Adolescents with wheeze have increased risk of additional health problems. 

The Young–HUNT study, Norway

Elin Tollefsen a,b,⁎, Arnulf Langhammer c, Leif Bjermer d, Nanna Kurtze c, Turid L. Holmen c

⁎ Corresponding author. Norwegian University of Science and Technology, Department of Public Health and General Practice, MTFS, Rode Kors-bygget, Eirik Jarls gt. 14, N-7489 Trondheim, Norway. Fax: +47 73592517.

E-mail address: elin.tollefsen@ntnu.no (E. Tollefsen).

Available online 19 October 2006

Abstract

Objective. To explore the hypothesis of an association between current wheeze and other health problems in adolescence and to investigate any sex differences.


Results. All subjective health problems were significantly more prevalent in current wheezers compared to non-wheezers (frequent headache: girls 18% vs. 9%, boys 8% vs. 3%; frequent neck and shoulder pain: girls 10% vs. 5%, boys 6% vs. 2%; frequent joint and muscle pain: girls 6% vs. 2%, boys 6% vs. 2%; and frequent abdominal pain: girls 10% vs. 3%, boys 3% vs. 1%). In both sexes, adjusted for covariates, current wheezers had statistically significant increased risk of reporting frequent headache (girls OR=2.0, boys OR=2.9), frequent neck and shoulder pain (girls OR=1.9, boys OR=3.3), frequent joint and muscle pain (girls OR=2.7, boys OR=3.5) and frequent abdominal pain (girls OR=2.7, boys OR=2.0).

Conclusions. Current adolescent wheezers reported more additional health problems compared to non-wheezers. Even if girls reported more symptoms in general, the associations were stronger in boys. The findings are important for the clinical approach to teenage wheezers and should increase doctors’ awareness of coexistence of other health complaints in these patients.

© 2006 Elsevier Inc. All rights reserved.

Keywords: Adolescence; Asthma; Headache; Muscle pain; Abdominal pain; Wheeze

Introduction

Wheeze is a common symptom of bronchial obstruction in all age groups. Among adolescents, the prevalence rates of wheeze are varying between countries (from 10.9% in Switzerland 1999/2000 (Braun-Fahrlander et al., 2004) to 29.1–32.2% in Australia, New Zealand, Ireland and UK (ISSAC Phase One 1994/1995)) (Asher et al., 1998) and even within countries (Selnes et al., 2005).

Few previous papers have addressed an association between wheeze or asthma and other common health problems among adolescents. Goldney et al. (2003) found a positive association between asthma and depression. Caffarelli et al. (2000) identified a subgroup of children with asthma and gastrointestinal symptoms such as abdominal pain, diarrhea and vomiting and concluded that these symptoms might be caused by an atopic gastroenteropathy. Ronchetti et al. (2002), in a study from 2002, stated that pediatric asthma (age range: 6–14 years) was associated with abdominal pain, itching and urticaria. These studies have drawn attention to a possible link between wheeze or asthma and other health problems. Chronic illness, including asthma, can cause stress (Suris et al., 1996), and managing chronic illness can be particularly difficult for adolescents while at school (Sawyer et al., 2003). Awareness of
additional health problems would be important for management of adolescent respiratory symptoms.

The objective of this study was to explore the hypothesis of an association between current wheeze and other health problems in adolescence and to investigate any sex differences.

Methods

Study population

The county of Nord-Trøndelag, situated in the central area of Norway, has about 127,000 inhabitants. The Nord-Trøndelag Health Study (HUNT), conducted in 1995–1997, invited all inhabitants 13 years and older to a large population-based study (www.hunt.ntnu.no). A total of 9917 students were invited to participate in the youth part of the study; Young–HUNT.

The students completed a comprehensive self-administered questionnaire including questions on health and lifestyle during one school hour in an exam setting. The questionnaire included questions on respiratory symptoms based on the International Study of Asthma and Allergy in Childhood (ISAAC, 1993) questionnaire. Within a month after completing the questionnaire, standardized measures of height and weight were performed. Students were light clothed without shoes. Height was read to the nearest cm and weight to the nearest 1/2 kg.

Ethics

All participants, and parents of children under the age of 16 years, signed a written consent to take part in the study. The study was approved by the Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate Board.

