.^{5,11,12}

A fair number of studies have been conducted in Saudi Arabia to investigate certain aspects of this disease, including the prevalence of this health problem among children.⁵⁻¹² However, to the best of the investigator's knowledge, no study has been conducted to measure school absenteeism among asthmatic children as an indicator of disability among school children in Al-Khobar city.

This study is an essential means of providing a profile of some of the factors that affect childhood asthma and its severity. Factors affecting the duration of absenteeism will also be determined. This is

expected to help in improving the design and provision of appropriate services to those children and their families. The main objective of this study was to determine the MPSA among asthmatic Saudi schoolboys in Al-Khobar City, in comparison with their non-asthmatic classmates, during the current academic year of the study. Another objective was to determine the factors associated with the TPSA during the same period.

POPULATION AND METHODS

The Saudi boys in elementary and preparatory schools at Al-Khobar city were the subjects of this cross-sectional study, which was conducted towards the end of the second term of the 1995 academic year. Al-Khobar City is located on the Arabian Gulf coast in the Eastern part of the Kingdom of Saudi Arabia. A total of 22077 schoolboys were identified at Elementary (15829 [71.7%]) and Preparatory (6248 [28.3%]) schools in Al-Khobar city. A sample of 1550 schoolboys (7% of the total number of schoolboys in the study area) was calculated as our sample. The determination of the sample size was based on the usual equation of sample estimation.¹³ In that equation, 7% was used as the estimated proportion of bronchial asthmatics among school children in the study area, based on an earlier study in the region.⁸ This sample size was determined as what would give a high degree of accuracy of the estimated proportion as narrow as $\pm 1\%$ away from the true estimated population proportion. The determined total sample of 1550 schoolboys (elementary = 1110 [71.6%] and preparatory = 440 [28.4%]) was drawn from the total number of schools through simple random sampling (4 elementary + 2 preparatory schools). The total number of sample students in each school was in accordance with the ratio they represented in relation to the total number of students in

all schools (at each level of education). In each school, the sample was drawn evenly and randomly from different academic classes. The non-inclusion of schoolgirls in this study was due to difficulty in gaining access, a limitation that previous investigators had faced.¹¹

The methods used included a self-administered pre-tested and pre-coded questionnaire directed to parents. This questionnaire was previously standardized, validated and applied to the Saudi community.^{5,10,11} The questionnaire used in this work was subjected to a reliability test based on psychometric analysis using the split-halves method and the general Spearman-Brown formula,¹⁴ which indicated a reliability of 95%.

The definition of asthma used in this study was modified from the Medical Research Council (MRC) definition.¹⁵ The criteria selected to identify asthmatic children were as follows: Any schoolboy whose parents responded to all of the following questions with "Yes" was considered a Questionnaire Diagnosed Asthmatic (QDA), otherwise the subject was considered a non-Questionnaire Diagnosed Asthmatic (non-QDA): (1) Has your child ever had an attack of wheezing? (a whistling noise that comes from the chest). (2) Has your child ever had attacks of shortness of breath with wheezing? (3) Does the breathing of your child become normal in between attacks? Each family was classified into upper, middle and lower socio-economic class based on the aggregate score of the father's education, occupation and income.¹⁶

The boys and their parents were requested to give details of personal data such as age, area of residence, father's education, occupation and income. Data included the history of smoking by any household member and, more specifically, parental smoking habit. A positive current smoking

history was defined as having a smoker in the family during any period of the current academic year. The survey inquired about the history of presence of family pet(s) at home (bird, cat, etc.). The presence of at least one pet at home, any time during the current academic year, was considered a positive history. Data collected also included information about the medications which had been used, or which were being used currently or regularly by the child during the current academic year, the duration of use and how they were/had been administered. The survey inquired about use of prophylactic medications for asthma by the QDAs. "Ever use" prophylactic medication(s) was defined as the positive history of using at least one prophylactic medication during the current academic year. Absence of such history was considered as "Never use." If such medications were being/had been used, they were further classified as either (a) Appropriate, or (b) Inappropriate (based on the dosage, frequency and method of administration). Histories pertaining to frequencies and reasons of school absenteeism, hospital admissions, emergency room visits during the current academic year were also collected. "Ever visited hospital emergency room" was defined as at least one emergency hospital visit and "Ever admitted to hospital" was defined as at least one hospital admission due to bronchial asthma during the current academic year. "Never visited emergency" and "Never admitted to hospital during the current academic year" were defined as absence of such specific histories. School records were checked for the exact TPSA during the current academic year.

