

Hayfever is associated with a significant detrimental impact on exam performance in UK teenagers: case control study

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Background

Seasonal allergic rhinitis (hayfever) affects a large proportion of the paediatric population with a peak onset in adolescence. Symptoms can be irritating and distracting and, in studies using simulated exam conditions, have been shown to impair concentration and learning ability in children. Critical student exams in the UK are held during the peak grass pollen season; the aim of the current study was to assess whether hayfever is associated with adverse exam performance in UK adolescents.

Participants and methods

- Case-control study in students sitting national exams in 3 subjects (English, maths & science)
- All students aged 15/16 (n=3286) in 14 schools in the West Midlands area of the UK were invited to participate in the study via parental letter and consent
- A questionnaire asking about socio-demographic information, respiratory health, smoking, and hayfever treatment was developed (using, where appropriate, validated questions from the ISAAC study) and distributed in April 2004
- On each exam day (May-June 2004) a further questionnaire regarding symptoms and medication use on that day was administered
- Students' winter ('mock') and summer (final) exam grades were collected by each school
- Cases were those students who dropped at least one grade in at least one subject between mocks and final exams
- Univariate comparisons between groups of students according to case status, smoking and other determinants were made using chi-squared tests and Mann-Whitney tests
- Mean symptom scores were calculated from all symptom scores reported on exam days (score

"no symptoms"; 10="bad symptoms")

- Crude associations between the hayfever exposures of interest were examined using logistic regression
- To adjust for differences between schools, associations with case status were quantified using multilevel regression models, with the school defined as a nested cluster. All models were adjusted for sex and smoking
- Results presented as Odds Ratios

Results

- 2282/3286 (72%) questionnaires were completed

Case status

- 662/1862 (36%) dropped at least 1 grade in at least 1 subject
- Factors associated with being a case were male sex (chi-squared test p=0.003), cigarette smoking (p<0.001) and school (p<0.001)

Relationship between hayfever, medication use and case/control status

- On any particular exam day, approximately half of all students reported symptoms consistent with hayfever
- Results from the adjusted multilevel models revealed that cases were more likely than controls to have had hayfever symptoms (OR 1.4; 95% CI 1.1, 1.8 p=0.002), taken any hayfever medication (OR 1.4 (1.1, 1.7) p=0.01) or taken sedating anti-histamines (OR 1.7 (1.1, 2.8) p=0.03) on any exam day
- Cases reported slightly higher average symptom scores (median 0.67 [range 0-9.83] versus 0.33 [0-10]; p=0.01)
- When categorized according to symptom severity, this data also displayed a dose-response association:

	Cases (n=662)	Controls (n=1172)	Odds ratio (95% CI)	p-value
mean symptom score;				
0	271 (41.4%)	549 (47.2%)	1.00	0.02
>0 – 2	121 (18.5%)	221 (19.0%)	1.27 (0.96, 1.68)	
>2 – 5	148 (22.6%)	228 (19.6%)	1.39 (1.06, 1.82)	
>5	115 (17.6%)	165 (14.2%)	1.48 (1.09, 1.99)	

- This exposure-response association was also found when the analysis was restricted to the 1010 students who had reported hayfever in the Spring questionnaire (OR 1.64 [1.01, 2.68], OR 2.07 [1.33, 3.24], OR 2.07 [1.31, 3.26]; p=0.004)

Hayfever symptoms and medication use

- 51% (1153) students reported symptoms indicative of hayfever
- 21% (485) reported a diagnosis of hayfever by their nurse or doctor
- 25% (570) reported a diagnosis of asthma
- 20% (461) smoked cigarettes
- 22% (502) reported taking hayfever medication

Discussion

In summary, current symptomatic hayfever in children is associated with a 40% increase in the risk of dropping an exam grade between summer and winter; for those taking hayfever medication and for those taking sedating medications the risk increases were 40% and 70% respectively. The symptoms of hayfever are often trivialised by patients, parents, teachers and exam boards; these findings however highlight their disruptive nature and the additional impact of sedating antihistamines. Consideration should be given to changing the timing of important exams to avoid the pollen season.

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