Variables

Current wheeze was defined as “wheeze last 12 months”. Current doctor-diagnosed asthma was defined as “wheeze last 12 months” and “asthma diagnosed by a doctor”. Other health problems were defined as yes to questions on frequent headache, frequent neck and shoulder pain, frequent joint and muscle pain or frequent abdominal pain last 12 months, as compared to those reporting these symptoms as never, rarely or from time to time. Current smoking was defined as yes to “daily or occasional smoking” or reported number of cigarettes smoked daily. Environmental smoking was defined as exposure to smoking at home by mother, father or siblings. For body mass index (BMI), we used the International Obesity Task Force definition described by Cole et al. (2000). Each sex and age (by half year) has percentile cutoff points for overweight and obesity. The overweight group included those defined as overweight or obese. Above the age 17, adult cutoff points are used, overweight being defined as BMI ≥ 25 kg/m².

Statistical analyses

SPSS for windows version 13.0 (SPSS Inc, Chicago, Illinois) was used for all analyses. Descriptive statistic was derived from 2 × 2 contingency tables with use of Pearson chi-square tests. Frequent headache, frequent neck and shoulder pain, frequent joint and muscle pain or frequent abdominal pain last 12 months, as compared to those reporting these symptoms as never, rarely or from time to time. Current smoking was defined as yes to “daily or occasional smoking” or reported number of cigarettes smoked daily. Environmental smoking was defined as exposure to smoking at home by mother, father or siblings. For body mass index (BMI), we used the International Obesity Task Force definition described by Cole et al. (2000). Each sex and age (by half year) has percentile cutoff points for overweight and obesity. The overweight group included those defined as overweight or obese. Above the age 17, adult cutoff points are used, overweight being defined as BMI ≥ 25 kg/m².

Results

The participation rate in Young–HUNT 1995–1997 was 89%. Data from 8817 students aged 13–19 years (girls 49.7%) were eligible for analyses. Mean age was 15.5 years.

Current wheeze and the other health problems were 50–100% more prevalent in girls compared to boys (Table 1). About 30% of current wheezers reported additional doctor-diagnosed asthma (girls n=393, boys n=314).

Girls and boys who reported current wheeze had a significantly higher prevalence of frequent headache, frequent neck and shoulder pain, frequent joint and muscle pain and frequent abdominal pain than those reporting no current wheeze (Table 2). Except for frequent joint and muscle pain, the other health problems were reported significantly more often in girls compared to boys.

The prevalence of frequent abdominal pain among girls without menstrual debut (n=291) was 4.8%, 95% CI (2.3–7.3), among girls with menstrual debut the prevalence was 5.6%, 95% CI (4.9–6.3). Among those reporting current wheeze, current smoking was more prevalent among those without doctor-diagnosed asthma (girls 46.1%, boys 33.1%) compared to those with doctor-diagnosed asthma (girls 10.8%, boys 8.7%).

Adjusted for current smoking, age, environmental smoking and overweight, current wheezers had statistically significant increased risk of reporting frequent headache, frequent neck and shoulder pain, frequent joint and muscle pain and frequent abdominal pain (Table 3). Compared to non-wheezers, wheezing girls had twice the risk of reporting additional health problems, while wheezing boys had triple risk of reporting such health problems. The interaction between sex and current wheeze was significant in all models, supporting stronger associations in boys compared to girls.

Adjusted for the same covariates, we found a similar pattern for current doctor-diagnosed asthma, with asthmatics having increased risk of reporting other health problems (Table 3). The associations were weaker than for current wheeze; however, the number of adolescents who reported current doctor-diagnosed asthma was lower compared to adolescents with current wheeze only.

Discussion

In this unselected population of 8817 adolescents, current wheeze was significantly associated with other health problems in both sexes. Even if girls reported more symptoms in general, the associations were stronger in boys.

We have previously from the same population reported a higher prevalence of current wheeze among girls compared to boys (Tollefsen et al., 2006). The findings confirmed a high prevalence of adolescent wheeze as reported by Asher et al. (1998); they reported a prevalence of wheeze of 32.2% among 13–14 years old in UK. Compared to doctor-diagnosed asthma, wheeze is an unspecific symptom of bronchial obstruction commonly used in epidemiological studies. Current smoking was more common among wheezers than among those who additionally reported doctor-diagnosed asthma. Holmen et al.
Table 1
Prevalence of current wheeze, other health problems and lifestyle factors in an unselected population of adolescents (N=8817) aged 13–19 years, stratified by sex