The statistical program SPSS/PC +(17) was used to calculate chi-square differences and to assess the statistical significance of contingency tables. Z-test was used to test the differences between the 2 mean and the

F-test of the analysis of variance (ANOVA) was used to test the significance of the difference between more than 2 mean. Multiple linear regression was used to analyze the data. TPSA during the current academic year was the dependent variable. The independent variables consisted of: age of the child (in years), socioeconomic class (coded as lower=1, middle=2, upper=3), history of the presence of pets at home (coded as no=1, yes=2), presence of a family member at home who is a smoker (coded as no=1, yes=2), presence of father who smoked at home (coded as no=1, yes=2), or both (coded as no=1, yes=2). They also included histories of visits to the hospital emergency room (coded as never=1, ever=2) and admission to hospital (coded as never=1, ever=2), both due to bronchial asthma; and the history of the use of prophylactic medication(s) (coded as never=1, ever=2). The stepwise method was used to determine the final multiple regression model. A test was considered statistically significant at P-value <0.05.

RESULTS

Sample Characteristics

A total of 1550 schoolboys were included in this study but the total of returned completed questionnaires was 1482 which gave a response rate of 95.6%. Twenty-one schoolboys (1.4%) were excluded from the study because they did not live in Al-Khobar City. The remaining 47 students (3.0%) declined to participate for reasons not related to the study.

The cumulative prevalence of QDA in the total sample was 9.5% (141/1482). The ages of the boys ranged from 6-15 years. The mean age of the schoolboys in the total sample was 10.7 ± 3.1 years. There was no statistical difference in mean age among QDAs (10.3 ± 2.1 years) and non- QDAs (10.3 ± 2.2 years), Z-test = 0.54, $p > 0.58$.

Table 1: Sample characteristics of QDAs and Non-QDAs

Variable	QDAs (n=141) No. (%)	Non-QDAs (n=1341) No. (%)	p-value
Age groups (years)			0.90
6-9	47 (33)	430 (32)	
9-12	45 (32)	443 (33)	
12-15	49 (35)	468 (35)	
Socio-economic class			0.12
Upper (n=223)	22 (15.6)	201 (15.0)	
Middle (n=756)	62 (44.0)	694 (51.8)	
Lower (n=503)	57 (40.4)	446 (33.2)	
Absence in days (Mean ± S.D)	13.6 ± 3.4	3.7 ± 2.2	<0.0001

Table 2: Comparison of MPSA and factors in QDAs' characteristics

Variable	QDA (n=141) No. (%)	MPSA (days)	S.D. (days)	p-value
Age groups (years)				0.001
6-9	47 (33)	13.2	2.4	
9-12	45 (32)	11.5	2.1	
12-15	49 (35)	8.6	2.2	
Socio-economic class				0.001
Upper	22 (15.6)	7.5	2.7	
Middle	62 (44.0)	9.3	2.3	
Lower	57 (40.4)	11.4	2.1	
Pets at home				0.0001
Yes	72 (51.1)	12.6	1.6	
No	69 (48.9)	5.3	1.4	
Smoking by father				0.0001
Yes	76 (53.9)	13.4	2.4	
No	65 (46.1)	7.3	3.1	
Smoking by both mother and father				0.0001
Yes	11 (7.8)	16.3	3.7	
No	130 (92.2)	11.4	1.2	
Smoking by a family member				0.0001
Yes	86 (61.0)	14.3	2.4	
No	55 (39.0)	6.1	2.7	
Hospital emergency visit				0.0001
Ever use	92 (65.2)	12.4	1.4	
Never use	49 (34.8)	8.2	3.6	
Hospital admission				0.0001
Ever use	17 (12.1)	12.4	3.6	
Never use	124 (87.9)	6.2	1.4	
Use of prophylactic medications(s)				0.0001
Ever use	52 (36.9)	6.7	2.8	
Never use	89 (63.1)	10.4	2.3	
Appropriateness of prophylactic medication (n=52)				0.007
Appropriate	37 (71.2)	4.7	2.5	
Inappropriate	15 (28.8)	7.3	3.4	

