Exercise-induced bronchoconstriction by ethnicity and presence of asthma in British nine year olds

Caroline O H Jones, Sameena Qureshi, Roberto J Rona, Susan Chinn

Abstract

Background – The prevalence of exercise-induced bronchoconstriction among British children by ethnicity has not been studied.

Methods – Peak expiratory flow rate (PEFR) was measured before and after an exercise challenge test using a cycle ergometer in 593 nine year olds from Scottish and inner city English schools. Logistic regression analysis was carried out to assess the association between changes in PEFR with exercise by reported asthma, ethnicity, and sex.

Results – The probability of exercise-induced bronchoconstriction was greater among the asthmatics than in either the children without asthma attacks or wheeze, or in the children with only wheeze (p <0.01). Asian children were 3.6 times more likely to have exercise-induced bronchoconstriction than white inner city children, and also were more likely to have exercise-induced bronchoconstriction than those from the other ethnic groups (p <0.01).

Conclusion – Exercise challenge can assess the prevalence of asthma in the community and detect under-reporting of asthma in ethnic minorities.

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Keywords: exercise-induced bronchoconstriction, asthma, ethnicity, children.

With the exception of the data provided by Burr and his colleagues on Welsh children, little information is available on the prevalence of exercise-induced bronchoconstriction in British children. Data are not available on the prevalence of exercise-induced bronchoconstriction in children of different ethnic groups, nor on the relationship between parents' reports of asthma attacks or wheezing and exercise-induced bronchoconstriction.

In 1992 the scope of the National Study of Health and Growth (NSHG) was increased to include measures of cardiovascular fitness in nine year olds and the peak expiratory flow rate (PEFR) of the participating children was measured before and after an exercise test. These data allowed us to assess the prevalence of exercise-induced bronchoconstriction according to the prevalence of reported asthma and ethnic origin.

Methods

Details of the sample selection for the NSHG have been published elsewhere. Briefly, in even years the survey covers two samples, an English representative sample and half of a Scottish representative sample, while in odd years the survey is undertaken in English inner city areas, half of which have a high proportion of Afro-Caribbeans or children originating from the Indian subcontinent (Asians), as well as in the other half of the Scottish representative sample. The data reported in this paper were collected in 1993, which was a year in which English inner cities and half of the Scottish sample were studied. The Scottish sample only included white children from rural and urban geographical areas. The exercise testing was carried out on children who were between 8.5 and 9.5 years old. As time for exercise testing was limited to one week in each study area, not all eligible children who had parental consent could be tested for exercise-induced bronchoconstriction, so testing was started either from the beginning or the end of the alphabetical class list by random allocation. PEFR measurements were made using a mini-Wright peak expiratory flow meter. After demonstrating the measurement to each child, PEFR was measured three times and the mean of the three values taken as the PEFR for that child. PEFR was measured before exercise and at five and 10 minutes after the completion of exercise. The exercise test consisted of six minutes of continuous cycling on a cycle ergo-
Asthma status was adjusted for each exercise-induced bronchoconstriction (EIB) according to ethnic group and asthma status, each adjusted for sex, height, and the other variable.

Table 2  Prevalence, odds ratio (OR) and 95% confidence interval (95% CI) for exercise-induced bronchoconstriction (EIB) according to ethnic group and asthma status, each adjusted for sex, height, and the other variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>EIB prevalence</th>
<th>EIB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>No (%)</td>
</tr>
<tr>
<td>Ethnic group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White inner city</td>
<td>155</td>
<td>7 (4.5)</td>
</tr>
<tr>
<td>Afro-Caribbean</td>
<td>55</td>
<td>5 (9.1)</td>
</tr>
<tr>
<td>Asian</td>
<td>138</td>
<td>17 (12.3)</td>
</tr>
<tr>
<td>Other</td>
<td>54</td>
<td>4 (7.4)</td>
</tr>
<tr>
<td>Scottish</td>
<td>191</td>
<td>5 (2.6)</td>
</tr>
<tr>
<td>Asthma status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asthma attacks</td>
<td>31</td>
<td>3 (9.4)</td>
</tr>
<tr>
<td>Wheeze, no asthma</td>
<td>46</td>
<td>1 (2.17)</td>
</tr>
<tr>
<td>No asthma, no wheeze</td>
<td>516</td>
<td>31 (6.00)</td>
</tr>
</tbody>
</table>

The prevalence of exercise-induced bronchoconstriction was highest among the reported asthmatics (19%), intermediate in the non-asthmatic non-wheezing group (6%), and lowest (2%) among the 46 wheezers with no asthma attacks (table 2). These differences were significant after adjustment for ethnic background, height, and sex (p<0.01). The prevalence of exercise-induced bronchoconstriction was greatest among the Asian children (12%) and least among the white Scottish children (3%). The difference between ethnic groups was significant (p<0.01) and the odds ratio for exercise-induced bronchoconstriction was 3.6 in Asian children compared with white inner city children. These results were virtually unchanged on adjusting for initial PEFR. Seventeen Asian children developed exercise-induced bronchoconstriction whereas only 10 were reported as having asthma attacks or wheeze by their parents.

Discussion

The prevalence of exercise-induced bronchoconstriction in those who were reported as being non-asthmatic by their parents (including both wheezers and non-wheezers) was 4.4%, slightly less than that found in other studies.56

The prevalence of exercise-induced bronchoconstriction in asthmatics undertaking the test without inhaler use was lower (19%) than the 20–63% for non-selected asthmatics reported elsewhere.44

The prevalence of exercise-induced bronchoconstriction among asthmatics may have been reduced by the exclusion from the analysis of three asthmatic children who did not finish the cycle ergometer test and 20 who used an inhaler on the morning of the test. If all those excluded had exercise-induced bronchoconstriction, the percentage would have increased from 19% to 48%. With a less extreme assumption, say 60% of those excluded had exercise-induced bronchoconstriction, the prevalence would have been 31%. This suggests that the reporting of asthma by parents correlates to some extent with a child’s bronchial response to exercise despite the known fact that exercise testing using a cycle ergometer is a less potent trigger for exercise-induced bronchoconstriction than free or treadmill running.7

Children of Asian origin were found to have a considerably higher prevalence of exercise-induced bronchoconstriction (12%) than those from any of the other ethnic groups (3–9%). This is interesting because, with the exception of Asian children, there was a correspondence between the reporting of asthma attacks by parents (table 1) and exercise-induced bronchoconstriction in their children (table 2). The perception of asthma by Asian parents is also contradicted by the larger number of casualty and hospital admissions among Asians than among white British subjects.88 A possible explanation for our findings is that some Asian
parents in our study did not understand the terms “wheeze” and “asthma” despite the use of a bilingual questionnaire.

This study shows, in an unselected sample, that a high percentage of children with asthma attacks have exercise-induced bronchoconstriction and that Asian parents may underreport asthma and wheeze in comparison with other ethnic groups in Britain.

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