<table>
<thead>
<tr>
<th>Health problems</th>
<th>Total population, N=8817</th>
<th>Girls, n=4384</th>
<th>Boys, n=4433</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>95% CI</td>
<td>%</td>
</tr>
<tr>
<td>Current wheeze</td>
<td>25.8</td>
<td>(24.9–26.7)</td>
<td>30.6</td>
</tr>
<tr>
<td>Current doctor-diagnosed asthma</td>
<td>8.0</td>
<td>(7.4–8.6)</td>
<td>9.0</td>
</tr>
<tr>
<td>Frequent headache</td>
<td>7.7</td>
<td>(7.1–8.3)</td>
<td>11.6</td>
</tr>
<tr>
<td>Frequent neck and shoulder pain</td>
<td>4.6</td>
<td>(4.2–5.0)</td>
<td>6.7</td>
</tr>
<tr>
<td>Frequent joint and muscle pain</td>
<td>3.2</td>
<td>(2.8–3.6)</td>
<td>3.6</td>
</tr>
<tr>
<td>Frequent abdominal pain</td>
<td>3.4</td>
<td>(3.0–3.8)</td>
<td>5.4</td>
</tr>
<tr>
<td>Frequent smoking</td>
<td>20.9</td>
<td>(20.1–21.8)</td>
<td>23.0</td>
</tr>
<tr>
<td>Environmental smoking</td>
<td>54.1</td>
<td>(53.1–55.1)</td>
<td>54.2</td>
</tr>
<tr>
<td>Overweight</td>
<td>17.5</td>
<td>(16.7–18.3)</td>
<td>17.3</td>
</tr>
</tbody>
</table>


(2000) have previously, in the same population, found that compared with nonsmokers, both boys and girls who smoked daily reported poorer general health and significantly more headaches, neck and shoulder pain, muscle and joint pain and abdominal pain. In the present study, regardless of adjustment for current smoking, the associations between current wheeze and other health problems were significant.

Few previous papers have addressed an association between wheeze or asthma and other common health problems among adolescents. Muscle pain in adolescents with wheeze may be a result of muscular tensions in general, excessive use of respiratory muscles as found in wheezing illness, anxiety caused by the wheezing illness itself or unknown causes. Muscular tensions may also lead to tension-type headaches. Pediatric headache or migraine is debated in several papers (Fearon and Hotopf, 2001; Pakalnis et al., 2005), but associations in migraine are mostly aimed toward psychiatric problems (Lake et al., 2005; Torelli and D’Amico, 2004). Glucocorticosteroids may induce myopathy (Owezarek et al., 2005). Our data were obtained in 1995–1997, prior to common reactivity and lifestyle factors have been discussed as possible reasons for the sex difference in wheeze (Nicolai et al., 2001; Tollefsen et al. 2006; Zimmerman et al., 2000), but so far their role of having asthma or not, duodenal abnormalities (airway-like inflammation of gut mucosa) similar to those observed in the bronchial mucosa in asthma was described by Wallaert et al. (1995). On the opposite, Strachan et al. (1996) stated that an atopic predisposition did not explain the association between asthma or wheezy bronchitis and recurrent abdominal pain. In our study, we found an association between current wheeze and frequent abdominal pain; however, the role of atopy is beyond the scope of this paper.

Menstrual symptoms might be expected to explain a higher prevalence of frequent abdominal pain in girls compared to boys. In the present study, few girls reported no menstrual debut, but the prevalence of frequent abdominal pain was equal among girls with or without menstrual debut. Both groups of girls reported significantly higher prevalence of frequent abdominal pain compared to boys. The result might indicate that frequent abdominal pain is more common in girls than boys, independent of menstrual symptoms.

Hormonal fluctuations, airway calibre, bronchial hyperreactivity and lifestyle factors have been discussed as possible reasons for the sex difference in wheeze (Nicolai et al., 2001; Tollefsen et al., 2006; Zimmerman et al., 2000), but so far their contribution is uncertain. Adolescent girls have previously been found to report significantly more health complaints (headache, abdominal pain, backache, feeling low, irritability, feeling nervous) compared to boys (Haugland et al., 2001). Wool and Barsky (1994) discussed the possibility of girls and women being more aware and sensitive to their bodies, more accepting of a disease status and more willing to talk about experienced

Table 2
Prevalence of health problems in girls and boys with current wheeze (girls n=1343, boys n=936) and no current wheeze in an unselected population of adolescents (N=8817) aged 13–19 years, stratified by sex