Table 3: Multiple linear regression coefficients and equation for TPSA during the current academic year in Al-Khobar QDAs

Independent variable	Coefficient value	SE (B)	95% CI	p-value
Constant	11.54	2.86	5.93, 17.14	0.0001
Presence of a smoking family member	6.03	2.83	0.48, 11.58	0.035
Socioeconomic class	-1.63	0.68	-3.0, -0.32	0.015
Use of prophylactic medication(s)	-1.7	0.45	-2.58, -0.81	0.0002
Visit to hospital Emergency Room	1.98	0.17	1.65, 2.31	0.0001

Equation: TPSA = 11.54 + 6.03 (presence of a smoking family member) – 1.63 (socioeconomic class) – 1.7 (use of prophylactic medication(s) + 1.98 (visit to hospital Emergency Room)
 $R^2=0.48$, p-value <0.00001, SE=Standard Error, CI= Confidence Interval

A total of 223 (15 %) schoolboys were found to belong to upper socio-economic class families as against 756 (51 %) and 503 (34 %) in the middle and lower socio-economic classes, respectively. No statistically significant difference was found among QDAs and non-QDAs regarding their socio-economic class, chi-square = 3.46, $p > 0.12$ (Table 1).

There was a statistically significant difference in MPSA during the current academic year among QDAs (13.6 ±3.4 days) and non-QDAs (3.7±2.2 days), Z-test= 33.8, $P<0.0001$ (Table 1).

Table 2 shows that the sample rate of the presence of pets at home among QDAs as 51% while the rates of presence of a smoking family member, father and both parents were 61%, 54.0%, 8.0%, respectively. It was interesting to find that all mothers who smoked were married to husbands who also smoked (fathers of QDAs). The rate of QDAs who had visited the emergency room was 65.0% and it was 12.0% for those who had been admitted to hospital, due to bronchial asthma. Only 37.0% of QDAs were found to have used prophylactic medication(s), and 71.0% of these users had not used them appropriately.

Association between MPSA and factors in schoolboys' characteristics

The highest prevalence of QDA was 35.0 % (49/141), and was among schoolboys aged between 12-15 years (Table 1); however, the MPSA was found to be associated

significantly and positively with younger QDAs (Table 2). Similarly, MPSA was found to be associated significantly and positively with the QDAs' decreasing socioeconomic level, pets at home and with a smoking family member, father or both parents. The MPSA was also found to be associated positively with QDA boys who had visited the emergency room or who had been admitted to hospital due to bronchial asthma. However, significantly negative associations were found between MPSA and QDAs who had ever used prophylactic medication(s) and among those who used them appropriately.

QDAs from the lower socioeconomic class (26%) were found to have used prophylactic medication(s) significantly less than QDAs from upper and middle socioeconomic classes together (44%), chi-square=4.6, $P<0.025$. However, QDAs from the lower socioeconomic class who were found to have attended the hospital emergency room and who had been admitted to hospital due to bronchial asthma (81% and 21%) were significantly more than QDAs from upper and middle socioeconomic classes together (55% and 6%), chi-square=10.1 and 7.3 with $P<0.005$ and $P<0.01$, respectively.

Multiple linear regression for TPSA during the current academic year

Table 3 shows the multiple linear regression coefficients and equation for the TPSA during the current academic year. The

presence of a family member who smoked and the history of visits to the hospital emergency room were found to correlate positively with TPSA, while the socioeconomic class of the family and the history of the use of prophylactic medications correlated negatively with TPSA. The variability in these 4 factors could explain up to 48% of the variation of TPSA during the current academic year.