<table>
<thead>
<tr>
<th></th>
<th>Frequent headache</th>
<th>Frequent neck and shoulder pain</th>
<th>Frequent joint and muscle pain</th>
<th>Frequent abdominal pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td></td>
<td>% (95% CI)</td>
<td>% (95% CI)</td>
<td>% (95% CI)</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td>Current wheeze</td>
<td>17.6 (15.6–19.6)</td>
<td>8.1 (6.4–9.9)</td>
<td>10.3 (8.7–11.9)</td>
<td>5.6 (4.1–7.1)</td>
</tr>
<tr>
<td>No current wheeze</td>
<td>8.9 (7.9–9.9)</td>
<td>2.7 (2.2–3.2)</td>
<td>5.1 (4.3–5.9)</td>
<td>1.7 (1.3–2.1)</td>
</tr>
</tbody>
</table>

Current wheeze 2.0 (1.7–2.4) Current doctor-diagnosed asthma 1.5 (1.2–1.8) The Young–HUNT study, Norway (1995–1997).  

Table 3  
Associations between current wheeze or doctor-diagnosed asthma and other health problems in an unselected population of adolescents (N=8817) aged 13–19 years, stratified by sex.

<table>
<thead>
<tr>
<th>Outcome measures</th>
<th>Frequent headache</th>
<th>Frequent neck and shoulder pain</th>
<th>Frequent joint and muscle pain</th>
<th>Frequent abdominal pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Girls</strong> (95% CI)</td>
<td><strong>Boys</strong> (95% CI)</td>
<td><strong>Girls</strong> (95% CI)</td>
<td><strong>Boys</strong> (95% CI)</td>
</tr>
<tr>
<td>Current wheeze</td>
<td>2.0 (1.7–2.4)</td>
<td>2.9 (2.1–4.0)</td>
<td>1.9 (1.5–2.4)</td>
<td>3.3 (2.2–4.8)</td>
</tr>
<tr>
<td>Current doctor-diagnosed asthma</td>
<td>1.5 (1.2–2.1)</td>
<td>1.9 (1.2–3.1)</td>
<td>1.2 (0.8–1.7)</td>
<td>2.1 (1.2–3.6)</td>
</tr>
</tbody>
</table>

The strengths of the study were the large number of participants from an unselected population and a high response rate. There are limitations to our study. Self-reported data may be a restriction to the study, but the questions on respiratory symptoms have previously been validated, confidentiality was stressed and there was a consistency in reporting of health problems and medications (data not shown). Youths not participating was mostly not in school on the day of the study, did not get consent to participate from their parents (less than 1%) or did not want to participate. Non-responders might have been absent from school due to more frequent illness. This potential bias would influence our estimates to a minor extent, as the overall response rate was high and larger number students with health problems could be expected to strengthen the association. In a cross-sectional study, the exposure and disease status are assessed at the same point in time among individuals in a well-defined population. A limitation to this type of descriptive epidemiology is that the survey cannot always distinguish whether the exposure preceded the development of the disease or weather presence of the disease affected the individual’s level of exposure. The term current wheeze may express variations between a few episodes of bronchial obstruction and severe bronchial asthma. Severity is a possible confounder; however, excluding the most likely severe cases of wheeze or asthma (those who used inhaled bronchodilators or inhaled glucocorticosteroids) did not change our estimates. The authors chose additional health variables that are common among adolescents (frequent headache, frequent neck and shoulder pain, frequent joint and muscle pain and frequent abdominal pain). It might be difficult to distinguish whether a health variable is entirely unrelated to wheeze or asthma. In that respect, the chosen variables were by random. Psychological variables such as depression, anger and anxiety were not taken into account in our study and may have contributed to the self-reporting of other health problems in a similar way as described by Niemi et al. (1997) who found that stress and depression was associated with neck and shoulder symptoms among Finnish adolescents.

Conclusion

Current wheeze was significantly associated with other health problems in both sexes. Even if girls reported more symptoms in general, the associations were stronger in boys. The findings may indicate the need of a broader clinical approach in dealing with these patients, thereby suggesting that some of these patients might best be treated by general practitioners, while pulmonary specialists should work as consultants and take care of the most severe cases. Furthermore, additional investigations are needed, as the pathogenesis behind the associations between wheeze and other health problems is not clear.

Acknowledgments

This study was supported by the Norwegian Research Council, the Norwegian State Department of Social and
Health Affairs and the Nord-Trøndelag County Council, Norway.

References