DISCUSSION

The response rate of 95.6% in this study was encouraging. This was probably due to the easy non-invasive method used, and the cooperation of schoolteachers and families. This supports previously reported successes using self-administered questionnaires on bronchial asthma.^{5,8,10,11,18}

In support of similar findings from previous studies,¹⁹⁻²¹ MPSA among asthmatic boys found in this study was significantly more than among non-asthmatic boys. Similar to earlier findings reported, there was no significant difference in socioeconomic class between QDAs and non-QDAs, excluding the variation of this factor as a possible cause for the difference in this study.²⁰ While MPSA among QDAs was also found to be higher than the same reported in other similar studies (22-24), this study is in accordance with earlier findings suggesting the decrease of the period of school absenteeism among asthmatic children as they got older.²⁰

In this study, socioeconomic class was not related to the presence or absence of QDA. Our finding is therefore, consistent with earlier similar studies here in Saudi Arabia,^{11,12} Arab²⁵ and other countries.²⁶⁻²⁹

Our results, consistent with the findings of others showed that a period of absenteeism from school (an indicator of the severity of bronchial asthma) was significantly associated with low socioeconomic class,³⁰ history of emergency

hospital visits,¹ hospital admissions,^{1,30,31} non- or under-use of prophylactic medication(s),^{22,32-37} parental or a family member smoking,³⁸ and presence of pets at home.³⁸

The rates of those who had attended hospital in emergency and who had been admitted to hospital in this study, were higher than those in the reports of other investigators.^{1,30,31} TPSA together with histories of emergency hospital visits and hospital admissions are well-recognized reflections of the degree of severity of bronchial asthma.^{1,3,31} In this work, asthmatic children belonging to families from lower and to a lesser extent middle socioeconomic classes were at a higher risk of such impacts. Similar findings were reported earlier.³⁰

These findings should be taken into consideration when designing and providing health care for this particular group of asthmatics. It is well documented that severe asthma is generally most prevalent in the lower socioeconomic class^{28,29} and that the lack of awareness of the varying degrees of severity of asthma may have resulted in the conflicting results in studies in relation to the association with socioeconomic class.^{28,29}

Compared with similar earlier work,²² the rate of those who had used prophylactic medication(s) in this study was comparatively low, indicating a high rate of undertreatment. Reports have shown that absence from school was reduced by 10-fold³⁷ and that overall disability because of asthma had fallen by about 50%³⁴ after the initiation of prophylactic medications. Though doctors in Saudi Arabia were known to diagnose asthma early and readily,^{5,10,11} this study proves that undertreatment is still a problem requiring resolution.

The multiple linear regression model for TPSA (response variable) had a reasonable

multiple correlation with the explanatory variables. The goodness of fit represented by the multiple regression coefficient was acceptable for similar studies, explaining reasonably the variability in TPSA. Similar associations between the response variable and some of the explanatory variables have been documented by earlier investigators.^{1,30,33,38} The association between these explanatory variables and TPSA can establish the basis in any screening program for bronchial asthma among school children.

This study may be considered a base line for further, broader studies covering a wider range of ages and female children in the same area in the future. Based on the results of this study, those in authority in the Ministry of Health and Education may consider investigating the reasons beyond the current situation. More effort should be exerted in providing health education to asthmatic children and their parents in an effort to address this problem and factors that contribute to its severity. Primary care physicians should be aware of such environmental factors as smoking and the presence of pets at home that are associated with poor asthmatic management outcome. They should also encourage parents to adhere to instructions on proper follow up and the use of prophylactic medications. Physicians and schoolteachers may consider school absentee records as an indicator of the severity of bronchial asthma among schoolboys in Al-Khobar city. Asthmatic schoolboys with a high rate of absence from school should be screened for possible associated factors such as the presence of a family member who smokes, a reduction or the lack of prophylaxis, visits to hospital emergency room, and belonging to the lower socioeconomic class. It is envisaged that the modification of some or all of these factors would moderate the severity and the disability associated with this disease and

lessen TPSA. More attention may be directed towards asthmatic children belonging to socioeconomically disadvantaged families.

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